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- **GEOTECHNICAL**
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**REPORT OF GEOTECHNICAL  
EXPLORATION AND REVIEW**

OST GRAVEL PIT EXPLORATION – PHASE II  
OGLALA & WESTERN JACKSON COUNTIES  
PINE RIDGE INDIAN RESERVATION, SOUTH DAKOTA

---

AET Project No. 17-20132

**Date:**

November 7, 2019

**Prepared for:**

Kadrmass, Lee & Jackson  
PO Box 3416  
Rapid City, South Dakota 57709

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November 7, 2019

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RE: Geotechnical Exploration & Review  
Oglala Sioux Tribe Gravel Pit Exploration – Phase II  
Oglala & Western Jackson Counties  
Pine Ridge Indian Reservation, South Dakota  
AET No. 17-20132

Dear Tonya:

American Engineering Testing, Inc. (AET) is pleased to present the results of our Phase II exploration for the Oglala Sioux Tribe Gravel Pit Exploration performed on the Pine Ridge Reservation, South Dakota. This work was performed in general accordance with KLJ's Task Order No. 10617143, dated October 7, 2017. We are submitting one (1) electronic copy of the report to you as well as one (1) electronic copy to Mr. Dave Kelly (OST).

Within the limitations of scope, budget, and schedule, our services have been conducted according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, either expressed or implied, is intended. Important information regarding risk management and proper use of this report is given in the Appendix entitled "Geotechnical Report Limitations and Guidelines for Use".

Please contact our office if you have any questions about the report. We can also be contacted for arranging construction observation and testing services during the earthwork phase.

Sincerely,  
**American Engineering Testing, Inc.**

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Geologist  
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*i*

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## Signature Page

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**Report of Geotechnical Exploration and Review**

OST Gravel Pit Exploration – Phase II  
Pine Ridge Indian Reservation, South Dakota  
November 7, 2019  
Report No. 17-20132

AMERICAN  
ENGINEERING  
TESTING, INC.

**TABLE OF CONTENTS**

Transmittal Letter.....i  
Signature Page.....ii  
1.0 INTRODUCTION.....2  
2.0 SCOPE OF SERVICES.....2  
3.0 PROJECT INFORMATION.....2  
4.0 EXPLORATION DRILLING PROