



**APPROVED**

RECEIVED

MAR 04 2016

BUREAU OF  
ENVIRONMENTAL REMEDIATION

***Soil Excavation Results Report  
Quail Crossing Neighborhood  
Andover Kansas***

Prepared for:  
NuStar Pipeline Operating Partnership L.P.

March 2, 2016  
1641-10



**Soil Excavation Results Report  
Quail Crossing Neighborhood  
Andover, Kansas**

Prepared for:  
NuStar Pipeline Operating Partnership L.P.

March 2, 2016  
1641-10

A handwritten signature in blue ink, appearing to read 'SJH', positioned above a horizontal line.

*Sam Jackson  
Associate Engineer*



*Amanda Spencer, P.G.  
Principal Hydrogeologist*

---

## Table of Contents

1.0 INTRODUCTION .....	1
1.1 Objectives .....	2
1.2 Report Organization .....	2
2.0 SITE DESCRIPTION .....	3
2.1 Geology .....	3
2.2 Groundwater / Aquifer Characteristics .....	3
2.3 Nature and Extent of Gasoline in Soil and Groundwater .....	4
3.0 SOIL EXCAVATION .....	5
3.1 Excavation Procedures .....	6
3.2 ORC Amendment Placement .....	7
3.3 Backfill and Site Restoration .....	7
3.4 Landfarm .....	8
4.0 SOIL SCREENING AND ANALYTICAL RESULTS .....	8
4.1 Soil Lithology, Screening and Sample Collection .....	8
4.2 Soil Analytical Results .....	9
4.3 Nature and Extent of Residual Hydrocarbons in Soil .....	10
5.0 REFERENCES .....	12

### Tables

1	Soil Analytical Data – October 2015
2	Soil Analytical Data, KDHE Samples – October 2015

### Figures

1	Site Location Map
2	Site Vicinity Plan
3	Soil Excavation Area and Cross Section Plan View
4	Cross Section A – A' Showing Vertical Excavation Extent
5	Cross Section A – A' Showing Site Restoration Materials
6	Soil Excavation Area – Sample Locations
7	Soil Excavation Area – Sample Results for GRO and Benzene
8	Soil Excavation Area – Sample Results for TMB and NAP
9	Soil Excavation Area – KDHE Sample Results for GRO and Benzene
10	Soil Excavation Area – KDHE Sample Results for TMB and NAP

---

## Appendices

- A Field Notes
- B Photograph Log
- C Equipment Specifications
- D Analytical Laboratory Reports and QA/QC Review
- E Apex Standard Operating Procedure 2.1

---

## **1.0 Introduction**

This Soil Excavation Report (Report) was prepared by Apex Companies, LLC (Apex) on behalf of NuStar Pipeline Operating Partnership L.P. (NuStar) and describes soil excavation activities performed in the vicinity of a gasoline release from a NuStar refined-petroleum pipeline. As detailed herein, approximately 1,050 cubic yards (yd<sup>3</sup>) of soil were excavated from the ground surface to approximately 20.5 feet below ground surface (bgs) in October 2015. The pipeline release was discovered in 2012 after separate-phase hydrocarbons (SPH) were detected in an irrigation well at 2006 N Colt Court, in the Quail Crossing Neighborhood (the Neighborhood) of Andover, Kansas (the Site; Figure 1). As shown on Figure 2, the NuStar pipeline is located less than 50 feet from the affected irrigation well and the release location is approximately 80 feet north of the affected irrigation well.

In response to the release, NuStar performed a number of emergency response actions, including: (1) inspections and testing of the pipeline; (2) hydrotesting of the identified affected portion of the pipeline; (3) excavation of soil along a 275-foot section of pipeline to identify the release location; (4) excavation and removal of soil containing petroleum constituents along a 45-foot section of pipeline; (4) replacement of a portion of the pipeline; (5) collection and analysis of water samples from the irrigation well at 2006 N Colt Court; (6) field screening of nearby irrigation wells; (7) vacuum and manual removal of separate-phase hydrocarbons (SPH) and water from the irrigation well at 2006 N Colt Court; and (8) deactivation of area irrigation wells and connection of the associated irrigation systems to the municipal water supply. In July through September 2013, a Comprehensive Investigation (CI) and quarterly groundwater monitoring program were implemented. Based on these investigations, NuStar determined that petroleum constituents were present in the vicinity of the release location.

To address the residual petroleum constituents in soil, NuStar proposed to implement a soil interim remedial measure (IRM), consisting of soil vapor extraction (SVE). NuStar performed an SVE pilot test in December 2013 to evaluate the feasibility of SVE technology for remediating petroleum constituents in soil. The pilot test results, which were presented in the *SVE Evaluation and Proposed Soil Investigation Report* (Apex, 2014b), indicated that SVE may be an effective remedial technology to remove petroleum constituents from the subsurface. NuStar presented the preliminary results of the SVE pilot test and a conceptual SVE system design to the Neighborhood in a meeting on February 17, 2014. The conceptual design included design enhancements such as noise mitigation, location of infrastructure, and aesthetic elements. Neighborhood representatives indicated that they would not approve of the construction and operation of an SVE system, and cited a number of reasons for not accepting an SVE system.

In consideration of Neighborhood concerns, NuStar evaluated excavation as a method of removing residual petroleum constituents in subsurface soil. Accordingly, in April 2014, a soil investigation was performed to further refine the understanding of petroleum constituents in the subsurface, and to define the extent of the prospective soil excavation. The investigation was performed in accordance with *SVE Evaluation and*

---

*Proposed Soil Investigation Report* (Apex, 2014b), which was approved by the Kansas Department of Health and Environment (KDHE) on April 3, 2014. Data collected during the 2014 investigation (Apex, 2014b), along with previously collected data, indicated that soil containing petroleum constituents appeared to be limited to the vicinity of the pipeline release and deeper than approximately seven feet bgs.

The results of the 2014 investigation were presented in the *Soil Investigation Report and Proposed Soil Excavation Work Plan* (Apex, 2014c). The work plan described proposed excavation methods and a general excavation design for removing vadose zone soil affected by petroleum constituents. KDHE approved the work plan on August 8, 2014. Subsequently, KDHE requested submittal of a detailed excavation work plan to document more specific materials and methods for the planned excavation. In addition to the standard excavation permit normally required for a project of this scope, the City of Andover requested a survey of the current infrastructure elevations and engineered excavation, backfill, and surface restoration plans. In response to the requests from KDHE and the City of Andover, the *Soil Excavation Work Plan* was prepared and approved by KDHE in August 2015. This Report details the implementation of the Work Plan.

## **1.1 Objectives**

The objective of the excavation described herein was to remove petroleum constituent mass from the subsurface. Removal of source material will ultimately result in improved groundwater quality at the Site. The purpose of this Report is to describe the means and methods that were used to: (1) complete the soil excavation; (2) introduce oxygen releasing compound (ORC Advanced®) into the excavation; (3) document soil conditions at the excavation boundaries; and (4) restore the excavation area.

## **1.2 Report Organization**

This report is organized as follows:

- Site Description (Section 2) – A description of the physical setting of the Site, including local geology and hydrogeology.
- Soil Excavation (Section 3) – A description of the: (1) preparatory activities; (2) methodology for the soil excavation; (3) introduction of oxygen releasing compound (ORC); and (4) backfilling and replacement of road and curb surfaces.
- Analytical Results (Section 4) – A presentation of soil sample methodology and locations, analytical results collected during the soil excavation, and an updated discussion of the nature and extent of gasoline in soil.
- Schedule (Section 5) – A description of ongoing monitoring activities to evaluate the effectiveness of the soil excavation and ORC amendment.

---

## **2.0 Site Description**

This section discusses the physical characteristics of the Site, including geology, hydrogeology, and the nature and extent of petroleum hydrocarbons in soil. The following discussion is based on data obtained during previous investigations (Apex, 2012, 2014a, and 2014b) as well as information presented in reports prepared by the Kansas Geological Survey (Aber, 1991; O'Connor et al., 1982).

### **2.1 Geology**

The regional geology in Butler County consists of unconsolidated sediments, including Tertiary and Quaternary alluvium and Quaternary loess at the ground surface, overlying lower Permian limestone and shale of the Council Grove and Chase Groups (Aber, 1991). O'Connor et al. (1982) report that the uppermost bedrock unit at the Site is the Permian Wellington Formation, which reportedly consists of up to 100 feet of light gray and green silty shale, with some thin limestone and gypsum beds. The Wellington Formation is underlain by the Nolans Limestone formation, which is approximately 20 to 30 feet thick.

Geological conditions at the Site are generally consistent with regional conditions, based on information presented in irrigation well construction logs (surface to 116 feet bgs) and observations in borings (surface to 65 feet bgs) advanced during the CI. At the Site, yellowish-brown clay (loess) is generally encountered from the surface to depths of approximately 10 to 13 feet bgs. The clay is underlain by gray, yellow, and olive brown shale; interbedded clays; and limestone of the Wellington Formation. The Wellington Formation is weathered at the interface between consolidated and unconsolidated sediments. Thin layers of gypsum are occasionally encountered in the shale.

### **2.2 Groundwater / Aquifer Characteristics**

This Section describes the regional groundwater conditions and those observed at the Site.

#### **2.2.1 Regional Conditions**

The Site and surrounding area are generally flat, although regional topography slopes gently to the east, toward the Whitewater River, which is approximately 4 miles east of the Site. O'Connor et al. (1982) report that the uppermost water-bearing unit at the Site is the Wellington Formation. O'Connor et al. (1982) indicate that the productivity and quality of water from the Wellington Formation is limited. A regional groundwater elevation map prepared by O'Connor et al. (1982) indicates that the groundwater level near the Site is approximately 1,320 feet above mean sea level (MSL), with a 0.005 foot per foot (ft/ft) easterly gradient.

O'Connor et al. (1982) also report that the shale units in southwest Butler County are relatively impermeable or of very low permeability with respect to vertical groundwater flow below approximately 50 feet. These

---

conclusions indicate that the potential for vertical migration of contaminants in groundwater below approximately 50 feet is low.

### **2.2.2 Site Conditions**

Observations from 23 borings completed between 2012 and 2015 within 60 feet of the release location showed that vadose zone occurs between the surface and approximately 18 feet bgs (Apex, 2015b). During the 2015 groundwater pilot test, groundwater was observed at depths ranging from 20 to 30 feet bgs in those borings, with the shallowest groundwater observed in boring IB-4, located approximately 15 feet southeast of the release location. Depth-to-groundwater measurements obtained in June 2015 showed groundwater depths of 21 to 34 feet bgs in the vicinity of the release.

The groundwater interface at the Site occurs in lithified or partially lithified material between approximately 18 and 32 feet bgs. Petroleum constituents are generally absent from samples of rock obtained below approximately 31 feet bgs. These conditions are consistent with the description of the Wellington Formation reported by O'Conner et al. (1992), which indicates that the shale units in southwest Butler County inhibit vertical groundwater flow below approximately 50 feet.

## **2.3 Nature and Extent of Gasoline in Soil and Groundwater**

This Section provides a summary of the nature and extent of gasoline in soil and groundwater at the Site.

### **2.3.1 Soil**

Data obtained from samples collected between 2012 and 2015 demonstrate that residual gasoline constituents are present in the vadose zone at depths of 7 to 18 feet bgs in the vicinity of the pipeline release location. A detailed description of the nature and extent of gasoline constituents in the vadose zone is provided in the *Soil Investigation Report and Proposed Soil Excavation Work Plan* (Apex, 2014e), which was approved by KDHE on August 8, 2014. The *Soil Excavation Work Plan* (Apex, 2015c), detailing the implementation aspects, was submitted to KDHE on August 19, 2015. On August 26, 2015, KDHE approved the *Soil Excavation Work Plan*; those excavation activities are described in Section 4.

Gasoline constituents have also been detected in lithified or partially lithified material below the vadose zone at depths between 18 and 31 feet bgs; however, those observations are generally attributed to constituents in groundwater.

### **2.3.2 Groundwater**

The nature and extent of gasoline constituents in groundwater at the Site have been characterized based on samples collected quarterly from a network of 19 groundwater monitoring wells and 17 neighborhood irrigation wells. During the most recent monitoring event (September and October 2015), two groundwater

---

monitoring wells (MW-1 and MW-3) and three pilot test wells (MW-17 through MW-19) exhibited benzene concentrations that exceeded the corresponding KDHE Tier 2 Risk-Based Screening Values (RBSVs) for drinking water. These wells are located near the release location, as shown on Figure 2. The highest concentrations were detected in monitoring well MW-1, which is approximately 50 feet from the pipeline release location.

### **2.3.3 Separate-Phase Hydrocarbons**

Groundwater data collected to date indicate that SPH are limited to the vicinity of the irrigation well at 2006 N Colt Court. SPH have not been observed on the water in any other irrigation wells or monitoring wells at the Site, including several wells in the immediate vicinity of the release location (*i.e.*, well MW-1, which is located 30 feet from the irrigation well at 2006 N Colt Court; and wells MW-17 through MW-19, which are located within 60 feet of the release location).

## **3.0 Soil Excavation**

The soil excavation and surface restoration was performed during the period October 5 through November 5, 2015 in general accordance with the *Soil Excavation Work Plan* (Apex, 2015c), which was approved by KDHE on August 26, 2015. Consistent with the City of Andover requirements, NuStar retained ASM Engineering Consultants, LLC, under subcontract to CDH Incorporated (CDH), to develop excavation and site restoration designs required by the City of Andover. Field notes and photos are presented in Appendix A and B, respectively.

As shown on Figure 3, the excavation consisted of two separate areas: (1) north of the NuStar pipeline, extending to the north of W Mountain; and (2) south of the NuStar pipeline, extending to the south of W Mountain. For the following reasons, the volume of gasoline impacted soil removed was greater than specified in the Work Plan:

1. The Work Plan specified a sloped and benched excavation; the area proposed for excavation depths of up to 17 feet bgs is shown on Figure 3. However, excellent sidewall stability permitted vertical sidewalls in the excavation, rather than the sloped/benched excavation proposed in the Work Plan. Therefore, the actual area excavated to target depths was larger than specified in the Work Plan.
2. The contractors were able to achieve an excavation depth of approximately 19.5 on the north excavation and 20.5 feet bgs on the south excavation. Accordingly, the excavated volume of vadose-zone soil containing petroleum hydrocarbons was larger than anticipated.

As shown in Appendix B (Photo 4), groundwater was observed on the floor of the south excavation. Prior to backfilling, Advanced Formula Oxygen Release Compound (ORC Advanced®) was added to the excavation

---

to enhance aerobic microbial degradation of residual petroleum constituents in the subsurface. Excavated soil and weathered rock were transported off-site for management at the NuStar El Dorado Landfarm.

### **3.1 Excavation Procedures**

This section describes the implementation of the excavation.

#### **3.1.1 Preparatory Activities**

Preparatory activities included Neighborhood notification, identification of underground utilities, and preparation of a traffic control plan.

- On September 8, 2015, the owners of properties in the Quail Crossing Neighborhood were notified of planned excavation activities. On September 29, 2015, KDHE hosted a public exhibit at the Andover Public Library to provide additional detail regarding excavation activities.
- Consistent with the *Soil Excavation Work Plan*, W Mountain was closed to through traffic on October 5, 2015. Road signs specified in the traffic control plan were deployed, and a work exclusion zone was established around the excavation area with a 6-ft chain link fence.
- Underground utilities in the proposed excavation area were surveyed by public and private utility locating contractors. On October 6, 2015, the location and depth of underground utilities in the immediate vicinity of the excavation area (*i.e.*, NuStar pipeline, natural gas line, and municipal water line) were confirmed using air knife excavation. The utilities were marked and a 5-foot protective zone was established around each underground utility.

#### **3.1.2 Asphalt-Concrete Pavement Removal**

On October 6, asphalt-concrete pavement was saw cut at the boundaries of the excavation. Asphalt-concrete was removed with an excavator and front end loader. The asphalt-concrete pavement was transported in trucks with covered half-round trailers to the APAC Missouri and Kansas City (APAC) Augusta asphalt plant (11221 SW US Highway 54 in Augusta, Kansas) for recycling. Baserock, present and separable from the underlying soil, was also transported to APAC's Augusta asphalt plant.

#### **3.1.3 Excavation Area and Depth**

Soil excavation activities were performed on October 7 and 8, 2015 using an excavator (CAT336D); equipment specifications are included in Appendix C. Excavated soil was direct-loaded into trailers and hauled to the NuStar El Dorado Landfarm for treatment. The excavation area is shown on Figure 3 and a generalized cross-section of the excavation is presented on Figure 4. As shown on Figure 4, the soil beneath the NuStar pipeline was previously excavated to a maximum depth of 13 feet bgs (Apex, 2014a).

---

The October 2015 excavation area did not include soil in this limited area from 13 to 20 feet bgs (approximately 120 yd<sup>3</sup>) in order to maintain soil stability in the vicinity of that section of the NuStar pipeline.

**North Excavation.** On October 7, 2015 soil excavation was performed on the north side of the pipeline; approximately 650 yd<sup>3</sup> of material were excavated. As shown on Figure 3, the lateral boundaries of the north excavation on the north, west, and south extents were limited by private property and underground utilities (water piping on the north and west, and the NuStar pipeline to the south). The limits of the excavation did not encroach on those utilities. As shown on Figure 4, the vertical extent of the excavation included soil between the surface and as deep as 19.5 feet bgs; excavation depth was limited by the working range of the excavator (approximately 20 feet bgs).

**South Excavation.** On October 8, 2015, soil excavation was performed on the south side of the pipeline; approximately 400 yd<sup>3</sup> of material were excavated. As shown on Figure 3, the lateral boundaries of the south excavation on the north, west, south, and east extents were limited by private property and underground utilities (municipal water on the west, natural gas pipeline to the south and east, and the NuStar pipeline to the north and east). The limits of the excavation did not encroach on those utilities. The vertical extent of the excavation included soil between the surface and as deep as 20.5 feet bgs; excavation depth was limited by the working range of the excavator (approximately 20 feet bgs). Groundwater was observed on the floor of the excavation, confirming that vadose-zone soil above the water table was removed from the excavation area.

### 3.2 ORC Amendment Placement

After completion of the excavation and prior to backfilling, approximately 1,400 pounds of ORC Advanced® were placed on the floor of the excavations to enhance aerobic degradation of residual petroleum constituents that remain in the subsurface; this amount is roughly equivalent to the weight of ORC Advanced® injected during the groundwater pilot test in March 2015 (Apex, 2015a). A layer of crushed rock was placed with the ORC Advanced® pellets to maintain placement of the pellets at the bottom of the excavation and in contact with the fluctuating groundwater table. The pelletized formulation of the ORC Advanced® product was selected for the Site because it is a safe food-grade compound and generates less dust compared with the powder version. Approximately 300 gallons of water were applied to the ORC after placement, to encourage additional penetration into the formation. In addition, groundwater was observed in the south excavation; confirming that the ORC Advanced® placement is within the depth of fluctuating groundwater.

### 3.3 Backfill and Site Restoration

As shown on Figure 5, the excavation was backfilled with controlled-density fill from the bottom of the excavation to approximately six feet bgs; controlled-density fill fills voids and provides the equivalent of high-

---

strength fill without compaction. The excavation was backfilled with imported granular fill from six feet bgs to approximately one foot bgs; this fill material was compacted to 95 percent standard proctor (ASTM D-698).

Ground surfaces were restored following excavation backfilling. Asphalt-concrete, Portland cement concrete, and landscaped areas were restored in accordance with the Work Plan. In addition, the affected portion of W Mountain from the 2012 excavation was resurfaced; restored surfaces are shown in Appendix B (Photo 7).

In the Work Plan, it was anticipated that a small portion of W Mountain would be closed to through traffic for a period of up to 30 days; however, the work was conducted expeditiously to minimize the length of the closure and that portion of W Mountain was closed for just 15 days (October 5 through October 19, 2015).

### **3.4 Landfarm**

Consistent with the El Dorado Landfarm Permit #737, excavated soil was direct-loaded into trucks with half-round end dump trailers and hauled to the Nustar El Dorado Landfarm for treatment. A backhoe was used to spread the soil in 6- to 12-inch lifts within an earthen berm. The management objective of the landfarm is to optimize moisture content, pH, nutrient and oxygen levels to promote the microbial growth and the subsequent degradation and volatilization of petroleum hydrocarbons in the landfarmed soils. Tilling of the soil was initiated on November 4, 2015 and will continue monthly. After one year, soil samples will be collected to confirm treatment goals (KDHE Tier 2 RBSVs) are achieved. Once treatment goals have been obtained, the soil will be reused on the El Dorado Site.

## **4.0 Soil Screening and Analytical Results**

This section presents the soil analytical results from the excavation extents and excavated material; and provides an updated understanding of the nature and extent of petroleum hydrocarbons in soil. The laboratory data report and a QA/QC review are included in Appendix D.

### **4.1 Soil Lithology, Screening and Sample Collection**

Lithology observed during excavation activities was consistent with conditions observed during previous investigations (Apex, 2014a; 2014c; 2015a). Unconsolidated clay was present from the surface to approximately 12 feet bgs, a partially lithified clay layer was observed from approximately 12 to 15 feet bgs (see Appendix B; Photo 1), and unconsolidated silty clay was observed from 15 feet bgs to the total depth excavated (approximately 20 feet bgs). Groundwater was observed at the bottom of the south excavation (Appendix B; Photo 4).

---

Excavated soil was field screened for VOCs and SPH using a photoionization detector (PID) and sheen tests, in accordance with Standard Operating Procedure (SOP) 2.1, included in Appendix E. Field screening indicated that petroleum impacts were limited to depths from 15 feet bgs to the total depth excavated (approximately 20 feet bgs).

Grab soil samples were selected from excavation extent areas that exhibited the highest potential for petroleum impacts. Several soil samples contained stiff or partially lithified aggregates that did not fit into laboratory-supplied glass jars. To minimize potential volatilization of target constituents, the soil samples were collected in a ziplock bag, sealed, and the soil aggregates were modified to fill the glass jar head space; the sample jar was labelled and immediately placed on ice. The remaining portion of the sample in the ziplock bag was screened for VOCs and SPH using a PID and sheen tests in accordance with SOP 2.1. During the soil sampling process, Apex staff wore disposable gloves; the gloves were changed between each sample location.

As shown on Figure 6, 19 soil samples were collected from the base and sidewalls of the excavation area; samples were collected from depths ranging from 10 to 20.5 feet bgs. Samples were submitted to ALS Laboratory in Houston, Texas for analysis of GRO by Iowa Method OA-1; and BTEX, 2-butanone, n-butylbenzene, naphthalene, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, cyclohexane, isopropylbenzene, and methylcyclohexane by U.S. EPA Method 8260B.

## 4.2 Soil Analytical Results

As discussed in Section 2, the magnitude and extent of petroleum constituents in soil and the necessary extent of excavation was established in the *Soil Investigation Report and Proposed Soil Excavation Work Plan* (Apex, 2014c), which was approved by KDHE on August 8, 2014. This section presents the soil analytical results from the excavation extents and landfarmed soil. Table 1 and Figure 7 show analytical results for excavation extent samples collected in October 2015.

As shown on Figure 9, KDHE personnel collected five soil samples using EPA Method 5035A. Samples were submitted to Continental Analytical Services in Salina, Kansas for analysis of GRO by EPA Method 8015D; and BTEX, 2-butanone, n-butylbenzene, naphthalene, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and isopropylbenzene by U.S. EPA Method 8260B. Table 2 lists October 2015 soil data collected by KDHE personnel.

**North excavation.** As shown on Figure 6, seven soil samples were collected from the base and sidewalls of the north excavation area; the samples were collected from depths ranging from 15 to 19.5 feet bgs. As shown on Figure 7 and in Table 1, constituents were not detected or were detected at concentrations below the KDHE Tier 2 RBSVs in the seven samples. One soil sample was collected by KDHE in the north excavation; consistent with the samples collected by Apex, constituents were not detected or were detected at concentrations below the KDHE Tier 2 RBSVs in the KDHE sample.

---

**South excavation.** As shown on Figure 6, 12 soil samples were collected from the base and sidewalls of the south excavation area; the samples were collected from depths ranging from 10 to 20.5 feet bgs. As shown on Figures 7 and 8, constituents were not detected or were detected at concentrations below the KDHE Tier 2 RBSVs in five samples collected from: (1) the east sidewall at 10 and 15 feet bgs (SW-SE [10'] and SW-SE [15']); (2) the south sidewall at 13 feet bgs (SW-SS [13']); (3) the west sidewall at 17 feet bgs (SW-SW [17']); and (4) the north sidewall at 15 feet bgs (SW-SNE [15']). Constituents were detected at concentrations above the corresponding KDHE Tier 2 RBSVs in seven samples: (1) east sidewall at 17.5 feet bgs (SW-SE [17.5']); (2) two samples collected from the south sidewall (SW-SNM [17'] and SW-SS [16.5']); (3) two samples collected from the north sidewall (SW-SNW [17'] and SW-SNM [17.5']); and (3) two samples collected from the floor of the excavation (Floor SW [20.5'] and Floor SE [19']). As shown on Figure 4, groundwater was observed at 20 feet bgs; approximately five feet to the north of sample *Floor SW* (20.5).

Figures 9 and 10 show analytical results for four samples collected by KDHE from the extents of the south excavation. Constituents were detected at concentrations above the corresponding KDHE Tier 2 RBSVs in the KDHE samples; the analytical results reflect the naturally occurring variability of constituent concentrations in soil at the Site as well as sample collection methods (*i.e.*, KDHE samples were collected using EPA Method 5035A; Apex samples were collected as described in Section 4.1).

### 4.3 Nature and Extent of Residual Hydrocarbons in Soil

The data compiled during the excavation and previous investigations have refined the understanding of the nature and extent of petroleum constituents in soil. Table 1 lists soil data collected during the October 2015 excavation. Field screening data (sheen test and PID measurements) from over 49 soil samples collected during the excavation indicate the absence of VOCs or SPH from the ground surface to approximately 15 feet bgs.

In the north excavation, laboratory analytical data from seven samples show that petroleum constituents either were not detected or were detected at concentrations less than Tier 2 RBSVs on the sidewall and floor extents. Residual gasoline constituents were observed at concentrations above Tier 2 RBSVs on the north, east, and south sidewalls and the floor of the south excavation; however, the exceedances were observed only in samples collected from 16.5 feet bgs or deeper. Additional lateral excavation was not feasible in the south excavation due to utility conflicts; and as evidenced by the presence of groundwater at the base of the excavation, the vertical extent of vadose zone soil was excavated. As detailed in Section 3, ORC Advanced® was applied at the base of the excavation to enhance the degradation of these residual hydrocarbons.

---

#### **4.3.1 Residual Petroleum Hydrocarbons in Vadose Zone Soil**

Based upon previous investigations (Apex, 2014a and Apex, 2014c) and soil data collected in October 2015, the majority of the petroleum hydrocarbon mass observed in vadose zone soil at the pipeline release area was removed during the work outlined herein or the previous soil removal conducted in 2012. Remaining residual petroleum hydrocarbons will not present an ongoing source of degradation to groundwater for the following reasons:

- Exceedances were only observed in samples collected from 16.5 feet or deeper. Groundwater was identified at a depth shallower than 20 feet and ORC was placed in the base of the excavations to enhance degradation; therefore, much of the residual hydrocarbons will be in the zone of the fluctuating groundwater table and will be treated via the ORC.
- The excavation was backfilled and covered by low permeability asphalt concrete which will minimize infiltration of surface water through the underlying vadose zone soils. Without surface water infiltration, there is no mechanism for the petroleum hydrocarbons in the vadose zone soil above the water table to leach and migrate to groundwater. Therefore, the limited soil that is above the fluctuating groundwater table and not exposed to the ORC will also not be exposed to infiltrating surface water.

To evaluate the effectiveness of the work presented herein, NuStar will maintain the quarterly groundwater monitoring and reporting schedule. For the reasons outlined above, concentrations of dissolved-phase hydrocarbons in groundwater near the release area are expected to decrease. Groundwater data, including levels of dissolved oxygen in groundwater, indications of microbial activity, and gasoline constituent concentration trends, will be used to draw conclusions about the effectiveness of the work presented herein.

---

## **5.0 References**

- Aber, J.S., 1991. *Surficial Geology of Butler County, Kansas, Final Report*. Earth Science Department, Emporia State University, KGS Open-File Report 1991-48. April 26, 1991.
- Apex Companies, LLC (Apex), 2012. *Initial Response Report, Separate-Phase Hydrocarbons in Irrigation Well, 2006 Colt Court, Quail Crossing Neighborhood, Andover, Kansas*. July 9, 2012.
- Apex, 2013. *Soil Vapor Extraction Pilot Test Work Plan. Quail Crossing Neighborhood, Andover, Kansas*. November 15, 2013.
- Apex, 2014a. *Comprehensive Investigation Report. Quail Crossing Neighborhood, Andover, Kansas*. February 4, 2014.
- Apex, 2014b. *SVE Evaluation and Proposed Soil Investigation Report. Quail Crossing Neighborhood, Andover, Kansas*. March 28, 2014.
- Apex, 2014c. *Soil Investigation Report and Proposed Soil Excavation Work Plan. Quail Crossing Neighborhood, Andover, Kansas*. July 17, 2014.
- Apex, 2015a. *Groundwater Pilot Test Work Plan. Quail Crossing Neighborhood, Andover, Kansas*. January 16, 2015.
- Apex, 2015b. *First Quarter 2015 Groundwater Monitoring Report. Quail Crossing Neighborhood, Andover, Kansas*. August 19, 2015.
- Apex, 2015c. *Soil Excavation Work Plan. Quail Crossing Neighborhood, Andover, Kansas*. April 15, 2015.
- O'Connor, Howard G., Chaffee, Pamela, and Link, Martha, 1982. *Geohydrology of Southwestern Butler County, Kansas: A Preliminary Report*. Kansas Geological Survey Open File Report 82-2. May 1982.

Table 1  
Soil Analytical Data – October 2015  
Andover Quail Crossing Neighborhood  
Andover, Kansas

Sample Location	Sample Depth (feet bgs)	Sample Date	GRO	1,2,4-Trimethylbenzene	1,2-Dichloroethane	1,3,5-Trimethylbenzene	2-Butanone	Benzene	Cyclohexane	Ethylbenzene	Isopropylbenzene	Methylcyclohexane	Naphthalene	n-Butylbenzene	n-Propylbenzene	Toluene	Total Xylenes
SW-E	16.0	10/7/2015	<0.049	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01
SW-N	16.5	10/7/2015	<0.048	<0.0048	<0.0048	<0.0048	<0.0095	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0095
SW-NE	18.0	10/7/2015	0.35	0.025	<0.0044	0.011	<0.0089	0.022	0.011	<0.0044	0.0064	0.014	0.0067	0.012	0.010	<0.0044	<0.0089
SW-NW	15.0	10/7/2015	2.2	0.090	<0.005	0.26	<0.010	<0.005	0.0080	0.17	0.024	0.012	0.18	0.074	0.12	0.069	0.18
SW-S	15.0	10/7/2015	<0.050	<0.005	<0.005	<0.005	<0.0099	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099
FLOOR-NE	19.5	10/7/2015	0.066	<0.005	<0.0050	<0.005	<0.010	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.010	<0.010
FLOOR-NW	19.0	10/7/2015	0.13	0.028	<0.0048	0.0085	<0.0096	0.027	<0.0048	0.0056	0.0052	<0.0048	0.012	0.0060	<0.0048	<0.0048	0.027
SW-SE	10.0	10/8/2015	<0.050	<0.005	<0.005	<0.005	<0.0099	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099
SW-SE	15.0	10/8/2015	<0.048	<0.0048	<0.0048	<0.0048	<0.0095	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0095
SW-SE	17.5	10/8/2015	37	<b>19</b>	<0.046	1.2	<0.093	<0.046	<0.046	0.13	0.091	<0.046	<b>1.5</b>	0.64	0.44	<0.046	0.76
SW-SNE	15.0	10/8/2015	0.055	0.030	<0.005	0.0077	<0.0099	<0.005	<0.005	0.0073	<0.005	<0.005	0.019	0.0058	<0.005	0.011	0.033
SW-SNM	17.0	10/8/2015	45	<b>12</b>	<0.05	3.9	<0.099	<0.05	<0.05	1.1	0.29	<0.05	<b>2.9</b>	1.7	1.8	0.074	5.6
SW-SNW	17.0	10/8/2015	40	<b>2.1</b>	<0.05	0.56	<0.10	<0.05	<0.05	0.061	0.064	<0.05	<b>0.96</b>	0.39	0.22	<0.05	0.45
SW-SS	13.0	10/8/2015	<0.05	<0.005	<0.005	<0.005	<0.0099	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0099
SW-SS	16.5	10/8/2015	16	<b>1.3</b>	<0.05	0.42	<0.10	<0.050	0.16	0.36	0.080	0.19	<b>0.36</b>	0.25	0.26	0.22	1.2
SW-SSE	17.0	10/8/2015	26	<b>10</b>	<0.048	1.3	<0.097	0.069	0.46	1.3	0.18	0.61	<b>0.35</b>	0.65	0.84	0.53	2.5
SW-SW	17.0	10/8/2015	0.45	<0.0048	<0.0048	<0.0048	0.016	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0048	<0.0097
FLOOR-SE	19.0	10/8/2015	<b>250</b>	<b>6.4</b>	<0.045	2.7	<0.090	<b>0.23</b>	0.61	6.1	0.43	0.64	<b>1.5</b>	0.93	1.3	7.8	24
FLOOR-SW	20.5	10/8/2015	<b>1300</b>	<b>54</b>	<0.050	<b>22</b>	<0.10	<b>0.29</b>	3.2	28	1.8	2.7	<b>9.9</b>	5.9	11	35	130
<b>KDHE Tier 2 Screening Value (soil to groundwater pathway)</b>			<b>50.0</b>	<b>1.07</b>	<b>0.060</b>	<b>5.51</b>	<b>24.15</b>	<b>0.168</b>	--	<b>65.6</b>	<b>65.14</b>	--	<b>0.349</b>	<b>50.9</b>	<b>110</b>	<b>51.2</b>	<b>809</b>

Notes:

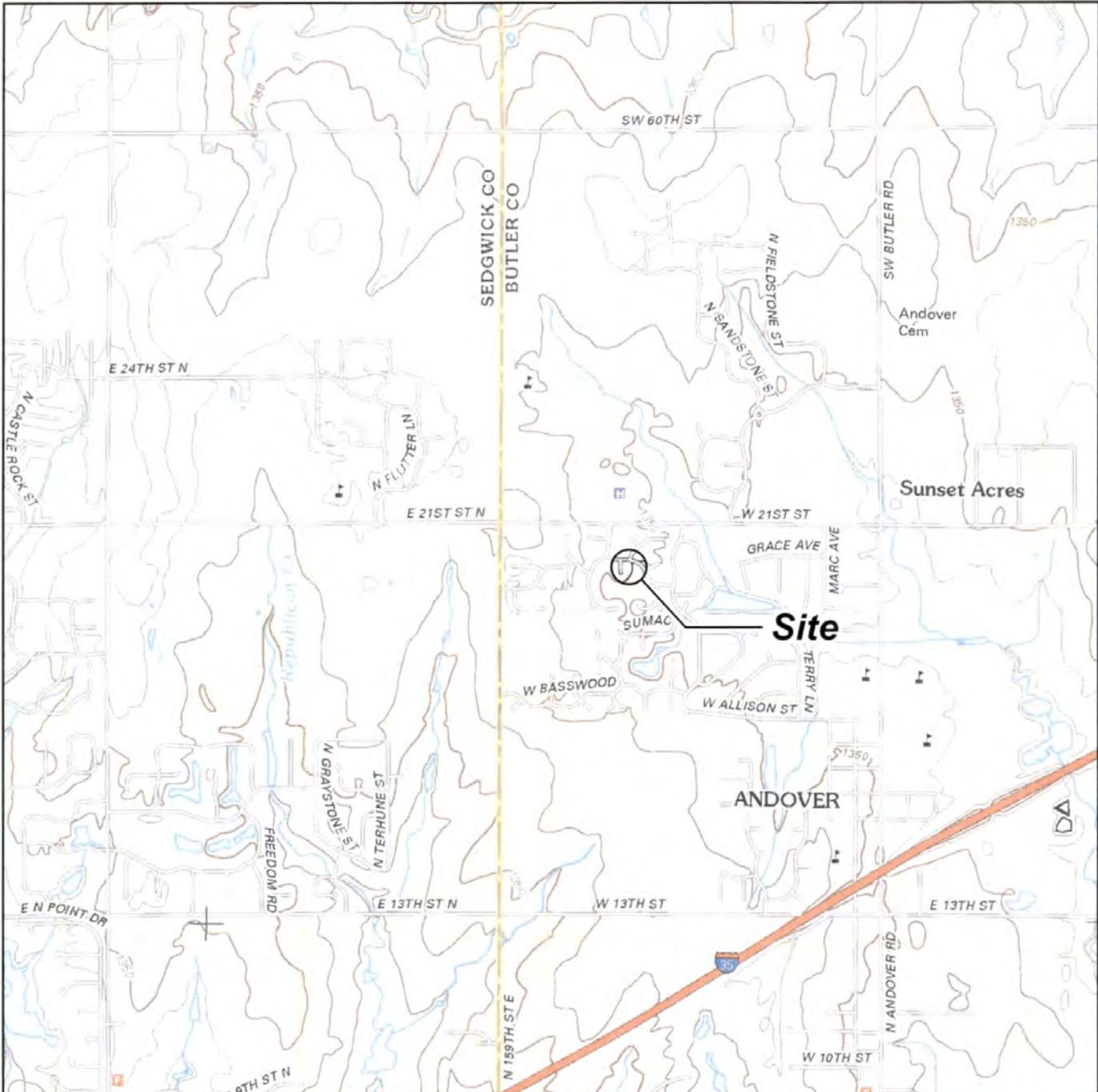
- GRO = Gasoline-range organics quantified by IOWA OA-1.
- Volatile organic compounds by U.S. Environmental Protection Agency (EPA) Method 8260B
- mg/kg (ppm) = Milligrams per kilogram (parts per million).
- Bold** indicates detected concentration above the KDHE screening value
- < = Not detected above the method reporting limit (MRL)
- = A KDHE Tier 2 Risk Based Screening Value has not been established.
- KDHE Soil to Groundwater Screening Values for: (1) VOCs from the *Risk-Based Tier 2 Standards for Kansas, 5th Edition*, October 2010; (2) GRO from BER Policy BER-041, September 1, 2015.
- bgs = below ground surface.

Table 2  
 Soil Analytical Data, KDHE Samples – October 2015  
 Andover Quail Crossing Neighborhood  
 Andover, Kansas

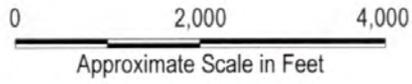
Sample Location	Sample Depth (feet bgs)	Sample Date	GRO	1,2,4 Trimethylbenzene	1,2 Dichloroethane	1,3,5- Trimethylbenzene	2-Butanone	Benzene	Cyclohexane	Ethylbenzene	Isopropylbenzene	Methylcyclohexane	Naphthalene	n-Butylbenzene	n-Propylbenzene	Toluene	Total Xylenes
			Concentrations in mg/kg (ppm)														
S-1	19.5	10/7/2015	<0.130	0.0798	--	0.0241	<0.033	0.0138	--	0.0133	<0.0065	--	0.0355	<0.0065	<0.0132	0.0435	0.108
S-9	15.0	10/8/2015	<0.130	<0.040	--	<0.040	<0.8	<b>1.08</b>	--	0.170	<0.040	--	<0.040	<0.040	<0.040	<0.040	<0.118
S-8	17.5	10/8/2015	31	<b>12.8</b>	--	4.1	<3.0	<b>2.58</b>	--	6.33	0.560	--	<b>1.9</b>	1.0	2.64	8.49	21.6
S-11	17.0	10/8/2015	<b>350</b>	<b>8.68</b>	--	2.8	<4.0	<b>5.2</b>	--	5.68	0.480	--	<b>0.940</b>	0.890	2.0	10.7	9.3
S-3	20.5	10/8/2015	<b>3800</b>	<b>309</b>	--	<b>97.9</b>	<80.0	<b>12.0</b>	--	<b>199</b>	15.0	--	<b>50.0</b>	<b>17.0</b>	64.6	<b>334.0</b>	798.0
KDHE Tier 2 Screening Value (soil to groundwater pathway)			50.0	1.07	0.060	5.51	24.15	0.168	--	65.6	65.14	--	0.349	50.9	110	51.2	809

Notes:

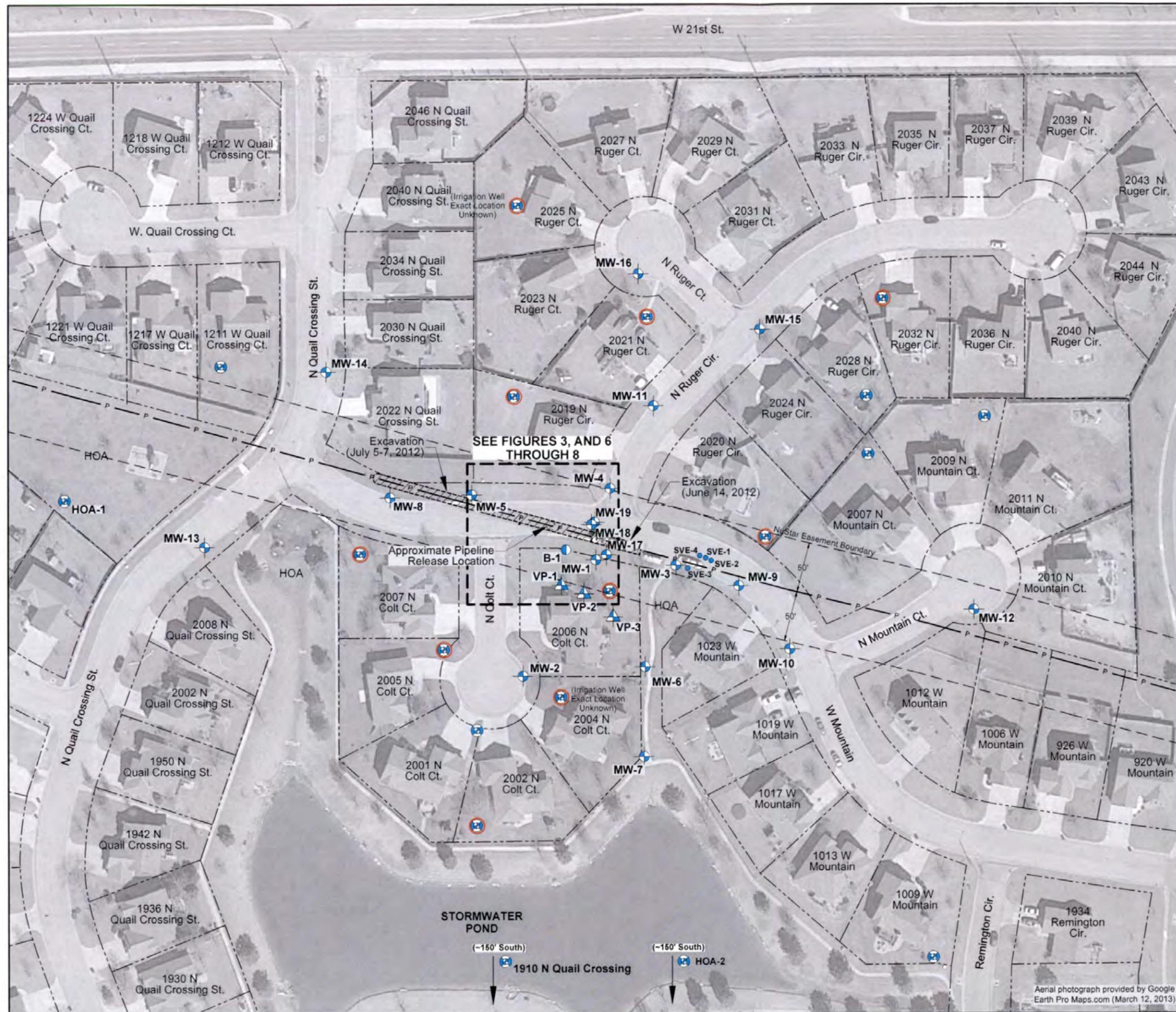
1. GRO = Gasoline-range organics quantified by EPA Method 8015D.
2. Volatile organic compounds by U.S. Environmental Protection Agency (EPA) Method 5035/8260B
3. mg/kg (ppm) = Milligrams per kilogram (parts per million).
4. **Bold** indicates detected concentration above the KDHE screening value
5. < = Not detected above the method reporting limit (MRL)
6. -- = A KDHE Tier 2 Risk Based Screening Value has not been established.
7. KDHE Soil to Groundwater Screening Values for: (1) VOCs from the Risk-Based Tier 2 Standards for Kansas, 5th Edition, October 2010; (2) GRO from BER Policy BER-041, September 1, 2015
8. bgs = below ground surface



**Note:** Base map prepared from USGS 7.5-minute quadrangles of Andover, KS, dated 2012 as provided by USGS.gov.



<h2>Site Location Map</h2> <p>Soil Excavation Report          NuStar Pipeline Operating Partnership L.P.          Andover, Kansas</p>			
 <p>Apex Companies, LLC          3015 SW First Avenue          Portland, Oregon 97201</p>	Project Number	1641-08	Figure <b>I</b>
	December 2015		



**Legend:**

- MW-1 Monitoring Well Location
- Irrigation Well
- VP-1 Soil Vapor Monitoring Point
- B-1 Boring Location
- sve-1 Soil Vapor Extraction Pilot Test Well
- Property Line
- Pipeline
- Pipeline Easement Boundary
- HOA Lot Owned by Quail Crossing Homeowner's Association
- Deactivated Irrigation Well
- Excavation Area

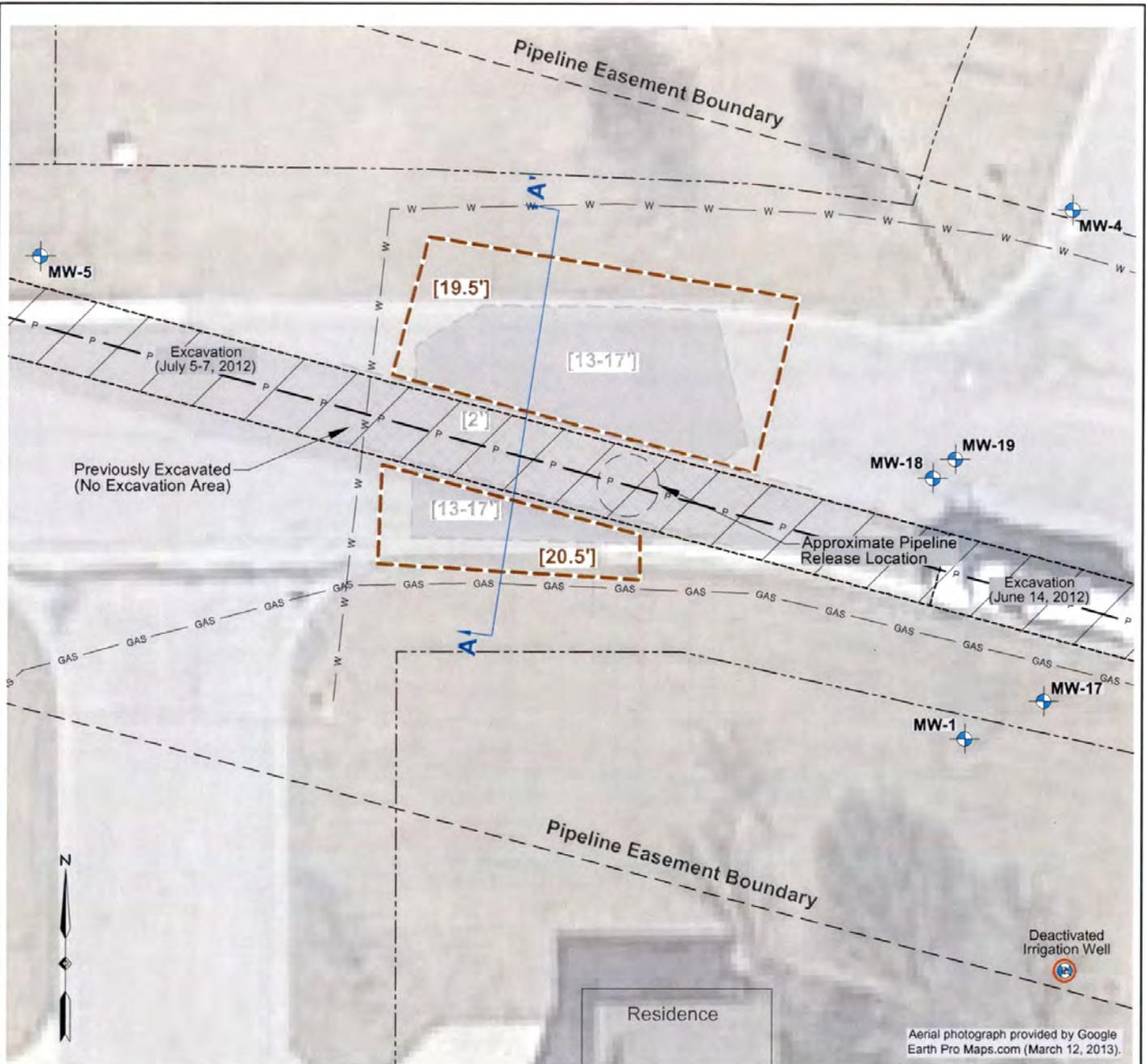


**Site Vicinity Plan**

Soil Excavation Report  
NuStar Pipeline Operating Partnership L.P.  
Andover, Kansas

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1641-08	Figure
	December 2015		2

Aerial photograph provided by Google Earth Pro Maps.com (March 12, 2013).

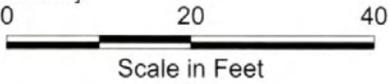


Aerial photograph provided by Google Earth Pro Maps.com (March 12, 2013).

**Legend:**

- MW-1 Monitoring Well Location
- Deactivated Irrigation Well
- Property Line
- Pipeline
- Pipeline Easement Boundary
- Approximate Gas Line
- Approximate Water Line
- Cross-Section Location (See Figure 6)

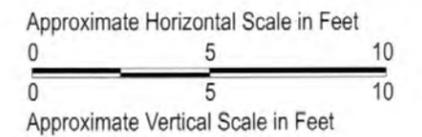
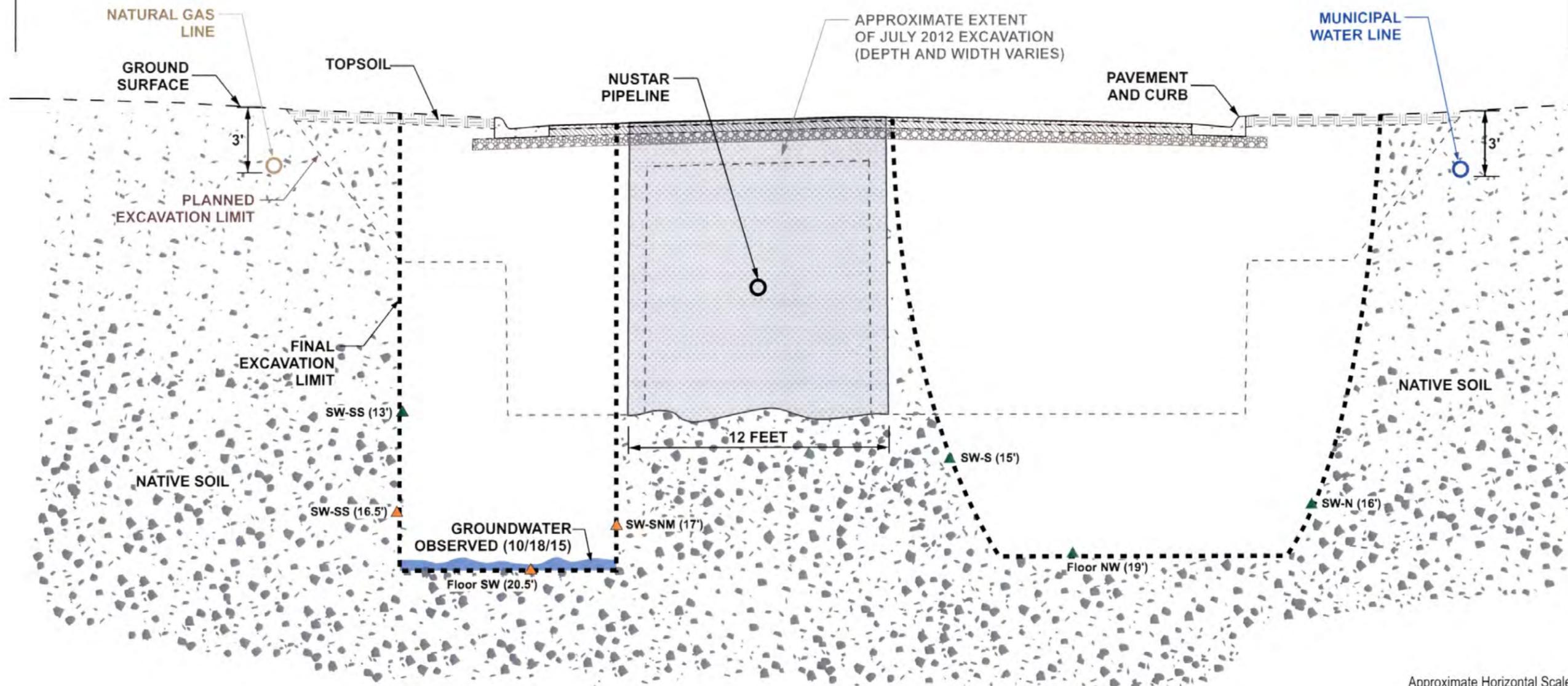
- [13-17'] Proposed Excavation Area and [Depth in Feet Below Ground Surface] (Apex, 2015c)
- [19.5'] Actual Excavation Area and [Depth in Feet Below Ground Surface]



<h2 style="margin: 0;">Soil Excavation Area and Cross-Section Plan View</h2> <p style="margin: 0;">Soil Excavation Report NuStar Pipeline Operating Partnership L.P. Andover, Kansas</p>		
Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number 1641-08 December 2015	Figure 3

A (South)

A' (North)



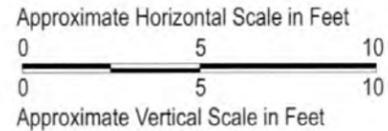
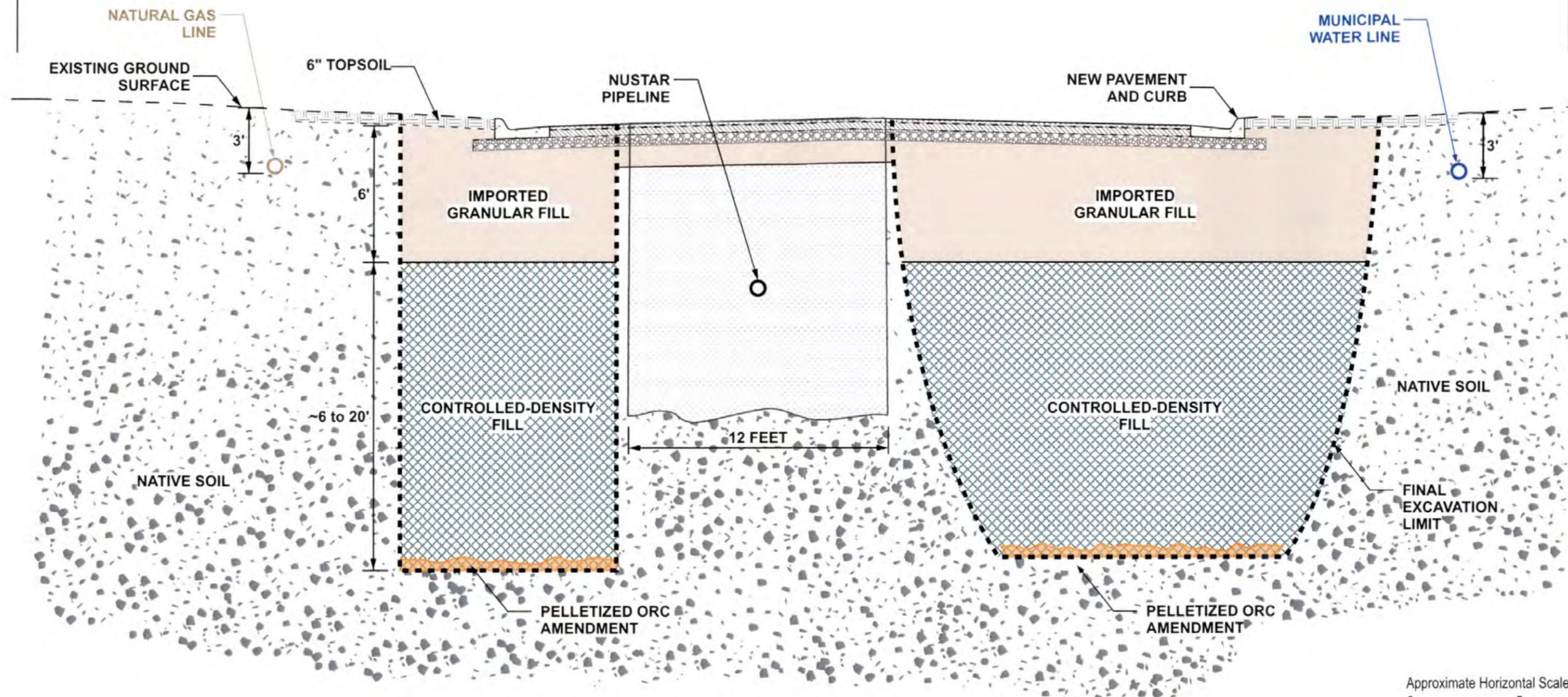
**Legend:**

- Approximate Extent of July 2012 Excavation
- Planned Excavation Limit
- Final Excavation Limit
- Constituent Concentrations Not Detected or < KDHE Tier 2 RBSVs
- Constituent > KDHE Tier 2 RBSVs
- Native Soil/Material
- Backfill from July 2012 Excavation

**Cross-Section A-A' Showing Vertical Excavation Extent**  
 Soil Excavation Report  
 NuStar Pipeline Operating Partnership L.P.  
 Andover, Kansas

A (South)

A' (North)

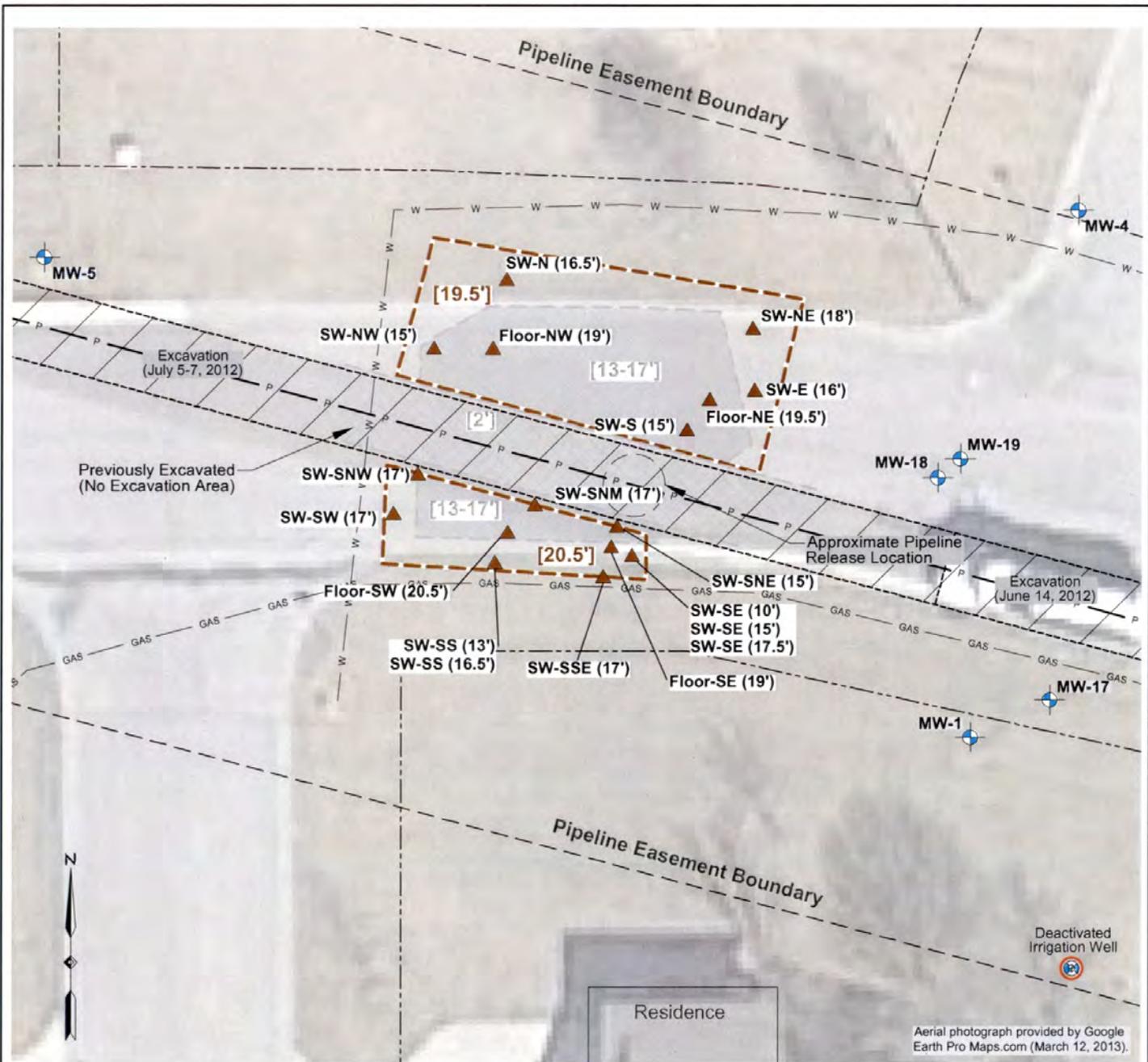


**Legend:**

- Final Excavation Limit
- Native Soil/Material
- Backfill from July 2012 Excavation

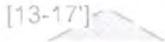
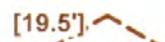
**Cross-Section A-A' Showing Site Restoration Materials**  
 Soil Excavation Report  
 NuStar Pipeline Operating Partnership L.P.  
 Andover, Kansas

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1641-08	Figure
	December 2015		<b>5</b>



**Legend:**

- MW-1  Monitoring Well Location
- SW-E(16')  Soil Sample Location (Apex)
-  Deactivated Irrigation Well
-  Property Line
-  Pipeline
-  Pipeline Easement Boundary
-  Approximate Gas Line
-  Approximate Water Line

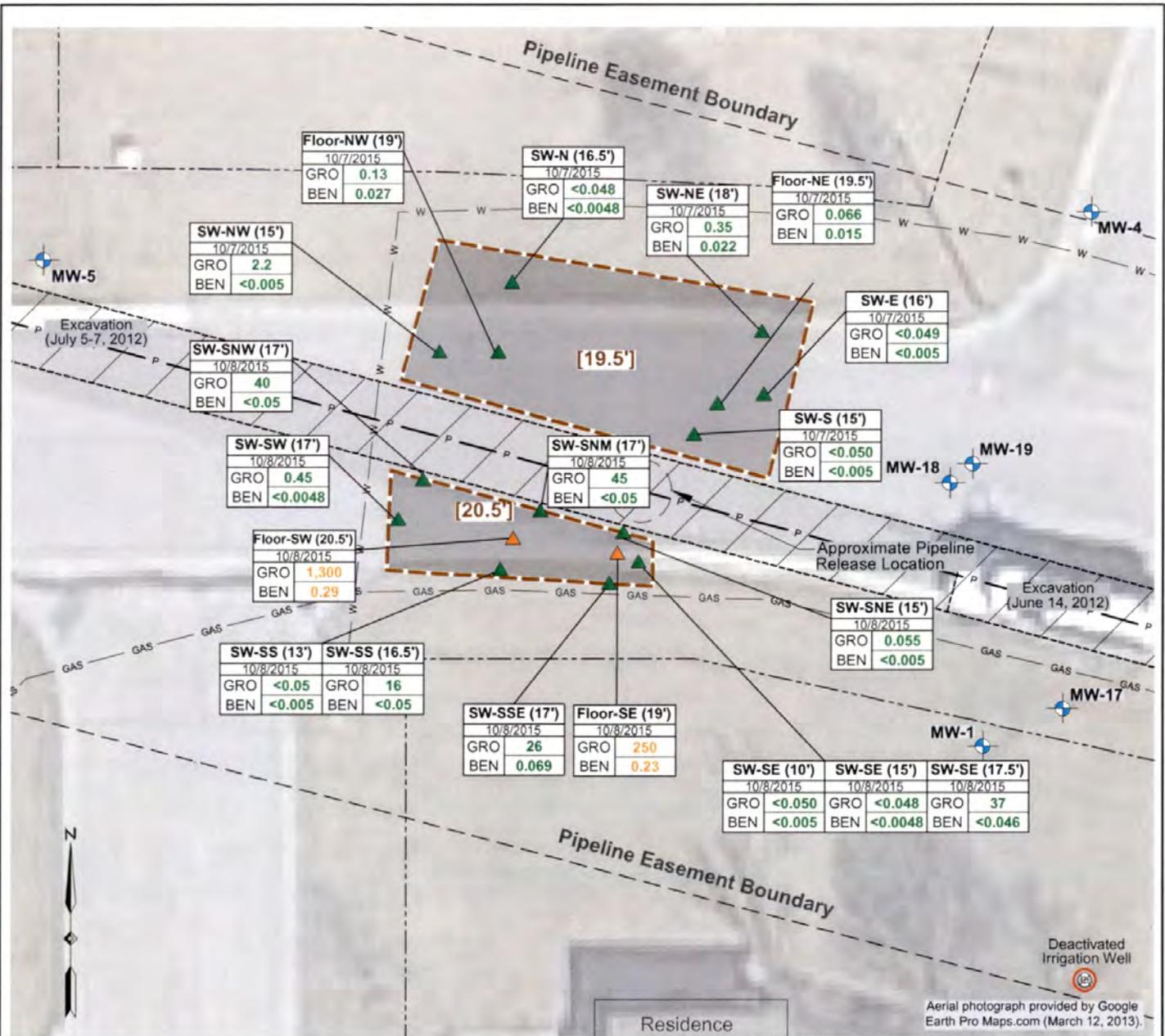
-  Proposed Excavation Area and [Depth in Feet Below Ground Surface] (Apex, 2015c)
-  Actual Excavation Area and [Depth in Feet Below Ground Surface]



## Soil Excavation Area - Sample Locations

Soil Excavation Report  
NuStar Pipeline Operating Partnership L.P.  
Andover, Kansas

 Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1641-08	Figure	6
	December 2015			



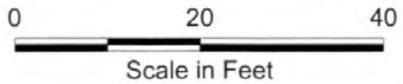
**Legend:**

- MW-1 Monitoring Well Location
- SW-E(16') Soil Sample Location (Apex)
- Deactivated Irrigation Well
- Property Line
- Pipeline
- Pipeline Easement Boundary
- Approximate Gas Line
- Approximate Water Line

- Sample Identification and (Depth in Feet)
- Sample Date
- Concentration in mg/kg
- Analyte Sampled
- Constituent Concentrations Not Detected or < KDHE Tier 2 RBSVs
- Constituent > KDHE Tier 2 RBSVs

Abbreviations	
GRO	Total Petroleum Hydrocarbons Gasoline-Range
BEN	Benzene

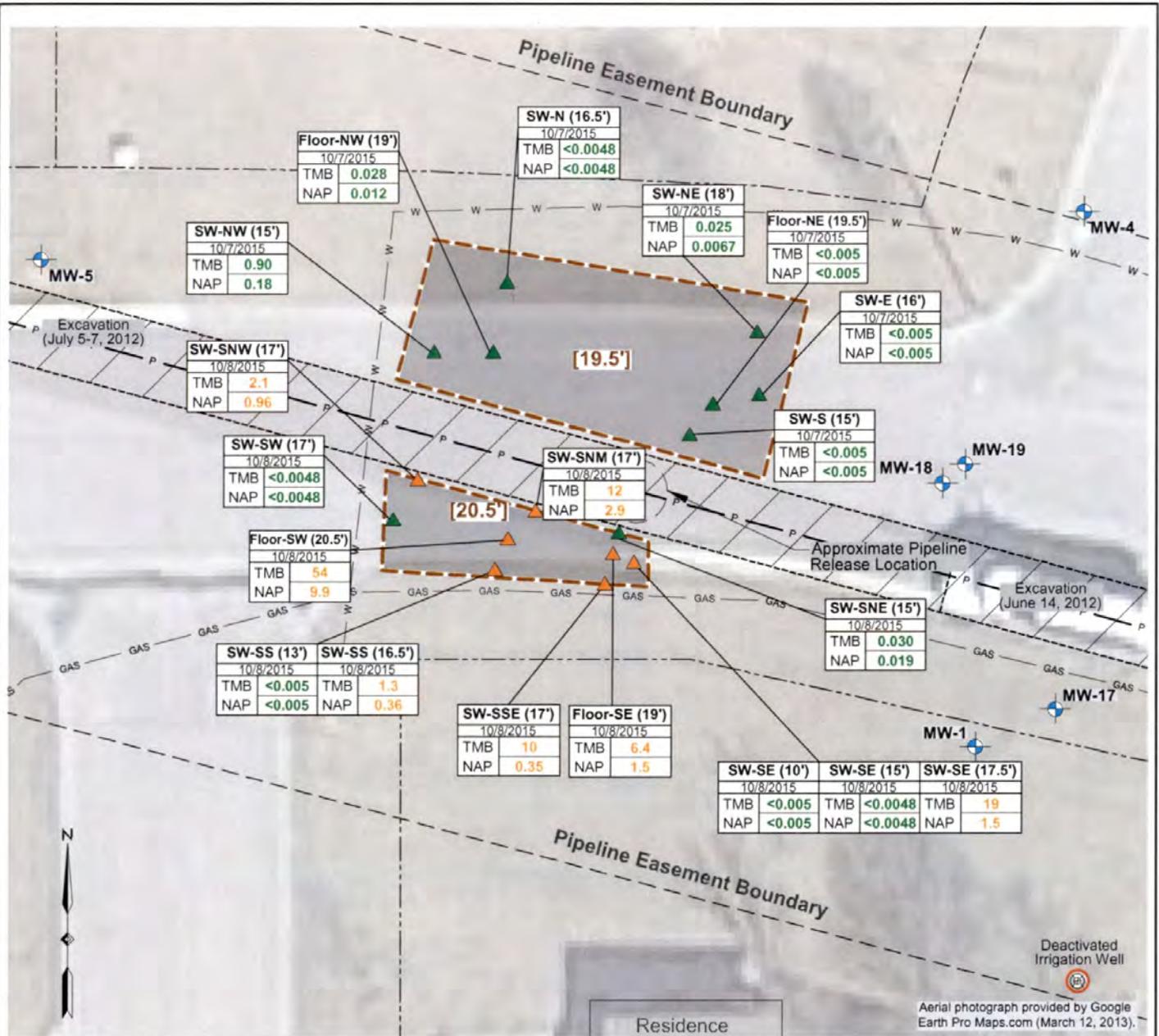
[19.5'] Actual Excavation Area and [Depth in Feet Below Ground Surface]



### Soil Excavation Area - Sample Results for GRO and Benzene

Soil Excavation Report  
 NuStar Pipeline Operating Partnership L.P.  
 Andover, Kansas

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1641-08	Figure <b>7</b>
	December 2015		



**Legend:**

- MW-1 Monitoring Well Location
- SW-E(16') Soil Sample Location (Apex)
- Deactivated Irrigation Well
- Property Line
- Pipeline
- Pipeline Easement Boundary
- Approximate Gas Line
- Approximate Water Line
- Actual Excavation Area and [Depth in Feet Below Ground Surface]
- Sample Identification and (Depth in Feet)
- Sample Date
- Concentration in mg/kg
- Analyte Sampled
- Constituent Concentrations Not Detected or < KDHE Tier 2 RBSVs
- Constituent > KDHE Tier 2 RBSVs

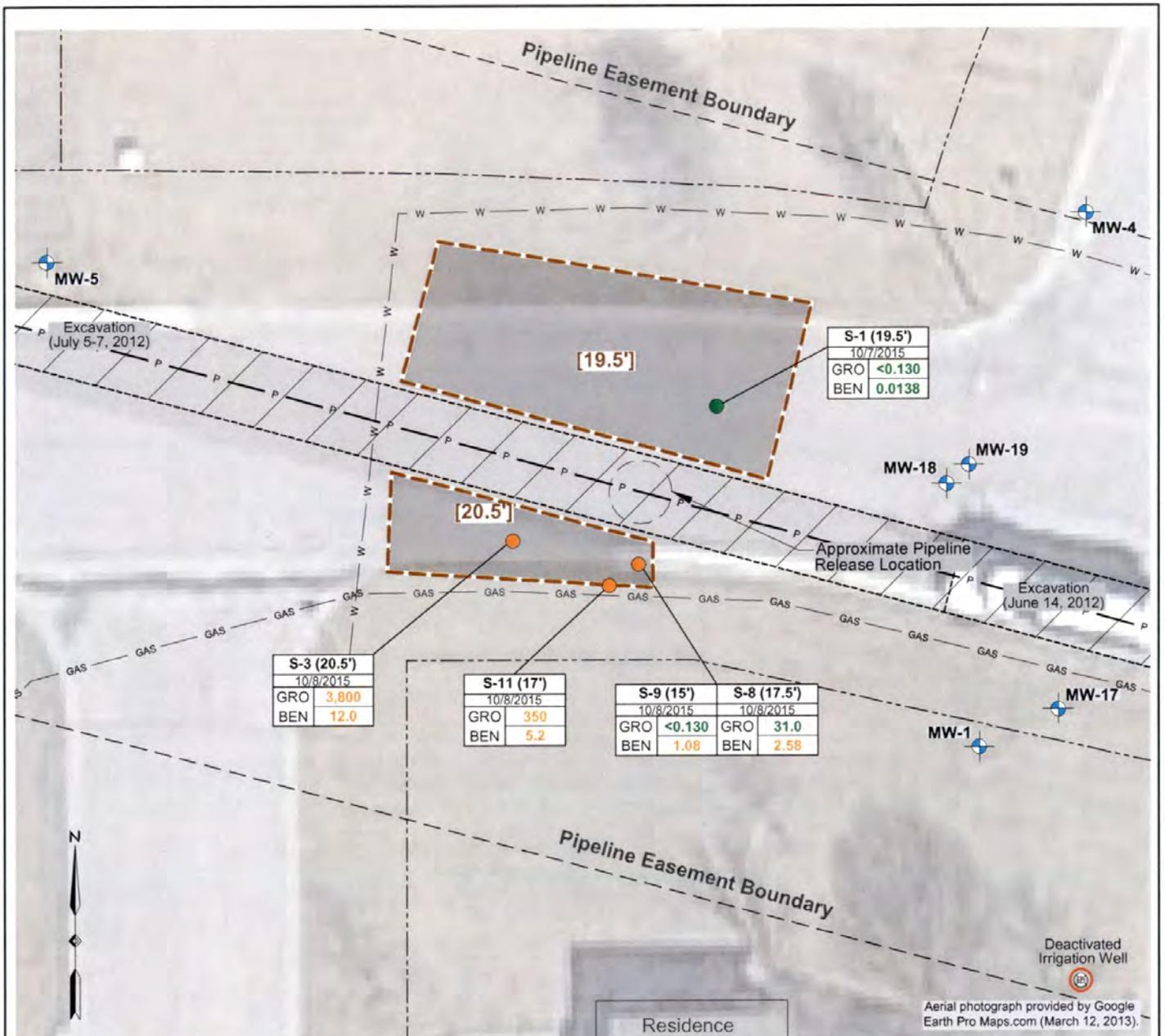
Abbreviations	
TMB	1,2,4 Trimethylbenzene
NAP	Naphthalene



### Soil Excavation Area - Sample Results for TMB and NAP

Soil Excavation Report  
NuStar Pipeline Operating Partnership L.P.  
Andover, Kansas

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1641-08	Figure	8
	December 2015			



Aerial photograph provided by Google Earth Pro Maps.com (March 12, 2013).

**Legend:**

- MW-1 Monitoring Well Location
- S-8 Soil Sample Location (KDHE)
- Deactivated Irrigation Well
- Property Line
- Pipeline
- Pipeline Easement Boundary
- Approximate Gas Line
- Approximate Water Line

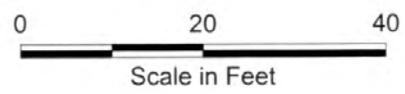
<b>S-8 (16')</b>	
10/8/2015	
GRO	31.0
BEN	2.58

- Sample Identification and (Depth in Feet)
- Sample Date
- Concentration in mg/kg
- Analyte Sampled

Abbreviations	
GRO	Total Petroleum Hydrocarbons Gasoline-Range
BEN	Benzene

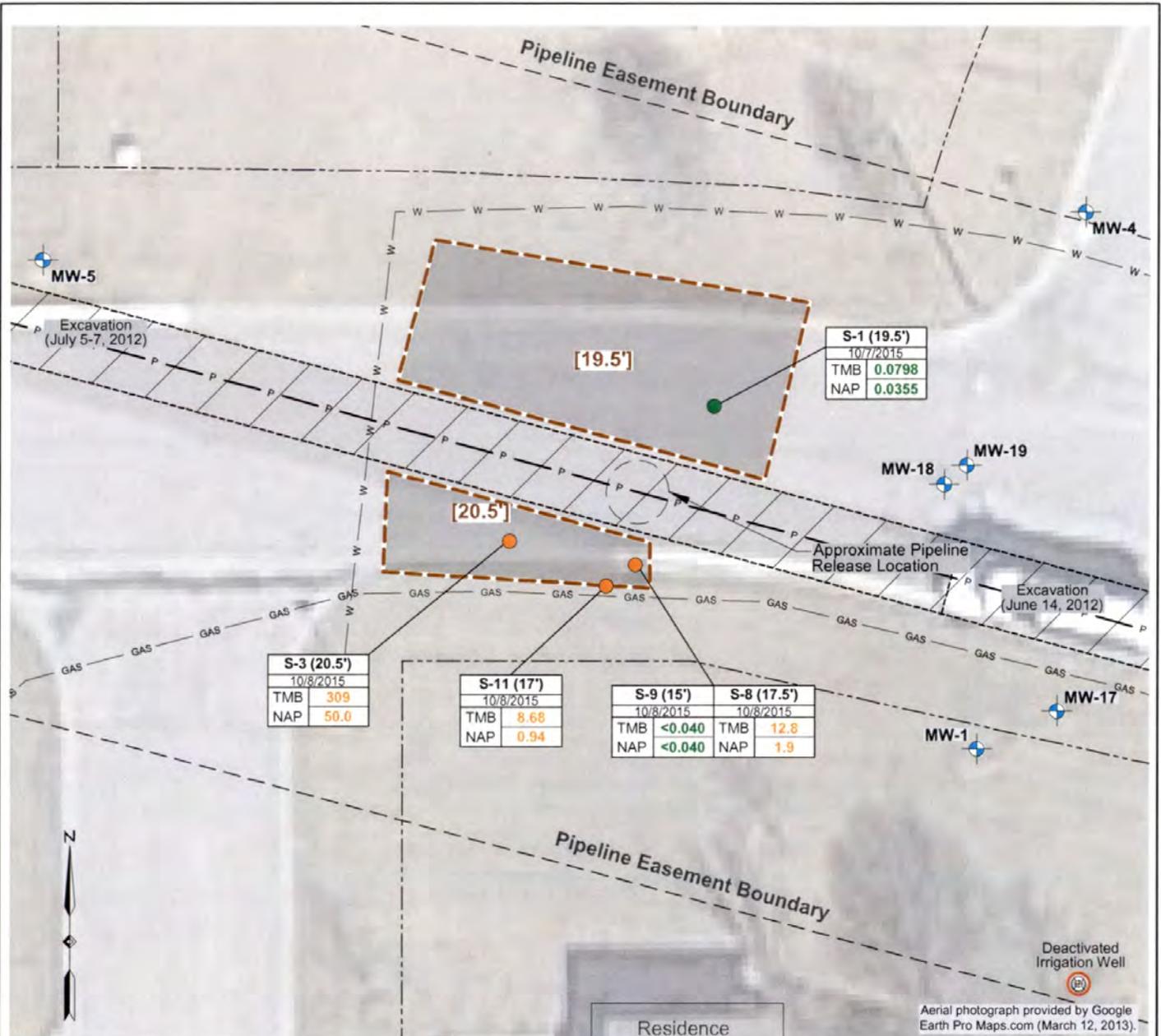
- Constituent Concentrations Not Detected or < KDHE Tier 2 RBSVs
- Constituent > KDHE Tier 2 RBSVs

Actual Excavation Area and [Depth in Feet Below Ground Surface]



**Soil Excavation Area - KDHE Sample Results for GRO and Benzene**  
 Soil Excavation Report  
 NuStar Pipeline Operating Partnership L.P.  
 Andover, Kansas

Apex Companies, LLC 3015 SW First Avenue Portland, Oregon 97201	Project Number	1641-08	Figure <b>9</b>
	December 2015		



Aerial photograph provided by Google Earth Pro Maps.com (March 12, 2013).

**Legend:**

- MW-1 Monitoring Well Location
- S-8 Soil Sample Location (KDHE)
- Deactivated Irrigation Well
- Property Line
- Pipeline
- Pipeline Easement Boundary
- Approximate Gas Line
- Approximate Water Line

<b>S-8 (16')</b>	
10/8/2015	
TMB	12.8
NAP	1.9

- Sample Identification and (Depth in Feet)
- Sample Date
- Concentration in mg/kg
- Analyte Sampled

Abbreviations	
TMB	1,2,4 Trimethylbenzene
NAP	Naphthalene

- Constituent Concentrations Not Detected or < KDHE Tier 2 RBSVs
- Constituent > KDHE Tier 2 RBSVs

Actual Excavation Area and [Depth in Feet Below Ground Surface]



**Soil Excavation Area - KDHE Sample Results for TMB and NAP**  
 Soil Excavation Report  
 NuStar Pipeline Operating Partnership L.P.  
 Andover, Kansas

Apex Companies, LLC  
 3015 SW First Avenue  
 Portland, Oregon 97201

Project Number	1641-08
December 2015	

Figure  
**10**

## ***Appendix A***

---

**Field Notes**



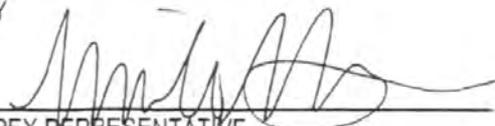
3015 SW First Avenue  
 Portland, Oregon 97201-4707  
 (503) 924-4704 Phone  
 (503) 943-6357 Fax

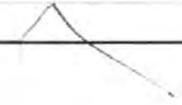
PROJECT NUMBER 320001641-08.003  
 FIELD REPORT NUMBER \_\_\_\_\_  
 PAGE 1 OF 1  
 DATE TUESDAY 10-06-2015

PROJECT	<u>NUSTAR ANDOVER QUAIL CROSSING</u>	ARRIVAL TIME	<u>0800</u>
LOCATION	<u>ANDOVER, KS</u>	DEPARTURE TIME	<u>0930</u>
CLIENT	<u>NUSTAR</u>	WEATHER	<u>OVERCAST/CLOUDY</u>
PURPOSE OF OBSERVATIONS	<u>POTHOLE TO UTILITIES</u>		
APEX REPRESENTATIVE	<u>M. WHITSON</u>	APEX PROJECT MANAGER	<u>S. JACKSON</u>
CONTRACTOR	<u>ALLEN'S EXC.</u>	PERMIT NO.	<u>-</u>
CONTRACTOR REP.	<u>DEAN</u>	H&S REVIEW	<u>✓</u>

Our firm's professionals are represented on site solely to observe operations of the contractor identified, to form opinions about the adequacy of those operations, and to report those opinions to our client. The presence and activities of our field representative do not relieve any contractor from its obligation to meet contractual requirements. The contractor retains sole responsibility for site safety and the methods, operations, and sequence of construction. Unless signed by the Ash Creek Associates Project Manager, this report is preliminary. A preliminary report is provided solely as evidence that field observation was performed. Observations and/or conclusions and/or recommendations conveyed in the final report may vary from and shall take precedence over those included in a preliminary report.

0800 APEX ARRIVES ON SITE, ALLEN ON SITE WITH VAC TRUCK/AIR KNIFE, NUSTAR ON SITE  
 POTHOLE DOWN TO WATER LINE/GAS LINE/NUSTAR PIPELINE USING VAC AND AIR KNIFE/WAND  
 2-INCH PLASTIC WATER LINE NO TRACER  
 2-INCH PLASTIC GAS LINE WITH TRACER  
 BOYD DEPARTS SITE  
 SITE SECURED, WILL BEGIN EXCAVATION ON WEDNESDAY  
 0930 APEX DEPARTS SITE

BY   
 APEX REPRESENTATIVE

REVIEWED BY   
 APEX PROJECT MANAGER



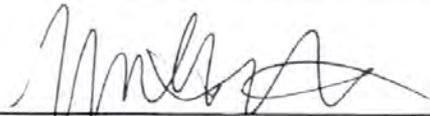
3015 SW First Avenue  
 Portland, Oregon 97201-4707  
 (503) 924-4704 Phone  
 (503) 943-6357 Fax

PROJECT NUMBER 320001641-08.003  
 FIELD REPORT NUMBER \_\_\_\_\_  
 PAGE 1 OF 3  
 DATE 10/07/2015

PROJECT	<u>QUAIL CROSSING</u>	ARRIVAL TIME	<u>0730</u>
LOCATION	<u>ANDOVER, KS</u>	DEPARTURE TIME	<u>1800</u>
CLIENT	<u>NUSTAR</u>	WEATHER	<u>CLEAR (60'S/70'S)</u>
PURPOSE OF OBSERVATIONS	<u>EXCAVATION</u>		
APEX REPRESENTATIVE	<u>M. WHITSON</u>	APEX PROJECT MANAGER	<u>S. JACKSON</u>
CONTRACTOR	<u>ALAN'S EXC.</u>	PERMIT NO.	<u>-</u>
CONTRACTOR REP.	<u>DEAN</u>	H&S REVIEW	<u>✓</u>

Our firm's professionals are represented on site solely to observe operations of the contractor identified, to form opinions about the adequacy of those operations, and to report those opinions to our client. The presence and activities of our field representative do not relieve any contractor from its obligation to meet contractual requirements. The contractor retains sole responsibility for site safety and the methods, operations, and sequence of construction. Unless signed by the Ash Creek Associates Project Manager, this report is preliminary. A preliminary report is provided solely as evidence that field observation was performed. Observations and/or conclusions and/or recommendations conveyed in the final report may vary from and shall take precedence over those included in a preliminary report.

0730 APEX ARRIVES ON SITE, ALLEN ON SITE, APEX IN SITE, ALLEN HAS NAD  
 3 TRUCKS OF ASPHALT, 1 TRUCK OF CONCRETE, FROM NORTH SIDE TAKEN  
 OFF SITE  
 H&S MEETING EXCAVATION PLAN  
 0820 START EXCAVATING NORTH SIDE OF PIPELINE  
 SCREEN ONE BUCKET PER TRUCK LOAD  
 SEE TRUCK LOG  
 0-6' DARK BROWN CLAY; S. MOIST, STIFF  
 6-11.5' YELLOWISH BROWN SILTY CLAY - CLAYEY SILT; DRY TO S. MOIST, STIFF - V. STIFF  
 1000 NO IMPACTS OBSERVED ABOVE DENSER MATERIAL, EXCAVATOR BREAKS THROUGH  
 1100 CRUSHED ROCK DELIVERED TO SITE DENSER MATERIAL TO FIND IMPACTS  
 IMPACTS OBSERVED, STRONG ODORS NOTED AT SURFACE, STOP WORK, CHECK AIR  
 DETECTOR TUBE (<0.05 ppm), NO STAND DOWN NECESSARY, NO PPE UPGRADE  
 1345 KPIE ON SITE  
 ORIENT KPIE TO PROGRESS  
 FINISH EXCAVATION, EXTENTS IN PLAN REACHED, MAXIMUM DEPTH REACHED  
 KPIE POINTS OUT THAT WORK PLAN CALLED FOR SURF OF ORC TO GO IN  
 BASE OF EXCAVATION, NOT THE DRY PELLETS THAT ARE ON SITE.  
 STOP WORK, ~~WHILE~~ MN CALL S. JACKSON, ORC PELLETS ARE PREFERRED  
 KPIE WILL DISCUSS WITH S. JACKSON  
 KPIE OKAY WITH USING ORC PELLETS IF THEY ARE WETTED IN PLACE  
 1510 START BACKFILLING W/ CRUSHED ROCK (6-INCH COVER)  
 1535 CRUSHED ROCK PLACED OVER ORC, WILL BE WETTED DOWN, CRUSHED ROCK  
 APPEARS GREATER THAN 6-INCHES IN SOME PLACES ON EXC. FLOOR

BY   
 APEX REPRESENTATIVE

REVIEWED BY \_\_\_\_\_  
 APEX PROJECT MANAGER



3015 SW First Avenue  
 Portland, Oregon 97201-4707  
 (503) 924-4704 Phone  
 (503) 943-6357 Fax

PROJECT NUMBER 32000/641-08.003  
 FIELD REPORT NUMBER \_\_\_\_\_  
 PAGE 2 OF 3  
 DATE 10-07-15

1340 START WETTING DOWN CRUSHED ROCK AND GRC POWDER USING WATER FROM 1800 GALLON CEMENT TRUCK  
 1345 KPHE SATISFIED WITH WETTING DOWN OF CRUSHED ROCK AND GRC, START POURING FLOWABLE FILL  
 1620 18 TRUCKS (9 YDS EACH) POUR FLOWABLE INTO EXCAVATION  
 1655 FLOWABLE FILL PLACEMENT COMPLETE, FILL BROUGHT UP TO 6' BGS  
 KPHE DEPARTS SITE  
 START CLEANING UP SITE  
 WILL WORK ON SOUTH SIDE OF EXCAVATION TOMORROW  
 SECURE SITE  
 1800 APEX DEPARTS

BY

APEX REPRESENTATIVE

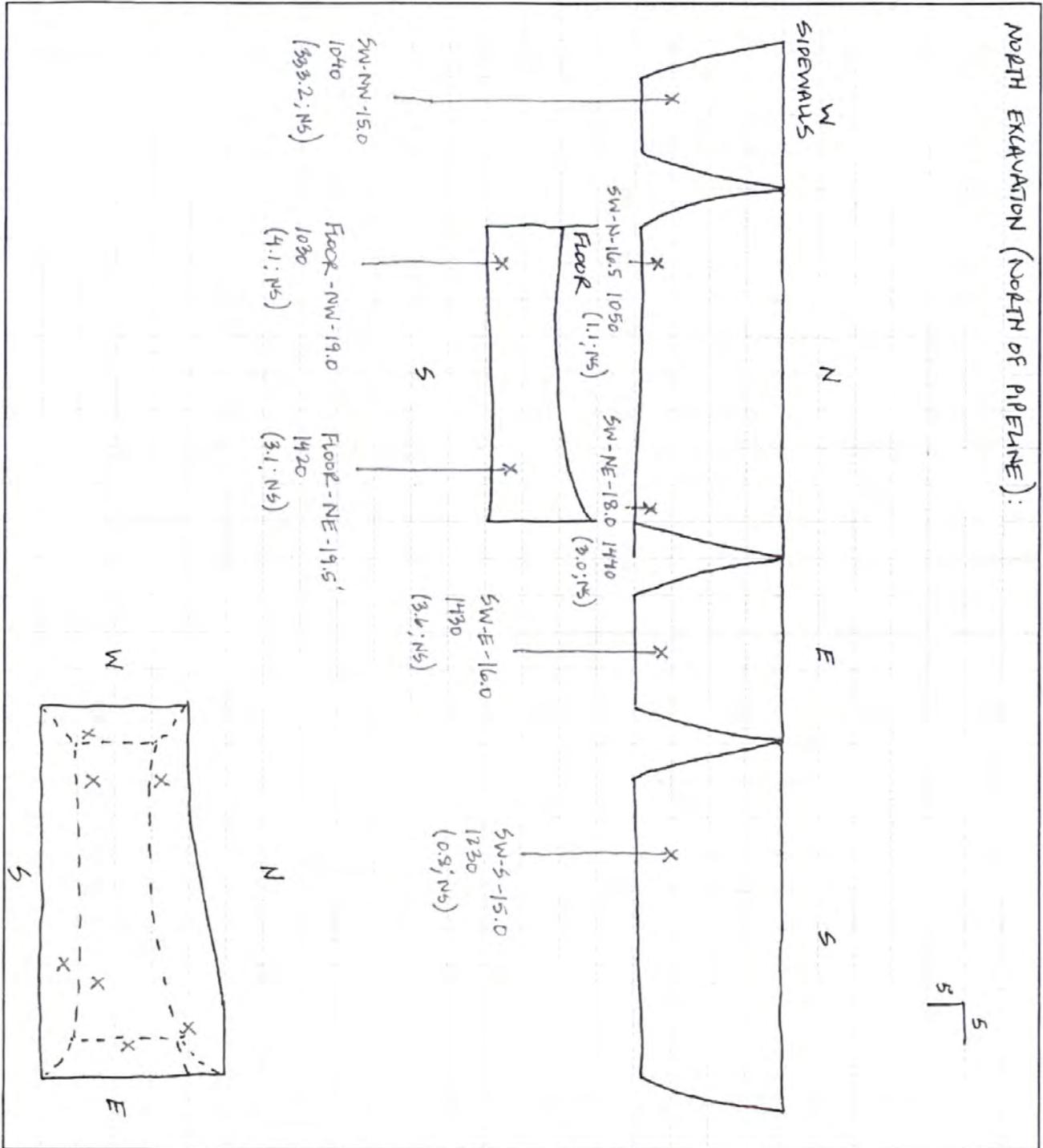
REVIEWED BY

APEX PROJECT MANAGER



3015 SW First Avenue  
 Portland, Oregon 97201-4707  
 (503) 924-4704 Phone  
 (503) 943-6357 Fax

PROJECT NUMBER 320001641-08.002  
 FIELD REPORT NUMBER \_\_\_\_\_  
 PAGE 2 OF 2  
 DATE 10/07/2015



BY \_\_\_\_\_

REVIEWED BY \_\_\_\_\_

\_\_\_\_\_  
 APEX REPRESENTATIVE

\_\_\_\_\_  
 APEX PROJECT MANAGER

WELL GAGING DATA SHEET

	Client:	NUSTAR	Job Number:	320001641-08
	Project:	ANDOVER GC	Date:	10-07-15
	Weather:	CLEAR (50s/60s)	Sampler:	MW
			Time In/Out:	0820 /

WATER LEVEL DATA

Load	Truck ID	Time In	Time Out	Load Description	Volume (cu. YDS)	Destination	Notes/Other Remarks
1		0820	0825	SOIL	~12 CUYDS	EL DORADO	(0.0; NS) NORTH SIDE
2		0825	0830	SOIL	~12	"	(0.0; NS)
3		0830	0835	SOIL	~12	"	(0.1; LS)
4		0835	0840	SOIL	~12	"	(0.0; NS)
5		0840	0845	SOIL	~12	"	(0.0; NS) 10' NORTH
6		0845	0848	SOIL	~12	"	(0.0; NS) 11.5' NORTH
ALL TRUCKS EN ROUTE TO EL DORADO LAND FARM							
EXCAVATION ON NORTH SIDE DEEPENED TO 11.5' BGS, VERY HARD ROCKY MATERIAL							
7		0925	0930	SOIL	~12	"	(0.0; NS) 12.5' NORTH W.
8		0930	0935	SOIL	~12	"	(0.0; NS) 12.5' 6' NORTH
9		0935	0940	SOIL	~12	"	(0.0; NS) "
10		0940	0945	SOIL	~12	"	(0.0; NS) "
11		0945	0950	SOIL	~12	"	(0.0; NS) "
12		0950	0955	SOIL	~12	"	(0.6; NS) "
JUST SHORT OF 15' BGS IN MIDDLE OF NORTH EXCAVATION, ODORS NOTED							
BUCKET PULLED UP FROM APPROXIMATELY 16' BGS, ODORS MUCH STRONGER							
(126.2; NS) MEASURED 1300 ON BUCKET TO 1580 PPM							
AT 17' FOR EXCAVATION							
13		1010	1015	SOIL	~18	"	(126.2; NS) 18' NORTH BOTTOM
EXCAVATION DEEPENED TO ~19' BGS, SAMPLE FLOOR OF EXCAVATION							
14		1030	1038		~12	"	
15		1043	1046		~12'	"	
16		1046	1050		~12'	"	(0.5; NS) NE END SHALLOW
17		1050	1052		~12'	"	" "
18		1100	1103		~12'	"	(9.6; NS) NE END AT
19		1105	1110	SOIL	~12'	"	(332; LS) NE END 18' APPROX.
20		1118	1121	SOIL	~18'	"	(0.4; NS) NE END 0-6' BGS
21		1130	1133	SOIL	~12'	"	(0.1; NS) "
22		1134	1137	SOIL	~12	"	(0.0; NS) 6-8' BGS NE END
23		1139	1143	SOIL	~12	"	(9.02; LS) 15-16' BGS NE END
PULL BUCKET FROM NE END UNDER PARTIALLY WITH SHALE, ODOR							
RETURNS 600 PPM IN BUCKET							

473-333 PPM IN BUCKET

WELL GAGING DATA SHEET

	Client:	NUSTAR	Job Number:	
	Project:	ANDOVER	Date:	10-07-15
	Weather:	CLOUDY (60's/70's)	Sampler:	MW
			Time In/Out:	

WATER LEVEL DATA

Load	Truck ID	Time In	Time Out	Load Description	Volume (W. YDS)	Destination	Notes/Other Remarks
24		1145	1147	SOIL NE	~12	EL DORADO	(443.1; LS) 18' NE END
25		1155	1200	"	~12	"	(73.4; NS) 19' NE END
26		1245	1248	"	~18	"	(383.1; LS) 16-17' SE END
27		1248	1252	"	~12	"	→ 19-20' EXC. BUS ON NE END
28		1255	1258	"	~12	"	
29		1302	1306	"	~12	"	NE END 0-6' (0.0; NS)
30		1306	1309	"	~12		
31		1309	1312	"	~12		1345 KPHE ON SITE
32		1350	1352	"	~12	"	MIXED SIDE/AST MATERIAL
33		1353	1356	"	~12		
34		1405	1407	"	~12	"	(0.3; NS) NE SIDEWALL SIDE/AST MATER.
35		1407	1412	"	~12	"	(220.6; NS) NE SIDEWALL/SIDE/AST
				ROCK DELIVERY ON SITE, POUR CRUSHED		ROCK	AGGREGATE
				APEX WALKS KPHE THROUGH		SITE	
36	--	--	--	"	~12	"	MISSED TRUCK, WAS NOT ABLE TO FIELD SCREEN
				NORTH EXCAVATION (NORTH OF PIPELINE) COMPLETE, SEE NOTES FOR BACKFILL			



3015 SW First Avenue  
 Portland, Oregon 97201-4707  
 (503) 924-4704 Phone  
 (503) 943-6357 Fax

PROJECT NUMBER 320001641-08.003  
 FIELD REPORT NUMBER \_\_\_\_\_  
 PAGE 1 OF 2  
 DATE 10-08-2015

PROJECT	<u>NUSTAR ANDOVER QC</u>	ARRIVAL TIME	<u>0800</u>
LOCATION	<u>ANDOVER, KS</u>	DEPARTURE TIME	<u>1610</u>
CLIENT	<u>NUSTAR</u>	WEATHER	<u>CLEAR/P.CLOUDY (60's)</u>
PURPOSE OF OBSERVATIONS	<u>SOIL EXCAVATION</u>		
APEX REPRESENTATIVE	<u>M. WHITSON</u>	APEX PROJECT MANAGER	<u>S. JACKSON</u>
CONTRACTOR	<u>ALAN</u>	PERMIT NO.	<input checked="" type="checkbox"/>
CONTRACTOR REP.	<u>DEAN</u>	H&S REVIEW	<input checked="" type="checkbox"/>

Our firm's professionals are represented on site solely to observe operations of the contractor identified, to form opinions about the adequacy of those operations, and to report those opinions to our client. The presence and activities of our field representative do not relieve any contractor from its obligation to meet contractual requirements. The contractor retains sole responsibility for site safety and the methods, operations, and sequence of construction. Unless signed by the Ash Creek Associates Project Manager, this report is preliminary. A preliminary report is provided solely as evidence that field observation was performed. Observations and/or conclusions and/or recommendations conveyed in the final report may vary from and shall take precedence over those included in a preliminary report.

0800 APEX ARRIVES ON SITE, TED AND TONY ON SITE (APEX) DEAN (ALAN) ON SITE, H&S REVIEW  
 START EXCAVATING SOUTH SIDE  
 SEE TRUCK LOG FOR FIELD SCREENING  
 OBSERVE BLACK IRRIGATION LINE IN EXCAVATION RUNNING ALONG SOUTH SIDE OF MOUNTAIN.  
 PROCEED WITH EXCAVATION

1010 EXCAVATION COMPLETED TO MAXIMUM EXTENT AND DEPTH

1050 KOHE ARRIVES ON SITE  
 SPLIT SAMPLES WITH KOHE, COORDINATE SAMPLING EFFORTS, SEE SAMPLING SHEET  
 ORE PLACED IN EXCAVATION AT BOTTOM, COVERED WITH CRUSHED ROCK BACKFILL/HYDRATE, KOHE DEPARTS SITE

1340 FLOWABLE FILL ON SOUTH SIDE 100 CU YDS  
 CALL IN TWO MORE TRUCKS

1520 LAST TRUCK OF FLOWABLE FILL ~117 YDS  
 CLEAN UP SITE  
 SECURE SITE, DISCUSS PLAN WITH TED AND SUBS FOR NEXT WEEK

1610 DEPART SITE

BY   
 APEX REPRESENTATIVE

REVIEWED BY \_\_\_\_\_  
 APEX PROJECT MANAGER



WELL GAGING DATA SHEET



Client:	NUSTAR	Job Number:	
Date:	10-08-2015	Sampler:	MVN
Project:	ANDOVER	Time In/Out:	0800
Weather:	CLEAR (60S)		

WATER LEVEL DATA

Load	Truck ID	Time In	Time Out	Load Description	Volume	Destination	Notes/Other Remarks	
1		0800	0805	SOIL	~12	EL PASO	(0.0; NS) SOUTH EXCAVATION	
2		0805	0810	SOIL	~12	"	(0.0; NS) GET TO 10 FEET ON EAST END	
3		0821	0823	SOIL	~12	"	(0.0; NS)	
4		0823	0827	SOIL	~12	"	(51.7; NS) START PICKING UP ODD	
5		0829	0833	SOIL	~12	"	(1874; NS) IN EXCAVATION	
6		0835	0853	SOIL	~12	"	(2380; NS) 25-150 APR (PID)	
0845		COLLECT SAMPLE FROM			SEE FLOOR AT 19.0' BGS	(2,370; NS)	← 18' BGS HALO FLUR	
7		0905	0908	SOIL	~12	"	0-6' SOUTHWEST SHALLOW SOIL (0.0; NS)	
8		0909	0915	SOIL	~12	"	(0.2; NS) SURFACE 0-6' BGS	
9		0920	0926	SOIL	~12	"	(3.3; NS) 11.5' FROM SW END. CLOSE TO PIPELINE	
10		0928	0934	SOIL	~12	"	(1875; LS) 16.0' FROM SW END OF SOUTH EXCAVATION	
							EXCAVATION TO 20 FEET BGS	
11		0947	0952	SOIL	~12	"	(2,177; LS) #	
12		1003	1007	SOIL	~12	"	(18.2; NS)	
13		1010	1017	SOIL	~12	"	(73.1; NS) 21' BGS, WEST END OF SOUTH EXC.	
		WATER OBSERVED IN EXCAVATION AT 21' BGS CENTER						
		SAMPLES WILL BE COLLECTED FROM EXCAVATION LEAVE SURFACES TARGETING HIGHEST CONCENTRATION MATERIAL						

***Appendix B***

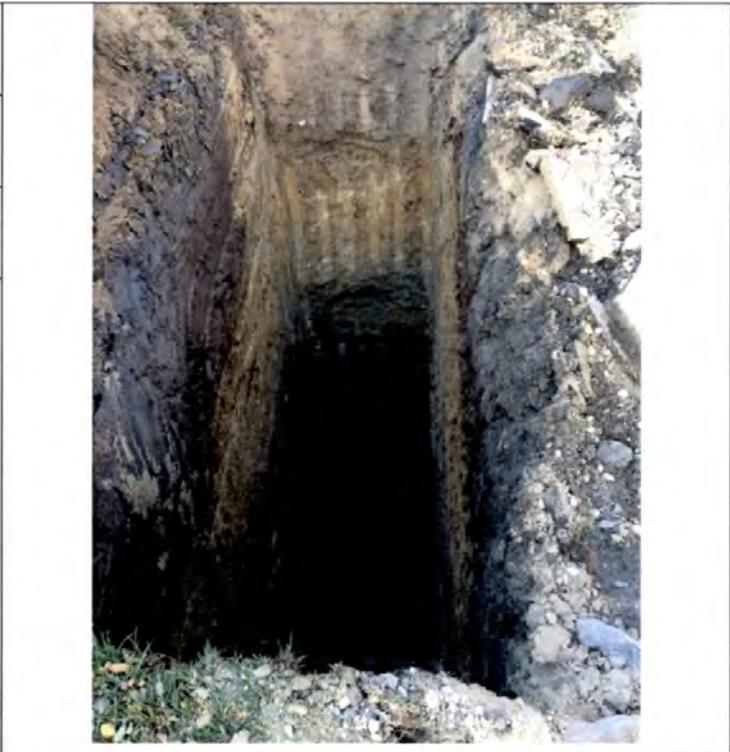
---

**Photograph Log**

## APPENDIX B PHOTOGRAPH LOG

**Project Name:** NuStar Andover Quail Crossing  
**Project Number:** 1641-08

**Client:** NuStar Pipeline Operating Partnership L.P.  
**Location:** Andover, Kansas

<b>Photo No:</b> 1	
<b>Photo Date:</b> October 7, 2015	
<b>Orientation:</b> Unknown	
<b>Description:</b>  A partially lithified layer was observed from approximately 12 to 15 feet bgs in both excavations; this photo is from the north excavation.	
<b>Photo No:</b> 2	
<b>Photo Date:</b> October 7, 2015	
<b>Orientation:</b> Northeast	
<b>Description:</b>  On October 7, soil excavation was performed on the north side of the pipeline; approximately 700 cubic yards of material was excavated. The vertical extent of the excavation included soil between the surface and as deep as 19.5 feet bgs; excavation depth was limited by the working range of the excavator (approximately 20 feet bgs).	

## APPENDIX B PHOTOGRAPH LOG

**Project Name:** NuStar Andover Quail Crossing  
**Project Number:** 1641-08

**Client:** NuStar Pipeline Operating Partnership L.P.  
**Location:** Andover, Kansas

<b>Photo No:</b> 3	
<b>Photo Date:</b> October 8, 2015	
<b>Orientation:</b> West	
<b>Description:</b> <p>On October 8, soil excavation was performed on the south side of the pipeline; approximately 430 cubic yards of material was excavated. The vertical extent of the excavation included soil between the surface and as deep as 20.5 feet bgs; excavation depth was limited by the working range of the excavator (approximately 20 feet bgs).</p>	
<b>Photo No:</b> 4	
<b>Photo Date:</b> October 8, 2015	
<b>Orientation:</b> Unknown	
<b>Description:</b> <p>On October 8, soil excavation was performed on the south side of the pipeline. Groundwater was observed in the south excavation; therefore, the ORC placement is within the area of fluctuating groundwater.</p>	

## APPENDIX B PHOTOGRAPH LOG

**Project Name:** NuStar Andover Quail Crossing  
**Project Number:** 1641-08

**Client:** NuStar Pipeline Operating Partnership L.P.  
**Location:** Andover, Kansas

<p><b>Photo No:</b> 5</p>	
<p><b>Photo Date:</b> October 8, 2015</p>	
<p><b>Orientation:</b> West</p>	
<p><b>Description:</b></p> <p>After completion of the excavation and prior to backfilling, approximately 1,400 pounds of ORC Advanced® was placed on the floor of the excavations to enhance aerobic degradation of residual petroleum constituents that remain in the subsurface. A layer of crushed rock was placed with the ORC Advanced® pellets to maintain placement of the pellets at the bottom of the excavation and in contact with the fluctuating groundwater table.</p>	
<p><b>Photo No:</b> 6</p>	
<p><b>Photo Date:</b> October 8, 2015</p>	
<p><b>Orientation:</b> Unknown</p>	
<p><b>Description:</b></p> <p>The excavation was backfilled with controlled-density fill (CDF) from the bottom of the excavation to approximately six feet bgs.</p>	

**APPENDIX B  
PHOTOGRAPH LOG**

**Project Name:** NuStar Andover Quail Crossing  
**Project Number:** 1641-08

**Client:** NuStar Pipeline Operating Partnership L.P.  
**Location:** Andover, Kansas

<b>Photo No:</b> 7	
<b>Photo Date:</b> November 6, 2015	
<b>Orientation:</b> Northwest	
<b>Description:</b> <p>Ground surfaces were restored following excavation backfilling. AC, Portland cement concrete (PCC), and landscaped areas were restored in accordance with the Work Plan. In addition, the affected portion of West Mountain Street from the 2012 excavation was resurfaced.</p>	

***Appendix C***

---

**Equipment Specification**



# 336D/ 336D L

Hydraulic Excavator

**CAT**<sup>®</sup>

---

#### Engine

Engine Model	Cat <sup>®</sup> C9 with ACERT <sup>™</sup> Technology
Net Flywheel Power	200 kW

---

#### Weights

Operating Weight – Std. Undercarriage	33 750 kg
Operating Weight – Long Undercarriage	35 020 kg

# 336D/336D L Hydraulic Excavator

*The D Series incorporates innovations for improved performance and versatility.*

---

## Engine

- ✓ The C9 with ACERT™ Technology offers better fuel efficiency and reduced wear. It works at the point of combustion to optimize engine performance and provide low exhaust emissions. By combining ACERT Technology with the new Economy Mode and Power Management, customers can balance the demands of performance and fuel economy to suit their requirements and application. **pg. 4**

---

## Service and Maintenance

Fast, easy service has been designed in with extended service intervals, advanced filtration, convenient filter access and user-friendly electronic diagnostics for increased productivity and reduced maintenance costs. **pg. 12**

---

## Hydraulics

The hydraulic system has been designed to provide reliability and outstanding controllability. An optional Tool Control System provides enhanced flexibility. **pg. 5**

---

## Complete Customer Support

Your Cat® dealer offers a wide range of services that can be set up under a customer support agreement when you purchase your equipment. The dealer will help you choose a plan that can cover everything from machine configuration to eventual replacement. **pg. 13**

---

## Operator Station

- ✓ Provides maximum space, wider visibility and easy access to switches. The monitor is a full-color graphical display that allows the operator to understand the machine information easily. Overall, the new cab provides a comfortable environment for the operator. **pg. 6**



---

**Structures**

Caterpillar® design and manufacturing techniques assure outstanding durability and service life from these important components. **pg. 8**

---

**Booms and Sticks**

Three lengths of booms and eight sticks are available to suit a variety of application conditions. **pg. 9**

---

**Work Tools – Attachments**

✓ A variety of work tools, including buckets, couplers, hammers, and shears are available through Cat Work Tools. **pg. 10**



✓ *New Feature*

## Engine

*The Cat® C9 gives the 336D exceptional power and fuel efficiency unmatched in the industry for consistently high performance in all applications.*



**Cat C9.** The Cat C9 with ACERT™ Technology introduces a series of evolutionary, incremental improvements that provide breakthrough engine technology. The building blocks of ACERT Technology are fuel delivery, air management and electronic control. ACERT Technology optimizes engine performance while meeting local engine emission regulations for off-road applications. By combining ACERT Technology with the new Economy Mode, customers can balance the demands of performance and fuel economy to suit their requirements and application.

**Performance.** The 336D/336D L, equipped with a C9 with ACERT Technology, provides 9% more horsepower as compared to the C9 in the 330C/330C L.

**Power Management.** Optimizes machine performance for each type of application. The operator can change the engine power on the monitor (password protected) from standard to high. The high power mode is recommended for extremely productive and hard digging applications. The standard power mode is recommended for lighter duty applications and optimizes fuel efficiency.

**Automatic Engine Speed Control.** The two-stage, one-touch control maximizes fuel efficiency and reduces sound levels.

### **ADEM™ A4 Engine Controller.**

The ADEM A4 electronic control module manages fuel delivery to get the best performance per liter of fuel used. The engine management system provides flexible fuel mapping, allowing the engine to respond quickly to varying application needs. It tracks engine and machine conditions while keeping the engine operating at peak efficiency.

**Fuel Delivery.** The Cat C9 features electronic controls that govern the unit fuel injection system. Multiple injection fuel delivery involves a high degree of precision. Precisely shaping the combustion cycle lowers combustion chamber temperatures, generating fewer emissions and optimizing fuel combustion. This translates into more work output for your fuel cost.

**Cooling System.** The cooling fan is hydraulically driven with a variable speed control that manages fan speed to provide optimized cooling. The optimum fan speed is calculated based on the target engine speed, coolant temperature, hydraulic oil temperature and actual fan speed. The Cat C9 delivered a completely new layout that separates the cooling system from the engine compartment.

**Air Cleaner.** The radial seal air filter features a double-layered filter core for more efficient filtration and is located in a compartment behind the cab. A warning is displayed on the monitor when dust accumulates above a preset level.

### **Noise Reduction Technologies.**

The engine mounts are rubber-isolating mounts matched with the engine package. Further noise reduction has been achieved through design changes to the isolated top cover, oil pan, multiple injection strategy, insulated timing cover, sculpted crankcase and gear train refinements.

## Hydraulics

*Cat hydraulics delivers power and precise control to keep material moving.*

**Component Layout.** The 336D hydraulic system and component locations have been designed to provide a high level of system efficiency. The main pumps, control valves and hydraulic tank are located close together to allow for shorter tubes and lines between components, which reduce friction loss, and pressure drops in the lines. The layout further provides greater operator comfort by placing the radiator on the cab side of the upper structure. This allows incoming air to enter the engine compartment from the operator side and hot air and corresponding engine sound to exit on the opposite side away from the operator. This reduces engine compartment heat and sound being transmitted to the operator.

**Pilot System.** The pilot pump is independent from the main pumps and controls the front linkage, swing and travel operations.

**Hydraulic Cross Sensing System.** The hydraulic cross sensing system utilizes each of two hydraulic pumps to 100 percent of engine power, under all operating conditions. This improves productivity with faster implement speeds and quicker, stronger pivot turns.

**Boom and Stick Regeneration Circuit.** Boom and stick regeneration circuit saves energy during boom-down and stick-in operation which increases efficiency, reduces cycle times and pressure loss for higher productivity, lower operating costs and increased fuel efficiency.



**Auxiliary Hydraulic Valve.** The auxiliary valve is standard on the 336D. Control Circuits are available as attachments, allowing for operation of high and medium pressure tools such as shears, grapples, hammers, pulverizers, multi-processors and vibratory plate compactors.

**Hydraulic Cylinder Snubbers.** Snubbers are located at the rod-end of the boom cylinders and both ends of the stick cylinders to cushion shocks while reducing sound levels and extending component life.

## Operator Station

*Designed for comfort, simple and easy operation, the 336D allows the operator to focus on production.*



**Operator Station.** The workstation is spacious, quiet and comfortable, assuring high productivity during a long workday. The air conditioner and attachment switches are conveniently located on the right-hand wall, and the key switch and throttle dial are on the right-hand console. The monitor is mounted in front of the right front cab post and is easy to see.

**Standard Cab Equipment.** To enhance operator comfort and productivity, the cab includes a lighter, drink holder, coat hook, service meter, literature holder, magazine rack and storage compartment.



**Monitor.** The monitor is a full color 400x234 pixels Liquid Crystal Display (LCD) graphic display. The monitor angle can be adjusted to minimize sun glare and has the capability of displaying information in twenty-seven different languages.

The Master Caution Lamp blinks ON and OFF when one of the critical conditions below occurs:

- Engine oil pressure low
- Coolant temperature high
- Hydraulic oil temperature high

Under normal conditions or the default condition, the monitor display screen is divided into four areas; clock and throttle dial, gauge, event display and multi-information display.

**Clock and Throttle Dial Display.**

The clock and throttle dial position are displayed in this area. When Economy mode/Power management system is activated, the icon of the gas station icon will be indicated at the side of the throttle dial.

**Gauge Display.** Three analog gauges, fuel level, hydraulic oil temperature and coolant temperature, are displayed in this area.

**Event Display.** Machine information is displayed in this area with the icon and language.

**Multi-information Display.** This area is reserved for displaying various information that is convenient for the operator. The “CAT” logo mark is displayed when no information is available to be displayed.

**Joystick Control.** Joystick controls have low lever effort and are designed to match the operator’s natural wrist and arm position. The operator can operate joystick controls with an arm on the armrest and the horizontal and vertical strokes have been designed to reduce operator fatigue.

**Seat.** A new optional air suspension seat is available in the 336D. The standard and optional seats provide a variety of adjustments to suit the operator’s size and weight including fore/aft, height and weight. Wide adjustable armrests and a retractable seat belt are also included.

**Hydraulic Activation Control Lever.**

For added safety, this lever must be in the operate position to activate the machine control functions.

**Climate Control.** Positive filtered ventilation with a pressurized cab is standard. Fresh air or re-circulated air can be selected with a switch on the left console.



**Console.** Redesigned consoles feature a simple, functional design to reduce operator fatigue, ease of switch operation and excellent visibility. Both consoles have attached armrests with height adjustments.

**Cab Exterior.** The exterior design uses thick steel tubing along the bottom perimeter of the cab, improving the resistance of fatigue and vibration. This design allows the FOGS to be bolted directly to the cab, at the factory or as an attachment later, enabling the machine to meet specifications and job site requirements.

**Cab Mounts.** The cab shell is attached to the frame with viscous rubber cab mounts, which dampen vibrations and sound levels while enhancing operator comfort.

**Windows.** To promote visibility, all glass is affixed directly to the cab, eliminating window frames. The upper front windshield opens, closes and stores on the roof above the operator with a one-touch action release system.

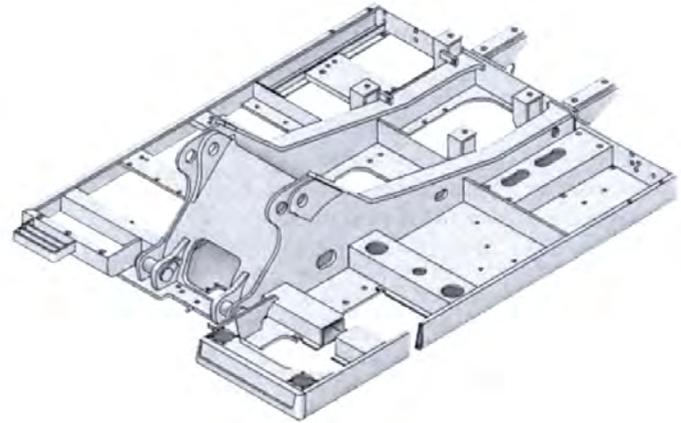
**Wipers.** Pillar-mounted wipers increase the operator’s viewing area and offer continuous and intermittent modes.

**Skylight.** An enlarged skylight with sunshade provides excellent visibility and excellent ventilation.

**Product Link.** Product Link is now an attachment available from the factory.

## Structures

*336D structural components and undercarriage are the backbone of the machine's durability.*



**Robotic Welding.** Up to 95% of the structural welds on a Caterpillar® Excavator are completed by robots. Robotic welds achieve over three times the penetration of manual welds.

**Carbody Design and Track Roller Frames.** X-shaped, box-section carbody provides excellent resistance to torsion bending. Robot-welded track roller frames are press-formed, pentagonal units to deliver exceptional strength and service life.

**Main Frame.** Rugged main frame is designed for maximum durability and efficient use of materials.

**Undercarriage.** Durable Cat undercarriage absorbs stresses and provides excellent stability.

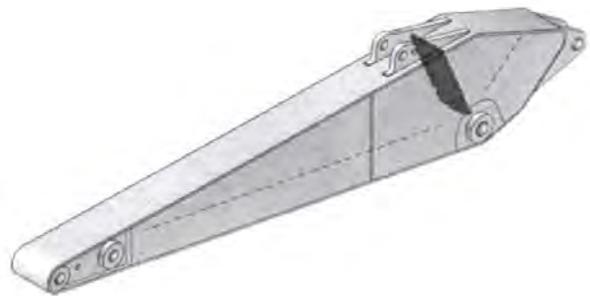
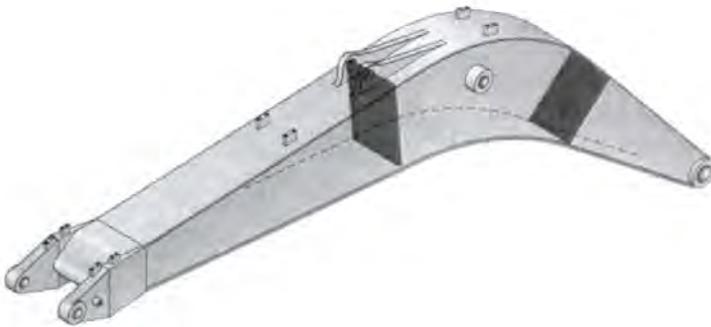
**Rollers and Idlers.** Sealed and lubricated track rollers, carrier rollers, and idlers provide excellent service life, to keep the machine in the field longer.

**Standard Undercarriage.** The standard undercarriage is well suited for applications that require frequent repositioning of the machine, have restricted working space or uneven, rocky terrain.

**Long Undercarriage.** The long (L) undercarriage maximizes stability and lift capacity. This long, wide, and sturdy undercarriage offers a very stable work platform.

## Booms and Sticks

*Designed-in flexibility to help bring higher production and efficiency to all jobs.*



### **Booms, Sticks and Attachments.**

Designed for maximum flexibility, productivity and high efficiency on all jobs, the 336D offers a wide range of configurations suitable for a variety of applications.

**Front Linkage Attachments.** Three lengths of booms and eight sticks are available, offering a range of configurations suitable for a wide variety of application conditions.

**Booms.** The booms have large cross-sections and internal baffle plates to provide long life durability.

**Sticks.** The sticks are made of high-tensile strength steel using a large box section design with interior baffle plates and an additional bottom guard.

**Reach Boom.** The reach boom features an optimum design that maximizes digging envelopes with four stick choices:

R3.9DB, R3.2DB and R2.8DB Sticks

- The DB-family bucket associated with these sticks have enough capacity for excellent reach and depth in trenching and general construction applications.

### **R3.9DB Stick**

- Suited for the high-capacity buckets used in trenching, excavation, and other general construction work. Designed with enough reach and depth to match a large-capacity bucket and high digging force.

### **R3.2DB Stick**

- This stick provides the most versatile front linkage. The R3.2DB is an excellent fit for all 11-ton to 32 ton dump trucks with regard to reach and bucket capacity.

### **R2.8DB Stick**

- Designed with enough reach and depth to match a large-capacity bucket and high digging force. Suitable for the high-capacity buckets used in trenching, excavation and other general construction work.

### **R2.15TB1 Stick**

- This stick was designed particularly for large capacity-construction work.

**Mass Excavation Boom.** The mass excavation boom maximizes productivity. The mass version offers significantly higher digging forces and allows use of larger buckets.

### **M2.55TB1 and M2.15TB1 Sticks**

- The TB1 Sticks use a TB-family bucket and were designed for high volume earth moving, powerful digging force and a large capacity bucket. Combined with a Mass boom, these sticks deliver outstanding productivity.

**Linkage Pins.** The bucket linkage pins have been enlarged to improve reliability and durability. All the pins in the front linkages have thick chrome plating, giving them high wear and corrosion resistance.

**Bucket Linkage.** The power link improves durability, increases machine-lifting capability in key lifting positions and is easier to use than compared to the previous lifting eye.

## Work Tools – Attachments

The 336D has an extensive selection of work tools to optimize machine performance.



**Service Life.** Caterpillar buckets increase service life and reduce repair costs.

- Dual radius design for increased heel clearance and reduced wear
- Robot welding of hinge assembly for increased weld penetration and longer life
- Incorporates the new aggressive and easier to install, K Series™ GET tool system
- High strength and heat-treated steel that exceeds T-1 in high wear areas

**Excavation Buckets (X).** Excavation (X) buckets for digging in low-impact, moderately abrasive materials such as dirt, loam, gravel and clay.

**Heavy-Duty Buckets.** Heavy duty (HD) buckets for a wide range of moderately abrasive applications such as mixed dirt, clay and rock. HD buckets have best loading and dumping characteristics and will empty easier in cohesive material. More robust construction than the GP buckets.

### Heavy-Duty Power (HDP) Buckets.

For use in moderately abrasive applications where breakout force and cycle times are critical. Maximizes tip force and improves cycle times in most materials. Not for use in sticky material conditions. Cutting edge and GET are up-sized.

**Heavy-Duty Rock Buckets.** Heavy-duty rock for aggressive bucket loading in highly abrasive application such as shot rock and granite. Features include:

- Thickest wear plates to extend the life of bucket in severe applications
- Side wear plated extend further up the side of the bucket for maximum protection in rocky soils
- Buckets accept sidebar protectors for best sidebar protection, or side cutters for best fill characteristics and bucket wear protection

### Caterpillar Ground Engaging Tools (GET).

The new Caterpillar K Series GET is featured on the new buckets. This new GET system uses a hammerless vertical retainer, which is easier to remove and install than the Cat J Series pin. The new tooth shapes are more aggressive and offer better penetration than the previous generation of tips. There are also a variety of side cutters and sidebar protectors to match operating conditions.



**Tool Control System.** The optional tool control system maximizes work tool productivity by configuring hydraulic flow, pressure, and operator controls to match a specific work tool. System versatility enables a wide range of tools to be used.

## Versatility

*A wide variety of optional factory-installed attachments are available to enhance performance and improve job site management.*



*Thumb*

Cat® thumbs multiply the capabilities of your excavator. This highly flexible tool works in conjunction with the bucket to transform an excavator into a highly versatile material-handling machine.



*Hammer*

Cat Hydraulic Hammers are precisely matched to Cat machines for optimum performance in a wide variety of demolition and construction applications.



*Multi-processor*

Multi-processors do the work of many types of demolition tools by use of interchangeable jaw sets. Changing jaws allows a single unit to crush, pulverize and perform a variety of specialized cutting tasks, such as cutting steel rebar and tanks.



*Vibratory Plate Compactor*

Caterpillar® Vibratory Plate Compactors provide superior compaction force in a reliable, low-maintenance package. These units produce high-power impulses at a rate of 2,200 impacts per minute. The forces generated by this vibration drive soil particles close together for solid, stable compactions. Whether in a trench or on a slope, driving sheeting or posts, Cat Compactors are the superior choice for any jobsite's compaction tasks.



*360° Scrap Shear*

Caterpillar Scrap Shears feature 360° rotation and high force-to-weight ratio. Used for demolishing steel structures and preparing bulk scrap (such as cars, farm machinery and railroad cars) for further processing.



*Pin-Grabber Quick Coupler*

Pin-Grabber Plus Quick Couplers multiply the versatility and utility of Cat Excavators by allowing them to pick up and use virtually any work tool equipped with standard pins.

**Dedicated Quick Coupler.** Quick Couplers increase the versatility of Cat excavators; allowing the ease of changing work tools to meet job requirements at hand in a matter of minutes or seconds. Dedicated quick coupler buckets have no loss of tip radius, and develop maximum breakout force.

## Service and Maintenance

*Simplified service and maintenance features save you time and money.*



**Ground Level Service.** The design and layout of the 336D was made with the service technician in mind. Many service locations are easily accessible at ground level allowing critical maintenance to get done quickly and efficiently.

**Air Filter Compartment.** The air filter features a double-element construction for superior cleaning efficiency. When the air cleaner plugs, a warning is displayed on the monitor screen inside the cab.

**Pump Compartment.** A service door on the right side of the upper structure allows ground-level access to the pump and pilot filter.

**Radiator Compartment.** The left rear service door allows easy access to the engine radiator, oil cooler and air-to-air-after-cooler. A reserve tank and drain cock are attached to the radiator for simplified maintenance.

**Capsule Filter.** The hydraulic return filter, a capsule filter, is situated outside the hydraulic tank. This filter prevents contaminants from entering the system when hydraulic oil is changed and keeps the operation clean.



**Greasing Points.** A concentrated remote greasing block on the boom delivers grease to hard-to-reach locations on the front.

**Fan Guard.** Engine radiator fan is completely enclosed by fine wire mesh, reducing the risk of an accident.

**Anti-Skid Plate.** Anti-skid plate covers top of storage box and upper structure to prevent slipping during maintenance.

**Diagnostics and Monitoring.** The 336D is equipped with S•O•S<sup>SM</sup> sampling ports and hydraulic test ports for the hydraulic system, engine oil, and for coolant. A test connection for the Cat Electronic Technician (Cat ET) service tool is located in the cab.

**Extended Service Interval.** 336D service and maintenance intervals have been extended to reduce machine service time and increase machine availability.

## Complete Customer Support

*Cat dealer services help you operate longer with lower costs.*



**Product Support.** You will find nearly all parts at our dealer parts counter. Cat dealers utilize a worldwide computer network to find in-stock parts to minimize machine down time. Save money with remanufactured components.

**Machine Selection.** Make detailed comparisons of the machines you are considering before you buy. What are the job requirements, machine attachments and operating hours? What production is needed? Your Cat dealer can provide recommendations.

**Purchase.** Look past initial price. Consider the financing options available as well as day-to-day operating costs. This is also the time to look at dealer services that can be included in the cost of the machine to yield lower equipment owning and operating costs over the long run.

**Customer Support Agreements.** Cat dealers offer a variety of product support agreements, and work with customers to develop a plan the best meets specific needs. These plans can cover the entire machine, including attachments, to help protect the customer's investment.

**Operation.** Improving operating techniques can boost your profits. Your Cat dealer has videotapes, literature and other ideas to help you increase productivity, and Caterpillar offers certified operator training classes to help maximize the return on your investment.

**Maintenance Services.** Repair option programs guarantee the cost of repairs up front. Diagnostic programs such as Scheduled Oil Sampling, Coolant Sampling and Technical Analysis help you avoid unscheduled repairs.

**Replacement.** Repair, rebuild, or replace? Your Cat dealer can help you evaluate the cost involved so you can make the right choice.

**SAFETY.CAT.COM™.**

## Engine

Engine Model	Cat C9 with ACERT Technology
Net Flywheel Power	200 kW
Net Power – ISO 9249	200 kW
Bore	112 mm
Stroke	149 mm
Displacement	8.8 L

- Net power advertised is the power available at the flywheel when the engine is equipped with fan, air cleaner, muffler and alternator.
- No engine derating needed up to 2300 m.

## Weights

Operating Weight – Std. Undercarriage	33 750 kg
Operating Weight – Long Undercarriage	35 020 kg

- Reach boom, R3.2DB Stick, 1.4 m<sup>3</sup> Bucket, 600 mm Shoes
- Reach boom, R3.2DB Stick, 1.5 m<sup>3</sup> Bucket, 700 mm Shoe

## Track

Standard w/Standard Undercarriage	700 mm
Standard w/Long Undercarriage	800 mm
Optional – Double Grouser	600 mm

## Swing Mechanism

Swing Speed	10 rpm
Swing Torque	108.6 kN•m

## Drive

Maximum Drawbar Pull	300 kN
Maximum Travel Speed	5 km/h

## Hydraulic System

Main Implement System – Maximum Flow (2x)	280 L/min
Max. Pressure – Equipment	35 000 kPa
Max. Pressure – Travel	35 000 kPa
Max. Pressure – Swing	28 000 kPa
Pilot System – Maximum Flow	43 L/min
Pilot System – Maximum Pressure	3900 kPa
Boom Cylinder – Bore	150 mm
Boom Cylinder – Stroke	1440 mm
Stick Cylinder – Bore	170 mm
Stick Cylinder – Stroke	1738 mm
DB Family Bucket Cylinder – Bore	150 mm
DB Family Bucket Cylinder – Stroke	1151 mm
TB1 Family Bucket Cylinder – Bore	160 mm
TB1 Family Bucket Cylinder – Stroke	1356 mm

## Service Refill Capacities

Fuel Tank Capacity	620 L
Cooling System	40 L
Engine Oil	40 L
Swing Drive	19 L
Final Drive (each)	8 L
Hydraulic System (including tank)	410 L
Hydraulic Tank	175 L

## Sound Performance

Performance	ANSI/SAE J1166 OCT 98
-------------	-----------------------

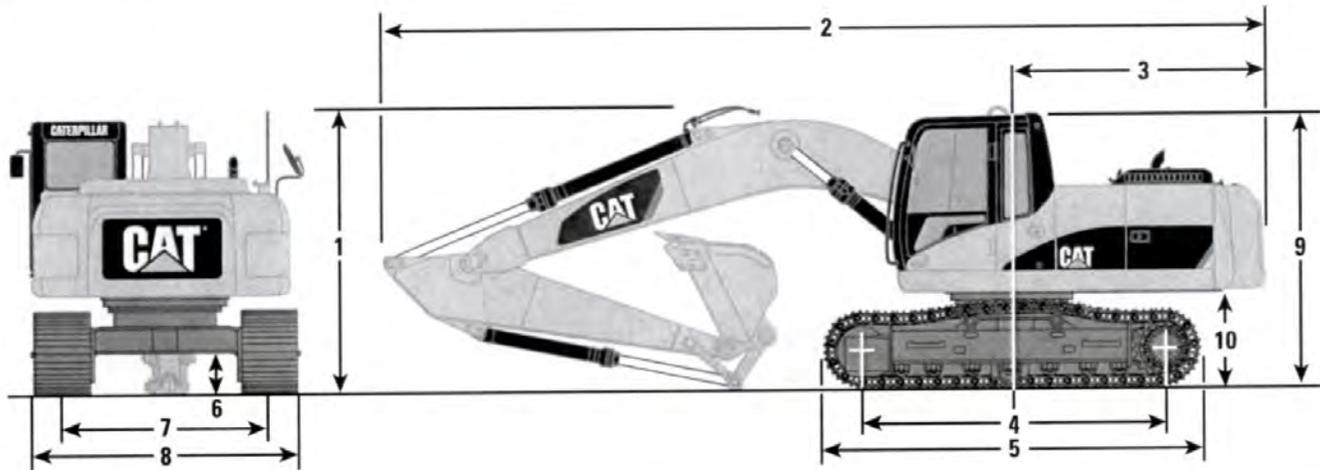
- When properly installed and maintained, the cab offered by Caterpillar, when tested with doors and windows closed according to ANSI/SAE J1166 OCT 98, meets OSHA and MSHA requirements for operator sound exposure limits in effect at time of manufacture.
- Hearing protection may be needed when operating with an open operator station and cab (when not properly maintained or doors/windows open) for extended periods or in noisy environment.

## Standards

Brakes	SAE J1026 APR90
Cab/FOGS	SAE J1356 FEB88 ISO 10262

## Dimensions

All dimensions are approximate.



Boom Options	Reach Boom 6.5 m			Mass Boom 6.18 m		
	R3.9DB	R3.2DB	R2.8DB	R2.15TB1	M2.55TB1	M2.15TB1
<b>Stick Options</b>						
1 Shipping height**	3700 mm	3340 mm	3570 mm	3540 mm	3650 mm	3680 mm
2 Shipping length	11 200 mm	11 150 mm	11 210 mm	11 500 mm	10 910 mm	11 200 mm
3 Tail swing radius	3500 mm	3500 mm	3500 mm	3500 mm	3500 mm	3500 mm
<b>Undercarriage</b>		<b>Fixed Gauge</b>		<b>Long Fixed Gauge</b>		
4 Length to center of rollers		3610 mm		4040 mm		
5 Track length		4590 mm		5020 mm		
6 Ground clearance***		450 mm		450 mm		
7 Track gauge		2590 mm		2590 mm		
8 Track width*		3190 mm		3290 mm		
9 Cab height**		3140 mm		3140 mm		
10 Counterweight clearance***		1220 mm		1220 mm		

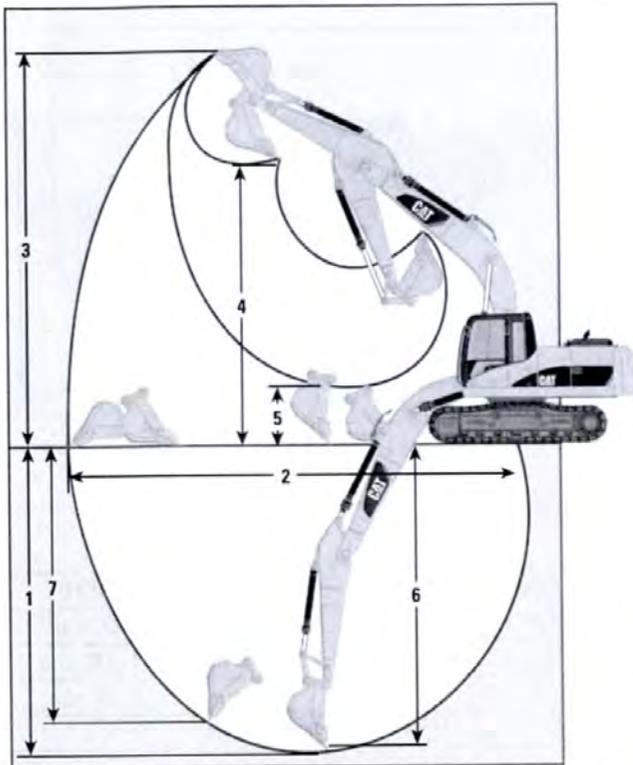
\* Track width shown is for 600 mm track shoes for Fixed Gauge and 700 mm for Long Fixed Gauge.

\*\* Includes 30 mm shoe lug height.

\*\*\* Without 30 mm shoe lug height.

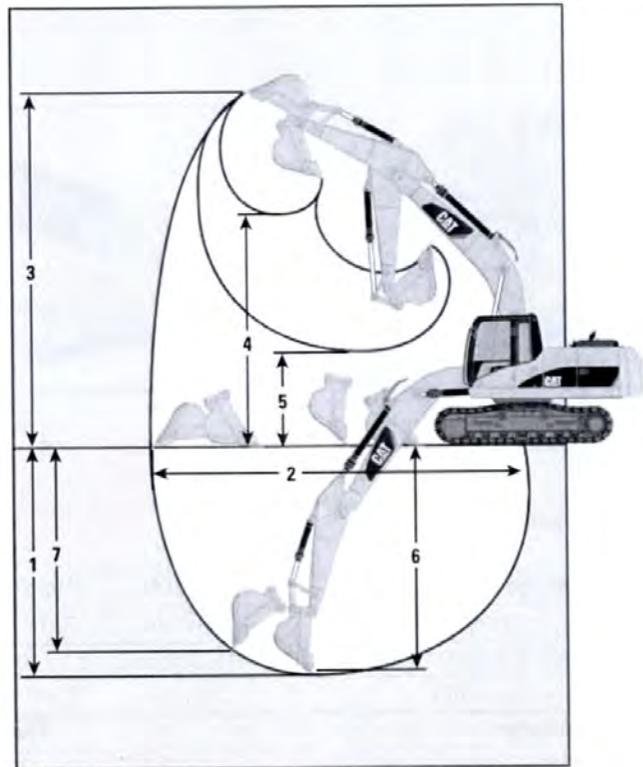
## Reach Excavator Working Ranges

Reach (R) boom configuration



## Mass Excavator Working Ranges

Mass (M) boom configuration



### Boom Options

#### Reach Boom 6.5 m

#### Mass Boom 6.18 m

Stick Options	R3.9DB	R3.2DB	R2.8DB	R2.15TB1	M2.55TB1	M2.15TB1
1 Maximum digging depth	8090 mm	7390 mm	6990 mm	6500 mm	6570 mm	6170 mm
2 Maximum reach at ground level	11 640 mm	10 920 mm	10 620 mm	10 070 mm	10 180 mm	9760 mm
3 Maximum cutting height	10 710 mm	10 240 mm	10 300 mm	9820 mm	10 070 mm	9740 mm
4 Maximum loading height	7640 mm	7200 mm	7200 mm	6530 mm	6690 mm	6410 mm
5 Minimum loading height	2010 mm	2710 mm	3110 mm	3590 mm	3000 mm	3400 mm
6 Maximum depth cut for 2240 mm level bottom	7960 mm	7230 mm	6820 mm	6280 mm	6400 mm	5970 mm
7 Maximum vertical wall digging depth	6700 mm	5830 mm	5770 mm	4800 mm	5340 mm	4710 mm
Bucket digging force (SAE)	198 kN	198 kN	198 kN	234 kN	234 kN	234 kN
(ISO)	222 kN	222 kN	222 kN	264 kN	264 kN	264 kN
Stick digging force (SAE)	143 kN	164 kN	183 kN	215 kN	185 kN	215 kN
(ISO)	146 kN	169 kN	188 kN	224 kN	192 kN	224 kN

## Major Component Weights

	kg	
Base machine with counterweight and 800 mm shoes (without front linkage)	With 600 mm Shoe	26 160
	With 700 mm Shoe	27 390
Two boom cylinders (Each)	320	
Counterweight		
Non-removal type	6020	
Boom (includes lines, pins and stick cylinder)		
Reach boom	3227	
Mass boom	3255	
Stick (includes lines, pins, bucket cylinder and linkage)		
R3.9DB	2012	
R3.2DB	1867	
R2.8DB	1792	
R2.15TB1	2011	
M2.55TB1	2079	
M2.15TB1	2011	
Track roller frame [includes frame, rollers, idlers, steps, guards, final drive, 800 mm shoes] – each	With 600 mm Shoe	11 980
	With 700 mm Shoe	13 210

## 336D/336D L Work Tool Matching Guide

Boom Options	Reach Boom 6.5 m			Mass Boom 6.18 m		
	R3.9DB	R3.2DB	R2.80DB	R2.15TB1	M2.55TB1	M2.15TB1
Stick Options						
Hydraulic Hammer	H130s/ H140Ds/ H160Ds	H130s/ H140Ds/ H160Ds	H130s/ H140Ds/ H160Ds	H130s/ H140Ds/ H160Ds	H130s/ H140Ds/ H160Ds	H130s/ H140Ds/ H160Ds
Vibratory Plate Compactor	CVP110	CVP110	CVP110	CVP110	CVP110	CVP110
Multi-Processor	MP20	MP20	MP20	n/a	n/a	n/a
360 Scrap Shear	S320	S320	S320	n/a	n/a	n/a
Trash Grapple	4.4 m <sup>3</sup>	4.4 m <sup>3</sup>	4.4 m <sup>3</sup>	n/a	n/a	n/a
	5.8 m <sup>3</sup>	5.8 m <sup>3</sup>	5.8 m <sup>3</sup>			
Dedicated Quick Coupler	yes	yes	yes	yes	yes	yes
Pin-Grabber Quick Coupler	yes	yes	yes	yes	yes	yes
Contractors' Grapple	yes	yes	yes	yes	n/a	n/a
Hydraulic Thumb	yes	yes	yes	yes	n/a	n/a

## 336D Bucket Specifications and Compatibility

	Capacity	Width	Tip Radius	Weight (w/o tips)	Teeth	Total Weight	Reach Stick			Mass Stick		
	m <sup>3</sup>	mm	mm	kg	Qty	kg	R3.9DB	R3.2DB	R2.8DB	R2.15TB1	M2.55TB1	M2.15TB1
<b>DB Buckets</b>												
Excavation	1.4	1472	1660	1124	5	1124	●	●	●	—	—	—
	1.5	1559	1660	1167	5	1167	◐	●	●	—	—	—
Heavy Duty	1.4	1500	1691	1305	5	1305	◐	●	●	—	—	—
	1.5	1585	1691	1352	5	1352	◐	●	●	—	—	—
Mass Excavation	1.6	1538	1660	1214	6	1214	◐	●	●	—	—	—
	1.9	1780	1660	1336	6	1336	○	◐	◐	—	—	—
<b>TB Buckets</b>												
Excavation	1.6	1360	1821	1405	4	1405	—	—	—	●	●	●
	1.9	1560	1821	1546	5	1546	—	—	—	●	●	●
	2.0	1628	1821	1583	5	1583	—	—	—	◐	◐	●

## 336D L Bucket Specifications and Compatibility

	Capacity	Width	Tip Radius	Weight (w/o tips)	Teeth	Total Weight	Reach Stick			Mass Stick		
	m <sup>3</sup>	mm	mm	kg	Qty	kg	R3.9DB	R3.2DB	R2.8DB	R2.15TB1	M2.55TB1	M2.15TB1
<b>DB Buckets</b>												
Excavation	1.4	1472	1660	1124	5	1124	●	●	●	—	—	—
	1.5	1559	1660	1167	5	1167	●	●	●	—	—	—
Heavy Duty	1.4	1500	1691	1305	5	1305	●	●	●	—	—	—
	1.5	1585	1691	1352	5	1352	●	●	●	—	—	—
Mass Excavation	1.6	1538	1660	1214	6	1214	◐	●	●	—	—	—
	1.9	1780	1660	1336	6	1336	○	◐	●	—	—	—
<b>TB Buckets</b>												
Excavation	1.6	1360	1821	1405	4	1405	—	—	—	●	●	●
	1.9	1560	1821	1546	5	1546	—	—	—	●	●	●
	2.0	1628	1821	1583	5	1583	—	—	—	◐	●	●

Assumptions for maximum material density rating:

1. Front linkage fully extended at ground line
2. Bucket curled
3. 100% bucket fill factor

\* Based on SAE J296, some calculations of capacity specs fall on borderlines. Rounding may allow two buckets to have the same English rating, but different metric ratings.

- 2100 kg/m<sup>3</sup> max material density
- ◐ 1800 kg/m<sup>3</sup> max material density
- 1500 kg/m<sup>3</sup> max material density
- ∴ 1200 kg/m<sup>3</sup> max material density
- Not Available

# Reach Boom Lift Capacities



Load Point Height



Load Radius Over Front



Load Radius Over Side



Load at Maximum Reach

**R3.2DB STICK** – 3200 mm  
**BUCKET** – 1.5 m<sup>3</sup>

**UNDERCARRIAGE** – Long  
**SHOES** – 600 mm triple grouser

**BOOM** – 6500 mm

	1.5 m		3.0 m		4.5 m		6.0 m		7.5 m		9.0 m				m	
9.0 m kg														*3900	*3900	8.27
7.5 m kg									*6450	6350				*3700	*3700	9.43
6.0 m kg									*6700	6300				*3650	3500	10.16
4.5 m kg							*8450	*8450	*7350	6050	*6750	4250	*3700	3100	10.59	
3.0 m kg					*13 750	13 050	*10 050	8300	*8200	5750	6950	4100	*3900	2950	10.76	
1.5 m kg					*16 350	11 900	*11 500	7700	*9050	5400	6800	3950	*4200	2900	10.67	
Ground Line kg			*6800	*6800	*17 500	11 300	*12 450	7300	8900	5200	6650	3850	*4700	3050	10.33	
-1.5 m kg	*8150	*8150	*12 000	*12 000	*17 500	11 150	12 550	7100	8750	5050	6600	3800	*5450	3400	9.71	
-3.0 m kg	*13 350	*13 350	*18 300	*18 300	*16 500	11 250	*12 250	7100	8800	5050			*6750	4100	8.74	
-4.5 m kg			*19 800	*19 800	*14 350	11 550	*10 700	7300					*5950	5750	7.28	
-6.0 m kg					*10 050	*10 050							*7750	*7750	5.47	

\* Limited by hydraulic capacity rather than tipping load. The above loads are in compliance with SAE hydraulic excavator lift capacity rating standard J1097. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping capacity. Weight of all lifting accessories must be deducted from the above lifting capacities.

**R2.8DB STICK** – 2800 mm  
**BUCKET** – 1.6 m<sup>3</sup>

**UNDERCARRIAGE** – Long  
**SHOES** – 600 mm triple grouser

**BOOM** – 6500 mm

	3.0 m		4.5 m		6.0 m		7.5 m		9.0 m				m	
9.0 m kg												*4900	*4900	7.85
7.5 m kg							*6850	6250				*4600	4450	9.07
6.0 m kg							*7100	6150				*4500	3700	9.84
4.5 m kg			*11 400	*11 400	*8950	8800	*7700	5950	7000	4150	*4550	3250	10.29	
3.0 m kg			*14 600	12 750	*10 500	8150	*8500	5650	6900	4050	*4750	3050	10.46	
1.5 m kg			*16 900	11 700	*11 850	7650	9150	5400	6750	3900	*5100	3050	10.37	
Ground Line kg			*17 650	11 250	*12 650	7300	8900	5150	6650	3850	5600	3200	10.02	
-1.5 m kg	*11 400	*11 400	*17 300	11 200	12 600	7150	8800	5100			6250	3600	9.38	
-3.0 m kg	*19 250	*19 250	*16 000	11 350	*12 000	7200	8850	5150			*6750	4450	8.36	
-4.5 m kg	*18 150	*18 150	*13 500	11 750	*10 000	7450					*5900	*5900	6.82	

\* Limited by hydraulic capacity rather than tipping load. The above loads are in compliance with SAE hydraulic excavator lift capacity rating standard J1097. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping capacity. Weight of all lifting accessories must be deducted from the above lifting capacities.

Always refer to the appropriate Operation and Maintenance Manual for specific product information.

## Reach Boom Lift Capacities



Load Point Height



Load Radius Over Front



Load Radius Over Side



Load at Maximum Reach

**R3.2DB STICK** – 3200 mm  
**BUCKET** – 1.5 m<sup>3</sup>

**UNDERCARRIAGE** – Standard  
**SHOES** – 600 mm triple grouser

**BOOM** – 6500 mm

Load Point Height	1.5 m		3.0 m		4.5 m		6.0 m		7.5 m		9.0 m		Load at Maximum Reach		m		
	Over Front	Over Side	Over Front	Over Side													
9.0 m kg															*3900	*3900	8.27
7.5 m kg										*6450	6200				*3700	*3700	9.43
6.0 m kg										*6700	6150				*3650	3400	10.16
4.5 m kg								*8450	*8450	*7350	5900	5950	4150		*3700	3000	10.59
3.0 m kg						*13 750	12 750	*10 050	8100	7950	5600	5750	4000		*3900	2850	10.76
1.5 m kg						*16 350	11 600	10 900	7500	7600	5250	5600	3850		4200	2800	10.67
Ground Line kg			*6800	*6800	16 850	11 000	10 500	7100	7350	5000	5450	3700	4400		2900		10.33
-1.5 m kg	*8150	*8150	*12 000	*12 000	16 650	10 850	10 250	6900	7200	4900	5400	3650	4850		3250		9.71
-3.0 m kg	*13 350	*13 350	*18 300	*18 300	*16 500	10 950	10 250	6900	7250	4900					5850	4000	8.74
-4.5 m kg			*19 800	*19 800	*14 350	11 250	10 500	7100							*5950	5550	7.28
-6.0 m kg					*10 050	*10 050									*7750	*7750	5.47

\* Limited by hydraulic capacity rather than tipping load. The above loads are in compliance with SAE hydraulic excavator lift capacity rating standard J1097. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping capacity. Weight of all lifting accessories must be deducted from the above lifting capacities.

## Mass Boom Lift Capacities



Load Point Height



Load Radius Over Front



Load Radius Over Side



Load at Maximum Reach

**M2.55TB1 STICK** – 2550 mm  
**BUCKET** – 1.9 m<sup>3</sup>

**UNDERCARRIAGE** – Long  
**SHOES** – 600 mm triple grouser

**BOOM** – 6180 mm

Load Point Height	3.0 m		4.5 m		6.0 m		7.5 m		Load at Maximum Reach		m	
	Over Front	Over Side	Over Front	Over Side								
7.5 m kg										*3850	*3850	8.56
6.0 m kg					*7800	*7800	*7250	5800	*3750	3750	9.37	
4.5 m kg			*11 300	*11 300	*8950	8500	*7750	5600	*3800	3250	9.83	
3.0 m kg			*14 250	12 450	*10 350	7850	*8450	5350	*4000	3000	9.99	
1.5 m kg			*16 450	11 300	*11 600	7300	8800	5050	*4350	3000	9.87	
Ground Line kg			*17 150	10 800	*12 250	6900	8600	4850	*4900	3200	9.48	
-1.5 m kg	*15 350	*15 350	*16 650	10 750	*12 200	6800	8500	4750	*5800	3750	8.76	
-3.0 m kg	*20 700	*20 700	*15 050	10 950	*11 200	6900			*6400	4950	7.62	
-4.5 m kg	*15 900	*15 900	*11 850	11 500	*8200	7300			*8100	7250	6.04	

\* Limited by hydraulic capacity rather than tipping load. The above loads are in compliance with SAE hydraulic excavator lift capacity rating standard J1097. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping capacity. Weight of all lifting accessories must be deducted from the above lifting capacities.

Always refer to the appropriate Operation and Maintenance Manual for specific product information.

## Standard Equipment

*Standard equipment may vary. Consult your Caterpillar dealer for details.*

### Upper Structure

#### Electrical

- Alternator, 80A
- Light, storage box mounted (one)
- Signaling/Warning horn

#### Engine

- Cat C9 with ACERT Technology
- Cooling package, high ambient, 48° C with VSF for standard power
- 2300 m altitude capability with no deration
- Air intake heater
- Automatic engine speed control
- EU Stage II compliant
- Radial seal air filter
- Water separator in fuel line
- Waved fin radiator with space for cleaning
- 2 micron fuel filter
- Automatic swing parking brake
- Boom drift reducing valve
- Boom lowering device for back-up
- Caterpillar one key security system
- Counterweight
- Door locks and cap locks
- Mirrors, rearview (frame-right, cab-left)
- Regeneration circuit for boom and stick
- Reverse swing damping valve
- Stick drift reducing valve
- Two speed travel

### Operator Station

#### Cab

- Adjustable armrest
- Ashtray with lighter
- Beverage holder
- Bi-Level air conditioner (automatic) with defroster
- Bolt-on FOGS capability
- Capability of installing two additional pedals
- Coat hook
- Front windshield glass split 70/30
- Interior lighting
- Literature holder
- Mounting for two stereo speakers (two locations)
- Neutral lever (lock out) for all controls
- Openable front windshield with assist device
- Openable skylight
- Pillar mounted upper windshield wiper and washer
- Pressurized cab (positive filtered ventilation)
- Radio mounting (DIN size)
- Rear window, emergency exit
- Removable lower windshield with in-cab storage bracket
- Seat with integrated, adjustable console
- Seat belt, retractable (50.8 mm width)
- Sliding upper door window
- Storage compartment suitable for lunch box
- Travel control pedals with removable hand levers
- Utility space for magazine
- Washable floor mat

#### Monitor

- Economy mode
- Full time clock
- Language display – Full color and graphical display
- Machine condition, error code and tool mode setting
- Start-up level check for hydraulic oil, engine oil and coolant
- Warning information, filter/fluid change information and working hour

#### Undercarriage

- Grease lubricated GLT2, resin seal
- Idler and center section track guiding
- 800 mm triple grouser track shoe (336D L)
- 700 mm triple grouser track shoes (336D)

## Optional Equipment

*Optional equipment may vary. Consult your Caterpillar dealer for details.*

### Front Linkage

- Bucket linkage, DB-family with lifting eye
- Bucket linkage, TB1-family with lifting eye
- Heavy-duty 6.5 m reach boom (with left and right side light)
- Heavy-duty 3.2 m stick for heavy-duty reach boom
- Heavy-duty 2.8 m stick for heavy-duty reach boom
- Reach boom 6.5 m with left and right side light
  - R3.9DB 3900 mm stick
  - R3.2DB 3000 mm stick
  - R2.8DB 2800 mm stick
  - R2.15TB1 2150 mm stick
- Mass boom 6.18 m with left and right side light
  - M2.55TB1 2550 mm stick
  - M2.15TB1 2150 mm stick

### Track

- Standard undercarriage
  - 700 mm triple grouser shoes
  - 800 mm triple grouser shoes
- Long undercarriage
  - 600 mm triple grouser shoes
  - 700 mm triple grouser shoes

### Guards

- FOGS, bolt-on
- Guard, cab front
- Guard, cab top
- Guard, full length for long undercarriage (two piece)
- Guard, heavy-duty bottom, 4 mm, without swivel guard and travel motor protection
- Guard, track end guide for long undercarriage
- Guard, track end guide for standard undercarriage
- Guard, vandalism
- Heavy-duty swivel protection, 16 mm, swivel guard only
- Heavy-duty travel motor protection
- Net for front guard (full net, one piece)
- Net for front guard (half net, one piece)
- Swivel protection, 6 mm, swivel guard only

### Auxiliary Hydraulics and Lines

- Additional circuit
  - Hammer return filter circuit
- Boom and stick lines
  - Cat quick coupler line (high and medium pressure capable)
  - Drain line
  - High pressure line
  - Medium pressure line
- Quick coupler
  - Quick coupler for high pressure
- Tool control system
  - Configuration 1 (hammer 1), foot pedal operated 1P, one-way circuit
  - Configuration 2 (common), foot pedals operated 1/2P, common circuit
  - Configuration 3 (hammer 2), foot pedal operated 2P, one-way circuit

### Operator Station

- Tempered glass windows
- Polycarbonate windows
- Power supply, 12V-7A (1)
- Power supply, 12V-7A (2)
- Rear window emergency exit
- Seat, high-back air suspension
- Seat, high-back air suspension with heater
- Seat, high-back mechanical suspension
- Seat, low-back suspension without headrest
- Headrest
- Sunscreen
- Windshield wiper, lower with washer
- Working lights, cab mounted
- Rain protector for front windshield
- Sun visor
- AM/FM radio
- Control pattern quick-changer, two way
- Control pattern quick-changer, four way
- Cat MSS (anti-theft device)
- Lunch box with cover
- Water level indicator for water separator

### Other Optional Equipment

- Additional gear train for auxiliary pump
- Air pre-filter
- Electric refueling pump with auto shut off
- Fine swing
- Starting kit, cold weather, -32° C
- Travel alarm

***Appendix D***

---

**Analytical Laboratory Reports and QA/QC Review**

# **Appendix D – Laboratory Analytical Reports and Quality Assurance/Quality Control Results Summary**

## **1.0 Introduction**

This appendix documents the results of a quality assurance (QA) review of the analytical data for soil samples that were collected: (1) during soil excavation activities performed in October 2015 at the Quail Crossing neighborhood (the Neighborhood) in Andover, Kansas (Site); and (2) during soil landfarm confirmation sampling activities at the NuStar El Dorado Site performed in November 2015.

The soil samples collected were analyzed by ALS Environmental (ALS) of Houston, Texas.

The QA review outlines the applicable quality control criteria utilized during the data review process, as well as any deviations from those criteria. Examination and validation of the laboratory summary reports include:

- Analytical methods;
- Reporting limits;
- Detection limits and estimated concentrations;
- Sample holding times;
- Custody records and sample receipt;
- Spikes, blanks, and surrogates; and
- Duplicates.

The QA review did not include a review of calibration or raw data. Section 2.0 lists the analytical methods used in sample analysis. Section 3.0 defines the QA terms used in this report. Section 4.0 provides the QA results for each sampling event.

## **2.0 Analytical Methods**

### **2.1 Soil Analyses**

Chemical analyses performed on groundwater samples consisted of the following:

- Volatile petroleum hydrocarbons as gasoline (GRO) by IA OA-1; and
- 1,2,4-Trimethylbenzene, 1,2-dichloroethane, 1,3,5-trimethylbenzene, 2-butanone, cyclohexane, isopropylbenzene methylcyclohexane BTEX (benzene, toluene, ethylbenzene, total xylenes), naphthalene, n-butylbenzene, n-propylbenzene by U.S. Environmental Protection Agency (EPA) Method SW846 8260.

## **Appendix D – Laboratory Analytical Reports and Quality Assurance/Quality Control Results Summary**

### **3.0 Quality Assurance Objectives and Review Procedures**

The general QA objectives for this project were to develop and implement procedures for obtaining, evaluating, and confirming the usability of environmental data of a specified quality. To collect such information, analytical data must have an appropriate degree of accuracy and reproducibility, samples collected must be representative of actual field conditions, and samples must be collected and analyzed using unbroken chain-of-custody (COC) procedures.

Reporting limits and analytical results were compared to action levels for each parameter. Precision, accuracy, representativeness, completeness, and comparability parameters used to indicate data quality are defined below.

**Reporting Limits.** Method reporting limits (MRLs) are set by the laboratory and are based on instrumentation abilities, sample matrix, and suggested MRLs by the EPA or KDHE. In some cases, the MRLs are raised due to high concentrations of analytes in the samples or matrix interferences. MRLs are generally consistent with industry standards and below promulgated regulatory standards when possible.

**Detection Limits and Estimated Concentrations.** The method detection limit (MDL) is the lowest quantity of a substance that can be distinguished from the absence of that substance within a stated confidence limit. The MDL is estimated from the mean of the blank, the standard deviation of the blank and some confidence factor.

**Holding Times.** Holding times are the length of time a sample can be stored after collection and prior to analysis without significantly affecting the analytical results. Holding times vary by analyte, sample matrix, and analytical methodology.

**Custody Records and Sample Receipt.** COC refers to the document or paper trail showing the collection, custody, control, transfer, analysis, and disposition of physical materials. The sample receipt identifies the condition of samples upon arrival at the analytical laboratory.

**Method Blanks.** A method, or laboratory, blank is a sample prepared in the laboratory along with the field samples and analyzed for the same parameters at the same time. It is used to assess for laboratory introduced contamination.

**Laboratory Control Sample.** A laboratory control sample (LCS) is analyzed by the laboratory to assess the accuracy of the analytical equipment. The sample is prepared from an analyte-free matrix that is then spiked with known levels of the constituents of interest (i.e., a standard). The concentrations are measured and the results compared to the known spiked levels. This comparison is expressed as percent recovery.

## **Appendix D – Laboratory Analytical Reports and Quality Assurance/Quality Control Results Summary**

**Laboratory Control Sample Duplicate.** A laboratory control sample duplicate (LCSD) is prepared and analyzed along with the LCS. The LCS and LCSD data are compared to assess the precision of the analytical method (i.e., the relative percent difference [RPD]).

**Matrix Spike Analyses.** Matrix spike (MS) analyses are performed on samples submitted to the laboratory that are of the same matrix as the field sample. The MS sample is spiked with known levels of the constituents of interest and analyzed to assess the potential for matrix interference with recovery or detection of the constituents of interest and the accuracy of the determination. The spiked sample results are compared to the expected result (i.e., sample concentration plus spike amount) and reported as percent recovery.

**Lab Duplicate.** A laboratory duplicate is a second analysis of a QA/QC sample, which serves as an internal check on laboratory quality as well as potential variability of the sample matrix. The laboratory duplicate is analyzed and compared to the primary sample results to assess the precision of the analytical method. This comparison can be expressed by the RPD between the primary and duplicate samples.

**Surrogate Recovery.** Surrogates are organic compounds that are similar in chemical composition to the analytes of interest and spiked into environmental and batch QC samples prior to sample preparation and analysis. Surrogate recoveries for environmental samples are used to evaluate matrix interference on a sample-specific basis.

**Field Duplicate.** A field duplicate is a second field sample collected from a sampling location (e.g., a well or soil core). Field duplicate samples serve as a check on laboratory quality as well as potential variability of the sample matrix. The field duplicate is analyzed and compared to the primary sample to assess the precision of the analytical method. This comparison can be expressed by the RPD between the original and duplicate samples.

**Trip Blanks.** A trip blank is a sample prepared in the laboratory that is shipped along with the sample bottles to the field, kept with the soil and groundwater samples during collection, and shipped back to the laboratory with the field samples. The trip blank is analyzed for constituents of interest, along with the primary samples, to assess if detected contaminants may have been the result of contamination of the samples during transport or storage.

**Equipment Blank.** An equipment blank is a sample collected in the field along with the primary samples and analyzed for the same parameters. Equipment blanks are collected by pouring deionized water over or through decontaminated equipment used to collect the samples, into laboratory supplied containers. The equipment blank is used to assess if field samples may have been affected by inadequate decontamination of field equipment.

## **Appendix D – Laboratory Analytical Reports and Quality Assurance/Quality Control Results Summary**

### **4.0 QA/QC Review Results**

#### **4.1 Lab Report HS15100386**

The data reviewed includes soil samples collected from excavation extents on October 7 and 8, 2015. Samples were analyzed for GRO and volatile organic compounds (VOCs) using the methods listed in Section 2.1.

**Reporting Limits.** MRLs were not elevated for samples. No data are flagged.

**Detection Limits and Estimated Concentrations.** MDLs and concentrations were not reported as estimates.

**Holding Times.** The samples were analyzed within applicable holding times.

**Custody Records and Sample Receipt.** The samples were received below the required temperature of 4°C and consistent with the accompanying COC.

**Method Blanks.** No compounds were detected in the method blanks. No data are flagged.

**Laboratory Control Sample.** Percent recoveries of the LCS were within control limits.

**Laboratory Control Sample Duplicate.** Percent recoveries of the LCSD were within control limits. LCS/LCSD RPDs were within control limits for reported constituents.

**Matrix Spike Analyses.** With the following exceptions, the RPD for the MS and MS duplicate (MSD) were within control limits:

- For sample SW-SE-15.0', the MS for naphthalene, n-butylbenzene, and total xylenes were outside control limits. The percent recoveries of the LCS and LCSD were within control limits, which provides control for the batch.
- For sample Floor-SE-19.0', the MS for 1,2,4-trimethylbenzene and 1,3,5- trimethylbenzene were outside control limits. The percent recoveries of the LCS and LCSD were within control limits, which provides control for the batch.

**Lab Duplicate.** No lab duplicate was analyzed.

## **Appendix D – Laboratory Analytical Reports and Quality Assurance/Quality Control Results Summary**

**Surrogate Recovery.** With the following exceptions, surrogate recoveries were within control limits for samples:

- For samples SW-SNM-17.0' and SW-SE-17.5', the surrogate recoveries for GRO were outside the established control limits due to matrix interference. The remaining surrogate recoveries were within acceptable control limits.

**Field Duplicate.** A field duplicate was not collected.

**Trip Blank.** No compounds were detected in the trip blank. No data are flagged.

**Equipment Blank.** No reusable equipment was utilized during this sampling event; therefore, an equipment blank was not collected.

**Conclusion.** In conclusion, the overall QA objectives have been met and the data are of adequate quality for use in this project.

### **4.2 Lab Report HS15100925**

The data reviewed includes soil samples collected from the excavated soil, which is managed at the El Dorado Landfarm. Samples were analyzed for GRO and VOCs using the methods listed in Section 2.1,

**Reporting Limits.** MRLs were not elevated for samples. No data are flagged.

**Detection Limits and Estimated Concentrations.** MDLs and concentrations were not reported as estimates.

**Holding Times.** The samples were analyzed within applicable holding times.

**Custody Records and Sample Receipt.** The samples were received below the required temperature of 4°C and consistent with the accompanying COC.

**Method Blanks.** No compounds were detected in the method blanks. No data are flagged.

**Laboratory Control Sample.** Percent recoveries of the LCS were within control limits.

**Laboratory Control Sample Duplicate.** Percent recoveries of the LCSD were within control limits. LCS/LCSD RPDs were within control limits for reported constituents.

## **Appendix D – Laboratory Analytical Reports and Quality Assurance/Quality Control Results Summary**

---

**Matrix Spike Analyses.** The MS/MSD recoveries were within limits for constituents.

**Lab Duplicate.** No lab duplicate was analyzed.

**Surrogate Recovery.** Surrogate recoveries were within control limits for samples.

**Field Duplicates.** A field duplicate was not collected.

**Trip Blank.** No compounds were detected in the trip blanks. No data are flagged.

**Equipment Blank.** No reusable equipment was utilized during this sampling event; therefore, an equipment blank was not collected.

**Conclusion.** In conclusion, the overall QA objectives have been met and the data are of adequate quality for use in this project.



---

10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887  
www.alsglobal.com

October 21, 2015

Samuel Jackson  
Apex Companies  
3015 SW First Avenue  
Portland, OR 97201

Work Order: **HS15100386**

Laboratory Results for: **E3CE-0065 Andover Release Site**

Dear Samuel,

ALS Environmental received 20 sample(s) on Oct 09, 2015 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

A handwritten signature in cursive script that reads "Erica Padilla".

Generated By: Jumoke.Lawal  
Erica Padilla  
PM

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**Work Order:** HS15100386

**SAMPLE SUMMARY**

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS15100386-01	Floor-NW-19.0'	Soil		07-Oct-2015 10:30	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-02	SW-NW-15.0'	Soil		07-Oct-2015 10:40	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-03	SW-N-16.5'	Soil		07-Oct-2015 10:50	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-04	SW-S-15.0'	Soil		07-Oct-2015 12:30	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-05	Floor-NE-19.5'	Soil		07-Oct-2015 14:20	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-06	SW-E-16.0'	Soil		07-Oct-2015 14:30	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-07	SW-NE-18.0'	Soil		07-Oct-2015 14:40	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-08	Floor-SE-19.0'	Soil		08-Oct-2015 08:45	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-09	Floor-SW-20.5'	Soil		08-Oct-2015 11:15	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-10	SW-SW-17.0'	Soil		08-Oct-2015 11:30	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-11	SW-SNE-15.0'	Soil		08-Oct-2015 11:45	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-12	SW-SNM-17.0'	Soil		08-Oct-2015 11:50	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-13	SW-SNW-17.0'	Soil		08-Oct-2015 11:55	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-14	SW-SS-16.5'	Soil		08-Oct-2015 12:00	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-15	SW-SS-13.0'	Soil		08-Oct-2015 12:15	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-16	SW-SE-17.5'	Soil		08-Oct-2015 12:25	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-17	SW-SE-15.0'	Soil		08-Oct-2015 12:35	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-18	SW-SE-10.0'	Soil		08-Oct-2015 12:45	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-19	SW-SSE-17.0'	Soil		08-Oct-2015 12:50	09-Oct-2015 08:44	<input type="checkbox"/>
HS15100386-20	Trip Blank	Water	10/02/2015-07	07-Oct-2015 00:00	09-Oct-2015 08:44	<input type="checkbox"/>

Client: Apex Companies  
Project: E3CE-0065 Andover Release Site  
Work Order: HS15100386

## CASE NARRATIVE

---

**GC Volatiles by Method IA OA-1****Batch ID: R263133**Sample ID: **SW-SNM-17.0' (HS15100386-12)**

- Due to sample matrix interferences, the surrogate recovery was outside of the established control limits.

**Batch ID: R263110**Sample ID: **SW-SE-17.5' (HS15100386-16)**

- Due to sample matrix interferences, the surrogate recovery was outside of the established control limits.

**Batch ID: R263325**Sample ID: **HS15100647-01MS**

- MS and MSD are for an unrelated sample

---

**GCMS Volatiles by Method SW8260****Batch ID: R263093**Sample ID: **SW-NW-15.0' (HS15100386-02)**

- MS and MSD are for an unrelated sample

**Batch ID: R263158**Sample ID: **HS15100537-01MS**

- MS and MSD are for an unrelated sample

**Batch ID: R263222**Sample ID: **SW-SE-15.0' (HS15100386-17MS)**

- MS/MSD failed QC limits for few compounds.

**Batch ID: R263230**Sample ID: **Floor-SE-19.0' (HS15100386-08MS)**

- MS/MSD failed QC limits for few compounds,

Sample ID: **Floor-SE-19.0' (HS15100386-08MSD)**

- The RPD between the MS and MSD was outside of the control limit.

**Batch ID: R263319**Sample ID: **HS15100588-03MS**

- MS and MSD are for an unrelated sample

Sample ID: **HS15100588-03MSD**

- The RPD between the MS and MSD was outside of the control limit.

**Batch ID: R262940**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.
-

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Floor-NW-19.0'  
 Collection Date: 07-Oct-2015 10:30

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-01  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>			<b>Method:SW8260</b>			Analyst: WLR
1,2,4-Trimethylbenzene	0.028		0.0048	mg/Kg	1	14-Oct-2015 20:16
1,2-Dichloroethane	ND		0.0048	mg/Kg	1	14-Oct-2015 20:16
1,3,5-Trimethylbenzene	0.0085		0.0048	mg/Kg	1	14-Oct-2015 20:16
2-Butanone	ND		0.0096	mg/Kg	1	14-Oct-2015 20:16
Benzene	0.027		0.0048	mg/Kg	1	14-Oct-2015 20:16
Cyclohexane	ND		0.0048	mg/Kg	1	14-Oct-2015 20:16
Ethylbenzene	0.0056		0.0048	mg/Kg	1	14-Oct-2015 20:16
Isopropylbenzene	0.0052		0.0048	mg/Kg	1	14-Oct-2015 20:16
Methylcyclohexane	ND		0.0048	mg/Kg	1	14-Oct-2015 20:16
Naphthalene	0.012		0.0048	mg/Kg	1	14-Oct-2015 20:16
n-Butylbenzene	0.0060		0.0048	mg/Kg	1	14-Oct-2015 20:16
n-Propylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 20:16
Toluene	ND		0.0048	mg/Kg	1	14-Oct-2015 20:16
Xylenes, Total	0.027		0.0096	mg/Kg	1	14-Oct-2015 20:16
Surr: 1,2-Dichloroethane-d4	99.5		70-128	%REC	1	14-Oct-2015 20:16
Surr: 4-Bromofluorobenzene	95.7		73-126	%REC	1	14-Oct-2015 20:16
Surr: Dibromofluoromethane	103		71-128	%REC	1	14-Oct-2015 20:16
Surr: Toluene-d8	103		73-127	%REC	1	14-Oct-2015 20:16
<b>VPH - IOWA OA-1</b>			<b>Method:IA OA-1</b>			Analyst: SFE
VPH - Gasoline Range Organics	0.13		0.048	mg/Kg	1	15-Oct-2015 09:58
Surr: 4-Bromofluorobenzene	87.9		70-130	%REC	1	15-Oct-2015 09:58

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-NW-15.0'  
 Collection Date: 07-Oct-2015 10:40

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-02  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	0.90		0.050	mg/Kg	10	17-Oct-2015 01:40
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	14-Oct-2015 20:39
1,3,5-Trimethylbenzene	0.26		0.050	mg/Kg	10	17-Oct-2015 01:40
2-Butanone	ND		0.010	mg/Kg	1	14-Oct-2015 20:39
Benzene	ND		0.0050	mg/Kg	1	14-Oct-2015 20:39
Cyclohexane	0.0080		0.0050	mg/Kg	1	14-Oct-2015 20:39
Ethylbenzene	0.17		0.0050	mg/Kg	1	14-Oct-2015 20:39
Isopropylbenzene	0.024		0.0050	mg/Kg	1	14-Oct-2015 20:39
Methylcyclohexane	0.012		0.0050	mg/Kg	1	14-Oct-2015 20:39
Naphthalene	0.18		0.0050	mg/Kg	1	14-Oct-2015 20:39
n-Butylbenzene	0.074		0.0050	mg/Kg	1	14-Oct-2015 20:39
n-Propylbenzene	0.12		0.0050	mg/Kg	1	14-Oct-2015 20:39
Toluene	0.069		0.0050	mg/Kg	1	14-Oct-2015 20:39
Xylenes, Total	0.18		0.10	mg/Kg	10	17-Oct-2015 01:40
Surr: 1,2-Dichloroethane-d4	91.9		70-128	%REC	1	14-Oct-2015 20:39
Surr: 1,2-Dichloroethane-d4	95.6		70-128	%REC	10	17-Oct-2015 01:40
Surr: 4-Bromofluorobenzene	100		73-126	%REC	1	14-Oct-2015 20:39
Surr: 4-Bromofluorobenzene	94.4		73-126	%REC	10	17-Oct-2015 01:40
Surr: Dibromofluoromethane	98.7		71-128	%REC	1	14-Oct-2015 20:39
Surr: Dibromofluoromethane	101		71-128	%REC	10	17-Oct-2015 01:40
Surr: Toluene-d8	102		73-127	%REC	1	14-Oct-2015 20:39
Surr: Toluene-d8	99.0		73-127	%REC	10	17-Oct-2015 01:40
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	2.2		0.050	mg/Kg	1	15-Oct-2015 09:42
Surr: 4-Bromofluorobenzene	108		70-130	%REC	1	15-Oct-2015 09:42

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-N-16.5'  
 Collection Date: 07-Oct-2015 10:50

**ANALYTICAL REPORT**  
 WorkOrder: HS15100386  
 Lab ID: HS15100386-03  
 Matrix: Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method: SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
1,2-Dichloroethane	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
1,3,5-Trimethylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
2-Butanone	ND		0.0095	mg/Kg	1	14-Oct-2015 21:02
Benzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Cyclohexane	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Ethylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Isopropylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Methylcyclohexane	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Naphthalene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
n-Butylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
n-Propylbenzene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Toluene	ND		0.0048	mg/Kg	1	14-Oct-2015 21:02
Xylenes, Total	ND		0.0095	mg/Kg	1	14-Oct-2015 21:02
Surr: 1,2-Dichloroethane-d4	102		70-128	%REC	1	14-Oct-2015 21:02
Surr: 4-Bromofluorobenzene	96.1		73-126	%REC	1	14-Oct-2015 21:02
Surr: Dibromofluoromethane	104		71-128	%REC	1	14-Oct-2015 21:02
Surr: Toluene-d8	105		73-127	%REC	1	14-Oct-2015 21:02
<b>VPH - IOWA OA-1</b>		<b>Method: IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.048	mg/Kg	1	15-Oct-2015 09:27
Surr: 4-Bromofluorobenzene	82.0		70-130	%REC	1	15-Oct-2015 09:27

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-S-15.0'  
 Collection Date: 07-Oct-2015 12:30

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-04  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
2-Butanone	ND		0.0099	mg/Kg	1	14-Oct-2015 22:59
Benzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Cyclohexane	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Ethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Isopropylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Methylcyclohexane	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Naphthalene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
n-Butylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
n-Propylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Toluene	ND		0.0050	mg/Kg	1	14-Oct-2015 22:59
Xylenes, Total	ND		0.0099	mg/Kg	1	14-Oct-2015 22:59
Surr: 1,2-Dichloroethane-d4	101		70-128	%REC	1	14-Oct-2015 22:59
Surr: 4-Bromofluorobenzene	93.3		73-126	%REC	1	14-Oct-2015 22:59
Surr: Dibromofluoromethane	102		71-128	%REC	1	14-Oct-2015 22:59
Surr: Toluene-d8	101		73-127	%REC	1	14-Oct-2015 22:59
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	15-Oct-2015 09:11
Surr: 4-Bromofluorobenzene	79.7		70-130	%REC	1	15-Oct-2015 09:11

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Floor-NE-19.5'  
 Collection Date: 07-Oct-2015 14:20

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-05  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
2-Butanone	ND		0.010	mg/Kg	1	14-Oct-2015 23:22
<b>Benzene</b>	<b>0.015</b>		<b>0.0050</b>	<b>mg/Kg</b>	1	14-Oct-2015 23:22
Cyclohexane	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
Ethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
Isopropylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
Methylcyclohexane	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
Naphthalene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
n-Butylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
n-Propylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:22
<b>Toluene</b>	<b>0.010</b>		<b>0.0050</b>	<b>mg/Kg</b>	1	14-Oct-2015 23:22
Xylenes, Total	ND		0.010	mg/Kg	1	14-Oct-2015 23:22
Surr: 1,2-Dichloroethane-d4	98.9		70-128	%REC	1	14-Oct-2015 23:22
Surr: 4-Bromofluorobenzene	91.0		73-126	%REC	1	14-Oct-2015 23:22
Surr: Dibromofluoromethane	104		71-128	%REC	1	14-Oct-2015 23:22
Surr: Toluene-d8	101		73-127	%REC	1	14-Oct-2015 23:22
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
<b>VPH - Gasoline Range Organics</b>	<b>0.066</b>		<b>0.050</b>	<b>mg/Kg</b>	1	15-Oct-2015 08:55
Surr: 4-Bromofluorobenzene	81.7		70-130	%REC	1	15-Oct-2015 08:55

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-E-16.0'  
 Collection Date: 07-Oct-2015 14:30

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-06  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
2-Butanone	ND		0.010	mg/Kg	1	14-Oct-2015 23:45
Benzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Cyclohexane	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Ethylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Isopropylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Methylcyclohexane	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Naphthalene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
n-Butylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
n-Propylbenzene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Toluene	ND		0.0050	mg/Kg	1	14-Oct-2015 23:45
Xylenes, Total	ND		0.010	mg/Kg	1	14-Oct-2015 23:45
Surr: 1,2-Dichloroethane-d4	96.0		70-128	%REC	1	14-Oct-2015 23:45
Surr: 4-Bromofluorobenzene	93.4		73-126	%REC	1	14-Oct-2015 23:45
Surr: Dibromofluoromethane	101		71-128	%REC	1	14-Oct-2015 23:45
Surr: Toluene-d8	105		73-127	%REC	1	14-Oct-2015 23:45
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.049	mg/Kg	1	15-Oct-2015 12:20
Surr: 4-Bromofluorobenzene	70.4		70-130	%REC	1	15-Oct-2015 12:20

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-NE-18.0'  
 Collection Date: 07-Oct-2015 14:40

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-07  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	0.025		0.0044	mg/Kg	1	15-Oct-2015 00:09
1,2-Dichloroethane	ND		0.0044	mg/Kg	1	15-Oct-2015 00:09
1,3,5-Trimethylbenzene	0.011		0.0044	mg/Kg	1	15-Oct-2015 00:09
2-Butanone	ND		0.0089	mg/Kg	1	15-Oct-2015 00:09
Benzene	0.022		0.0044	mg/Kg	1	15-Oct-2015 00:09
Cyclohexane	0.011		0.0044	mg/Kg	1	15-Oct-2015 00:09
Ethylbenzene	ND		0.0044	mg/Kg	1	15-Oct-2015 00:09
Isopropylbenzene	0.0064		0.0044	mg/Kg	1	15-Oct-2015 00:09
Methylcyclohexane	0.014		0.0044	mg/Kg	1	15-Oct-2015 00:09
Naphthalene	0.0067		0.0044	mg/Kg	1	15-Oct-2015 00:09
n-Butylbenzene	0.012		0.0044	mg/Kg	1	15-Oct-2015 00:09
n-Propylbenzene	0.010		0.0044	mg/Kg	1	15-Oct-2015 00:09
Toluene	ND		0.0044	mg/Kg	1	15-Oct-2015 00:09
Xylenes, Total	ND		0.0089	mg/Kg	1	15-Oct-2015 00:09
Surr: 1,2-Dichloroethane-d4	95.3		70-128	%REC	1	15-Oct-2015 00:09
Surr: 4-Bromofluorobenzene	93.0		73-126	%REC	1	15-Oct-2015 00:09
Surr: Dibromofluoromethane	99.3		71-128	%REC	1	15-Oct-2015 00:09
Surr: Toluene-d8	102		73-127	%REC	1	15-Oct-2015 00:09
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	0.35		0.050	mg/Kg	1	15-Oct-2015 12:36
Surr: 4-Bromofluorobenzene	92.0		70-130	%REC	1	15-Oct-2015 12:36

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Floor-SE-19.0'  
 Collection Date: 08-Oct-2015 08:45

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-08  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	6.4		0.50	mg/Kg	100	15-Oct-2015 18:24
1,2-Dichloroethane	ND		0.045	mg/Kg	10	17-Oct-2015 03:13
1,3,5-Trimethylbenzene	2.7		0.50	mg/Kg	100	15-Oct-2015 18:24
2-Butanone	ND		0.090	mg/Kg	10	17-Oct-2015 03:13
Benzene	0.23		0.045	mg/Kg	10	17-Oct-2015 03:13
Cyclohexane	0.61		0.045	mg/Kg	10	17-Oct-2015 03:13
Ethylbenzene	6.1		0.50	mg/Kg	100	15-Oct-2015 18:24
Isopropylbenzene	0.43		0.045	mg/Kg	10	17-Oct-2015 03:13
Methylcyclohexane	0.64		0.045	mg/Kg	10	17-Oct-2015 03:13
Naphthalene	1.5		0.045	mg/Kg	10	17-Oct-2015 03:13
n-Butylbenzene	0.93		0.045	mg/Kg	10	17-Oct-2015 03:13
n-Propylbenzene	1.3		0.50	mg/Kg	100	15-Oct-2015 18:24
Toluene	7.8		0.50	mg/Kg	100	15-Oct-2015 18:24
Xylenes, Total	24		1.0	mg/Kg	100	15-Oct-2015 18:24
Surr: 1,2-Dichloroethane-d4	97.6		70-128	%REC	10	17-Oct-2015 03:13
Surr: 1,2-Dichloroethane-d4	106		70-128	%REC	100	15-Oct-2015 18:24
Surr: 4-Bromofluorobenzene	107		73-126	%REC	10	17-Oct-2015 03:13
Surr: 4-Bromofluorobenzene	99.5		73-126	%REC	100	15-Oct-2015 18:24
Surr: Dibromofluoromethane	103		71-128	%REC	10	17-Oct-2015 03:13
Surr: Dibromofluoromethane	102		71-128	%REC	100	15-Oct-2015 18:24
Surr: Toluene-d8	98.1		73-127	%REC	10	17-Oct-2015 03:13
Surr: Toluene-d8	96.7		73-127	%REC	100	15-Oct-2015 18:24
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	250		5.0	mg/Kg	100	19-Oct-2015 15:05
Surr: 4-Bromofluorobenzene	126		70-130	%REC	100	19-Oct-2015 15:05

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Floor-SW-20.5'  
 Collection Date: 08-Oct-2015 11:15

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-09  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>			<b>Method:SW8260</b>		<b>Analyst: PC</b>	
1,2,4-Trimethylbenzene	54		5.0	mg/Kg	1000	19-Oct-2015 17:20
1,2-Dichloroethane	ND		0.050	mg/Kg	10	17-Oct-2015 03:36
1,3,5-Trimethylbenzene	22		1.2	mg/Kg	250	19-Oct-2015 15:19
2-Butanone	ND		0.10	mg/Kg	10	17-Oct-2015 03:36
Benzene	0.29		0.050	mg/Kg	10	17-Oct-2015 03:36
Cyclohexane	3.2		1.2	mg/Kg	250	19-Oct-2015 15:19
Ethylbenzene	28		1.2	mg/Kg	250	19-Oct-2015 15:19
Isopropylbenzene	1.8		0.050	mg/Kg	10	17-Oct-2015 03:36
Methylcyclohexane	2.7		1.2	mg/Kg	250	19-Oct-2015 15:19
Naphthalene	9.9		1.2	mg/Kg	250	19-Oct-2015 15:19
n-Butylbenzene	5.9		1.2	mg/Kg	250	19-Oct-2015 15:19
n-Propylbenzene	11		1.2	mg/Kg	250	19-Oct-2015 15:19
Toluene	35		1.2	mg/Kg	250	19-Oct-2015 15:19
Xylenes, Total	130		2.5	mg/Kg	250	19-Oct-2015 15:19
Surr: 1,2-Dichloroethane-d4	90.1		70-128	%REC	10	17-Oct-2015 03:36
Surr: 1,2-Dichloroethane-d4	84.0		70-128	%REC	250	19-Oct-2015 15:19
Surr: 1,2-Dichloroethane-d4	81.4		70-128	%REC	1000	19-Oct-2015 17:20
Surr: 4-Bromofluorobenzene	99.8		73-126	%REC	10	17-Oct-2015 03:36
Surr: 4-Bromofluorobenzene	93.1		73-126	%REC	1000	19-Oct-2015 17:20
Surr: 4-Bromofluorobenzene	96.5		73-126	%REC	250	19-Oct-2015 15:19
Surr: Dibromofluoromethane	98.8		71-128	%REC	10	17-Oct-2015 03:36
Surr: Dibromofluoromethane	89.7		71-128	%REC	250	19-Oct-2015 15:19
Surr: Dibromofluoromethane	87.9		71-128	%REC	1000	19-Oct-2015 17:20
Surr: Toluene-d8	94.9		73-127	%REC	10	17-Oct-2015 03:36
Surr: Toluene-d8	86.4		73-127	%REC	1000	19-Oct-2015 17:20
Surr: Toluene-d8	89.9		73-127	%REC	250	19-Oct-2015 15:19
<b>VPH - IOWA OA-1</b>			<b>Method:IA OA-1</b>		<b>Analyst: SFE</b>	
VPH - Gasoline Range Organics	1,300		25	mg/Kg	500	19-Oct-2015 15:21
Surr: 4-Bromofluorobenzene	123		70-130	%REC	500	19-Oct-2015 15:21

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SW-17.0'  
 Collection Date: 08-Oct-2015 11:30

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-10  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
1,2-Dichloroethane	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
1,3,5-Trimethylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
<b>2-Butanone</b>	<b>0.016</b>		<b>0.0097</b>	<b>mg/Kg</b>	<b>1</b>	<b>16-Oct-2015 23:44</b>
Benzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Cyclohexane	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Ethylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Isopropylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Methylcyclohexane	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Naphthalene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
n-Butylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
n-Propylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Toluene	ND		0.0048	mg/Kg	1	16-Oct-2015 23:44
Xylenes, Total	ND		0.0097	mg/Kg	1	16-Oct-2015 23:44
Surr: 1,2-Dichloroethane-d4	106		70-128	%REC	1	16-Oct-2015 23:44
Surr: 4-Bromofluorobenzene	94.6		73-126	%REC	1	16-Oct-2015 23:44
Surr: Dibromofluoromethane	108		71-128	%REC	1	16-Oct-2015 23:44
Surr: Toluene-d8	101		73-127	%REC	1	16-Oct-2015 23:44
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
<b>VPH - Gasoline Range Organics</b>	<b>0.45</b>		<b>0.050</b>	<b>mg/Kg</b>	<b>1</b>	<b>15-Oct-2015 06:47</b>
Surr: 4-Bromofluorobenzene	84.7		70-130	%REC	1	15-Oct-2015 06:47

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SNE-15.0'  
 Collection Date: 08-Oct-2015 11:45

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-11  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	0.030		0.0050	mg/Kg	1	15-Oct-2015 01:19
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	15-Oct-2015 01:19
1,3,5-Trimethylbenzene	0.0077		0.0050	mg/Kg	1	15-Oct-2015 01:19
2-Butanone	ND		0.0099	mg/Kg	1	15-Oct-2015 01:19
Benzene	ND		0.0050	mg/Kg	1	15-Oct-2015 01:19
Cyclohexane	ND		0.0050	mg/Kg	1	15-Oct-2015 01:19
Ethylbenzene	0.0073		0.0050	mg/Kg	1	15-Oct-2015 01:19
Isopropylbenzene	ND		0.0050	mg/Kg	1	15-Oct-2015 01:19
Methylcyclohexane	ND		0.0050	mg/Kg	1	15-Oct-2015 01:19
Naphthalene	0.019		0.0050	mg/Kg	1	15-Oct-2015 01:19
n-Butylbenzene	0.0058		0.0050	mg/Kg	1	15-Oct-2015 01:19
n-Propylbenzene	ND		0.0050	mg/Kg	1	15-Oct-2015 01:19
Toluene	0.011		0.0050	mg/Kg	1	15-Oct-2015 01:19
Xylenes, Total	0.033		0.0099	mg/Kg	1	15-Oct-2015 01:19
Surr: 1,2-Dichloroethane-d4	86.5		70-128	%REC	1	15-Oct-2015 01:19
Surr: 4-Bromofluorobenzene	96.2		73-126	%REC	1	15-Oct-2015 01:19
Surr: Dibromofluoromethane	96.4		71-128	%REC	1	15-Oct-2015 01:19
Surr: Toluene-d8	101		73-127	%REC	1	15-Oct-2015 01:19
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	0.055		0.048	mg/Kg	1	15-Oct-2015 06:31
Surr: 4-Bromofluorobenzene	83.1		70-130	%REC	1	15-Oct-2015 06:31

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SNM-17.0'  
 Collection Date: 08-Oct-2015 11:50

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-12  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: PC		
1,2,4-Trimethylbenzene	12		0.50	mg/Kg	100	19-Oct-2015 14:55
1,2-Dichloroethane	ND		0.050	mg/Kg	10	17-Oct-2015 04:00
1,3,5-Trimethylbenzene	3.9		0.50	mg/Kg	100	19-Oct-2015 14:55
2-Butanone	ND		0.099	mg/Kg	10	17-Oct-2015 04:00
Benzene	ND		0.050	mg/Kg	10	17-Oct-2015 04:00
Cyclohexane	ND		0.050	mg/Kg	10	17-Oct-2015 04:00
Ethylbenzene	1.1		0.050	mg/Kg	10	17-Oct-2015 04:00
Isopropylbenzene	0.29		0.050	mg/Kg	10	17-Oct-2015 04:00
Methylcyclohexane	ND		0.050	mg/Kg	10	17-Oct-2015 04:00
Naphthalene	2.9		0.50	mg/Kg	100	19-Oct-2015 14:55
n-Butylbenzene	1.7		0.050	mg/Kg	10	17-Oct-2015 04:00
n-Propylbenzene	1.8		0.050	mg/Kg	10	17-Oct-2015 04:00
Toluene	0.074		0.050	mg/Kg	10	17-Oct-2015 04:00
Xylenes, Total	5.6		1.0	mg/Kg	100	19-Oct-2015 14:55
Surr: 1,2-Dichloroethane-d4	84.9		70-128	%REC	10	17-Oct-2015 04:00
Surr: 1,2-Dichloroethane-d4	80.6		70-128	%REC	100	19-Oct-2015 14:55
Surr: 4-Bromofluorobenzene	102		73-126	%REC	10	17-Oct-2015 04:00
Surr: 4-Bromofluorobenzene	92.5		73-126	%REC	100	19-Oct-2015 14:55
Surr: Dibromofluoromethane	99.7		71-128	%REC	10	17-Oct-2015 04:00
Surr: Dibromofluoromethane	89.5		71-128	%REC	100	19-Oct-2015 14:55
Surr: Toluene-d8	103		73-127	%REC	10	17-Oct-2015 04:00
Surr: Toluene-d8	86.9		73-127	%REC	100	19-Oct-2015 14:55
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	45		0.050	mg/Kg	1	15-Oct-2015 06:15
Surr: 4-Bromofluorobenzene	783	S	70-130	%REC	1	15-Oct-2015 06:15

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SNW-17.0'  
 Collection Date: 08-Oct-2015 11:55

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-13  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>			<b>Method:SW8260</b>		Analyst: WLR	
1,2,4-Trimethylbenzene	2.1		0.050	mg/Kg	10	17-Oct-2015 02:03
1,2-Dichloroethane	ND		0.050	mg/Kg	10	17-Oct-2015 02:03
1,3,5-Trimethylbenzene	0.56		0.050	mg/Kg	10	17-Oct-2015 02:03
2-Butanone	ND		0.10	mg/Kg	10	17-Oct-2015 02:03
Benzene	ND		0.050	mg/Kg	10	17-Oct-2015 02:03
Cyclohexane	ND		0.050	mg/Kg	10	17-Oct-2015 02:03
Ethylbenzene	0.061		0.050	mg/Kg	10	17-Oct-2015 02:03
Isopropylbenzene	0.064		0.050	mg/Kg	10	17-Oct-2015 02:03
Methylcyclohexane	ND		0.050	mg/Kg	10	17-Oct-2015 02:03
Naphthalene	0.96		0.050	mg/Kg	10	17-Oct-2015 02:03
n-Butylbenzene	0.39		0.050	mg/Kg	10	17-Oct-2015 02:03
n-Propylbenzene	0.22		0.050	mg/Kg	10	17-Oct-2015 02:03
Toluene	ND		0.050	mg/Kg	10	17-Oct-2015 02:03
Xylenes, Total	0.45		0.10	mg/Kg	10	17-Oct-2015 02:03
Surr: 1,2-Dichloroethane-d4	92.4		70-128	%REC	10	17-Oct-2015 02:03
Surr: 4-Bromofluorobenzene	96.4		73-126	%REC	10	17-Oct-2015 02:03
Surr: Dibromofluoromethane	100		71-128	%REC	10	17-Oct-2015 02:03
Surr: Toluene-d8	101		73-127	%REC	10	17-Oct-2015 02:03
<b>VPH - IOWA OA-1</b>			<b>Method:IA OA-1</b>		Analyst: SFE	
VPH - Gasoline Range Organics	40		0.050	mg/Kg	1	15-Oct-2015 03:33
Surr: 4-Bromofluorobenzene	128		70-130	%REC	1	15-Oct-2015 03:33

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SS-16.5'  
 Collection Date: 08-Oct-2015 12:00

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-14  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	1.3		0.050	mg/Kg	10	17-Oct-2015 02:27
1,2-Dichloroethane	ND		0.050	mg/Kg	10	17-Oct-2015 02:27
1,3,5-Trimethylbenzene	0.42		0.050	mg/Kg	10	17-Oct-2015 02:27
2-Butanone	ND		0.10	mg/Kg	10	17-Oct-2015 02:27
Benzene	ND		0.050	mg/Kg	10	17-Oct-2015 02:27
Cyclohexane	0.16		0.050	mg/Kg	10	17-Oct-2015 02:27
Ethylbenzene	0.36		0.050	mg/Kg	10	17-Oct-2015 02:27
Isopropylbenzene	0.080		0.050	mg/Kg	10	17-Oct-2015 02:27
Methylcyclohexane	0.19		0.050	mg/Kg	10	17-Oct-2015 02:27
Naphthalene	0.36		0.050	mg/Kg	10	17-Oct-2015 02:27
n-Butylbenzene	0.25		0.050	mg/Kg	10	17-Oct-2015 02:27
n-Propylbenzene	0.26		0.050	mg/Kg	10	17-Oct-2015 02:27
Toluene	0.22		0.050	mg/Kg	10	17-Oct-2015 02:27
Xylenes, Total	1.2		0.10	mg/Kg	10	17-Oct-2015 02:27
Surr: 1,2-Dichloroethane-d4	97.5		70-128	%REC	10	17-Oct-2015 02:27
Surr: 4-Bromofluorobenzene	95.2		73-126	%REC	10	17-Oct-2015 02:27
Surr: Dibromofluoromethane	104		71-128	%REC	10	17-Oct-2015 02:27
Surr: Toluene-d8	99.0		73-127	%REC	10	17-Oct-2015 02:27
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	16		0.047	mg/Kg	1	15-Oct-2015 03:17
Surr: 4-Bromofluorobenzene	122		70-130	%REC	1	15-Oct-2015 03:17

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SS-13.0'  
 Collection Date: 08-Oct-2015 12:15

**ANALYTICAL REPORT**  
 WorkOrder: HS15100386  
 Lab ID: HS15100386-15  
 Matrix: Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method: SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
2-Butanone	ND		0.0099	mg/Kg	1	16-Oct-2015 23:21
Benzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Cyclohexane	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Ethylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Isopropylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Methylcyclohexane	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Naphthalene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
n-Butylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
n-Propylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Toluene	ND		0.0050	mg/Kg	1	16-Oct-2015 23:21
Xylenes, Total	ND		0.0099	mg/Kg	1	16-Oct-2015 23:21
Surr: 1,2-Dichloroethane-d4	92.6		70-128	%REC	1	16-Oct-2015 23:21
Surr: 4-Bromofluorobenzene	92.3		73-126	%REC	1	16-Oct-2015 23:21
Surr: Dibromofluoromethane	101		71-128	%REC	1	16-Oct-2015 23:21
Surr: Toluene-d8	99.3		73-127	%REC	1	16-Oct-2015 23:21
<b>VPH - IOWA OA-1</b>		<b>Method: IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	15-Oct-2015 05:26
Surr: 4-Bromofluorobenzene	82.1		70-130	%REC	1	15-Oct-2015 05:26

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SE-17.5'  
 Collection Date: 08-Oct-2015 12:25

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-16  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	19		0.50	mg/Kg	100	15-Oct-2015 19:11
1,2-Dichloroethane	ND		0.046	mg/Kg	10	17-Oct-2015 02:50
1,3,5-Trimethylbenzene	1.2		0.046	mg/Kg	10	17-Oct-2015 02:50
2-Butanone	ND		0.093	mg/Kg	10	17-Oct-2015 02:50
Benzene	ND		0.046	mg/Kg	10	17-Oct-2015 02:50
Cyclohexane	ND		0.046	mg/Kg	10	17-Oct-2015 02:50
Ethylbenzene	0.13		0.046	mg/Kg	10	17-Oct-2015 02:50
Isopropylbenzene	0.091		0.046	mg/Kg	10	17-Oct-2015 02:50
Methylcyclohexane	ND		0.046	mg/Kg	10	17-Oct-2015 02:50
Naphthalene	1.5		0.046	mg/Kg	10	17-Oct-2015 02:50
n-Butylbenzene	0.64		0.046	mg/Kg	10	17-Oct-2015 02:50
n-Propylbenzene	0.44		0.046	mg/Kg	10	17-Oct-2015 02:50
Toluene	ND		0.046	mg/Kg	10	17-Oct-2015 02:50
Xylenes, Total	0.76		0.093	mg/Kg	10	17-Oct-2015 02:50
Surr: 1,2-Dichloroethane-d4	94.0		70-128	%REC	10	17-Oct-2015 02:50
Surr: 1,2-Dichloroethane-d4	106		70-128	%REC	100	15-Oct-2015 19:11
Surr: 4-Bromofluorobenzene	101		73-126	%REC	10	17-Oct-2015 02:50
Surr: 4-Bromofluorobenzene	103		73-126	%REC	100	15-Oct-2015 19:11
Surr: Dibromofluoromethane	103		71-128	%REC	10	17-Oct-2015 02:50
Surr: Dibromofluoromethane	105		71-128	%REC	100	15-Oct-2015 19:11
Surr: Toluene-d8	102		73-127	%REC	10	17-Oct-2015 02:50
Surr: Toluene-d8	96.9		73-127	%REC	100	15-Oct-2015 19:11
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	37		0.050	mg/Kg	1	15-Oct-2015 03:01
Surr: 4-Bromofluorobenzene	492	S	70-130	%REC	1	15-Oct-2015 03:01

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SE-15.0'  
 Collection Date: 08-Oct-2015 12:35

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-17  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
1,2-Dichloroethane	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
1,3,5-Trimethylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
2-Butanone	ND		0.0095	mg/Kg	1	16-Oct-2015 22:58
Benzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Cyclohexane	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Ethylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Isopropylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Methylcyclohexane	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Naphthalene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
n-Butylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
n-Propylbenzene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Toluene	ND		0.0048	mg/Kg	1	16-Oct-2015 22:58
Xylenes, Total	ND		0.0095	mg/Kg	1	16-Oct-2015 22:58
Surr: 1,2-Dichloroethane-d4	102		70-128	%REC	1	16-Oct-2015 22:58
Surr: 4-Bromofluorobenzene	92.7		73-126	%REC	1	16-Oct-2015 22:58
Surr: Dibromofluoromethane	107		71-128	%REC	1	16-Oct-2015 22:58
Surr: Toluene-d8	99.0		73-127	%REC	1	16-Oct-2015 22:58
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.048	mg/Kg	1	15-Oct-2015 02:45
Surr: 4-Bromofluorobenzene	79.8		70-130	%REC	1	15-Oct-2015 02:45

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SE-10.0'  
 Collection Date: 08-Oct-2015 12:45

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-18  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
2-Butanone	ND		0.0099	mg/Kg	1	16-Oct-2015 00:16
Benzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Cyclohexane	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Ethylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Isopropylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Methylcyclohexane	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Naphthalene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
n-Butylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
n-Propylbenzene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Toluene	ND		0.0050	mg/Kg	1	16-Oct-2015 00:16
Xylenes, Total	ND		0.0099	mg/Kg	1	16-Oct-2015 00:16
Surr: 1,2-Dichloroethane-d4	102		70-128	%REC	1	16-Oct-2015 00:16
Surr: 4-Bromofluorobenzene	94.5		73-126	%REC	1	16-Oct-2015 00:16
Surr: Dibromofluoromethane	109		71-128	%REC	1	16-Oct-2015 00:16
Surr: Toluene-d8	102		73-127	%REC	1	16-Oct-2015 00:16
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	15-Oct-2015 02:29
Surr: 4-Bromofluorobenzene	78.8		70-130	%REC	1	15-Oct-2015 02:29

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: SW-SSE-17.0'  
 Collection Date: 08-Oct-2015 12:50

**ANALYTICAL REPORT**  
 WorkOrder:HS15100386  
 Lab ID:HS15100386-19  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	10		0.50	mg/Kg	100	15-Oct-2015 19:35
1,2-Dichloroethane	ND		0.048	mg/Kg	10	17-Oct-2015 04:23
1,3,5-Trimethylbenzene	1.3		0.048	mg/Kg	10	17-Oct-2015 04:23
2-Butanone	ND		0.097	mg/Kg	10	17-Oct-2015 04:23
Benzene	0.069		0.048	mg/Kg	10	17-Oct-2015 04:23
Cyclohexane	0.46		0.048	mg/Kg	10	17-Oct-2015 04:23
Ethylbenzene	1.3		0.048	mg/Kg	10	17-Oct-2015 04:23
Isopropylbenzene	0.18		0.048	mg/Kg	10	17-Oct-2015 04:23
Methylcyclohexane	0.61		0.048	mg/Kg	10	17-Oct-2015 04:23
Naphthalene	0.35		0.048	mg/Kg	10	17-Oct-2015 04:23
n-Butylbenzene	0.65		0.048	mg/Kg	10	17-Oct-2015 04:23
n-Propylbenzene	0.84		0.048	mg/Kg	10	17-Oct-2015 04:23
Toluene	0.53		0.048	mg/Kg	10	17-Oct-2015 04:23
Xylenes, Total	2.5		0.097	mg/Kg	10	17-Oct-2015 04:23
Surr: 1,2-Dichloroethane-d4	88.4		70-128	%REC	10	17-Oct-2015 04:23
Surr: 1,2-Dichloroethane-d4	103		70-128	%REC	100	15-Oct-2015 19:35
Surr: 4-Bromofluorobenzene	103		73-126	%REC	10	17-Oct-2015 04:23
Surr: 4-Bromofluorobenzene	100		73-126	%REC	100	15-Oct-2015 19:35
Surr: Dibromofluoromethane	94.3		71-128	%REC	10	17-Oct-2015 04:23
Surr: Dibromofluoromethane	104		71-128	%REC	100	15-Oct-2015 19:35
Surr: Toluene-d8	104		73-127	%REC	10	17-Oct-2015 04:23
Surr: Toluene-d8	97.5		73-127	%REC	100	15-Oct-2015 19:35
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	26		0.048	mg/Kg	1	15-Oct-2015 01:24
Surr: 4-Bromofluorobenzene	121		70-130	%REC	1	15-Oct-2015 01:24

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Trip Blank  
 Collection Date: 07-Oct-2015 00:00

**ANALYTICAL REPORT**  
 WorkOrder: HS15100386  
 Lab ID: HS15100386-20  
 Matrix: Water

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>LOW LEVEL VOLATILES BY SW8260C</b>		<b>Method: SW8260</b>				Analyst: AKP
1,2,4-Trimethylbenzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
1,2-Dichloroethane	ND		0.0010	mg/L	1	13-Oct-2015 00:36
1,3,5-Trimethylbenzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
2-Butanone	ND		0.0020	mg/L	1	13-Oct-2015 00:36
Benzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Cyclohexane	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Ethylbenzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Isopropylbenzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Methylcyclohexane	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Naphthalene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
n-Butylbenzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
n-Propylbenzene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Toluene	ND		0.0010	mg/L	1	13-Oct-2015 00:36
Xylenes, Total	ND		0.0030	mg/L	1	13-Oct-2015 00:36
Surr: 1,2-Dichloroethane-d4	83.0		71-125	%REC	1	13-Oct-2015 00:36
Surr: 4-Bromofluorobenzene	95.6		70-125	%REC	1	13-Oct-2015 00:36
Surr: Dibromofluoromethane	98.6		74-125	%REC	1	13-Oct-2015 00:36
Surr: Toluene-d8	100		75-125	%REC	1	13-Oct-2015 00:36

Note: See Qualifiers Page for a list of qualifiers and their explanation.

## WEIGHT LOG

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

Batch ID: 579 Method: VOLATILES BY SW8260C

SampID	Container	Sample Wt/Vol	Final Volume	Weight Factor	Container Type
HS15100386-01	1	5.195 (g)	5 (mL)	0.96	Bulk (5030B)
HS15100386-02	1	5.328 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-03	1	5.25 (g)	5 (mL)	0.95	Bulk (5030B)
HS15100386-04	1	5.058 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-05	1	4.942 (g)	5 (mL)	1.01	Bulk (5030B)
HS15100386-06	1	5.084 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-07	1	5.59 (g)	5 (mL)	0.89	Bulk (5030B)
HS15100386-08	1	5.571 (g)	5 (mL)	0.9	Bulk (5030B)
HS15100386-08	1	5.571 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-09	1	5.39 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-10	1	5.155 (g)	5 (mL)	0.97	Bulk (5030B)
HS15100386-11	1	5.204 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-12	1	5.059 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-12	1	5.059 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-13	1	4.993 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-14	1	5.341 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-15	1	4.948 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-16	1	5.404 (g)	5 (mL)	0.93	Bulk (5030B)
HS15100386-16	1	5.404 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-17	1	5.283 (g)	5 (mL)	0.95	Bulk (5030B)
HS15100386-18	1	5.054 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-19	1	5.131 (g)	5 (mL)	0.97	Bulk (5030B)
HS15100386-19	1	5.131 (g)	5 (mL)	1	Bulk (5030B)

Batch ID: 589 Method: VPH - IOWA OA-1 Prep:

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor	
HS15100386-01	1	5.04 (g)	5 (mL)	0.96	Bulk (5030B)
HS15100386-02	1	5.02 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-03	1	5.04 (g)	5 (mL)	0.95	Bulk (5030B)
HS15100386-04	1	5.04 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-05	1	5.02 (g)	5 (mL)	1.01	Bulk (5030B)
HS15100386-06	1	5.01 (g)	5 (mL)	0.98	Bulk (5030B)
HS15100386-07	1	5.03 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-08	1	5.04 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-09	1	5.02 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-10	1	5.03 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-11	1	5.04 (g)	5 (mL)	0.96	Bulk (5030B)
HS15100386-12	1	5.03 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-13	1	5.01 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-14	1	5 (g)	5 (mL)	0.94	Bulk (5030B)
HS15100386-15	1	5.06 (g)	5 (mL)	1.01	Bulk (5030B)
HS15100386-16	1	5 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-17	1	5.04 (g)	5 (mL)	0.95	Bulk (5030B)
HS15100386-18	1	5.04 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100386-19	1	5.05 (g)	5 (mL)	0.97	Bulk (5030B)

**WEIGHT LOG**

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**Batch ID:** 594      **Method:** VPH - IOWA OA-1      **Prep:**

SampleID	Container	Sample Wt/Vol	Final Volume	Prep Factor	
HS15100386-08	1	5.04 (g)	5 (mL)	1	Bulk (5030B)
HS15100386-09	1	5.02 (g)	5 (mL)	1	Bulk (5030B)

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID R262940</b>		<b>Test Name : LOW LEVEL VOLATILES BY SW8260C</b>		<b>Matrix: Water</b>		
HS15100386-20	Trip Blank	07 Oct 2015 00:00			13 Oct 2015 00:36	1
<b>Batch ID R263093</b>		<b>Test Name : VOLATILES BY SW8260C</b>		<b>Matrix: Soil</b>		
HS15100386-01	Floor-NW-19.0'	07 Oct 2015 10:30			14 Oct 2015 20:16	1
HS15100386-02	SW-NW-15.0'	07 Oct 2015 10:40			14 Oct 2015 20:39	1
HS15100386-03	SW-N-16.5'	07 Oct 2015 10:50			14 Oct 2015 21:02	1
HS15100386-04	SW-S-15.0'	07 Oct 2015 12:30			14 Oct 2015 22:59	1
HS15100386-05	Floor-NE-19.5'	07 Oct 2015 14:20			14 Oct 2015 23:22	1
HS15100386-06	SW-E-16.0'	07 Oct 2015 14:30			14 Oct 2015 23:45	1
HS15100386-07	SW-NE-18.0'	07 Oct 2015 14:40			15 Oct 2015 00:09	1
HS15100386-11	SW-SNE-15.0'	08 Oct 2015 11:45			15 Oct 2015 01:19	1
<b>Batch ID R263110</b>		<b>Test Name : VPH - IOWA OA-1</b>		<b>Matrix: Soil</b>		
HS15100386-13	SW-SNW-17.0'	08 Oct 2015 11:55			15 Oct 2015 03:33	1
HS15100386-14	SW-SS-16.5'	08 Oct 2015 12:00			15 Oct 2015 03:17	1
HS15100386-16	SW-SE-17.5'	08 Oct 2015 12:25			15 Oct 2015 03:01	1
HS15100386-17	SW-SE-15.0'	08 Oct 2015 12:35			15 Oct 2015 02:45	1
HS15100386-18	SW-SE-10.0'	08 Oct 2015 12:45			15 Oct 2015 02:29	1
HS15100386-19	SW-SSE-17.0'	08 Oct 2015 12:50			15 Oct 2015 01:24	1
<b>Batch ID R263133</b>		<b>Test Name : VPH - IOWA OA-1</b>		<b>Matrix: Soil</b>		
HS15100386-01	Floor-NW-19.0'	07 Oct 2015 10:30			15 Oct 2015 09:58	1
HS15100386-02	SW-NW-15.0'	07 Oct 2015 10:40			15 Oct 2015 09:42	1
HS15100386-03	SW-N-16.5'	07 Oct 2015 10:50			15 Oct 2015 09:27	1
HS15100386-04	SW-S-15.0'	07 Oct 2015 12:30			15 Oct 2015 09:11	1
HS15100386-05	Floor-NE-19.5'	07 Oct 2015 14:20			15 Oct 2015 08:55	1
HS15100386-06	SW-E-16.0'	07 Oct 2015 14:30			15 Oct 2015 12:20	1
HS15100386-07	SW-NE-18.0'	07 Oct 2015 14:40			15 Oct 2015 12:36	1
HS15100386-10	SW-SW-17.0'	08 Oct 2015 11:30			15 Oct 2015 06:47	1
HS15100386-11	SW-SNE-15.0'	08 Oct 2015 11:45			15 Oct 2015 06:31	1
HS15100386-12	SW-SNM-17.0'	08 Oct 2015 11:50			15 Oct 2015 06:15	1
HS15100386-15	SW-SS-13.0'	08 Oct 2015 12:15			15 Oct 2015 05:26	1
<b>Batch ID R263158</b>		<b>Test Name : VOLATILES BY SW8260C</b>		<b>Matrix: Soil</b>		
HS15100386-18	SW-SE-10.0'	08 Oct 2015 12:45			16 Oct 2015 00:16	1

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID R263222 Test Name : VOLATILES BY SW8260C Matrix: Soil</b>						
HS15100386-02	SW-NW-15.0'	07 Oct 2015 10:40			17 Oct 2015 01:40	10
HS15100386-08	Floor-SE-19.0'	08 Oct 2015 08:45			17 Oct 2015 03:13	10
HS15100386-09	Floor-SW-20.5'	08 Oct 2015 11:15			17 Oct 2015 03:36	10
HS15100386-10	SW-SW-17.0'	08 Oct 2015 11:30			16 Oct 2015 23:44	1
HS15100386-12	SW-SNM-17.0'	08 Oct 2015 11:50			17 Oct 2015 04:00	10
HS15100386-13	SW-SNW-17.0'	08 Oct 2015 11:55			17 Oct 2015 02:03	10
HS15100386-14	SW-SS-16.5'	08 Oct 2015 12:00			17 Oct 2015 02:27	10
HS15100386-15	SW-SS-13.0'	08 Oct 2015 12:15			16 Oct 2015 23:21	1
HS15100386-16	SW-SE-17.5'	08 Oct 2015 12:25			17 Oct 2015 02:50	10
HS15100386-17	SW-SE-15.0'	08 Oct 2015 12:35			16 Oct 2015 22:58	1
HS15100386-19	SW-SSE-17.0'	08 Oct 2015 12:50			17 Oct 2015 04:23	10
<b>Batch ID R263230 Test Name : VOLATILES BY SW8260C Matrix: Soil</b>						
HS15100386-08	Floor-SE-19.0'	08 Oct 2015 08:45			15 Oct 2015 18:24	100
HS15100386-16	SW-SE-17.5'	08 Oct 2015 12:25			15 Oct 2015 19:11	100
HS15100386-19	SW-SSE-17.0'	08 Oct 2015 12:50			15 Oct 2015 19:35	100
<b>Batch ID R263319 Test Name : VOLATILES BY SW8260C Matrix: Soil</b>						
HS15100386-09	Floor-SW-20.5'	08 Oct 2015 11:15			19 Oct 2015 17:20	1000
HS15100386-09	Floor-SW-20.5'	08 Oct 2015 11:15			19 Oct 2015 15:19	250
HS15100386-12	SW-SNM-17.0'	08 Oct 2015 11:50			19 Oct 2015 14:55	100
<b>Batch ID R263325 Test Name : VPH - IOWA OA-1 Matrix: Soil</b>						
HS15100386-08	Floor-SE-19.0'	08 Oct 2015 08:45			19 Oct 2015 15:05	100
HS15100386-09	Floor-SW-20.5'	08 Oct 2015 11:15			19 Oct 2015 15:21	500

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263110      **Instrument:** FID-14      **Method:** IA OA-1

MBLK		Sample ID: BLK-151014	Units: mg/Kg			Analysis Date: 14-Oct-2015 20:04			
Client ID:		Run ID: FID-14_263110	SeqNo: 3461956		PrepDate:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
VPH - Gasoline Range Organics	ND	0.050							
<i>Surr: 4-Bromofluorobenzene</i>	0.07458	0.0050	0.1	0	74.6	70 - 130			

LCS		Sample ID: LCS-151014	Units: mg/Kg			Analysis Date: 14-Oct-2015 19:31			
Client ID:		Run ID: FID-14_263110	SeqNo: 3461955		PrepDate:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
VPH - Gasoline Range Organics	0.977	0.050	1	0	97.7	70 - 130			
<i>Surr: 4-Bromofluorobenzene</i>	0.09104	0.0050	0.1	0	91.0	70 - 130			

MS		Sample ID: HS15100391-35MS	Units: mg/Kg			Analysis Date: 14-Oct-2015 20:35			
Client ID:		Run ID: FID-14_263110	SeqNo: 3461958		PrepDate:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
VPH - Gasoline Range Organics	0.9794	0.050	1	0	97.9	70 - 130			
<i>Surr: 4-Bromofluorobenzene</i>	0.08596	0.0050	0.1	0	86.0	70 - 130			

MSD		Sample ID: HS15100391-35MSD	Units: mg/Kg			Analysis Date: 14-Oct-2015 20:51			
Client ID:		Run ID: FID-14_263110	SeqNo: 3461959		PrepDate:		DF: 1		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
VPH - Gasoline Range Organics	0.9415	0.050	1	0	94.2	70 - 130	0.9794	3.95	30
<i>Surr: 4-Bromofluorobenzene</i>	0.08062	0.0050	0.1	0	80.6	70 - 130	0.08596	6.41	30

The following samples were analyzed in this batch:

HS15100386-13	HS15100386-14	HS15100386-16	HS15100386-17
HS15100386-18	HS15100386-19		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

<b>Batch ID: R263133</b>		<b>Instrument: FID-14</b>		<b>Method: IA OA-1</b>				
<b>MBLK</b>	Sample ID: <b>BLK-151014</b>	Units: <b>mg/Kg</b>		Analysis Date: <b>15-Oct-2015 05:10</b>				
Client ID:	Run ID: <b>FID-14_263133</b>	SeqNo: <b>3462536</b>		PrepDate:		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit Qual

VPH - Gasoline Range Organics ND 0.050  
 Surr: 4-Bromofluorobenzene 0.07558 0.0050 0.1 0 75.6 70 - 130

<b>LCS</b>	Sample ID: <b>LCS-151014</b>	Units: <b>mg/Kg</b>		Analysis Date: <b>15-Oct-2015 04:38</b>				
Client ID:	Run ID: <b>FID-14_263133</b>	SeqNo: <b>3462534</b>		PrepDate:		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit Qual

VPH - Gasoline Range Organics 0.9369 0.050 1 0 93.7 70 - 130  
 Surr: 4-Bromofluorobenzene 0.08379 0.0050 0.1 0 83.8 70 - 130

<b>MS</b>	Sample ID: <b>HS15100386-15MS</b>	Units: <b>mg/Kg</b>		Analysis Date: <b>15-Oct-2015 05:42</b>				
Client ID: <b>SW-SS-13.0'</b>	Run ID: <b>FID-14_263133</b>	SeqNo: <b>3462538</b>		PrepDate:		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit Qual

VPH - Gasoline Range Organics 0.8068 0.050 1 0 80.7 70 - 130  
 Surr: 4-Bromofluorobenzene 0.07137 0.0050 0.1 0 71.4 70 - 130

<b>MSD</b>	Sample ID: <b>HS15100386-15MSD</b>	Units: <b>mg/Kg</b>		Analysis Date: <b>15-Oct-2015 05:59</b>				
Client ID: <b>SW-SS-13.0'</b>	Run ID: <b>FID-14_263133</b>	SeqNo: <b>3462539</b>		PrepDate:		DF: <b>1</b>		
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit Qual

VPH - Gasoline Range Organics 0.854 0.050 1 0 85.4 70 - 130 0.8068 5.69 30  
 Surr: 4-Bromofluorobenzene 0.07063 0.0050 0.1 0 70.6 70 - 130 0.07137 1.04 30

The following samples were analyzed in this batch:

HS15100386-01	HS15100386-02	HS15100386-03	HS15100386-04
HS15100386-05	HS15100386-06	HS15100386-07	HS15100386-10
HS15100386-11	HS15100386-12	HS15100386-15	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263325      **Instrument:** FID-14      **Method:** IA OA-1

<b>MBLK</b>	Sample ID: <b>GBLKW-151019</b>	Units: <b>mg/Kg</b>	Analysis Date: <b>19-Oct-2015 10:01</b>	
Client ID:	Run ID: <b>FID-14_263325</b>	SeqNo: <b>3466542</b>	PrepDate:	DF: <b>50</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value    %REC    Control Limit    RPD Ref Value    %RPD    RPD Limit Qual

VPH - Gasoline Range Organics	ND	2.5						
Surr: 4-Bromofluorobenzene	5.145	0.25	5	0	103	70 - 130		

<b>LCS</b>	Sample ID: <b>GLCS-151019</b>	Units: <b>mg/Kg</b>	Analysis Date: <b>19-Oct-2015 09:30</b>	
Client ID:	Run ID: <b>FID-14_263325</b>	SeqNo: <b>3466541</b>	PrepDate:	DF: <b>1</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value    %REC    Control Limit    RPD Ref Value    %RPD    RPD Limit Qual

VPH - Gasoline Range Organics	1.127	0.050	1	0	113	70 - 130		
Surr: 4-Bromofluorobenzene	0.1126	0.0050	0.1	0	113	70 - 130		

<b>MS</b>	Sample ID: <b>HS15100647-01MS</b>	Units: <b>mg/Kg</b>	Analysis Date: <b>19-Oct-2015 10:50</b>	
Client ID:	Run ID: <b>FID-14_263325</b>	SeqNo: <b>3466544</b>	PrepDate:	DF: <b>1</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value    %REC    Control Limit    RPD Ref Value    %RPD    RPD Limit Qual

VPH - Gasoline Range Organics	1.928	0.050	1	0.6196	131	70 - 130		S
Surr: 4-Bromofluorobenzene	0.1279	0.0050	0.1	0	128	70 - 130		

<b>MSD</b>	Sample ID: <b>HS15100647-01MSD</b>	Units: <b>mg/Kg</b>	Analysis Date: <b>19-Oct-2015 11:06</b>	
Client ID:	Run ID: <b>FID-14_263325</b>	SeqNo: <b>3466545</b>	PrepDate:	DF: <b>1</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value    %REC    Control Limit    RPD Ref Value    %RPD    RPD Limit Qual

VPH - Gasoline Range Organics	1.961	0.050	1	0.6196	134	70 - 130	1.928	1.69	30	S
Surr: 4-Bromofluorobenzene	0.1289	0.0050	0.1	0	129	70 - 130	0.1279	0.829	30	

The following samples were analyzed in this batch: HS15100386-08      HS15100386-09

Note: See Qualifiers Page for a list of qualifiers and their explanation

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

**QC BATCH REPORT**

Batch ID: R262940 Instrument: VOA2 Method: SW8260

MBLK Sample ID: VBLKW-151012 Units: ug/L Analysis Date: 12-Oct-2015 22:55  
 Client ID: Run ID: VOA2\_262940 SeqNo: 3458677 PrepDate: DF: 1

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	RPD Qual
1,2,4-Trimethylbenzene	ND	1.0								
1,2-Dichloroethane	ND	1.0								
1,3,5-Trimethylbenzene	ND	1.0								
2-Butanone	ND	2.0								
Benzene	ND	1.0								
Cyclohexane	ND	1.0								
Ethylbenzene	ND	1.0								
Isopropylbenzene	ND	1.0								
Methylcyclohexane	ND	1.0								
Naphthalene	ND	1.0								
n-Butylbenzene	ND	1.0								
n-Propylbenzene	ND	1.0								
Toluene	ND	1.0								
Xylenes, Total	ND	3.0								
Surr: 1,2-Dichloroethane-d4	41.56	1.0	50	0	83.1	71 - 125				
Surr: 4-Bromofluorobenzene	48.39	1.0	50	0	96.8	70 - 125				
Surr: Dibromofluoromethane	49.67	1.0	50	0	99.3	74 - 125				
Surr: Toluene-d8	50.67	1.0	50	0	101	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R262940 Instrument: VOA2 Method: SW8260

LCS	Sample ID: VLCSW-151012	Units: ug/L			Analysis Date: 12-Oct-2015 22:04					
Client ID:	Run ID: VOA2_262940	SeqNo: 3458676	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	47.02	1.0	50	0	94.0	70 - 125				
1,2-Dichloroethane	45.09	1.0	50	0	90.2	76 - 120				
1,3,5-Trimethylbenzene	46.49	1.0	50	0	93.0	80 - 123				
2-Butanone	116.8	2.0	100	0	117	60 - 140				
Benzene	45.33	1.0	50	0	90.7	80 - 120				
Cyclohexane	48.77	1.0	50	0	97.5	70 - 130				
Ethylbenzene	46.31	1.0	50	0	92.6	80 - 120				
Isopropylbenzene	47.18	1.0	50	0	94.4	75 - 130				
Methylcyclohexane	47.72	1.0	50	0	95.4	70 - 126				
Naphthalene	54.28	1.0	50	0	109	65 - 135				
n-Butylbenzene	48.98	1.0	50	0	98.0	75 - 128				
n-Propylbenzene	47.18	1.0	50	0	94.4	75 - 130				
Toluene	45.47	1.0	50	0	90.9	75 - 121				
Xylenes, Total	137.3	3.0	150	0	91.6	79 - 124				
Surr: 1,2-Dichloroethane-d4	41.86	1.0	50	0	83.7	71 - 125				
Surr: 4-Bromofluorobenzene	49.57	1.0	50	0	99.1	70 - 125				
Surr: Dibromofluoromethane	47.21	1.0	50	0	94.4	74 - 125				
Surr: Toluene-d8	48.76	1.0	50	0	97.5	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R262940 Instrument: VOA2 Method: SW8260

MS	Sample ID: HS15100403-01MS	Units: ug/L			Analysis Date: 13-Oct-2015 01:27					
Client ID:	Run ID: VOA2_262940	SeqNo: 3458683	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	45.39	1.0	50	0	90.8	70 - 125				
1,2-Dichloroethane	45.65	1.0	50	0	91.3	76 - 120				
1,3,5-Trimethylbenzene	46.33	1.0	50	0	92.7	80 - 123				
2-Butanone	106.8	2.0	100	0	107	60 - 140				
Benzene	46.3	1.0	50	0	92.6	80 - 120				
Cyclohexane	51.65	1.0	50	0	103	70 - 130				
Ethylbenzene	46.99	1.0	50	0	94.0	80 - 120				
Isopropylbenzene	47.46	1.0	50	0	94.9	75 - 130				
Methylcyclohexane	51.17	1.0	50	0	102	70 - 126				
Naphthalene	49.69	1.0	50	0	99.4	65 - 135				
n-Butylbenzene	46.73	1.0	50	0	93.5	75 - 128				
n-Propylbenzene	47.04	1.0	50	0	94.1	75 - 130				
Toluene	45.23	1.0	50	0	90.5	75 - 121				
Xylenes, Total	136.8	3.0	150	0	91.2	80 - 124				
Surr: 1,2-Dichloroethane-d4	42.46	1.0	50	0	84.9	71 - 125				
Surr: 4-Bromofluorobenzene	49.34	1.0	50	0	98.7	70 - 125				
Surr: Dibromofluoromethane	48.38	1.0	50	0	96.8	74 - 125				
Surr: Toluene-d8	49.08	1.0	50	0	98.2	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R262940      **Instrument:** VOA2      **Method:** SW8260

MSD		Sample ID: HS15100403-01MSD			Units: ug/L		Analysis Date: 13-Oct-2015 01:53			
Client ID:		Run ID: VOA2_262940			SeqNo: 3458684		PrepDate:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	44.49	1.0	50	0	89.0	70 - 125	45.39	1.99	20	
1,2-Dichloroethane	43.3	1.0	50	0	86.6	76 - 120	45.65	5.28	20	
1,3,5-Trimethylbenzene	45.23	1.0	50	0	90.5	80 - 123	46.33	2.4	20	
2-Butanone	108.7	2.0	100	0	109	60 - 140	106.8	1.74	20	
Benzene	44.5	1.0	50	0	89.0	80 - 120	46.3	3.98	20	
Cyclohexane	49.75	1.0	50	0	99.5	70 - 130	51.65	3.73	20	
Ethylbenzene	45.31	1.0	50	0	90.6	80 - 120	46.99	3.63	20	
Isopropylbenzene	47.23	1.0	50	0	94.5	75 - 130	47.46	0.482	20	
Methylcyclohexane	48.6	1.0	50	0	97.2	70 - 126	51.17	5.16	20	
Naphthalene	50.56	1.0	50	0	101	65 - 135	49.69	1.73	20	
n-Butylbenzene	46.34	1.0	50	0	92.7	75 - 128	46.73	0.823	20	
n-Propylbenzene	45.97	1.0	50	0	91.9	75 - 130	47.04	2.3	20	
Toluene	44.51	1.0	50	0	89.0	75 - 121	45.23	1.59	20	
Xylenes, Total	135.9	3.0	150	0	90.6	80 - 124	136.8	0.711	20	
<i>Surr: 1,2-Dichloroethane-d4</i>	42.24	1.0	50	0	84.5	71 - 125	42.46	0.532	20	
<i>Surr: 4-Bromofluorobenzene</i>	49.31	1.0	50	0	98.6	70 - 125	49.34	0.0432	20	
<i>Surr: Dibromofluoromethane</i>	47.49	1.0	50	0	95.0	74 - 125	48.38	1.84	20	
<i>Surr: Toluene-d8</i>	50.03	1.0	50	0	100	75 - 125	49.08	1.93	20	

The following samples were analyzed in this batch: HS15100386-20

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263093 Instrument: VOA5 Method: SW8260

MBLK Sample ID: VBLKS2-101415 Units: ug/Kg Analysis Date: 14-Oct-2015 19:52  
 Client ID: Run ID: VOA5\_263093 SeqNo: 3461694 PrepDate: DF: 1

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
1,2,4-Trimethylbenzene	ND	5.0						
1,2-Dichloroethane	ND	5.0						
1,3,5-Trimethylbenzene	ND	5.0						
2-Butanone	ND	10						
Benzene	ND	5.0						
Cyclohexane	ND	5.0						
Ethylbenzene	ND	5.0						
Isopropylbenzene	ND	5.0						
Methylcyclohexane	ND	5.0						
Naphthalene	ND	5.0						
n-Butylbenzene	ND	5.0						
n-Propylbenzene	ND	5.0						
Toluene	ND	5.0						
Xylenes, Total	ND	10						
Surr: 1,2-Dichloroethane-d4	51.65	0	50	0	103	70 - 128		
Surr: 4-Bromofluorobenzene	46.87	0	50	0	93.7	73 - 126		
Surr: Dibromofluoromethane	51.1	0	50	0	102	71 - 128		
Surr: Toluene-d8	50.6	0	50	0	101	73 - 127		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263093      **Instrument:** VOA5      **Method:** SW8260

LCS		Sample ID: VLCSS2-101415			Units: ug/Kg		Analysis Date: 14-Oct-2015 19:06		
Client ID:		Run ID: VOA5_263093			SeqNo: 3461693		PrepDate:		DF: 1
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
1,2,4-Trimethylbenzene	42.96	5.0	50	0	85.9	79 - 123			
1,2-Dichloroethane	45.7	5.0	50	0	91.4	73 - 121			
1,3,5-Trimethylbenzene	46.8	5.0	50	0	93.6	70 - 123			
2-Butanone	90.61	10	100	0	90.6	65 - 130			
Benzene	46.87	5.0	50	0	93.7	79 - 122			
Cyclohexane	44.21	5.0	50	0	88.4	74 - 126			
Ethylbenzene	46.58	5.0	50	0	93.2	80 - 122			
Isopropylbenzene	42.16	5.0	50	0	84.3	72 - 127			
Methylcyclohexane	44.08	5.0	50	0	88.2	77 - 127			
Naphthalene	42.58	5.0	50	0	85.2	71 - 128			
n-Butylbenzene	43.88	5.0	50	0	87.8	77 - 126			
n-Propylbenzene	50.15	5.0	50	0	100	79 - 123			
Toluene	43.27	5.0	50	0	86.5	79 - 120			
Xylenes, Total	130.1	10	150	0	86.7	80 - 120			
<i>Surr: 1,2-Dichloroethane-d4</i>	<i>52.12</i>	<i>0</i>	<i>50</i>	<i>0</i>	<i>104</i>	<i>70 - 128</i>			
<i>Surr: 4-Bromofluorobenzene</i>	<i>49.04</i>	<i>0</i>	<i>50</i>	<i>0</i>	<i>98.1</i>	<i>73 - 126</i>			
<i>Surr: Dibromofluoromethane</i>	<i>51.65</i>	<i>0</i>	<i>50</i>	<i>0</i>	<i>103</i>	<i>71 - 128</i>			
<i>Surr: Toluene-d8</i>	<i>51.06</i>	<i>0</i>	<i>50</i>	<i>0</i>	<i>102</i>	<i>73 - 127</i>			

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263093      Instrument: VOA5      Method: SW8260

MS      Sample ID: HS15100466-05MS      Units: ug/Kg      Analysis Date: 14-Oct-2015 21:49  
 Client ID:      Run ID: VOA5\_263093      SeqNo: 3461699      PrepDate:      DF: 1

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	39.45	4.8	48.5	0	81.3	79 - 123				
1,2-Dichloroethane	45.94	4.8	48.5	0	94.7	73 - 121				
1,3,5-Trimethylbenzene	43.5	4.8	48.5	0	89.7	70 - 123				
2-Butanone	86	9.7	97	0	88.7	65 - 130				
Benzene	48.01	4.8	48.5	0	99.0	79 - 122				
Cyclohexane	43.8	4.8	48.5	0	90.3	74 - 126				
Ethylbenzene	44.55	4.8	48.5	0	91.9	80 - 122				
Isopropylbenzene	39.91	4.8	48.5	0	82.3	72 - 127				
Methylcyclohexane	40.51	4.8	48.5	0	83.5	77 - 127				
Naphthalene	33.26	4.8	48.5	0	68.6	71 - 128				S
n-Butylbenzene	37.5	4.8	48.5	0	77.3	77 - 126				
n-Propylbenzene	46.09	4.8	48.5	0	95.0	79 - 123				
Toluene	42.44	4.8	48.5	0	87.5	79 - 120				
Xylenes, Total	126	9.7	145.5	0	86.6	80 - 120				
Surr: 1,2-Dichloroethane-d4	49.94	0	48.5	0	103	70 - 128				
Surr: 4-Bromofluorobenzene	47.2	0	48.5	0	97.3	73 - 126				
Surr: Dibromofluoromethane	50.19	0	48.5	0	103	71 - 128				
Surr: Toluene-d8	48.77	0	48.5	0	101	73 - 127				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263093      **Instrument:** VOA5      **Method:** SW8260

MSD		Sample ID: HS15100466-05MSD			Units: ug/Kg		Analysis Date: 14-Oct-2015 22:12			
Client ID:		Run ID: VOA5_263093			SeqNo: 3461700		PrepDate:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	36.52	4.8	47.5	0	76.9	79 - 123	39.45	7.7	30	S
1,2-Dichloroethane	43.43	4.8	47.5	0	91.4	73 - 121	45.94	5.63	30	
1,3,5-Trimethylbenzene	40.06	4.8	47.5	0	84.3	70 - 123	43.5	8.24	30	
2-Butanone	83.5	9.5	95	0	87.9	65 - 130	86	2.95	30	
Benzene	45.87	4.8	47.5	0	96.6	79 - 122	48.01	4.56	30	
Cyclohexane	41.51	4.8	47.5	0	87.4	74 - 126	43.8	5.37	30	
Ethylbenzene	43.69	4.8	47.5	0	92.0	80 - 122	44.55	1.96	30	
Isopropylbenzene	37.67	4.8	47.5	0	79.3	72 - 127	39.91	5.77	30	
Methylcyclohexane	37.52	4.8	47.5	0	79.0	77 - 127	40.51	7.66	30	
Naphthalene	31.48	4.8	47.5	0	66.3	71 - 128	33.26	5.52	30	S
n-Butylbenzene	33.93	4.8	47.5	0	71.4	77 - 126	37.5	10	30	S
n-Propylbenzene	43.07	4.8	47.5	0	90.7	79 - 123	46.09	6.79	30	
Toluene	41.23	4.8	47.5	0	86.8	79 - 120	42.44	2.89	30	
Xylenes, Total	119.3	9.5	142.5	0	83.7	80 - 120	126	5.5	30	
Surr: 1,2-Dichloroethane-d4	49.43	0	47.5	0	104	70 - 128	49.94	1.03	30	
Surr: 4-Bromofluorobenzene	47.62	0	47.5	0	100	73 - 126	47.2	0.889	30	
Surr: Dibromofluoromethane	50.15	0	47.5	0	106	71 - 128	50.19	0.0661	30	
Surr: Toluene-d8	48.2	0	47.5	0	101	73 - 127	48.77	1.17	30	

The following samples were analyzed in this batch: HS15100386-01    HS15100386-02    HS15100386-03    HS15100386-04  
 HS15100386-05    HS15100386-06    HS15100386-07    HS15100386-11

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263158 Instrument: VOA5 Method: SW8260

MBLK Sample ID: VBLKS2-101515 Units: ug/Kg Analysis Date: 15-Oct-2015 20:00  
 Client ID: Run ID: VOA5\_263158 SeqNo: 3462984 PrepDate: DF: 1

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
1,2,4-Trimethylbenzene	ND	5.0						
1,2-Dichloroethane	ND	5.0						
1,3,5-Trimethylbenzene	ND	5.0						
2-Butanone	ND	10						
Benzene	ND	5.0						
Cyclohexane	ND	5.0						
Ethylbenzene	ND	5.0						
Isopropylbenzene	ND	5.0						
Methylcyclohexane	ND	5.0						
Naphthalene	ND	5.0						
n-Butylbenzene	ND	5.0						
n-Propylbenzene	ND	5.0						
Toluene	ND	5.0						
Xylenes, Total	ND	10						
Surr: 1,2-Dichloroethane-d4	47.79	0	50	0	95.6	70 - 128		
Surr: 4-Bromofluorobenzene	46.75	0	50	0	93.5	73 - 126		
Surr: Dibromofluoromethane	51.17	0	50	0	102	71 - 128		
Surr: Toluene-d8	51.57	0	50	0	103	73 - 127		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263158      **Instrument:** VOA5      **Method:** SW8260

LCS	Sample ID: VLCSS2-101515	Units: ug/Kg			Analysis Date: 15-Oct-2015 19:13				
Client ID:	Run ID: VOA5_263158	SeqNo: 3462983	PrepDate:	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
1,2,4-Trimethylbenzene	43.15	5.0	50	0	86.3	79 - 123			
1,2-Dichloroethane	46.97	5.0	50	0	93.9	73 - 121			
1,3,5-Trimethylbenzene	47.38	5.0	50	0	94.8	70 - 123			
2-Butanone	91.77	10	100	0	91.8	65 - 130			
Benzene	48.67	5.0	50	0	97.3	79 - 122			
Cyclohexane	46.74	5.0	50	0	93.5	74 - 126			
Ethylbenzene	47.55	5.0	50	0	95.1	80 - 122			
Isopropylbenzene	43	5.0	50	0	86.0	72 - 127			
Methylcyclohexane	44.89	5.0	50	0	89.8	77 - 127			
Naphthalene	44.23	5.0	50	0	88.5	71 - 128			
n-Butylbenzene	44.55	5.0	50	0	89.1	77 - 126			
n-Propylbenzene	50.58	5.0	50	0	101	79 - 123			
Toluene	43.9	5.0	50	0	87.8	79 - 120			
Xylenes, Total	130.4	10	150	0	86.9	80 - 120			
Surr: 1,2-Dichloroethane-d4	52.18	0	50	0	104	70 - 128			
Surr: 4-Bromofluorobenzene	50.03	0	50	0	100	73 - 126			
Surr: Dibromofluoromethane	52.89	0	50	0	106	71 - 128			
Surr: Toluene-d8	49.94	0	50	0	99.9	73 - 127			

Note: See Qualifiers Page for a list of qualifiers and their explanation

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263158		Instrument: VOA5		Method: SW8260						
MS	Sample ID: HS15100537-01MS	Units: ug/Kg		Analysis Date: 15-Oct-2015 22:20						
Client ID:	Run ID: VOA5_263158	SeqNo: 3462990	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	22.24	5.0	50.5	0	44.0	79 - 123				S
1,2-Dichloroethane	38.52	5.0	50.5	0	76.3	73 - 121				
1,3,5-Trimethylbenzene	27.14	5.0	50.5	0	53.7	70 - 123				S
2-Butanone	52.28	10	101	0	51.8	65 - 130				S
Benzene	39.88	5.0	50.5	0	79.0	79 - 122				S
Cyclohexane	36.95	5.0	50.5	0	73.2	74 - 126				S
Ethylbenzene	32.65	5.0	50.5	0	64.7	80 - 122				S
Isopropylbenzene	29.29	5.0	50.5	0	58.0	72 - 127				S
Methylcyclohexane	32.25	5.0	50.5	0	63.9	77 - 127				S
Naphthalene	11.46	5.0	50.5	0	22.7	71 - 128				S
n-Butylbenzene	21.68	5.0	50.5	0	42.9	77 - 126				S
n-Propylbenzene	31.07	5.0	50.5	0	61.5	79 - 123				S
Toluene	33.66	5.0	50.5	0	66.7	79 - 120				S
Xylenes, Total	87.73	10	151.5	0	57.9	80 - 120				S
Surr: 1,2-Dichloroethane-d4	54.85	0	50.5	0	109	70 - 128				
Surr: 4-Bromofluorobenzene	48.95	0	50.5	0	96.9	73 - 126				
Surr: Dibromofluoromethane	53.37	0	50.5	0	106	71 - 128				
Surr: Toluene-d8	50.79	0	50.5	0	101	73 - 127				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263158 Instrument: VOA5 Method: SW8260

MSD	Sample ID: HS15100537-01MSD	Units: ug/Kg			Analysis Date: 15-Oct-2015 22:43					
Client ID:	Run ID: VOA5_263158	SeqNo: 3462991	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	24.99	5.0	49.5	0	50.5	79 - 123	22.24	11.7	30	S
1,2-Dichloroethane	38.52	5.0	49.5	0	77.8	73 - 121	38.52	0	30	
1,3,5-Trimethylbenzene	29.54	5.0	49.5	0	59.7	70 - 123	27.14	8.48	30	S
2-Butanone	51.81	9.9	99	0	52.3	65 - 130	52.28	0.913	30	S
Benzene	41.31	5.0	49.5	0	83.5	79 - 122	39.88	3.52	30	
Cyclohexane	36.97	5.0	49.5	0	74.7	74 - 126	36.95	0.0579	30	
Ethylbenzene	34.53	5.0	49.5	0	69.7	80 - 122	32.65	5.59	30	S
Isopropylbenzene	30.54	5.0	49.5	0	61.7	72 - 127	29.29	4.18	30	S
Methylcyclohexane	32.71	5.0	49.5	0	66.1	77 - 127	32.25	1.42	30	S
Naphthalene	13.68	5.0	49.5	0	27.6	71 - 128	11.46	17.6	30	S
n-Butylbenzene	24.58	5.0	49.5	0	49.7	77 - 126	21.68	12.6	30	S
n-Propylbenzene	33.16	5.0	49.5	0	67.0	79 - 123	31.07	6.51	30	S
Toluene	34.75	5.0	49.5	0	70.2	79 - 120	33.66	3.18	30	S
Xylenes, Total	92.97	9.9	148.5	0	62.6	80 - 120	87.73	5.8	30	S
Surr: 1,2-Dichloroethane-d4	53.86	0	49.5	0	109	70 - 128	54.85	1.82	30	
Surr: 4-Bromofluorobenzene	48.17	0	49.5	0	97.3	73 - 126	48.95	1.59	30	
Surr: Dibromofluoromethane	52.6	0	49.5	0	106	71 - 128	53.37	1.46	30	
Surr: Toluene-d8	49.62	0	49.5	0	100	73 - 127	50.79	2.34	30	

The following samples were analyzed in this batch: HS15100386-18

Note: See Qualifiers Page for a list of qualifiers and their explanation

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263222 Instrument: VOA5 Method: SW8260

MBLK	Sample ID: VBLKS1-101615	Units: ug/Kg			Analysis Date: 16-Oct-2015 22:34				
Client ID:	Run ID: VOA5_263222	SeqNo: 3464338	PrepDate:	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
1,2,4-Trimethylbenzene	ND	5.0							
1,2-Dichloroethane	ND	5.0							
1,3,5-Trimethylbenzene	ND	5.0							
2-Butanone	ND	10							
Benzene	ND	5.0							
Cyclohexane	ND	5.0							
Ethylbenzene	ND	5.0							
Isopropylbenzene	ND	5.0							
Methylcyclohexane	ND	5.0							
Naphthalene	ND	5.0							
n-Butylbenzene	ND	5.0							
n-Propylbenzene	ND	5.0							
Toluene	ND	5.0							
Xylenes, Total	ND	10							
Surr: 1,2-Dichloroethane-d4	49	0	50	0	98.0	70 - 128			
Surr: 4-Bromofluorobenzene	46.77	0	50	0	93.5	73 - 126			
Surr: Dibromofluoromethane	50.19	0	50	0	100	71 - 128			
Surr: Toluene-d8	51.26	0	50	0	103	73 - 127			

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263222 Instrument: VOA5 Method: SW8260

LCS	Sample ID: VLCSS1-101615	Units: ug/Kg			Analysis Date: 16-Oct-2015 21:48			
Client ID:	Run ID: VOA5_263222	SeqNo: 3464337	PrepDate:	DF: 1				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
1,2,4-Trimethylbenzene	40.86	5.0	50	0	81.7	79 - 123		
1,2-Dichloroethane	48.44	5.0	50	0	96.9	73 - 121		
1,3,5-Trimethylbenzene	45.81	5.0	50	0	91.6	70 - 123		
2-Butanone	100.4	10	100	0	100	65 - 130		
Benzene	48.74	5.0	50	0	97.5	79 - 122		
Cyclohexane	46.06	5.0	50	0	92.1	74 - 126		
Ethylbenzene	45.34	5.0	50	0	90.7	80 - 122		
Isopropylbenzene	41.07	5.0	50	0	82.1	72 - 127		
Methylcyclohexane	44.05	5.0	50	0	88.1	77 - 127		
Naphthalene	43.43	5.0	50	0	86.9	71 - 128		
n-Butylbenzene	41.24	5.0	50	0	82.5	77 - 126		
n-Propylbenzene	48.01	5.0	50	0	96.0	79 - 123		
Toluene	42.25	5.0	50	0	84.5	79 - 120		
Xylenes, Total	126.3	10	150	0	84.2	80 - 120		
Surr: 1,2-Dichloroethane-d4	53.89	0	50	0	108	70 - 128		
Surr: 4-Bromofluorobenzene	50.01	0	50	0	100	73 - 126		
Surr: Dibromofluoromethane	55.51	0	50	0	111	71 - 128		
Surr: Toluene-d8	49.92	0	50	0	99.8	73 - 127		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263222		Instrument: VOA5		Method: SW8260						
MS	Sample ID: HS15100386-17MS	Units: ug/Kg		Analysis Date: 17-Oct-2015 00:07						
Client ID: SW-SE-15.0'	Run ID: VOA5_263222	SeqNo: 3464342	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	36.62	5.0	50	0	73.2	79 - 123				S
1,2-Dichloroethane	45.97	5.0	50	0	91.9	73 - 121				
1,3,5-Trimethylbenzene	39.92	5.0	50	0	79.8	70 - 123				
2-Butanone	99.6	10	100	0	99.6	65 - 130				
Benzene	46.93	5.0	50	0	93.9	79 - 122				
Cyclohexane	43.99	5.0	50	0	88.0	74 - 126				
Ethylbenzene	42.81	5.0	50	0.5281	84.6	80 - 122				
Isopropylbenzene	38.43	5.0	50	0	76.9	72 - 127				
Methylcyclohexane	42.17	5.0	50	0	84.3	77 - 127				
Naphthalene	34.38	5.0	50	0	68.8	71 - 128				S
n-Butylbenzene	35.49	5.0	50	0	71.0	77 - 126				S
n-Propylbenzene	42.87	5.0	50	0	85.7	79 - 123				
Toluene	40.54	5.0	50	0.6236	79.8	79 - 120				
Xylenes, Total	118.9	10	150	0	79.3	80 - 120				S
Surr: 1,2-Dichloroethane-d4	55.17	0	50	0	110	70 - 128				
Surr: 4-Bromofluorobenzene	49.88	0	50	0	99.8	73 - 126				
Surr: Dibromofluoromethane	55.78	0	50	0	112	71 - 128				
Surr: Toluene-d8	48.61	0	50	0	97.2	73 - 127				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263222 Instrument: VOA5 Method: SW8260

MSD	Sample ID: HS15100386-17MSD	Units: ug/Kg	Analysis Date: 17-Oct-2015 00:31							
Client ID: SW-SE-15.0'	Run ID: VOA5_263222	SeqNo: 3464343	PrepDate: DF: 1							
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	35.48	5.0	50	0	71.0	79 - 123	36.62	3.18	30	S
1,2-Dichloroethane	42.83	5.0	50	0	85.7	73 - 121	45.97	7.07	30	
1,3,5-Trimethylbenzene	39.2	5.0	50	0	78.4	70 - 123	39.92	1.84	30	
2-Butanone	96.46	10	100	0	96.5	65 - 130	99.6	3.2	30	
Benzene	45.39	5.0	50	0	90.8	79 - 122	46.93	3.35	30	
Cyclohexane	45.19	5.0	50	0	90.4	74 - 126	43.99	2.7	30	
Ethylbenzene	41.38	5.0	50	0.5281	81.7	80 - 122	42.81	3.4	30	
Isopropylbenzene	37.47	5.0	50	0	74.9	72 - 127	38.43	2.54	30	
Methylcyclohexane	42.1	5.0	50	0	84.2	77 - 127	42.17	0.171	30	
Naphthalene	34.17	5.0	50	0	68.3	71 - 128	34.38	0.616	30	S
n-Butylbenzene	34.87	5.0	50	0	69.7	77 - 126	35.49	1.76	30	S
n-Propylbenzene	42.02	5.0	50	0	84.0	79 - 123	42.87	1.99	30	
Toluene	38.95	5.0	50	0.6236	76.7	79 - 120	40.54	3.99	30	S
Xylenes, Total	115.8	10	150	0	77.2	80 - 120	118.9	2.69	30	S
Surr: 1,2-Dichloroethane-d4	56.31	0	50	0	113	70 - 128	55.17	2.05	30	
Surr: 4-Bromofluorobenzene	49.56	0	50	0	99.1	73 - 126	49.88	0.643	30	
Surr: Dibromofluoromethane	57.36	0	50	0	115	71 - 128	55.78	2.79	30	
Surr: Toluene-d8	48.82	0	50	0	97.6	73 - 127	48.61	0.411	30	

The following samples were analyzed in this batch:

HS15100386-02	HS15100386-08	HS15100386-09	HS15100386-10
HS15100386-12	HS15100386-13	HS15100386-14	HS15100386-15
HS15100386-16	HS15100386-17	HS15100386-19	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263230 Instrument: VOA8 Method: SW8260

MBLK		Sample ID: MBLKW1-101515		Units: ug/Kg		Analysis Date: 15-Oct-2015 18:01			
Client ID:		Run ID: VOA8_263230		SeqNo: 3464654		PrepDate:		DF: 50	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual
1,2,4-Trimethylbenzene	ND	250							
1,3,5-Trimethylbenzene	ND	250							
Ethylbenzene	ND	250							
n-Propylbenzene	ND	250							
Toluene	ND	250							
Xylenes, Total	ND	500							
Surr: 1,2-Dichloroethane-d4	2541	0	2500	0	102	70 - 128			
Surr: 4-Bromofluorobenzene	2468	0	2500	0	98.7	73 - 126			
Surr: Dibromofluoromethane	2505	0	2500	0	100	71 - 128			
Surr: Toluene-d8	2538	0	2500	0	102	73 - 127			

LCS		Sample ID: VLCSW1-101515		Units: ug/L		Analysis Date: 15-Oct-2015 17:15			
Client ID:		Run ID: VOA8_263230		SeqNo: 3464529		PrepDate:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual
1,2,4-Trimethylbenzene	58.75	5.0	50	0	117	70 - 125			
1,3,5-Trimethylbenzene	53.91	5.0	50	0	108	80 - 123			
Ethylbenzene	54.35	5.0	50	0	109	80 - 120			
n-Propylbenzene	57.7	5.0	50	0	115	78 - 120			
Toluene	52.64	5.0	50	0	105	80 - 120			
Xylenes, Total	160.9	15	150	0	107	80 - 120			
Surr: 1,2-Dichloroethane-d4	48.88	0	50	0	97.8	70 - 125			
Surr: 4-Bromofluorobenzene	50.75	0	50	0	102	72 - 125			
Surr: Dibromofluoromethane	48.7	0	50	0	97.4	71 - 125			
Surr: Toluene-d8	50.38	0	50	0	101	75 - 125			

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263230      **Instrument:** VOA8      **Method:** SW8260

MS		Sample ID: HS15100386-08MS	Units: ug/L		Analysis Date: 15-Oct-2015 19:58					
Client ID: Floor-SE-19.0'		Run ID: VOA8_263230	SeqNo: 3464531	PrepDate:	DF: 100					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	8154	500	5000	6414	34.8	70 - 125				S
1,3,5-Trimethylbenzene	ND	500	5000	2651	-53.0	80 - 120				S
Ethylbenzene	11340	500	5000	6102	105	80 - 120				
n-Propylbenzene	6585	500	5000	1286	106	78 - 120				
Toluene	13010	500	5000	7796	104	80 - 120				
Xylenes, Total	40040	1500	15000	24180	106	80 - 120				
Surr: 1,2-Dichloroethane-d4	5155	0	5000	0	103	70 - 125				
Surr: 4-Bromofluorobenzene	5096	0	5000	0	102	72 - 125				
Surr: Dibromofluoromethane	5141	0	5000	0	103	71 - 125				
Surr: Toluene-d8	4794	0	5000	0	95.9	75 - 125				

MSD		Sample ID: HS15100386-08MSD	Units: ug/L		Analysis Date: 15-Oct-2015 20:21					
Client ID: Floor-SE-19.0'		Run ID: VOA8_263230	SeqNo: 3464532	PrepDate:	DF: 100					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	5825	500	5000	6414	-11.8	70 - 125	8154	33.3	20	SR
1,3,5-Trimethylbenzene	8719	500	5000	2651	121	80 - 123	0	200	20	R
Ethylbenzene	12590	500	5000	6102	130	80 - 120	11340	10.5	20	S
n-Propylbenzene	7799	500	5000	1286	130	78 - 120	6585	16.9	20	S
Toluene	14300	500	5000	7796	130	80 - 120	13010	9.47	20	S
Xylenes, Total	44230	1500	15000	24180	134	78 - 121	40040	9.95	20	S
Surr: 1,2-Dichloroethane-d4	5265	0	5000	0	105	70 - 125	5155	2.12	20	
Surr: 4-Bromofluorobenzene	5094	0	5000	0	102	72 - 125	5096	0.033	20	
Surr: Dibromofluoromethane	5161	0	5000	0	103	71 - 125	5141	0.387	20	
Surr: Toluene-d8	4820	0	5000	0	96.4	75 - 125	4794	0.558	20	

The following samples were analyzed in this batch: HS15100386-08      HS15100386-16      HS15100386-19

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100386

QC BATCH REPORT

Batch ID: R263319		Instrument: VOA6		Method: SW8260						
MBLK	Sample ID: VBLKM-151019	Units: ug/Kg		Analysis Date: 19-Oct-2015 13:19						
Client ID:	Run ID: VOA6_263319	SeqNo: 3466438	PrepDate:	DF: 50						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

1,2,4-Trimethylbenzene	ND	250								
1,3,5-Trimethylbenzene	ND	250								
Cyclohexane	ND	250								
Ethylbenzene	ND	250								
Methylcyclohexane	ND	250								
Naphthalene	ND	250								
n-Butylbenzene	ND	250								
n-Propylbenzene	ND	250								
Toluene	ND	250								
Xylenes, Total	ND	500								
Surr: 1,2-Dichloroethane-d4	2057	0	2500	0	82.3	70 - 128				
Surr: 4-Bromofluorobenzene	2275	0	2500	0	91.0	73 - 126				
Surr: Dibromofluoromethane	2180	0	2500	0	87.2	71 - 128				
Surr: Toluene-d8	2127	0	2500	0	85.1	73 - 127				

LCS	Sample ID: VLCSW-151019	Units: ug/L		Analysis Date: 19-Oct-2015 10:49						
Client ID:	Run ID: VOA6_263319	SeqNo: 3466437	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual

1,2,4-Trimethylbenzene	43.6	5.0	50	0	87.2	70 - 125				
1,3,5-Trimethylbenzene	48.71	5.0	50	0	97.4	80 - 123				
Cyclohexane	49.42	5.0	50	0	98.8	66 - 125				
Ethylbenzene	47.46	5.0	50	0	94.9	80 - 120				
Methylcyclohexane	38.64	5.0	50	0	77.3	70 - 122				
Naphthalene	47.82	5.0	50	0	95.6	65 - 135				
n-Butylbenzene	48.6	5.0	50	0	97.2	77 - 120				
n-Propylbenzene	43.19	5.0	50	0	86.4	78 - 120				
Toluene	48.25	5.0	50	0	96.5	80 - 120				
Xylenes, Total	142.4	15	150	0	94.9	80 - 120				
Surr: 1,2-Dichloroethane-d4	44.47	0	50	0	88.9	70 - 125				
Surr: 4-Bromofluorobenzene	48.64	0	50	0	97.3	72 - 125				
Surr: Dibromofluoromethane	46.49	0	50	0	93.0	71 - 125				
Surr: Toluene-d8	45.38	0	50	0	90.8	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QC BATCH REPORT**

**Batch ID:** R263319      **Instrument:** VOA6      **Method:** SW8260

MS		Sample ID: HS15100588-03MS			Units: ug/Kg		Analysis Date: 19-Oct-2015 15:44			
Client ID:		Run ID: VOA6_263319			SeqNo: 3466442		PrepDate:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	47.2	5.0	50	0	94.4	79 - 123				
1,3,5-Trimethylbenzene	45.14	5.0	50	0	90.3	70 - 123				
Cyclohexane	28.76	5.0	50	0	57.5	74 - 126				S
Ethylbenzene	45.63	5.0	50	0	91.3	80 - 122				
Methylcyclohexane	28.85	5.0	50	0	57.7	77 - 127				S
Naphthalene	70.23	5.0	50	0	140	71 - 128				S
n-Butylbenzene	41.64	5.0	50	0	83.3	77 - 126				
n-Propylbenzene	38.66	5.0	50	0	77.3	79 - 123				S
Toluene	47.26	5.0	50	0	94.5	79 - 120				
Xylenes, Total	142.2	10	150	0	94.8	80 - 120				
<i>Surr: 1,2-Dichloroethane-d4</i>	43.45	0	50	0	86.9	70 - 128				
<i>Surr: 4-Bromofluorobenzene</i>	47.33	0	50	0	94.7	73 - 126				
<i>Surr: Dibromofluoromethane</i>	43.84	0	50	0	87.7	71 - 128				
<i>Surr: Toluene-d8</i>	44.8	0	50	0	89.6	73 - 127				

MSD		Sample ID: HS15100588-03MSD			Units: ug/Kg		Analysis Date: 19-Oct-2015 16:08			
Client ID:		Run ID: VOA6_263319			SeqNo: 3466443		PrepDate:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	44.64	5.0	50	0	89.3	79 - 123	47.2	5.57	30	
1,3,5-Trimethylbenzene	47.54	5.0	50	0	95.1	70 - 123	45.14	5.18	30	
Cyclohexane	35.54	5.0	50	0	71.1	74 - 126	28.76	21.1	30	S
Ethylbenzene	49.11	5.0	50	0	98.2	80 - 122	45.63	7.34	30	
Methylcyclohexane	40.17	5.0	50	0	80.3	77 - 127	28.85	32.8	30	R
Naphthalene	73.09	5.0	50	0	146	71 - 128	70.23	4	30	S
n-Butylbenzene	45.81	5.0	50	0	91.6	77 - 126	41.64	9.53	30	
n-Propylbenzene	42.06	5.0	50	0	84.1	79 - 123	38.66	8.45	30	
Toluene	49.19	5.0	50	0	98.4	79 - 120	47.26	4	30	
Xylenes, Total	147.8	10	150	0	98.5	80 - 120	142.2	3.9	30	
<i>Surr: 1,2-Dichloroethane-d4</i>	42.62	0	50	0	85.2	70 - 128	43.45	1.94	30	
<i>Surr: 4-Bromofluorobenzene</i>	47.7	0	50	0	95.4	73 - 126	47.33	0.779	30	
<i>Surr: Dibromofluoromethane</i>	44.42	0	50	0	88.8	71 - 128	43.84	1.33	30	
<i>Surr: Toluene-d8</i>	44.45	0	50	0	88.9	73 - 127	44.8	0.784	30	

The following samples were analyzed in this batch: HS15100386-09      HS15100386-12

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100386

**QUALIFIERS,  
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

<u>Acronym</u>	<u>Description</u>
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

<u>Unit Reported</u>	<u>Description</u>
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Liter

**CERTIFICATIONS, ACCREDITATIONS & LICENSES**

<b>Agency</b>	<b>Number</b>	<b>Expire Date</b>
Arkansas	15-024-0	27-Mar-2016
California	2919	31-Jul-2016
Dept of Defense	L2231 Rev 3-20-2014	22-Dec-2015
Illinois	003622	09-May-2016
Kansas	E-10352 2014-2015	30-Nov-2015
Kentucky	KY 2015-2016	30-Apr-2016
Louisiana	03087 2015/2016	30-Jun-2016
North Carolina	624 - 2015	31-Dec-2015
North Dakota	R-193 2015-2016	30-Apr-2016
Oklahoma	2015-047	31-Aug-2016
Texas	T104704231-15-15	30-Apr-2016

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Work Order: HS15100386

## SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS15100386-01	Floor-NW-19.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-01	Floor-NW-19.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-02	SW-NW-15.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-02	SW-NW-15.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-03	SW-N-16.5'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-03	SW-N-16.5'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-04	SW-S-15.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-04	SW-S-15.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-05	Floor-NE-19.5'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-05	Floor-NE-19.5'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-06	SW-E-16.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-06	SW-E-16.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-07	SW-NE-18.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-07	SW-NE-18.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-08	Floor-SE-19.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-08	Floor-SE-19.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-09	Floor-SW-20.5'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-09	Floor-SW-20.5'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-10	SW-SW-17.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-10	SW-SW-17.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-11	SW-SNE-15.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-11	SW-SNE-15.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-12	SW-SNM-17.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-12	SW-SNM-17.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-13	SW-SNW-17.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-13	SW-SNW-17.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-14	SW-SS-16.5'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-14	SW-SS-16.5'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-15	SW-SS-13.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-15	SW-SS-13.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-16	SW-SE-17.5'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-16	SW-SE-17.5'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-17	SW-SE-15.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-17	SW-SE-15.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-18	SW-SE-10.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-18	SW-SE-10.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-19	SW-SSE-17.0'	Login	10/9/2015 2:30:34 PM	CGG	VW-2
HS15100386-19	SW-SSE-17.0'	Login	10/9/2015 2:30:34 PM	CGG	BTEX B1
HS15100386-20	Trip Blank	Login	10/9/2015 2:30:34 PM	CGG	VW-3

**Sample Receipt Checklist**

Client Name: APEX-PORTLAND  
 Work Order: HS15100386

Date/Time Received: **09-Oct-2015 08:44**  
 Received by: **RPG**

Checklist completed by: Corey Grandits 9-Oct-2015  
 eSignature Date

Reviewed by: Erica Padilla 9-Oct-2015  
 eSignature Date

Matrices: **Soil**

Carrier name: **ALS Courier**

- Shipping container/cooler in good condition? Yes  No  Not Present
- Custody seals intact on shipping container/cooler? Yes  No  Not Present
- Custody seals intact on sample bottles? Yes  No  Not Present
- Chain of custody present? Yes  No
- Chain of custody signed when relinquished and received? Yes  No
- Chain of custody agrees with sample labels? Yes  No
- Samples in proper container/bottle? Yes  No
- Sample containers intact? Yes  No
- TX1005 solids received in hermetically sealed vials? Yes  No  N/A
- Sufficient sample volume for indicated test? Yes  No
- All samples received within holding time? Yes  No
- Container/Temp Blank temperature in compliance? Yes  No

Temperature(s)/Thermometer(s): 1.4c/1.3c uc/c IR1

Cooler(s)/Kit(s): 24302

Date/Time sample(s) sent to storage: 10/09/2015 14:50

Water - VOA vials have zero headspace? Yes  No  No VOA vials submitted

Water - pH acceptable upon receipt? Yes  No  N/A

pH adjusted? Yes  No  N/A

pH adjusted by:

Login Notes: **VOA soil samples not received in hermetically sealed vials.**

Client Contacted: Date Contacted: Person Contacted:

Contacted By: 0 Regarding:

Comments:

Corrective Action:



Environmental

Cincinnati, OH  
+1 513 733 5336

Everett, WA  
+1 425 356 2600

Fort Collins, CO  
+1 970 490 1511

Holland, MI  
+1 616 399 6070

Chain of Custody Fo

Page 1 of 2

COC ID: 134764

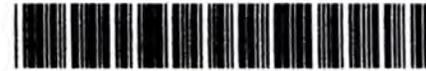
HS15100386

Apex Companies

E3CE-0065 Andover Release Site

ton, WV  
168

180



ALS Project Manager:

Customer Information		Project Information			
Purchase Order		Project Name	Andover Release Site	A	VOCs (8260) 14 compound Select List
Work Order		Project Number	E3CE-0065	B	GRO - VPH OA-1
Company Name	Apex Companies	Bill To Company	Apex Companies	C	
Send Report To	Samuel Jackson	Invoice Attn	Samuel Jackson	D	
Address	3015 SW First Avenue	Address	3015 SW First Avenue	E	
				F	
City/State/Zip	Portland, OR 97201	City/State/Zip	Portland, OR 97201	G	
Phone	(503) 924-4704	Phone	(503) 924-4704	H	
Fax		Fax		I	
e-Mail Address	sjackson@apexcos.com	e-Mail Address	sjackson@apexcos.com	J	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	FLOOR-NW-19.0'	10-07-15	1030	S	8	2	X	X									
2	SW-NW-15.0'	"	1040	S	8	2	X	X									
3	SW-N-16.5'	"	1050	S	8	2	X	X									
4	SW-S-15.0'	"	1230	S	8	2	X	X									
5	FLOOR-NE-19.5'	"	1420	S	8	2	X	X									
6	SW-E-16.0'	"	1430	S	8	2	X	X									
7	SW-NE-18.0'	"	1440	S	8	2	X	X									
8	FLOOR-SE-19.0'	10-08-15	0845	S	8	2	X	X									
9	FLOOR-SW-20.5'	"	1115	S	8	2	X	X									
10	SW-SW-17.0'	"	1130	S	8	2	X	X									

Sampler(s) Please Print & Sign <b>MIKE WHITSON</b>		Shipment Method <b>FEDEX OVERNIGHT</b>		Required Turnaround Time: (Check Box) <input checked="" type="checkbox"/> Std 10 WK days <input type="checkbox"/> 5 WK Days <input type="checkbox"/> 2 WK Days <input type="checkbox"/> 24 Hour			Results Due Date:	
Relinquished by: <b>MIKE WHITSON</b>	Date: 10-08-15	Time: 1900	Received by:		Notes: E3CE-0065 Andover Release Site			
Relinquished by:	Date:	Time:	Received by (Laboratory): <b>RG Simon</b>		Cooler ID: 24302	Cooler Temp.: 1.4	QC Package: (Check One Box Below)	
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):		<input checked="" type="checkbox"/> Level 2 Std QC	<input type="checkbox"/> TRRP ChkList		
Preservative Key: 1-HCl 2-HNO <sub>3</sub> 3-H <sub>2</sub> SO <sub>4</sub> 4-NaOH 5-Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> 6-NaHSO <sub>4</sub> 7-Other 8-4°C 9-5035					<input type="checkbox"/> Level 3 Std QC/Row da <input type="checkbox"/> TRRP Level 4			
					<input type="checkbox"/> Level 4 SW846/CLP			
					<input type="checkbox"/> Other/EDD			

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.  
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.  
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2011 by ALS Environmental.



Environmental

Cincinnati, OH  
+1 513 733 5336  
Everett, WA  
+1 425 356 2600

Fort Collins, CO  
+1 970 490 1511  
Holland, MI  
+1 616 399 6070

Chain of Custody Form

Page 2 of 2

COC ID: 13476

HS15100386

Apex Companies  
E3CE-0065 Andover Release Site

ston, WV  
168  
280



ALS Project Manager:

Customer Information		Project Information			
Purchase Order		Project Name	Andover Release Site	A	VOCs (8260) 14 compound Select List
Work Order		Project Number	E3CE-0065	B	GRO - VPH OA-1
Company Name	Apex Companies	Bill To Company	Apex Companies	C	
Send Report To	Samuel Jackson	Invoice Attn	Samuel Jackson	D	
Address	3015 SW First Avenue	Address	3015 SW First Avenue	E	
				F	
City/State/Zip	Portland, OR 97201	City/State/Zip	Portland, OR 97201	G	
Phone	(503) 824-4704	Phone	(503) 824-4704	H	
Fax		Fax		I	
e-Mail Address	sjackson@apexcos.com	e-Mail Address	sjackson@apexcos.com	J	

lo.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold
1	SW-SNE-15.0'	10-08-15	1145	S	8	2	X	X									
2	SW-SNM-17.0'	"	1150	S	8	2	X	X									
3	SW-SNW-17.0'	"	1155	S	8	2	X	X									
4	SW-SS-16.5'	"	1200	S	8	2	X	X									
5	SW-SS-13.0'	"	1215	S	8	2	X	X									
6	SW-SE-17.5'	"	1225	S	8	2	X	X									
7	SW-SE-15.0'	"	1235	S	8	2	X	X									
8	SW-SE-10.0'	"	1245	S	8	2	X	X									
9	SW-SSE-17.0'	"	1250	S	8	2	X	X									
10	TRIP BLANK	-	-	W	1,8	2	X										

Sampler(s) Please Print & Sign: **MIKE WHITSON** / *[Signature]*

Shipment Method: **FEDEX OVERNIGHT**

Required Turnaround Time: (Check Box)  
 Std 10 Wk days  
 5 Wk Days  
 2 Wk Days  
 24 Hour

Results Due Date: \_\_\_\_\_

Received by: *[Signature]* Date: **10-09-15** Time: **1900**

Received by (Laboratory): *[Signature]* Date: **10/09/15** Time: **08:41**

Checked by (Laboratory): \_\_\_\_\_

Cooler ID: **24302** Cooler Temp: **4/C**

QC Package: (Check One Box Below)  
 Level 2 Std QC  
 Level 3 Std QC/Row ds  
 Level 4 SW846/CLP  
 Other EDD

Preservative Key: 1-HCl 2-HNO<sub>3</sub> 3-H<sub>2</sub>SO<sub>4</sub> 4-NaOH 5-Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> 6-NaHSO<sub>4</sub> 7-Other 8-4°C 9-5035

1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.  
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.  
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2011 by ALS Environmental.

 <b>ALS Environmental</b> 10450 Stanciff Rd., Suite 210 Houston, Texas 77099 Tel. +1 281 530 5656 Fax. +1 281 530 5887	<b>CUSTODY SEAL</b>		Seal Broken By:
	Date:	Time:	SM
	Name:	Company:	Date:

24302 10/09/15

 <b>ALS Environmental</b> 10450 Stanciff Rd., Suite 210 Houston, Texas 77099 Tel. +1 281 530 5656 Fax. +1 281 530 5887	<b>CUSTODY SEAL</b>		Seal Broken By:
	Date:	Time:	SM
	Name:	Company:	Date:

24302 10/09/15

TRK# 8079 4509 2590      FRI - 09 OCT 10:30A  
0215      PRIORITY OVERNIGHT

**AB SGRA**      77099  
 TX-US IAH

24302





---

10450 Stancliff Rd. Suite 210  
Houston, TX 77099  
T: +1 281 530 5656  
F: +1 281 530 5887  
www.alsglobal.com

October 30, 2015

Samuel Jackson  
Apex Companies  
3015 SW First Avenue  
Portland, OR 97201

Work Order: **HS15100925**

Laboratory Results for: **E3CE-0065 Andover Release Site**

Dear Samuel,

ALS Environmental received 9 sample(s) on Oct 23, 2015 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

A handwritten signature in cursive script that reads "Erica Padilla".

Generated By: Dayna.Fisher  
Erica Padilla  
PM

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Work Order: HS15100925

**SAMPLE SUMMARY**

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS15100925-01	Land Farm 1	Soil		21-Oct-2015 14:59	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-02	Land Farm 2	Soil		21-Oct-2015 15:08	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-03	Land Farm 3	Soil		21-Oct-2015 15:17	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-04	Land Farm 4	Soil		21-Oct-2015 15:34	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-05	Land Farm 5	Soil		21-Oct-2015 15:41	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-06	Land Farm 6	Soil		21-Oct-2015 15:50	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-07	Land Farm 7	Soil		21-Oct-2015 16:01	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-08	IDW Drum	Water		21-Oct-2015 14:47	23-Oct-2015 08:55	<input type="checkbox"/>
HS15100925-09	TB-10/19/2015-08	Water		21-Oct-2015 00:00	23-Oct-2015 08:55	<input checked="" type="checkbox"/>

---

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**Work Order:** HS15100925

**CASE NARRATIVE**

---

**GC Volatiles by Method IA OA-1**

**Batch ID: R263664,R263667**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

---

**GCMS Volatiles by Method SW8260**

**Batch ID: R263992**

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

**Batch ID: R263737**

Sample ID: **HS15100990-01**

- MS and MSD are for an unrelated sample
-

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 1  
 Collection Date: 21-Oct-2015 14:59

**ANALYTICAL REPORT**  
 WorkOrder:HS15100925  
 Lab ID:HS15100925-01  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
2-Butanone	ND		0.0099	mg/Kg	1	28-Oct-2015 01:21
Benzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Cyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Ethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Isopropylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Methylcyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Naphthalene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
n-Butylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
n-Propylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Toluene	ND		0.0050	mg/Kg	1	28-Oct-2015 01:21
Xylenes, Total	ND		0.0099	mg/Kg	1	28-Oct-2015 01:21
Surr: 1,2-Dichloroethane-d4	93.0		70-128	%REC	1	28-Oct-2015 01:21
Surr: 4-Bromofluorobenzene	96.8		73-126	%REC	1	28-Oct-2015 01:21
Surr: Dibromofluoromethane	100		71-128	%REC	1	28-Oct-2015 01:21
Surr: Toluene-d8	101		73-127	%REC	1	28-Oct-2015 01:21
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	26-Oct-2015 20:00
Surr: 4-Bromofluorobenzene	79.9		70-130	%REC	1	26-Oct-2015 20:00

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 2  
 Collection Date: 21-Oct-2015 15:08

**ANALYTICAL REPORT**  
 WorkOrder:HS15100925  
 Lab ID:HS15100925-02  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>		Analyst: WLR		
1,2,4-Trimethylbenzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
1,2-Dichloroethane	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
1,3,5-Trimethylbenzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
2-Butanone	ND		0.0097	mg/Kg	1	28-Oct-2015 01:44
Benzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Cyclohexane	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Ethylbenzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Isopropylbenzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Methylcyclohexane	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Naphthalene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
n-Butylbenzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
n-Propylbenzene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Toluene	ND		0.0048	mg/Kg	1	28-Oct-2015 01:44
Xylenes, Total	ND		0.0097	mg/Kg	1	28-Oct-2015 01:44
Surr: 1,2-Dichloroethane-d4	84.2		70-128	%REC	1	28-Oct-2015 01:44
Surr: 4-Bromofluorobenzene	92.6		73-126	%REC	1	28-Oct-2015 01:44
Surr: Dibromofluoromethane	91.4		71-128	%REC	1	28-Oct-2015 01:44
Surr: Toluene-d8	101		73-127	%REC	1	28-Oct-2015 01:44
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>		Analyst: SFE		
VPH - Gasoline Range Organics	ND		0.048	mg/Kg	1	26-Oct-2015 20:16
Surr: 4-Bromofluorobenzene	83.9		70-130	%REC	1	26-Oct-2015 20:16

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 3  
 Collection Date: 21-Oct-2015 15:17

**ANALYTICAL REPORT**  
 WorkOrder: HS15100925  
 Lab ID: HS15100925-03  
 Matrix: Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
2-Butanone	ND		0.0099	mg/Kg	1	28-Oct-2015 02:07
Benzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Cyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Ethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Isopropylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Methylcyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Naphthalene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
n-Butylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
n-Propylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Toluene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:07
Xylenes, Total	ND		0.0099	mg/Kg	1	28-Oct-2015 02:07
<i>Surr: 1,2-Dichloroethane-d4</i>	81.8		70-128	%REC	1	28-Oct-2015 02:07
<i>Surr: 4-Bromofluorobenzene</i>	92.4		73-126	%REC	1	28-Oct-2015 02:07
<i>Surr: Dibromofluoromethane</i>	91.5		71-128	%REC	1	28-Oct-2015 02:07
<i>Surr: Toluene-d8</i>	98.8		73-127	%REC	1	28-Oct-2015 02:07
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	26-Oct-2015 20:32
<i>Surr: 4-Bromofluorobenzene</i>	85.0		70-130	%REC	1	26-Oct-2015 20:32

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 4  
 Collection Date: 21-Oct-2015 15:34

**ANALYTICAL REPORT**  
 WorkOrder:HS15100925  
 Lab ID:HS15100925-04  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
2-Butanone	ND		0.010	mg/Kg	1	28-Oct-2015 02:30
Benzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Cyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Ethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Isopropylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Methylcyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Naphthalene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
n-Butylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
n-Propylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Toluene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:30
Xylenes, Total	ND		0.010	mg/Kg	1	28-Oct-2015 02:30
Surr: 1,2-Dichloroethane-d4	89.5		70-128	%REC	1	28-Oct-2015 02:30
Surr: 4-Bromofluorobenzene	95.3		73-126	%REC	1	28-Oct-2015 02:30
Surr: Dibromofluoromethane	97.3		71-128	%REC	1	28-Oct-2015 02:30
Surr: Toluene-d8	102		73-127	%REC	1	28-Oct-2015 02:30
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	26-Oct-2015 20:48
Surr: 4-Bromofluorobenzene	85.4		70-130	%REC	1	26-Oct-2015 20:48

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 5  
 Collection Date: 21-Oct-2015 15:41

**ANALYTICAL REPORT**  
 WorkOrder: HS15100925  
 Lab ID: HS15100925-05  
 Matrix: Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method: SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
2-Butanone	ND		0.0099	mg/Kg	1	28-Oct-2015 02:54
Benzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Cyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Ethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Isopropylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Methylcyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Naphthalene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
n-Butylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
n-Propylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Toluene	ND		0.0050	mg/Kg	1	28-Oct-2015 02:54
Xylenes, Total	ND		0.0099	mg/Kg	1	28-Oct-2015 02:54
Surr: 1,2-Dichloroethane-d4	91.0		70-128	%REC	1	28-Oct-2015 02:54
Surr: 4-Bromofluorobenzene	92.9		73-126	%REC	1	28-Oct-2015 02:54
Surr: Dibromofluoromethane	93.9		71-128	%REC	1	28-Oct-2015 02:54
Surr: Toluene-d8	99.6		73-127	%REC	1	28-Oct-2015 02:54
<b>VPH - IOWA OA-1</b>		<b>Method: IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.050	mg/Kg	1	26-Oct-2015 21:52
Surr: 4-Bromofluorobenzene	84.6		70-130	%REC	1	26-Oct-2015 21:52

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 6  
 Collection Date: 21-Oct-2015 15:50

**ANALYTICAL REPORT**  
 WorkOrder:HS15100925  
 Lab ID:HS15100925-06  
 Matrix:Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
1,2-Dichloroethane	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
1,3,5-Trimethylbenzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
2-Butanone	ND		0.0094	mg/Kg	1	28-Oct-2015 03:17
Benzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Cyclohexane	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Ethylbenzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Isopropylbenzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Methylcyclohexane	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Naphthalene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
n-Butylbenzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
n-Propylbenzene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Toluene	ND		0.0047	mg/Kg	1	28-Oct-2015 03:17
Xylenes, Total	ND		0.0094	mg/Kg	1	28-Oct-2015 03:17
Surr: 1,2-Dichloroethane-d4	85.1		70-128	%REC	1	28-Oct-2015 03:17
Surr: 4-Bromofluorobenzene	91.9		73-126	%REC	1	28-Oct-2015 03:17
Surr: Dibromofluoromethane	93.1		71-128	%REC	1	28-Oct-2015 03:17
Surr: Toluene-d8	101		73-127	%REC	1	28-Oct-2015 03:17
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.047	mg/Kg	1	26-Oct-2015 22:07
Surr: 4-Bromofluorobenzene	83.5		70-130	%REC	1	26-Oct-2015 22:07

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: Land Farm 7  
 Collection Date: 21-Oct-2015 16:01

**ANALYTICAL REPORT**  
 WorkOrder: HS15100925  
 Lab ID: HS15100925-07  
 Matrix: Soil

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>VOLATILES BY SW8260C</b>			<b>Method: SW8260</b>			Analyst: WLR
1,2,4-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
1,2-Dichloroethane	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
1,3,5-Trimethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
2-Butanone	ND		0.0099	mg/Kg	1	28-Oct-2015 03:40
Benzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Cyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Ethylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Isopropylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Methylcyclohexane	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Naphthalene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
n-Butylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
n-Propylbenzene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Toluene	ND		0.0050	mg/Kg	1	28-Oct-2015 03:40
Xylenes, Total	ND		0.0099	mg/Kg	1	28-Oct-2015 03:40
Surr: 1,2-Dichloroethane-d4	90.1		70-128	%REC	1	28-Oct-2015 03:40
Surr: 4-Bromofluorobenzene	94.2		73-126	%REC	1	28-Oct-2015 03:40
Surr: Dibromofluoromethane	92.9		71-128	%REC	1	28-Oct-2015 03:40
Surr: Toluene-d8	98.1		73-127	%REC	1	28-Oct-2015 03:40
<b>VPH - IOWA OA-1</b>			<b>Method: IA OA-1</b>			Analyst: SFE
VPH - Gasoline Range Organics	ND		0.048	mg/Kg	1	26-Oct-2015 19:13
Surr: 4-Bromofluorobenzene	87.0		70-130	%REC	1	26-Oct-2015 19:13

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 Sample ID: IDW Drum  
 Collection Date: 21-Oct-2015 14:47

**ANALYTICAL REPORT**  
 WorkOrder:HS15100925  
 Lab ID:HS15100925-08  
 Matrix:Water

ANALYSES	RESULT	QUAL	REPORT LIMIT	UNITS	DILUTION FACTOR	DATE ANALYZED
<b>LOW LEVEL VOLATILES BY SW8260C</b>		<b>Method:SW8260</b>				Analyst: AKP
1,2,4-Trimethylbenzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
1,2-Dichloroethane	ND		0.0010	mg/L	1	30-Oct-2015 17:01
1,3,5-Trimethylbenzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
2-Butanone	ND		0.0020	mg/L	1	30-Oct-2015 17:01
Benzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Cyclohexane	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Ethylbenzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Isopropylbenzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Methylcyclohexane	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Naphthalene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
n-Butylbenzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
n-Propylbenzene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Toluene	ND		0.0010	mg/L	1	30-Oct-2015 17:01
Xylenes, Total	ND		0.0030	mg/L	1	30-Oct-2015 17:01
Surr: 1,2-Dichloroethane-d4	84.1		71-125	%REC	1	30-Oct-2015 17:01
Surr: 4-Bromofluorobenzene	93.1		70-125	%REC	1	30-Oct-2015 17:01
Surr: Dibromofluoromethane	101		74-125	%REC	1	30-Oct-2015 17:01
Surr: Toluene-d8	101		75-125	%REC	1	30-Oct-2015 17:01
<b>VPH - IOWA OA-1</b>		<b>Method:IA OA-1</b>				Analyst: SFE
VPH - Gasoline Range Organics	ND		0.050	mg/L	1	26-Oct-2015 15:43
Surr: 4-Bromofluorobenzene	110		70-130	%REC	1	26-Oct-2015 15:43

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**WEIGHT LOG**

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100925

**Batch ID:** 608                      **Method:** VOLATILES BY SW8260C

SampID	Container	Sample Wt/Vol	Final Volume	Weight Factor	Container Type
HS15100925-01	1	5.121 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100925-02	1	5.17 (g)	5 (mL)	0.97	Bulk (5030B)
HS15100925-03	1	5.429 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100925-04	1	4.932 (g)	5 (mL)	1.01	Bulk (5030B)
HS15100925-05	1	5.209 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100925-06	1	5.294 (g)	5 (mL)	0.94	Bulk (5030B)
HS15100925-07	1	5.271 (g)	5 (mL)	0.99	Bulk (5030B)

**Batch ID:** 611                      **Method:** VPH - IOWA OA-1                      **Prep:**

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor	
HS15100925-01	1	5.03 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100925-02	1	5.05 (g)	5 (mL)	0.97	Bulk (5030B)
HS15100925-03	1	5.05 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100925-04	1	5.03 (g)	5 (mL)	1.01	Bulk (5030B)
HS15100925-05	1	5.04 (g)	5 (mL)	0.99	Bulk (5030B)
HS15100925-06	1	5.05 (g)	5 (mL)	0.94	Bulk (5030B)
HS15100925-07	1	5.05 (g)	5 (mL)	0.95	Bulk (5030B)

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100925

**DATES REPORT**

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
<b>Batch ID R263664</b>		<b>Test Name : VPH - IOWA OA-1</b>		<b>Matrix: Water</b>		
HS15100925-08	IDW Drum	21 Oct 2015 14:47			26 Oct 2015 15:43	1
<b>Batch ID R263667</b>		<b>Test Name : VPH - IOWA OA-1</b>		<b>Matrix: Soil</b>		
HS15100925-01	Land Farm 1	21 Oct 2015 14:59			26 Oct 2015 20:00	1
HS15100925-02	Land Farm 2	21 Oct 2015 15:08			26 Oct 2015 20:16	1
HS15100925-03	Land Farm 3	21 Oct 2015 15:17			26 Oct 2015 20:32	1
HS15100925-04	Land Farm 4	21 Oct 2015 15:34			26 Oct 2015 20:48	1
HS15100925-05	Land Farm 5	21 Oct 2015 15:41			26 Oct 2015 21:52	1
HS15100925-06	Land Farm 6	21 Oct 2015 15:50			26 Oct 2015 22:07	1
HS15100925-07	Land Farm 7	21 Oct 2015 16:01			26 Oct 2015 19:13	1
<b>Batch ID R263737</b>		<b>Test Name : VOLATILES BY SW8260C</b>		<b>Matrix: Soil</b>		
HS15100925-01	Land Farm 1	21 Oct 2015 14:59			28 Oct 2015 01:21	1
HS15100925-02	Land Farm 2	21 Oct 2015 15:08			28 Oct 2015 01:44	1
HS15100925-03	Land Farm 3	21 Oct 2015 15:17			28 Oct 2015 02:07	1
HS15100925-04	Land Farm 4	21 Oct 2015 15:34			28 Oct 2015 02:30	1
HS15100925-05	Land Farm 5	21 Oct 2015 15:41			28 Oct 2015 02:54	1
HS15100925-06	Land Farm 6	21 Oct 2015 15:50			28 Oct 2015 03:17	1
HS15100925-07	Land Farm 7	21 Oct 2015 16:01			28 Oct 2015 03:40	1
<b>Batch ID R263992</b>		<b>Test Name : LOW LEVEL VOLATILES BY SW8260C</b>		<b>Matrix: Water</b>		
HS15100925-08	IDW Drum	21 Oct 2015 14:47			30 Oct 2015 17:01	1

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

QC BATCH REPORT

Batch ID: R263664 Instrument: FID-14 Method: IA OA-1

<b>MBLK</b>	Sample ID: <b>GBLKW-151026</b>	Units: <b>mg/L</b>	Analysis Date: <b>26-Oct-2015 12:22</b>		
Client ID:	Run ID: <b>FID-14_263664</b>	SeqNo: <b>3472628</b>	PrepDate:	DF: <b>1</b>	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %RPD RPD Limit Qual

VPH - Gasoline Range Organics ND 0.050  
 Surr: 4-Bromofluorobenzene 0.1272 0.0050 0.1 0 127 70 - 130

<b>LCS</b>	Sample ID: <b>GLCS-151026</b>	Units: <b>mg/L</b>	Analysis Date: <b>26-Oct-2015 11:50</b>		
Client ID:	Run ID: <b>FID-14_263664</b>	SeqNo: <b>3472626</b>	PrepDate:	DF: <b>1</b>	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %RPD RPD Limit Qual

VPH - Gasoline Range Organics 1.139 0.050 1 0 114 70 - 130  
 Surr: 4-Bromofluorobenzene 0.1101 0.0050 0.1 0 110 70 - 130

<b>MS</b>	Sample ID: <b>HS15100917-01MS</b>	Units: <b>mg/L</b>	Analysis Date: <b>26-Oct-2015 13:06</b>		
Client ID:	Run ID: <b>FID-14_263664</b>	SeqNo: <b>3472630</b>	PrepDate:	DF: <b>1</b>	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %RPD RPD Limit Qual

VPH - Gasoline Range Organics 1.101 0.050 1 0 110 70 - 130  
 Surr: 4-Bromofluorobenzene 0.1084 0.0050 0.1 0 108 70 - 130

<b>MSD</b>	Sample ID: <b>HS15100917-01MSD</b>	Units: <b>mg/L</b>	Analysis Date: <b>26-Oct-2015 13:22</b>		
Client ID:	Run ID: <b>FID-14_263664</b>	SeqNo: <b>3472631</b>	PrepDate:	DF: <b>1</b>	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC Control Limit RPD Ref Value %RPD RPD Limit Qual

VPH - Gasoline Range Organics 1.193 0.050 1 0 119 70 - 130 1.101 8.03 30  
 Surr: 4-Bromofluorobenzene 0.1133 0.0050 0.1 0 113 70 - 130 0.1084 4.37 30

The following samples were analyzed in this batch: HS15100925-08

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

**QC BATCH REPORT**

Batch ID: R263667 Instrument: FID-14 Method: IA OA-1

MBLK	Sample ID: BLK-151026	Units: mg/Kg				Analysis Date: 26-Oct-2015 18:57				
Client ID:	Run ID: FID-14_263667	SeqNo: 3472719	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
VPH - Gasoline Range Organics	ND	0.050								
Surr: 4-Bromofluorobenzene	0.07923	0.0050	0.1	0	79.2	70 - 130				

LCS	Sample ID: LCS-151026	Units: mg/Kg				Analysis Date: 26-Oct-2015 18:25				
Client ID:	Run ID: FID-14_263667	SeqNo: 3472717	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
VPH - Gasoline Range Organics	1.029	0.050	1	0	103	70 - 130				
Surr: 4-Bromofluorobenzene	0.09491	0.0050	0.1	0	94.9	70 - 130				

MS	Sample ID: HS15100925-07MS	Units: mg/Kg				Analysis Date: 26-Oct-2015 19:29				
Client ID: Land Farm 7	Run ID: FID-14_263667	SeqNo: 3472721	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
VPH - Gasoline Range Organics	0.9186	0.050	1	0	91.9	70 - 130				
Surr: 4-Bromofluorobenzene	0.1027	0.0050	0.1	0	103	70 - 130				

MSD	Sample ID: HS15100925-07MSD	Units: mg/Kg				Analysis Date: 26-Oct-2015 19:44				
Client ID: Land Farm 7	Run ID: FID-14_263667	SeqNo: 3472722	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
VPH - Gasoline Range Organics	0.8822	0.050	1	0	88.2	70 - 130	0.9186	4.04	30	
Surr: 4-Bromofluorobenzene	0.0969	0.0050	0.1	0	96.9	70 - 130	0.1027	5.79	30	

The following samples were analyzed in this batch:

HS15100925-01	HS15100925-02	HS15100925-03	HS15100925-04
HS15100925-05	HS15100925-06	HS15100925-07	

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

QC BATCH REPORT

Batch ID: R263737 Instrument: VOA5 Method: SW8260

MBLK	Sample ID: VBLKS2-102715	Units: ug/Kg		Analysis Date: 27-Oct-2015 22:14					
Client ID:	Run ID: VOA5_263737	SeqNo: 3474013	PrepDate:	DF: 1					
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit Qual
1,2,4-Trimethylbenzene	ND	5.0							
1,2-Dichloroethane	ND	5.0							
1,3,5-Trimethylbenzene	ND	5.0							
2-Butanone	ND	10							
Benzene	ND	5.0							
Cyclohexane	ND	5.0							
Ethylbenzene	ND	5.0							
Isopropylbenzene	ND	5.0							
Methylcyclohexane	ND	5.0							
Naphthalene	ND	5.0							
n-Butylbenzene	ND	5.0							
n-Propylbenzene	ND	5.0							
Toluene	ND	5.0							
Xylenes, Total	ND	10							
Surr: 1,2-Dichloroethane-d4	41.5	0	50	0	83.0	70 - 128			
Surr: 4-Bromofluorobenzene	45.37	0	50	0	90.7	73 - 126			
Surr: Dibromofluoromethane	44.69	0	50	0	89.4	71 - 128			
Surr: Toluene-d8	48.68	0	50	0	97.4	73 - 127			

Note. See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

QC BATCH REPORT

Batch ID: R263737 Instrument: VOA5 Method: SW8260

LCS	Sample ID: VLCSS2-102715	Units: ug/Kg			Analysis Date: 27-Oct-2015 21:04					
Client ID:	Run ID: VOA5_263737	SeqNo: 3474012	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	47.6	5.0	50	0	95.2	79 - 123				
1,2-Dichloroethane	47.28	5.0	50	0	94.6	73 - 121				
1,3,5-Trimethylbenzene	47.62	5.0	50	0	95.2	70 - 123				
2-Butanone	91.43	10	100	0	91.4	65 - 130				
Benzene	47.72	5.0	50	0	95.4	79 - 122				
Cyclohexane	43.92	5.0	50	0	87.8	74 - 126				
Ethylbenzene	46.99	5.0	50	0	94.0	80 - 122				
Isopropylbenzene	44.47	5.0	50	0	88.9	72 - 127				
Methylcyclohexane	45.01	5.0	50	0	90.0	77 - 127				
Naphthalene	43.22	5.0	50	0	86.4	71 - 128				
n-Butylbenzene	46.54	5.0	50	0	93.1	77 - 126				
n-Propylbenzene	46.5	5.0	50	0	93.0	79 - 123				
Toluene	46.3	5.0	50	0	92.6	79 - 120				
Xylenes, Total	142.4	10	150	0	94.9	80 - 120				
Surr: 1,2-Dichloroethane-d4	45.82	0	50	0	91.6	70 - 128				
Surr: 4-Bromofluorobenzene	50.43	0	50	0	101	73 - 126				
Surr: Dibromofluoromethane	46.91	0	50	0	93.8	71 - 128				
Surr: Toluene-d8	49.33	0	50	0	98.7	73 - 127				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

QC BATCH REPORT

Batch ID: R263737 Instrument: VOA5 Method: SW8260

MS	Sample ID: HS15100990-01MS	Units: ug/Kg			Analysis Date: 28-Oct-2015 00:11					
Client ID:	Run ID: VOA5_263737	SeqNo: 3474018	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	18	4.6	46	0	39.1	79 - 123				S
1,2-Dichloroethane	25.7	4.6	46	0	55.9	73 - 121				S
1,3,5-Trimethylbenzene	18.9	4.6	46	0	41.1	70 - 123				S
2-Butanone	36.99	9.2	92	0	40.2	65 - 130				S
Benzene	26.15	4.6	46	0	56.9	79 - 122				S
Cyclohexane	22.69	4.6	46	0	49.3	74 - 126				S
Ethylbenzene	21.59	4.6	46	0	46.9	80 - 122				S
Isopropylbenzene	20.16	4.6	46	0	43.8	72 - 127				S
Methylcyclohexane	21.37	4.6	46	0	46.4	77 - 127				S
Naphthalene	11.03	4.6	46	0	24.0	71 - 128				S
n-Butylbenzene	14.88	4.6	46	0	32.4	77 - 126				S
n-Propylbenzene	18.89	4.6	46	0	41.1	79 - 123				S
Toluene	23.86	4.6	46	0	51.9	79 - 120				S
Xylenes, Total	64	9.2	138	0	46.4	80 - 120				S
Surr: 1,2-Dichloroethane-d4	44.43	0	46	0	96.6	70 - 128				
Surr: 4-Bromofluorobenzene	46.12	0	46	0	100	73 - 126				
Surr: Dibromofluoromethane	45.66	0	46	0	99.3	71 - 128				
Surr: Toluene-d8	46.44	0	46	0	101	73 - 127				

Note: See Qualifiers Page for a list of qualifiers and their explanation

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

QC BATCH REPORT

Batch ID: R263737 Instrument: VOA5 Method: SW8260

MSD	Sample ID: HS15100990-01MSD	Units: ug/Kg		Analysis Date: 28-Oct-2015 00:34						
Client ID:	Run ID: VOA5_263737	SeqNo: 3474019	PrepDate:	DF: 1						
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	25.93	5.0	50	0	51.9	79 - 123	18	36.1	30	SR
1,2-Dichloroethane	33.45	5.0	50	0	66.9	73 - 121	25.7	26.2	30	S
1,3,5-Trimethylbenzene	26.76	5.0	50	0	53.5	70 - 123	18.9	34.4	30	SR
2-Butanone	46.92	10	100	0	46.9	65 - 130	36.99	23.7	30	S
Benzene	34.24	5.0	50	0	68.5	79 - 122	26.15	26.8	30	S
Cyclohexane	29.66	5.0	50	0	59.3	74 - 126	22.69	26.6	30	S
Ethylbenzene	29.76	5.0	50	0	59.5	80 - 122	21.59	31.8	30	SR
Isopropylbenzene	26.61	5.0	50	0	53.2	72 - 127	20.16	27.6	30	S
Methylcyclohexane	27.49	5.0	50	0	55.0	77 - 127	21.37	25.1	30	S
Naphthalene	17.13	5.0	50	0	34.3	71 - 128	11.03	43.4	30	SR
n-Butylbenzene	21.29	5.0	50	0	42.6	77 - 126	14.88	35.4	30	SR
n-Propylbenzene	26.64	5.0	50	0	53.3	79 - 123	18.89	34	30	SR
Toluene	30.98	5.0	50	0	62.0	79 - 120	23.86	26	30	S
Xylenes, Total	87.13	10	150	0	58.1	80 - 120	64	30.6	30	SR
Surr: 1,2-Dichloroethane-d4	47.62	0	50	0	95.2	70 - 128	44.43	6.95	30	
Surr: 4-Bromofluorobenzene	48.32	0	50	0	96.6	73 - 126	46.12	4.67	30	
Surr: Dibromofluoromethane	49.21	0	50	0	98.4	71 - 128	45.66	7.49	30	
Surr: Toluene-d8	49.79	0	50	0	99.6	73 - 127	46.44	6.96	30	

The following samples were analyzed in this batch: HS15100925-01 HS15100925-02 HS15100925-03 HS15100925-04  
 HS15100925-05 HS15100925-06 HS15100925-07

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100925

**QC BATCH REPORT**

**Batch ID:** R263992                      **Instrument:** VOA2                      **Method:** SW8260

MBLK	Sample ID: VBLKW-151030	Units: ug/L		Analysis Date: 30-Oct-2015 11:09				
Client ID:	Run ID: VOA2_263992	SeqNo: 3479070	PrepDate:	DF: 1				
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD Limit Qual
1,2,4-Trimethylbenzene	ND	1.0						
1,2-Dichloroethane	ND	1.0						
1,3,5-Trimethylbenzene	ND	1.0						
2-Butanone	ND	2.0						
Benzene	ND	1.0						
Cyclohexane	ND	1.0						
Ethylbenzene	ND	1.0						
Isopropylbenzene	ND	1.0						
Methylcyclohexane	ND	1.0						
Naphthalene	ND	1.0						
n-Butylbenzene	ND	1.0						
n-Propylbenzene	ND	1.0						
Toluene	ND	1.0						
Xylenes, Total	ND	3.0						
<i>Surr: 1,2-Dichloroethane-d4</i>	39.71	1.0	50	0	79.4	71 - 125		
<i>Surr: 4-Bromofluorobenzene</i>	48.87	1.0	50	0	97.7	70 - 125		
<i>Surr: Dibromofluoromethane</i>	49.21	1.0	50	0	98.4	74 - 125		
<i>Surr: Toluene-d8</i>	50.08	1.0	50	0	100	75 - 125		

Note: See Qualifiers Page for a list of qualifiers and their explanation.

Client: Apex Companies  
 Project: E3CE-0065 Andover Release Site  
 WorkOrder: HS15100925

QC BATCH REPORT

Batch ID: R263992		Instrument: VOA2		Method: SW8260						
LCS	Sample ID: VLCSW-151030	Units: ug/L			Analysis Date: 30-Oct-2015 10:18					
Client ID:	Run ID: VOA2_263992	SeqNo: 3479069		PrepDate:			DF: 1			
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	43.92	1.0	50	0	87.8	70 - 125				
1,2-Dichloroethane	46.79	1.0	50	0	93.6	76 - 120				
1,3,5-Trimethylbenzene	46.9	1.0	50	0	93.8	80 - 123				
2-Butanone	91.47	2.0	100	0	91.5	60 - 140				
Benzene	46.1	1.0	50	0	92.2	80 - 120				
Cyclohexane	46.21	1.0	50	0	92.4	70 - 130				
Ethylbenzene	47.48	1.0	50	0	95.0	80 - 120				
Isopropylbenzene	49.36	1.0	50	0	98.7	75 - 130				
Methylcyclohexane	46.18	1.0	50	0	92.4	70 - 126				
Naphthalene	47.18	1.0	50	0	94.4	65 - 135				
n-Butylbenzene	51.43	1.0	50	0	103	75 - 128				
n-Propylbenzene	48.24	1.0	50	0	96.5	75 - 130				
Toluene	46.17	1.0	50	0	92.3	75 - 121				
Xylenes, Total	138.7	3.0	150	0	92.5	79 - 124				
Surr: 1,2-Dichloroethane-d4	42.34	1.0	50	0	84.7	71 - 125				
Surr: 4-Bromofluorobenzene	49.23	1.0	50	0	98.5	70 - 125				
Surr: Dibromofluoromethane	47.67	1.0	50	0	95.3	74 - 125				
Surr: Toluene-d8	48.89	1.0	50	0	97.8	75 - 125				

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100925

**QC BATCH REPORT**

**Batch ID:** R263992                      **Instrument:** VOA2                      **Method:** SW8260

<b>MS</b>		Sample ID: <b>HS15101163-04MS</b>			Units: <b>ug/L</b>		Analysis Date: <b>30-Oct-2015 13:14</b>		
Client ID:		Run ID: <b>VOA2_263992</b>			SeqNo: <b>3479075</b>		PrepDate:		DF: <b>1</b>
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD Limit	RPD Qual
1,2,4-Trimethylbenzene	43.45	1.0	50	0	86.9	70 - 125			
1,2-Dichloroethane	44.84	1.0	50	0	89.7	76 - 120			
1,3,5-Trimethylbenzene	46.09	1.0	50	0	92.2	80 - 123			
2-Butanone	85.9	2.0	100	0	85.9	60 - 140			
Benzene	44.33	1.0	50	0	88.7	80 - 120			
Cyclohexane	45.96	1.0	50	0	91.9	70 - 130			
Ethylbenzene	46.85	1.0	50	0	93.7	80 - 120			
Isopropylbenzene	48.79	1.0	50	0	97.6	75 - 130			
Methylcyclohexane	48.67	1.0	50	0	97.3	70 - 126			
Naphthalene	43.16	1.0	50	0	86.3	65 - 135			
n-Butylbenzene	50.15	1.0	50	0	100	75 - 128			
n-Propylbenzene	47.3	1.0	50	0	94.6	75 - 130			
Toluene	45.5	1.0	50	0	91.0	75 - 121			
Xylenes, Total	135.3	3.0	150	0	90.2	80 - 124			
<i>Surr: 1,2-Dichloroethane-d4</i>	42.22	1.0	50	0	84.4	71 - 125			
<i>Surr: 4-Bromofluorobenzene</i>	50.52	1.0	50	0	101	70 - 125			
<i>Surr: Dibromofluoromethane</i>	47.87	1.0	50	0	95.7	74 - 125			
<i>Surr: Toluene-d8</i>	49.73	1.0	50	0	99.5	75 - 125			

Note: See Qualifiers Page for a list of qualifiers and their explanation.

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100925

**QC BATCH REPORT**

**Batch ID:** R263992      **Instrument:** VOA2      **Method:** SW8260

MSD		Sample ID: HS15101163-04MSD			Units: ug/L		Analysis Date: 30-Oct-2015 13:40			
Client ID:		Run ID: VOA2_263992			SeqNo: 3479076		PrepDate:		DF: 1	
Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,2,4-Trimethylbenzene	43.38	1.0	50	0	86.8	70 - 125	43.45	0.151	20	
1,2-Dichloroethane	42.56	1.0	50	0	85.1	76 - 120	44.84	5.23	20	
1,3,5-Trimethylbenzene	46.55	1.0	50	0	93.1	80 - 123	46.09	0.981	20	
2-Butanone	89.02	2.0	100	0	89.0	60 - 140	85.9	3.56	20	
Benzene	42.91	1.0	50	0	85.8	80 - 120	44.33	3.25	20	
Cyclohexane	44.72	1.0	50	0	89.4	70 - 130	45.96	2.75	20	
Ethylbenzene	45.49	1.0	50	0	91.0	80 - 120	46.85	2.95	20	
Isopropylbenzene	47.87	1.0	50	0	95.7	75 - 130	48.79	1.89	20	
Methylcyclohexane	46.56	1.0	50	0	93.1	70 - 126	48.67	4.42	20	
Naphthalene	44.87	1.0	50	0	89.7	65 - 135	43.16	3.87	20	
n-Butylbenzene	50.91	1.0	50	0	102	75 - 128	50.15	1.51	20	
n-Propylbenzene	47.09	1.0	50	0	94.2	75 - 130	47.3	0.458	20	
Toluene	44.07	1.0	50	0	88.1	75 - 121	45.5	3.19	20	
Xylenes, Total	133.4	3.0	150	0	88.9	80 - 124	135.3	1.46	20	
Surr: 1,2-Dichloroethane-d4	43.45	1.0	50	0	86.9	71 - 125	42.22	2.86	20	
Surr: 4-Bromofluorobenzene	49.49	1.0	50	0	99.0	70 - 125	50.52	2.06	20	
Surr: Dibromofluoromethane	47.23	1.0	50	0	94.5	74 - 125	47.87	1.33	20	
Surr: Toluene-d8	49.07	1.0	50	0	98.1	75 - 125	49.73	1.32	20	

The following samples were analyzed in this batch: HS15100925-08

Note: See Qualifiers Page for a list of qualifiers and their explanation

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**WorkOrder:** HS15100925

**QUALIFIERS,  
ACRONYMS, UNITS**

<u>Qualifier</u>	<u>Description</u>
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte detected below quantitation limit
M	Manually integrated, see raw data for justification
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
O	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL/SDL

<u>Acronym</u>	<u>Description</u>
DCS	Detectability Check Study
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MBLK	Method Blank
MDL	Method Detection Limit
MQL	Method Quantitation Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PDS	Post Digestion Spike
PQL	Practical Quantitation Limit
SD	Serial Dilution
SDL	Sample Detection Limit
TRRP	Texas Risk Reduction Program

<u>Unit Reported</u>	<u>Description</u>
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Liter

---

**CERTIFICATIONS,ACCREDITATIONS & LICENSES**

<b>Agency</b>	<b>Number</b>	<b>Expire Date</b>
Arkansas	15-024-0	27-Mar-2016
California	2919	31-Jul-2016
Dept of Defense	L2231 Rev 3-20-2014	22-Dec-2015
Illinois	003622	09-May-2016
Kansas	E-10352 2014-2015	30-Nov-2015
Kentucky	KY 2015-2016	30-Apr-2016
Louisiana	03087 2015/2016	30-Jun-2016
North Carolina	624 - 2015	31-Dec-2015
North Dakota	R-193 2015-2016	30-Apr-2016
Oklahoma	2015-047	31-Aug-2016
Texas	T104704231-15-15	30-Apr-2016

**Client:** Apex Companies  
**Project:** E3CE-0065 Andover Release Site  
**Work Order:** HS15100925

**SAMPLE TRACKING**

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS15100925-01	Land Farm 1	Login	10/24/2015 12:15:02 PM	PMG	VW-2
HS15100925-01	Land Farm 1	Login	10/24/2015 12:15:02 PM	PMG	BTEX B1
HS15100925-02	Land Farm 2	Login	10/24/2015 12:18:06 PM	PMG	VW-2
HS15100925-02	Land Farm 2	Login	10/24/2015 12:18:06 PM	PMG	BTEX B1
HS15100925-03	Land Farm 3	Login	10/24/2015 12:18:06 PM	PMG	VW-2
HS15100925-03	Land Farm 3	Login	10/24/2015 12:18:06 PM	PMG	BTEX B1
HS15100925-04	Land Farm 4	Login	10/24/2015 12:18:06 PM	PMG	VW-2
HS15100925-04	Land Farm 4	Login	10/24/2015 12:18:06 PM	PMG	BTEX B1
HS15100925-05	Land Farm 5	Login	10/24/2015 12:18:06 PM	PMG	VW-2
HS15100925-05	Land Farm 5	Login	10/24/2015 12:18:06 PM	PMG	BTEX B1
HS15100925-06	Land Farm 6	Login	10/24/2015 12:18:06 PM	PMG	VW-2
HS15100925-06	Land Farm 6	Login	10/24/2015 12:18:06 PM	PMG	BTEX B1
HS15100925-07	Land Farm 7	Login	10/24/2015 12:18:06 PM	PMG	VW-2
HS15100925-07	Land Farm 7	Login	10/24/2015 12:18:06 PM	PMG	BTEX B1
HS15100925-08	IDW Drum	Login	10/24/2015 12:18:36 PM	PMG	VW-3
HS15100925-08	IDW Drum	Login	10/24/2015 12:18:36 PM	PMG	BTEX A1
HS15100925-09	TB-10/19/2015-08	Login	10/24/2015 12:19:58 PM	PMG	VW-3

**Sample Receipt Checklist**

Client Name: APEX-PORTLAND  
 Work Order: HS15100925

Date/Time Received: **23-Oct-2015 08:55**  
 Received by: **RPG**

Checklist completed by: Paresh M. Giga      24-Oct-2015      Reviewed by: Erica Padilla      26-Oct-2015  
 eSignature      Date      eSignature      Date

Matrices: **Soil/Water**      Carrier name: **FedEx**

- Shipping container/cooler in good condition?      Yes       No       Not Present
- Custody seals intact on shipping container/cooler?      Yes       No       Not Present
- Custody seals intact on sample bottles?      Yes       No       Not Present
- Chain of custody present?      Yes       No
- Chain of custody signed when relinquished and received?      Yes       No
- Chain of custody agrees with sample labels?      Yes       No
- Samples in proper container/bottle?      Yes       No
- Sample containers intact?      Yes       No
- TX1005 solids received in hermetically sealed vials?      Yes       No       N/A
- Sufficient sample volume for indicated test?      Yes       No
- All samples received within holding time?      Yes       No
- Container/Temp Blank temperature in compliance?      Yes       No

Temperature(s)/Thermometer(s): 2.8c/3.1c U/C      IR4

Cooler(s)/Kit(s): 24829

Date/Time sample(s) sent to storage: 10/24/15 12:45

Water - VOA vials have zero headspace?      Yes       No       No VOA vials submitted

Water - pH acceptable upon receipt?      Yes       No       N/A

pH adjusted?      Yes       No       N/A

pH adjusted by:

Login Notes: Trip blank logged in on hold

Client Contacted:      Date Contacted:      Person Contacted:

Contacted By: 0      Regarding:

Comments:

Corrective Action:



Cincinnati, OH  
+1 513 733 5336

Fort Collins, CO  
+1 970 490 1511

Everett, WA  
+1 425 356 2600

Holland, MI  
+1 616 399 6070

# Chain of Custody Fo

Page 1 of 1

COC ID: 130618

HS15100925

Apex Companies

E3CE-0065 Andover Release Site

ton, WV  
68

80

## Environmental

ALS Project Manager:



Customer Information		Project Information		
Purchase Order		Project Name	Andover Release Site	A VOCs (8280) 14 compound Select List
Work Order		Project Number	E3CE-0065	B GRO - VPH OA-1
Company Name	Apex Companies	Bill To Company	Apex Companies	C
Send Report To	Samuel Jackson	Invoice Attn	Samuel Jackson	D
Address	3015 SW First Avenue	Address	3015 SW First Avenue	E
				F
				G
City/State/Zip	Portland, OR 97201	City/State/Zip	Portland, OR 97201	H
Phone	(503) 924-4704	Phone	(503) 924-4704	I
Fax		Fax		J
e-Mail Address	sjackson@apexcos.com	e-Mail Address	sjackson@apexcos.com	

No.	Sample Description	Date	Time	Matrix	Pres.	# Bottles	A	B	C	D	E	F	G	H	I	J	Hold	
1	LAND FARM 1	10/21/15	1459	S	ALA	2	X	X										
2	LAND FARM 2	}	1508	S	}	2	X	X										
3	LAND FARM 3		1517	S		2	X	X										
4	Land Farm 4		1534	S		2	X	X										
5	Land Farm 5		1541	S		2	X	X										
6	Land Farm 6		1550	S		2	X	X										
7	LAND FARM 7		1601	S		2	X	X										
8	LOW DRUM		1447	W		HCL	6	X	X									
9																		
10																		

Sampler(s) Please Print & Sign <b>Mark Edwards MSEM</b>		Shipment Method <b>FEDEX</b>		Required Turnaround Time: (Check Box) <input checked="" type="checkbox"/> Std 10 WK days <input type="checkbox"/> 5 WK Days <input type="checkbox"/> 2 WK Days <input type="checkbox"/> 24 Hour				Results Due Date:	
Relinquished by: <b>MSEM</b>	Date: 10/22/15	Time: 0900	Received by:	Notes: E3CE-0065 Andover Release Site					
Relinquished by:	Date:	Time:	Received by (Laboratory): Rf Simon 10/23/15 08:55	Cooler ID: 24829	Cooler Temp.: 2.80	QC Package: (Check One Box Below)			
Logged by (Laboratory):	Date:	Time:	Checked by (Laboratory):	#4		<input checked="" type="checkbox"/> Level 2 Std QC <input type="checkbox"/> TRRP ChkList <input type="checkbox"/> Level 3 Std QC/Row dz <input type="checkbox"/> TRRP Level 4 <input type="checkbox"/> Level 4 SW848/CLP <input type="checkbox"/> Other/EDD			
Preservative Key: 1-HCl 2-HNO <sub>3</sub> 3-H <sub>2</sub> SO <sub>4</sub> 4-NaOH 5-Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> 6-NaHSO <sub>4</sub> 7-Other 8-4°C 9-5035									

Note: 1. Any changes must be made in writing once samples and COC Form have been submitted to ALS Environmental.  
 2. Unless otherwise agreed in a formal contract, services provided by ALS Environmental are expressly limited to the terms and conditions stated on the reverse.  
 3. The Chain of Custody is a legal document. All information must be completed accurately.

Copyright 2011 by ALS Environmental.

 <b>ALS Environmental</b> 10450 Stancliff Rd., Suite 210 Houston, Texas 77099 Tel. +1 281 530 5656 Fax. +1 281 530 5887	<b>CUSTODY SEAL</b>		Seal Broken By: SM
	Date: 10/22/15 Name: Mark Ed Company: HPER	Time: 0830	Date: 10/23/15

24829 10123115

 <b>ALS Environmental</b> 10450 Stancliff Rd., Suite 210 Houston, Texas 77099 Tel. +1 281 530 5656 Fax. +1 281 530 5887	<b>CUSTODY SEAL</b>		Seal Broken By: SM
	Date: 10/22/15 Name: Mark Ed Company: HPER	Time: 0800	Date: 10/23/15

TRK# 8079 4509 0690  
 0215  
**AB SGRA** 24829  
 FRI - 23 OCT 10:30A  
 PRIORITY OVERNIGHT  
 AHS 77099  
 TX-US IAH



10/27/2015

Page: 1

Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date and Time Received: 10/07/2015 1756  
Continental File No.: 5962  
Continental Order No.: 128982  
Project ID: Nustar Andover  
Purchase Auth: 36773

Dear Mr. Newman:

This laboratory report, containing the samples indicated below, includes 9 pages for the analytical report, 1 page(s) for the chain of custody and/or analysis request, and 1 page(s) for the sample receipt form.

<u>CAS LAB ID #</u>	<u>SAMPLE DESCRIPTION</u>	<u>SAMPLE TYPE</u>	<u>DATE SAMPLED</u>
15100666	S-1	Solid	10/7/2015
15100667	S-2	Solid	10/7/2015

The Appendix and Quality Control sections are integral parts of this laboratory report and may contain important data qualifiers.

All results are reported on a wet weight basis unless otherwise stated.

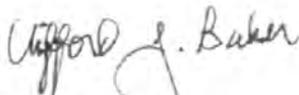
Samples will be retained for 180 days unless Continental is otherwise notified.

Continental is accredited by the State of Kansas through the National Environmental Laboratory Accreditation Program (NELAP). The results contained in this report were obtained using Continental's Standard Operating Procedures. These procedures are in substantial compliance with the approved methods referenced and the standards published by NELAP unless otherwise noted in the Appendix and Quality Control sections of this report.

This report may not be reproduced, except in full, without written approval from Continental Analytical Services, Inc.

Thank you for choosing Continental for this project.

CONTINENTAL ANALYTICAL SERVICES, INC.



Clifford J. Baker  
Technical Manager  
cjbaker@cas-lab.com



Gregory J. Groene  
Project Manager  
gjgroene@cas-lab.com



525 N. Eighth St. - Salina, KS 67401  
785-827-1273 800-535-3076 Fax 785-823-7830  
KDHE Environmental Laboratory Accreditation No. E-10146



## Sample Results

Page: 2

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/27/2015  
 Date Received: 10/07/2015  
 Continental File No: 5962  
 Continental Order No: 128982

Lab Number: 15100666  
 Sample Description: S-1

Date Sampled: 10/07/2015  
 Time Sampled: 1423

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
Total Purge. Hydrocarbons(GRO)	ND(130)	µg/kg dry wt.	1.0	130	7301/123
KDHE Target VOCs					
1,2,4-Trimethylbenzene	79.8	µg/kg dry wt.	1.0	6.5	7467/42
1,3,5-Trimethylbenzene	24.1	µg/kg dry wt.	1.0	6.5	7467/42
2-Butanone	ND(33)	µg/kg dry wt.	1.0	33	7467/42
Benzene	13.8	µg/kg dry wt.	1.0	6.5	7467/42
Ethylbenzene	13.3	µg/kg dry wt.	1.0	6.5	7467/42
Isopropylbenzene	ND(6.5)	µg/kg dry wt.	1.0	6.5	7467/42
Naphthalene	35.5	µg/kg dry wt.	1.0	6.5	7467/42
Toluene	43.5	µg/kg dry wt.	1.0	6.5	7467/42
m+p-Xylene	78	µg/kg dry wt.	1.0	13	7467/42
n-Butylbenzene	ND(6.5)	µg/kg dry wt.	1.0	6.5	7467/42
n-Propylbenzene	13.2	µg/kg dry wt.	1.0	6.5	7467/42
o-Xylene	30.0	µg/kg dry wt.	1.0	6.5	7467/42
Solids, Total	76.9	% by weight	1.0	0.1	7438/910

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
Total Purge. Hydrocarbons(GR)	N/A	10/15/15 1504	1GC5288	1GC5288	LPL	8015D
KDHE Target VOCs	N/A	10/19/15 1324	1MS4292	1MS4292	GMA	8260B
Solids, Total	N/A	10/13/15 1643	151013-1	151013-1	BLA	ASTM D2216(Mod)
Volatile Analysis Preparation Method						5035A
GC/FID Volatile Preparation Method						5035A

Conclusion of Lab Number: 15100666

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

Lab Number: 15100667  
Sample Description: S-2

Date Sampled: 10/07/2015  
Time Sampled: 1436

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution</u>	<u>Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
No Tests Assigned	on hold		1.0			COC/1
<u>Analysis</u>	<u>Date/Time</u>	<u>Date/Time</u>	<u>QC</u>	<u>Inst.</u>	<u>Analyst</u>	<u>Method(s)</u>
No Tests Assigned	<u>Prepared</u>	<u>Analyzed</u>	<u>Batch</u>	<u>Batch</u>		
	N/A	10/27/15	N/A	N/A		N/A

Conclusion of Lab Number: 15100667

## Appendix

Page: 4

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

---

ND indicates not detected with the LOQ (Limit of Quantitation) in parentheses. The LOQ value has been adjusted for the dilution factor and percent solids, as applicable. Due to rounding of significant figures, the LOQ value may vary slightly from the reported concentration. The LOQ is the lowest concentration of the analytical standard that was used for calibrating the instrument. If an analytical standard is analyzed at the LOQ, an error of as much as +/- 50% can be expected. N/A, if present, indicates not applicable.

---

Not all samples were received at the recommended temperature of less than 6 degrees Celsius. Because the samples were hand-delivered to the Laboratory immediately after collection and showed evidence of cooling by the presence of ice and/or cool blue ice, they are considered acceptable by NELAC. Refer to the enclosed Cooler/Sample Receipt Form(s) for the affected coolers and samples.

---

No analysis with a holding time of seventy-two hours or less was performed in this Continental order.

---

## Accreditation Summary

Page: 5

Client: Kansas Dept. of Health & Environment  
Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

---

NELAP accreditation is issued under each EPA regulatory program for a given matrix/analyte/method combination. Continental is NELAP accredited for each matrix/analyte/method and EPA program cited in this Laboratory Report, except for those listed in the table below and for analyses performed in the field. For most of the analyses listed in the table, NELAP accreditation is not offered under the listed EPA program and Continental is NELAP accredited for the analysis, using the same analytical technology, but under a different EPA program. Continental's full NELAP accreditation status may be viewed at [www.kdheks.gov/envlab](http://www.kdheks.gov/envlab). Note that unless qualified otherwise in the Laboratory Report, Continental performs all analyses, including each analysis listed in the table below, utilizing NELAP protocol.

<u>Test</u>	<u>Analysis</u>	<u>Matrix-Regulatory Program</u>	<u>Method</u>	<u>CAS NELAP Accredited in Other Reg. Program</u>
GL244	Solids, Total	S-RCRA	ASTM D2216(Mod)	Yes

## Quality Control Report Batch Summary

Page: 6

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

Test Code	Testname	QC Batch	Method Blank Date/Time Analyzed	LCS Date/Time Analyzed	MS Lab No. Date/Time Analyzed
CL489	Total Purge. Hydrocarbons(GRO)	1GC5288	BLK1GC5288 10/15/15 1135	LCS1GC5288 10/15/15 1110	
Lab numbers associated with this batch: 15100666					
MS372	KDHE Target VOCs	1MS4292	BLK1MS4292 10/19/15 1251	LCS1MS4292 10/19/15 1139	
Lab numbers associated with this batch: 15100666					
GL100	No Tests Assigned		N/A	N/A	
Lab numbers associated with this batch: 15100667					
GL244	Solids, Total	151013-1	151013BLK1 10/13/15 1637	N/A	15100990MS 10/13/15 1640
Lab numbers associated with this batch: 15100666					

Quality Control Report  
Method Blank, LCS, MS/MSD Data

Page: 7

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

Analysis	Method Blank	LCS % Rec	LCS Limits	LCS Spike Level	Units	Spiked Sample (% Recovery)		MS/MSD Limits	MS/MSD Spike Level	Units	Spiked Sample Precision Data	
						MS	MSD				RPD	Limit
<b>QC Batch: 151013-1</b>												
For sample analyzed on: 10/13/2015												
Spiked sample: 15100990												
Solids, Total	ND(0.1)	N/A	#	N/A	% by w	MN	MN	#	N/A	% by w	**	3.9
<b>QC Batch: 1GC5288</b>												
For sample analyzed on: 10/15/2015												
Spiked sample:												
Total Purge. Hydrocarbons(GRO)	ND(100)	101	72.5-123	500	µg/kg	MN	MN	30.4-138		µg/kg	**	33.4
<b>Surrogate Data:</b>												
4-BFB (8015D)	95.6	95.6	14.0-184	20.0	µg/kg	MN	MN	14.0-184		µg/kg	**	
FLUOROBENZENE (8015D)	93.7	93.7	50.0-150	20.0	µg/kg	MN	MN	50.0-150		µg/kg	**	
<b>QC Batch: 1MS4292</b>												
For sample analyzed on: 10/19/2015												
Spiked sample:												
KDHE Target VOCs												
1,2,4-Trimethylbenzene	ND(5.0)	112	89.7-126	25.0	µg/kg			66.2-157		µg/kg	**	19.0
1,3,5-Trimethylbenzene	ND(5.0)	112	89.7-126	25.0	µg/kg			56.4-170		µg/kg	**	17.4
2-Butanone	ND(25)	100	52.8-142	100	µg/kg			16.0-191		µg/kg	**	29.0
Benzene	ND(5.0)	98.9	80.7-127	25.0	µg/kg			59.2-150		µg/kg	**	15.9
Ethylbenzene	ND(5.0)	106	92.5-118	25.0	µg/kg			61.6-149		µg/kg	**	14.5
Isopropylbenzene	ND(5.0)	113	83.4-135	25.0	µg/kg			33.2-187		µg/kg	**	15.9
Naphthalene	ND(5.0)	87.3	52.6-135	25.0	µg/kg			34.2-184		µg/kg	**	20.3
Toluene	ND(5.0)	112	89.7-123	25.0	µg/kg			69.3-158		µg/kg	**	13.6
m-p-Xylene	ND(10)	109	92.7-118	50.0	µg/kg			53.0-154		µg/kg	**	19.8
n-Butylbenzene	ND(5.0)	113	88.0-127	25.0	µg/kg			72.7-167		µg/kg	**	10.8
n-Propylbenzene	ND(5.0)	115	85.1-131	25.0	µg/kg			40.3-183		µg/kg	**	20.0
o-Xylene	ND(5.0)	112	88.2-124	25.0	µg/kg			53.3-159		µg/kg	**	13.0
<b>Surrogate Data:</b>												
1,2-DICHLOROETHANE-d4	110	101	71.3-141	25.0	µg/kg	MN	MN	71.3-141		µg/kg	**	
TOLUENE-d8	110	111	78.1-147	25.0	µg/kg	MN	MN	78.1-147		µg/kg	**	
4-BFB(MS)	115	107	76.9-141	25.0	µg/kg	MN	MN	76.9-141		µg/kg	**	

Data Qualifiers:

MN - The MS/MSD sample analyses were not performed on a sample from this Continental order number.

# - Limits not applicable/not available for this analysis.

\*\* - RPD calculation not applicable/not available for this analysis.

# Quality Control Report Sample Surrogate Data

Page: 8

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

Surrogate	Date Prepared	Date Analyzed	Spike Level	Units	% Recovery	Acceptable % Limits
<b>Lab Number: 15100666</b>						
<b>Sample Description: S-1</b>						
GC/FID Volatile						
4-BFB (8015D)		10/15/2015	20	µg/kg	88.1	14.0-184
FLUOROBENZENE (8015D)		10/15/2015	20	µg/kg	84.4	50.0-150
KDHE Target VOCs						
1,2-DICHLOROETHANE-d4		10/19/2015	25	µg/kg	107	71.3-141
TOLUENE-d8		10/19/2015	25	µg/kg	113	78.1-147
4-BFB(MS)		10/19/2015	25	µg/kg	112	76.9-141

Quality Control Report  
Continuing Calibration Report

Page: 9

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/27/2015  
Date Received: 10/07/2015  
Continental File No: 5962  
Continental Order No: 128982

---

<u>Analysis</u>	<u>Date of</u> <u>Analysis</u>	<u>Instrument</u> <u>Batch ID</u>	<u>Amount in</u> <u>Standard</u>	<u>Amount</u> <u>Detected</u>	<u>Units</u>	<u>Percent</u> <u>Recovery</u>
Total Purge. Hydrocarbons(GRO)	10/15/2015	1GC5288	CCV recovery acceptable for this Instrument Batch.			
Total Purge. Hydrocarbons(GRO)	10/15/2015	2GC5288	CCV recovery acceptable for this Instrument Batch.			
KDHE Target VOCs	10/19/2015	1MS4292	CCV recovery acceptable for this Instrument Batch.			
KDHE Target VOCs	10/19/2015	2MS4292	CCV recovery acceptable for this Instrument Batch.			

---



Continental Analytical Services, Inc.  
Cooler/Sample Receipt Form (C/S RF)

CAS Order No.: 28982

Client Name: EDHE

CAS File No.: 5962

Sample ID's in cooler: 201 CC

Cooler 1 of 1 for this CAS Order No. Retained for Mac Samples

Cooler Identification: CAS Cooler #: 4108 / Client's Cooler / Box / Letter / Hand-delivered  
Other: \_\_\_\_\_

Date/Time Cooler Received: 10/7/15 17:56

Delivered By: UPS / FedEx / AB Express / Field Svcs / Mail / Walk-In / Other: \_\_\_\_\_

Custody Seal: Present: Intact / Broken / Absent Seal No: \_\_\_\_\_  
Seal Name: \_\_\_\_\_ Seal Date: \_\_\_\_\_

Seal matches Chain of Custody: Yes / No / N/A

Type of Packing Material: Blue Ice / Ice / Melted Ice / Bubble / Foam / Paper / Peanuts / Vermiculite / None / Other: \_\_\_\_\_

Cooler Temperature (°C): Original Reading (°C) 13.7 Corrected Reading (°C) 13.2

Temperature. By: Temperature Blank Surface Temperature  
Thermo. ID No.: 585 Thermo. Correction Factor (°C): -0.5

AK  
10/7/15

Evidence of Cooling and date received = date sampled

Sample Receipt Discrepancies:  No  Yes (See below for discrepancies.)

Note: If discrepancies are present, CAS will proceed with analyses until/unless directed otherwise by the client.

- |                                                                                                                                                                                                                                    |                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Chain of Custody not present - information taken from:<br>Cover Letter <input type="checkbox"/> Container <input type="checkbox"/><br>PO <input type="checkbox"/> CAS Proj. Mgr. <input type="checkbox"/> | <input type="checkbox"/> Sample excluded from Chain of Custody                                                                                    |
| <input type="checkbox"/> Container label absent                                                                                                                                                                                    | <input type="checkbox"/> Sample listed on Chain of Custody, not received                                                                          |
| <input type="checkbox"/> Chain of Custody incomplete [see detail below]                                                                                                                                                            | <input type="checkbox"/> Sample identification on container and Chain of Custody do not agree                                                     |
| <input type="checkbox"/> Chain of Custody missing date/time sampled (excl. TB or Dup.)                                                                                                                                             | <input type="checkbox"/> Air bubbles in Aqueous VOA vials larger than pea-size [approx. 6 mm]                                                     |
| <input type="checkbox"/> Date or Time sampled obtained from container label                                                                                                                                                        | <input type="checkbox"/> Cooler temperature exceeded 0.1 - 6.0 °C requirement<br>[Do not mark if samples do not require cooling to 0.1 - 6.0 °C.] |
| <input type="checkbox"/> Chain of Custody missing sampler's name                                                                                                                                                                   | <input type="checkbox"/> Broken or leaking containers (detail actions below)                                                                      |
| <input type="checkbox"/> Chain of Custody missing matrix (sample type)                                                                                                                                                             | <input type="checkbox"/> Sample container type or labeled chemical preservation inappropriate                                                     |
| <input type="checkbox"/> Missing relinquished information: signature date time                                                                                                                                                     | <input type="checkbox"/> Other discrepancies: _____                                                                                               |

Detail to discrepancies/comments:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Completed by: mw Date Completed: 10-8-15

10/29/2015

Page: 1

Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date and Time Received: 10/08/2015 1735  
Continental File No.: 5962  
Continental Order No.: 129018  
Project ID: Nustar Andover  
Purchase Auth: 36773

Dear Mr. Newman:

This laboratory report, containing the samples indicated below, includes 15 pages for the analytical report, 1 page(s) for the chain of custody and/or analysis request, and 1 page(s) for the sample receipt form.

<u>CAS LAB ID #</u>	<u>SAMPLE DESCRIPTION</u>	<u>SAMPLE TYPE</u>	<u>DATE SAMPLED</u>
15100822	S-3	Solid	10/8/2015
15100823	S-4	Solid	10/8/2015
15100824	S-5	Solid	10/8/2015
15100825	S-6	Solid	10/8/2015
15100826	S-7	Solid	10/8/2015
15100827	S-8	Solid	10/8/2015
15100828	S-9	Solid	10/8/2015
15100829	S-10	Solid	10/8/2015
15100830	S-11	Solid	10/8/2015

The Appendix and Quality Control sections are integral parts of this laboratory report and may contain important data qualifiers.

All results are reported on a wet weight basis unless otherwise stated.

Samples will be retained for 180 days unless Continental is otherwise notified.

Continental is accredited by the State of Kansas through the National Environmental Laboratory Accreditation Program (NELAP). The results contained in this report were obtained using Continental's Standard Operating Procedures. These procedures are in substantial compliance with the approved methods referenced and the standards published by NELAP unless otherwise noted in the Appendix and Quality Control sections of this report.

This report may not be reproduced, except in full, without written approval from Continental Analytical Services, Inc.

Thank you for choosing Continental for this project.



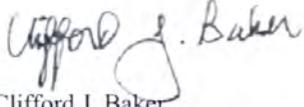
525 N. Eighth St. - Salina, KS 67401  
785-827-1273 800-535-3076 Fax 785-823-7830  
KDHE Environmental Laboratory Accreditation No. E-10146



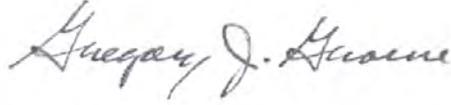
10/29/2015

Page: 2

CONTINENTAL ANALYTICAL SERVICES, INC.



Clifford J. Baker  
Technical Manager  
cjbaker@cas-lab.com



Gregory J. Groene  
Project Manager  
gjgroene@cas-lab.com



525 N. Eighth St. - Salina, KS 67401  
785-827-1273 800-535-3076 Fax 785-823-7830  
KDHE Environmental Laboratory Accreditation No. E-10146



## Sample Results

Page: 3

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Lab Number: 15100822  
 Sample Description: S-3

Date Sampled: 10/08/2015  
 Time Sampled: 1118

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
Total Purge. Hydrocarbons(GRO)	3800 QC	mg/kg dry wt.	6514	930	7194/407
KDHE Target VOCs	SR				
1,2,4-Trimethylbenzene	309000	µg/kg dry wt.	4815	3000	7466/187
1,3,5-Trimethylbenzene	97900	µg/kg dry wt.	4815	3000	7466/187
2-Butanone	ND(80000) QC	µg/kg dry wt.	4815	70000	7466/187
Benzene	12000	µg/kg dry wt.	4815	3000	7466/187
Ethylbenzene	199000	µg/kg dry wt.	4815	3000	7466/187
Isopropylbenzene	15000	µg/kg dry wt.	4815	3000	7466/187
Naphthalene	50000	µg/kg dry wt.	4815	3000	7466/187
Toluene	334000	µg/kg dry wt.	4815	3000	7466/187
m+p-Xylene	576000	µg/kg dry wt.	4815	6900	7466/187
n-Butylbenzene	17000	µg/kg dry wt.	4815	3000	7466/187
n-Propylbenzene	64600	µg/kg dry wt.	4815	3000	7466/187
o-Xylene	222000	µg/kg dry wt.	4815	3000	7466/187
Solids, Total	70.2	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
Total Purge. Hydrocarbons(GR)	10/13/15 1100	10/15/15 1334	151013-1	1GC2288	LPL	8015D
KDHE Target VOCs	10/16/15 1200	10/16/15 1525	151016-1	1MS8289	GMA	8260B
Solids, Total	N/A	10/09/15 1556	151009-1	151009-1	BLA	ASTM D2216(Mod)
Volatile Analysis Preparation Method						5035A
GC/FID Volatile Preparation Method						5035A

Conclusion of Lab Number: 15100822

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Lab Number: 15100823  
 Sample Description: S-4

Date Sampled: 10/08/2015  
 Time Sampled: 1129

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
No Tests Assigned	on hold		1.0		COC/1
Solids, Total	80.1	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
No Tests Assigned	N/A	10/28/15	N/A	N/A		N/A
Solids, Total	N/A	10/09/15 1558	151009-1	151009-1	BLA	ASTM D2216(Mod)

Conclusion of Lab Number: 15100823

Lab Number: 15100824  
 Sample Description: S-5

Date Sampled: 10/08/2015  
 Time Sampled: 1141

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
No Tests Assigned	on hold		1.0		COC/1
Solids, Total	75.4	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
No Tests Assigned	N/A	10/28/15	N/A	N/A		N/A
Solids, Total	N/A	10/09/15 1559	151009-1	151009-1	BLA	ASTM D2216(Mod)

Conclusion of Lab Number: 15100824

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Lab Number: 15100825  
 Sample Description: S-6

Date Sampled: 10/08/2015  
 Time Sampled: 1147

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
No Tests Assigned	on hold		1.0		COC/1
Solids, Total	78.6	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
No Tests Assigned	N/A	10/28/15	N/A	N/A	N/A	N/A
Solids, Total	N/A	10/09/15 1601	151009-1	151009-1	BLA	ASTM D2216(Mod)

Conclusion of Lab Number: 15100825

Lab Number: 15100826  
 Sample Description: S-7

Date Sampled: 10/08/2015  
 Time Sampled: 1155

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
No Tests Assigned	on hold		1.0		COC/1
Solids, Total	78.8	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
No Tests Assigned	N/A	10/28/15	N/A	N/A	N/A	N/A
Solids, Total	N/A	10/09/15 1602	151009-1	151009-1	BLA	ASTM D2216(Mod)

Conclusion of Lab Number: 15100826

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Lab Number: 15100827  
 Sample Description: S-8

Date Sampled: 10/08/2015  
 Time Sampled: 1218

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
Total Purge. Hydrocarbons(GRO)	31000	µg/kg dry wt.	119.8	15000	7194/407
KDHE Target VOCs					
1,2,4-Trimethylbenzene	12800	µg/kg dry wt.	200.1	100	7466/188
1,3,5-Trimethylbenzene	4100	µg/kg dry wt.	200.1	100	7466/188
2-Butanone	ND(3000) QC	µg/kg dry wt.	200.1	3000	7466/188
Benzene	2580	µg/kg dry wt.	200.1	100	7466/188
Ethylbenzene	6330	µg/kg dry wt.	200.1	100	7466/188
Isopropylbenzene	560	µg/kg dry wt.	200.1	100	7466/188
Naphthalene	1900	µg/kg dry wt.	200.1	100	7466/188
Toluene	8490	µg/kg dry wt.	200.1	100	7466/188
m+p-Xylene	15100	µg/kg dry wt.	200.1	250	7466/188
n-Butylbenzene	1000	µg/kg dry wt.	200.1	100	7466/188
n-Propylbenzene	2640	µg/kg dry wt.	200.1	100	7466/188
o-Xylene	6460	µg/kg dry wt.	200.1	100	7466/188
Solids, Total	79.2	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
Total Purge. Hydrocarbons(GR)	10/13/15 1100	10/15/15 1359	151013-1	1GC2288	LPL	8015D
KDHE Target VOCs	10/16/15 1200	10/19/15 1551	151016-1	1MS8292	GMA	8260B
Solids, Total	N/A	10/09/15 1604	151009-1	151009-1	BLA	ASTM D2216(Mod)
Volatile Analysis Preparation Method						5035A
GC/FID Volatile Preparation Method						5035A

Conclusion of Lab Number: 15100827

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Lab Number: 15100828  
 Sample Description: S-9

Date Sampled: 10/08/2015  
 Time Sampled: 1233

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
Total Purge. Hydrocarbons(GRO)	ND(130)	µg/kg dry wt.	1.0	130	7301/123
KDHE Target VOCs					
1,2,4-Trimethylbenzene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
1,3,5-Trimethylbenzene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
2-Butanone	ND(800) QC	µg/kg dry wt.	60.9	800	7466/188
Benzene	1080	µg/kg dry wt.	60.9	40	7466/188
Ethylbenzene	170	µg/kg dry wt.	60.9	40	7466/188
Isopropylbenzene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
Naphthalene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
Toluene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
m+p-Xylene	ND(78)	µg/kg dry wt.	60.9	78	7466/188
n-Butylbenzene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
n-Propylbenzene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
o-Xylene	ND(40)	µg/kg dry wt.	60.9	40	7466/188
Solids, Total	77.8	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
Total Purge. Hydrocarbons(GR)	N/A	10/15/15 1554	1GC5288	1GC5288	LPL	8015D
KDHE Target VOCs	10/16/15 1200	10/19/15 1515	151016-1	1MS8292	GMA	8260B
Solids, Total	N/A	10/09/15 1605	151009-1	151009-1	BLA	ASTM D2216(Mod)
Volatile Analysis Preparation Method						5035A
GC/FID Volatile Preparation Method						5035A

Conclusion of Lab Number: 15100828

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Lab Number: 15100829  
 Sample Description: S-10

Date Sampled: 10/08/2015  
 Time Sampled: 1239

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
No Tests Assigned	on hold		1.0		COC/I
Solids, Total	81.3	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
No Tests Assigned	N/A	10/28/15	N/A	N/A	N/A	N/A
Solids, Total	N/A	10/09/15 1607	151009-1	151009-1	BLA	ASTM D2216(Mod)

Conclusion of Lab Number: 15100829

Lab Number: 15100830  
 Sample Description: S-11

Date Sampled: 10/08/2015  
 Time Sampled: 1248

<u>Analysis</u>	<u>Concentration</u>	<u>Units</u>	<u>Dilution Factor</u>	<u>LOQ</u>	<u>Book/Page</u>
Total Purge. Hydrocarbons(GRO)	350000 SR	µg/kg dry wt.	620	95000	7194/407
KDHE Target VOCs					
1,2,4-Trimethylbenzene	8680	µg/kg dry wt.	271	200	7466/187
1,3,5-Trimethylbenzene	2800	µg/kg dry wt.	271	200	7466/187
2-Butanone	ND(4000) QC	µg/kg dry wt.	271	4000	7466/187
Benzene	5210	µg/kg dry wt.	271	200	7466/187
Ethylbenzene	5680	µg/kg dry wt.	271	200	7466/187
Isopropylbenzene	480	µg/kg dry wt.	271	200	7466/187
Naphthalene	940	µg/kg dry wt.	271	200	7466/187
Toluene	10700	µg/kg dry wt.	271	200	7466/187
m+p-Xylene	6250	µg/kg dry wt.	271	410	7466/187
n-Butylbenzene	890	µg/kg dry wt.	271	200	7466/187
n-Propylbenzene	2000	µg/kg dry wt.	271	200	7466/187
o-Xylene	3000	µg/kg dry wt.	271	200	7466/187
Solids, Total	65.6	% by weight	1.0	0.1	7438/902

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
Total Purge. Hydrocarbons(GR)	10/13/15 1100	10/15/15 1424	151013-1	1GC2288	LPL	8015D
KDHE Target VOCs	10/16/15 1200	10/16/15 1449	151016-1	1MS8289	GMA	8260B

-Continued-

## Sample Results

Page: 9

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/29/2015  
Date Received: 10/08/2015  
Continental File No: 5962  
Continental Order No: 129018

---

<u>Analysis</u>	<u>Date/Time Prepared</u>	<u>Date/Time Analyzed</u>	<u>QC Batch</u>	<u>Inst. Batch</u>	<u>Analyst</u>	<u>Method(s)</u>
Solids, Total	N/A	10/09/15 1609	151009-1	151009-1	BLA	ASTM D2216(Mod)
Volatile Analysis Preparation Method						5035A
GC/FID Volatile Preparation Method						5035A

Conclusion of Lab Number: 15100830

---

## Appendix

Page: 10

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/29/2015  
Date Received: 10/08/2015  
Continental File No: 5962  
Continental Order No: 129018

---

ND indicates not detected with the LOQ (Limit of Quantitation) in parentheses. The LOQ value has been adjusted for the dilution factor and percent solids, as applicable. Due to rounding of significant figures, the LOQ value may vary slightly from the reported concentration. The LOQ is the lowest concentration of the analytical standard that was used for calibrating the instrument. If an analytical standard is analyzed at the LOQ, an error of as much as +/- 50% can be expected. N/A, if present, indicates not applicable.

---

Not all samples were received at the recommended temperature of less than 6 degrees Celsius. Because the samples were hand-delivered to the Laboratory immediately after collection and showed evidence of cooling by the presence of ice and/or cool blue ice, they are considered acceptable by NELAC. Refer to the enclosed Cooler/Sample Receipt Form(s) for the affected coolers and samples.

---

No analysis with a holding time of seventy-two hours or less was performed in this Continental order.

---

QC - QC data qualifiers were noted. See the Quality Control Report.

SR - One or more surrogate recoveries for this analysis did not meet quality control limits. Please see the Quality Control Report for the sample surrogate data.

---

## Accreditation Summary

Page: 11

Client: Kansas Dept. of Health & Environment  
Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/29/2015  
Date Received: 10/08/2015  
Continental File No: 5962  
Continental Order No: 129018

NELAP accreditation is issued under each EPA regulatory program for a given matrix/analyte/method combination. Continental is NELAP accredited for each matrix/analyte/method and EPA program cited in this Laboratory Report, except for those listed in the table below and for analyses performed in the field. For most of the analyses listed in the table, NELAP accreditation is not offered under the listed EPA program and Continental is NELAP accredited for the analysis, using the same analytical technology, but under a different EPA program. Continental's full NELAP accreditation status may be viewed at [www.kdheks.gov/envlab](http://www.kdheks.gov/envlab). Note that unless qualified otherwise in the Laboratory Report, Continental performs all analyses, including each analysis listed in the table below, utilizing NELAP protocol.

<u>Test</u>	<u>Analysis</u>	<u>Matrix-Regulatory Program</u>	<u>Method</u>	<u>CAS NELAP Accredited in Other Reg. Program</u>
GL244	Solids, Total	S-RCRA	ASTM D2216(Mod)	Yes

## Quality Control Report Batch Summary

Page: 12

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/29/2015  
Date Received: 10/08/2015  
Continental File No: 5962  
Continental Order No: 129018

Test Code	Testname	QC Batch	Method Blank Date/Time Analyzed	LCS Date/Time Analyzed	MS Lab No. Date/Time Analyzed
CL489	Total Purge. Hydrocarbons(GRO)	151013-1	151013BLK1 10/14/15 1322	151013LCS1 10/14/15 1411	
Lab numbers associated with this batch: 15100822 15100827 15100830					
CL489	Total Purge. Hydrocarbons(GRO)	1GC5288	BLK1GC5288 10/15/15 1135	LCS1GC5288 10/15/15 1110	
Lab numbers associated with this batch: 15100828					
MS372	KDHE Target VOCs	151016-1	151016BLK1 10/16/15 1226	151016LCS1 10/16/15 1600	
Lab numbers associated with this batch: 15100822 15100827 15100828 15100830					
GL100	No Tests Assigned		N/A	N/A	
Lab numbers associated with this batch: 15100823 15100824 15100825 15100826 15100829					
GL244	Solids, Total	151009-1	151009BLK1 10/09/15 1543	N/A	15100830MS 10/09/15 1609
Lab numbers associated with this batch: 15100822 15100823 15100824 15100825 15100826 15100827 15100828 15100829 15100830					

**Quality Control Report**  
**Method Blank, LCS, MS/MSD Data**

Page: 13

Client: Kansas Dept. of Health & Environment  
 Attn: Daniel Newman  
 1000 SW Jackson  
 Suite 410  
 Topeka, KS 66612-1367

Date Reported: 10/29/2015  
 Date Received: 10/08/2015  
 Continental File No: 5962  
 Continental Order No: 129018

Analysis	Method Blank	LCS % Rec	LCS Limits	LCS Spike Level	Units	Spiked Sample (% Recovery)		MS/MSD Limits	MS/MSD Spike Level	Units	Spiked Sample Precision Data	
						MS	MSD				RPD	Limit
<b>QC Batch: 151009-1</b>	<b>For sample analyzed on: 10/09/2015</b>					<b>Spiked sample: 15100830</b>						
<b>Solids, Total</b>	ND(0.1)	N/A	#	N/A	% by w	65.6 T	64.7 T	#	N/A	% by w	1.40	3.9
<b>QC Batch: 151013-1</b>	<b>For samples prepared on: 10/13/2015 1100</b>					<b>Spiked sample:</b>						
<b>Total Purge. Hydrocarbons(GRO)</b>	ND(10000)	92.5	72.5-123	100000	µg/kg	MN	MN	30.4-138		µg/kg	**	33.4
<b>Surrogate Data:</b>												
4-BFB (8015D)	95.7	103	14.0-184	4000	µg/kg	MN	MN	14.0-184		µg/kg	**	
FLUOROBENZENE (8015D)	97.6	125	50.0-150	4000	µg/kg	MN	MN	50.0-150		µg/kg	**	
<b>QC Batch: 151016-1</b>	<b>For samples prepared on: 10/16/2015 1200</b>					<b>Spiked sample:</b>						
<b>KDHE Target VOCs</b>						MN	MN					
1,2,4-Trimethylbenzene	ND(30)	104	89.7-126	1000	µg/kg			66.2-157		µg/kg	**	19.0
1,3,5-Trimethylbenzene	ND(30)	104	89.7-126	1000	µg/kg			56.4-170		µg/kg	**	17.4
2-Butanone	ND(500)	151 LH	52.8-142	4000	µg/kg			16.0-191		µg/kg	**	29.0
Benzene	ND(30)	111	80.7-127	1000	µg/kg			59.2-150		µg/kg	**	15.9
Ethylbenzene	ND(30)	105	92.5-118	1000	µg/kg			61.6-149		µg/kg	**	14.5
Isopropylbenzene	ND(30)	112	83.4-135	1000	µg/kg			33.2-187		µg/kg	**	15.9
Naphthalene	ND(30)	117	52.6-135	1000	µg/kg			34.2-184		µg/kg	**	20.3
Toluene	ND(30)	107	89.7-123	1000	µg/kg			69.3-158		µg/kg	**	13.6
m-p-Xylene	ND(50)	103	92.7-118	2000	µg/kg			53.0-154		µg/kg	**	19.8
n-Butylbenzene	ND(30)	101	88.0-127	1000	µg/kg			72.7-167		µg/kg	**	10.8
n-Propylbenzene	ND(30)	106	85.1-131	1000	µg/kg			40.3-183		µg/kg	**	20.0
o-Xylene	ND(30)	100	88.2-124	1000	µg/kg			53.3-159		µg/kg	**	13.0
<b>Surrogate Data:</b>												
1,2-DICHLOROETHANE-d4	106	113	71.3-141	1000	µg/kg	MN	MN	71.3-141		µg/kg	**	
TOLUENE-d8	104	105	78.1-147	1000	µg/kg	MN	MN	78.1-147		µg/kg	**	
4-BFB(MS)	109	109	76.9-141	1000	µg/kg	MN	MN	76.9-141		µg/kg	**	
<b>QC Batch: 1GC5288</b>	<b>For sample analyzed on: 10/15/2015</b>					<b>Spiked sample:</b>						
<b>Total Purge. Hydrocarbons(GRO)</b>	ND(100)	101	72.5-123	500	µg/kg	MN	MN	30.4-138		µg/kg	**	33.4
<b>Surrogate Data:</b>												
4-BFB (8015D)	95.6	95.6	14.0-184	20.0	µg/kg	MN	MN	14.0-184		µg/kg	**	
FLUOROBENZENE (8015D)	93.7	93.7	50.0-150	20.0	µg/kg	MN	MN	50.0-150		µg/kg	**	

**Data Qualifiers:**

T - A MS/MSD cannot be performed for this analysis and a duplicate analysis is performed. The MS and MSD results are from two separate analyses.

MN - The MS/MSD sample analyses were not performed on a sample from this Continental order number.

LH - The Laboratory Control Sample (LCS) recovery for this analyte was above the method or laboratory quality control limit. The reported sample concentration may be biased high.

# - Limits not applicable/not available for this analysis.

\*\* - RPD calculation not applicable/not available for this analysis.

# Quality Control Report Sample Surrogate Data

Page: 14

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/29/2015  
Date Received: 10/08/2015  
Continental File No: 5962  
Continental Order No: 129018

Surrogate	Date Prepared	Date Analyzed	Spike Level	Units	% Recovery	Acceptable % Limits
<b>Lab Number: 15100822</b>		<b>Sample Description: S-3</b>				
GC/FID Volatile						
4-BFB (8015D)	10/13/2015	10/15/2015	4000	µg/kg	C	14.0-184
FLUOROBENZENE (8015D)	10/13/2015	10/15/2015	4000	µg/kg	C	50.0-150
KDHE Target VOCs						
1,2-DICHLOROETHANE-d4	10/16/2015	10/16/2015	1000	µg/kg	C	71.3-141
TOLUENE-d8	10/16/2015	10/16/2015	1000	µg/kg	C	78.1-147
4-BFB(MS)	10/16/2015	10/16/2015	1000	µg/kg	C	76.9-141
<b>Lab Number: 15100827</b>		<b>Sample Description: S-8</b>				
GC/FID Volatile						
4-BFB (8015D)	10/13/2015	10/15/2015	4000	µg/kg	115	14.0-184
FLUOROBENZENE (8015D)	10/13/2015	10/15/2015	4000	µg/kg	101	50.0-150
KDHE Target VOCs						
1,2-DICHLOROETHANE-d4	10/16/2015	10/19/2015	790	µg/kg	110	71.3-141
TOLUENE-d8	10/16/2015	10/19/2015	790	µg/kg	117	78.1-147
4-BFB(MS)	10/16/2015	10/19/2015	790	µg/kg	130	76.9-141
<b>Lab Number: 15100828</b>		<b>Sample Description: S-9</b>				
GC/FID Volatile						
4-BFB (8015D)		10/15/2015	20	µg/kg	85.1	14.0-184
FLUOROBENZENE (8015D)		10/15/2015	20	µg/kg	86.6	50.0-150
KDHE Target VOCs						
1,2-DICHLOROETHANE-d4	10/16/2015	10/19/2015	1000	µg/kg	110	71.3-141
TOLUENE-d8	10/16/2015	10/19/2015	1000	µg/kg	115	78.1-147
4-BFB(MS)	10/16/2015	10/19/2015	1000	µg/kg	118	76.9-141
<b>Lab Number: 15100830</b>		<b>Sample Description: S-11</b>				
GC/FID Volatile						
4-BFB (8015D)	10/13/2015	10/15/2015	3600	µg/kg	149	14.0-184
FLUOROBENZENE (8015D)	10/13/2015	10/15/2015	3600	µg/kg	152 SI	50.0-150
KDHE Target VOCs						
1,2-DICHLOROETHANE-d4	10/16/2015	10/16/2015	1000	µg/kg	127	71.3-141
TOLUENE-d8	10/16/2015	10/16/2015	1000	µg/kg	111	78.1-147
4-BFB(MS)	10/16/2015	10/16/2015	1000	µg/kg	116	76.9-141

**Data Qualifiers:**

C - Due to matrix interference(s) and/or high concentration(s) of analyte(s) present in the sample, dilution was required causing the spike level for this analyte to be below the reporting limit and/or below the lowest point of the calibration curve.

SI - One or more surrogate recoveries for this analysis were not within the laboratory or method control limits. The sample result(s) or reporting limit(s) for this analysis are estimated due to sample matrix interferences.

Quality Control Report  
Continuing Calibration Report

Page: 15

Client: Kansas Dept. of Health & Environment  
Attn: Daniel Newman  
1000 SW Jackson  
Suite 410  
Topeka, KS 66612-1367

Date Reported: 10/29/2015  
Date Received: 10/08/2015  
Continental File No: 5962  
Continental Order No: 129018

<u>Analysis</u>	<u>Date of Analysis</u>	<u>Instrument Batch ID</u>	<u>Amount in Standard</u>	<u>Amount Detected</u>	<u>Units</u>	<u>Percent Recovery</u>
Total Purge. Hydrocarbons(GRO)	10/15/2015	1GC2288	CCV recovery acceptable for this Instrument Batch.			
Total Purge. Hydrocarbons(GRO)	10/15/2015	2GC2288	CCV recovery acceptable for this Instrument Batch.			
Total Purge. Hydrocarbons(GRO)	10/15/2015	1GC5288	CCV recovery acceptable for this Instrument Batch.			
Total Purge. Hydrocarbons(GRO)	10/15/2015	2GC5288	CCV recovery acceptable for this Instrument Batch.			
KDHE Target VOCs	10/16/2015		CCV recovery acceptable except as qualified below.			
2-Butanone	10/16/2015	1MS8289	40.0	52.4	µg/L	131 CH

Samples associated with this Continuing Calibration Verification:

<u>Laboratory Number</u>	<u>Instrument Batch</u>	<u>Sample Description</u>
15100822	1MS8289	S-3
15100830	1MS8289	S-11

<u>Analysis</u>	<u>Date of Analysis</u>	<u>Instrument Batch ID</u>	<u>Amount in Standard</u>	<u>Amount Detected</u>	<u>Units</u>	<u>Percent Recovery</u>
KDHE Target VOCs	10/16/2015	2MS8289	CCV recovery acceptable for this Instrument Batch.			
KDHE Target VOCs	10/19/2015	1MS8292	CCV recovery acceptable for this Instrument Batch.			

**Data Qualifiers:**

CH - The continuing calibration verification (CCV) standard recovery for this analyte was above the method or SOP limit. The reported concentration for this analyte may be biased high.

29018

Client/Reporting Information				Client Invoice Information						Requested Test (s)						Comments				
Company Name: <b>KOHE</b>				Company Name: <b>KOHE</b>						Discrepancies See C/S RF m.w. 2 9-15 S035 volatiles S035 solids TPH - G0 OA - 1						will contact for analysis  Is dry weight required? Write Dry Wt. in this column for applicable samples. See (3) below.  Is Rush or Emergency TAT required? Write Rush or Emerg in this column for applicable samples. See (4) below.				
Address: <b>Twp 5w Jackson St Swok 410</b>				Address: <b>1000 Sw Jackson St Swok 410</b>																
City: <b>Turkey</b>		State: <b>KS</b>		Zip: <b>66612</b>		City: <b>Turkey</b>		State: <b>KS</b>									Zip: <b>66612</b>			
Contact: <b>Daniel Newman</b>				Contact: <b>Teresa Harden</b>																
E-mail: <b>DNewman@koheks.gov</b>				E-mail: <b>Theresa@koheks.gov</b>																
Phone: <b>785-246-0225</b>				Phone: _____																
File No. / Project No.:				Project Name: <b>Nasau Andrew P. 08/15/15</b>						Purchase Order:										
Sampled by (Print):				Sampled by (Signature):						No. of Preserved Containers										
Sample Identification (30 characters or less - to appear on lab report)				Matrix (1)	Program (2)	DATE Sampled	TIME Sampled	G-Grab or C-Composite	Total No. of Containers	HCl	NaOH	HNO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	Not preserved	Other:	S035 volatiles	S035 solids	TPH - G0 OA - 1		
S-3	S	0	10/8	11:19	6	5							2	3	X	X	X			
S-4	S	0	10/8	11:29	6	5							2	3	X	X	X			
S-5	S	0	10/8	11:41	6	5							2	3	X	X	X			
S-6	S	0	10/8	11:47	6	5							2	3	X	X	X			
S-7	S	0	10/8	11:55	6	5							2	3	X	X	X			
S-8	S	0	10/8	12:18	6	5							2	3	X	X	X			
S-9	S	0	10/8	12:33	6	5							2	3	X	X	X			
S-10	S	0	10/8	12:34	6	5							2	3	X	X	X			
S-11	S	0	10/8	12:48	6	5							2	3	X	X	X			

Hold \* 10/16/15

Hold \* 10/16/15

1. Matrix (sample type): DW = Drinking Water GW = Ground Water WW = Waste Water S = Soil / Solid SL = Sludge OL = Oil / Organic Liquid W = Wipe A = Air O = Other

2. Regulatory Program: D = Drinking Water N = NPDES R = RCRA SL = 503 Sludge O = No program applies If Regulatory Program is "O" or blank, Continental will select the test method.

3. Results will be reported on a wet weight (as received) basis unless dry weight is requested or required (503 regulation, PCB in solid, High level soil VOCs, etc.). Dry weight reporting is subject to an additional charge.

4. Turn around time (TAT): Standard TAT: 15 working days Rush TAT: 5 working days Emergency TAT: 2 - 3 working days Rush TAT and Emergency TAT are subject to an additional charge.

RELINQUISHED BY: <i>[Signature]</i>	DATE: <b>10/8/15</b>	TIME: <b>17:35</b>	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RECEIVED BY: <i>[Signature]</i>	DATE: <b>10/8/15</b>	TIME: <b>1735</b>	SHIPPED VIA:	SEAL #:	SEAL DATE:

Continental Analytical Services, Inc.  
Cooler/Sample Receipt Form (C/S RF)

CAS Order No.: 129018

Client Name: FOHE

CAS File No.: 5762

Sample ID's in cooler: 502 (C)

Cooler 1 of 1 for this CAS Order No.

Cooler Identification: CAS Cooler #: 4108 / Client's Cooler / Box / Letter / Hand-delivered  
Other:

Date/Time Cooler Received: 10/8/15 17:35

Delivered By: UPS / FedEx / AB Express / Field Svcs / Mail / Walk-In / Other:

Custody Seal: Present: Intact / Broken Absent: Seal No:  
Seal Name: Seal Date:

Seal matches Chain of Custody: Yes / No / N/A

Type of Packing Material: Blue Ice / Ice / Melted Ice Bubble / Foam / Paper / Peanuts / Vermiculite / None / Other:

Cooler Temperature (°C): Original Reading (°C) 10.1 Corrected Reading (°C) 9.6

MLB  
10/8/15

Temperature. By: Temperature Blank Surface Temperature  
Thermo. ID No.: 525 Thermo. Correction Factor (°C): -0.5

Evidence of Cooling and date received = date sampled

Sample Receipt Discrepancies:  No  Yes (See below for discrepancies.)

Note: If discrepancies are present, CAS will proceed with analyses until/unless directed otherwise by the client.

- |                                                                                                                                                                                                                                    |                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Chain of Custody not present - information taken from:<br>Cover Letter <input type="checkbox"/> Container <input type="checkbox"/><br>PO <input type="checkbox"/> CAS Proj. Mgr. <input type="checkbox"/> | <input type="checkbox"/> Sample excluded from Chain of Custody                                                                                    |
| <input type="checkbox"/> Container label absent                                                                                                                                                                                    | <input type="checkbox"/> Sample listed on Chain of Custody, not received                                                                          |
| <input type="checkbox"/> Chain of Custody incomplete [see detail below]                                                                                                                                                            | <input type="checkbox"/> Sample identification on container and Chain of Custody do not agree                                                     |
| <input type="checkbox"/> Chain of Custody missing date/time sampled (excl. TB or Dup.)                                                                                                                                             | <input type="checkbox"/> Air bubbles in Aqueous VOA vials larger than pea-size [approx. 6 mm]                                                     |
| <input type="checkbox"/> Date or Time sampled obtained from container label                                                                                                                                                        | <input type="checkbox"/> Cooler temperature exceeded 0.1 - 6.0 °C requirement<br>[Do not mark if samples do not require cooling to 0.1 - 6.0 °C.] |
| <input checked="" type="checkbox"/> Chain of Custody missing sampler's name                                                                                                                                                        | <input type="checkbox"/> Broken or leaking containers (detail actions below)                                                                      |
| <input type="checkbox"/> Chain of Custody missing matrix (sample type)                                                                                                                                                             | <input type="checkbox"/> Sample container type or labeled chemical preservation inappropriate                                                     |
| <input type="checkbox"/> Missing relinquished information: signature date time                                                                                                                                                     | <input type="checkbox"/> Other discrepancies: _____                                                                                               |

Detail to discrepancies/comments: no year on date sampled on COC

Completed by: ME Date Completed: 10-9-15

***Appendix E***

---

**Apex Standard Operating Procedure 2.1**

## 1. PURPOSE AND SCOPE

This Standard Operating Procedure (SOP) provides instructions for standard field screening. Field screening results are used to aid in the selection of soil samples for chemical analysis. This procedure is applicable during Apex Companies, LLC (Apex) soil sampling operations.

Standard field screening techniques include the use of a photoionization detector (PID) to assess for volatile organic compounds (VOCs), for the presence of separate-phase petroleum hydrocarbons using a sheen test. These methods will not detect all potential contaminants, so selection of screening techniques shall be based on an understanding of the site history. The PID is not compound or concentration-specific, but it can provide a qualitative indication of the presence of VOCs. PID measurements are affected by other field parameters such as temperature and soil moisture. Other field screening methods, such as screening for dense non-aqueous phase liquid (DNAPL) using dye or UV light, are not considered "standard" and will be detailed in the site-specific sampling and analysis plan (SAP).

## 2. EQUIPMENT AND MATERIALS

The following materials are necessary for this procedure:

- PID with calibration gas (record daily calibration/calibration check in field notes);
- Plastic resealable bags (for PID measurement); and
- Glass jars or stainless steel bowls (for sheen testing).

## 3. METHODOLOGY

Each soil sample will be field screened for VOCs using a PID and for the presence of separate-phase petroleum hydrocarbons using a sheen test. If the presence of DNAPL is suspected, then screening using dye and UV light may also to be completed. For information regarding screening using dye or UV light, refer to the site specific sampling and analysis plan.

PID lamps come in multiple sizes, typically 9.8, 10.6, and 11.7 electron volts (eV). The eV rating for the lamp must be greater than the ionization potential (in eV) of a compound in order for the PID to detect the compound. For petroleum hydrocarbons, a lamp of at least 9.8 eV should be used. For typical chlorinated alkenes (dichloroethene, trichloroethene, tetrachloroethene, or vinyl chloride.), a lamp of at least 10.6 eV should be used. The compatibility of the lamp size with the site constituents should be verified prior to the field event and will be detailed in the site-specific SAP.

**PID Calibration Procedure:** The PID used on-site should be calibrated daily or more frequently if needed. Calibration of the PID should be documented in field notes. Calibrations procedures should be conducted according to the manufacturer's instructions.

### PID Screening Procedure:

- Place a representative portion (approximately one ounce) of freshly exposed, uncompacted soil into a clean resealable plastic bag.
- Seal the bag and break up the soil to expose vapors from the soil matrix.
- Allow the bag to sit to reach ambient temperature. Note: Ambient temperature and weather conditions/humidity should be recorded in field notes. Changes in ambient temperature and weather during the field work should also be recorded, as temperature and humidity can affect PID readings.
- Carefully insert the intake port of the PID into the plastic bag.
- Record the PID measurement in the field notes or boring logs.

### Sheen Test Procedure:

- Following the PID screen, place approximately one ounce of freshly exposed, uncompacted soil into a clean glass jar or stainless steel bowl.

- Add enough water to cover the sample.
- Observe the water surface for signs of discoloration/sheen and characterize

No Sheen (NS)	No visible sheen on the water surface
Biogenic Film (BF)	Dull, platy/blocky or foamy film.
Slight Sheen (SS)	Light sheen with irregular spread, not rapid. May have small spots of color/iridescence. Majority of water surface not covered by sheen.
Moderate Sheen (MS)	Medium to heavy coverage, some color/iridescence, spread is irregular to flowing. Sheen covering a large portion of water surface.
Heavy Sheen (HS)	Heavy sheen coverage with color/iridescence, spread is rapid, entire water surface covered with sheen. Separate-phase hydrocarbons may be evident during sheen test.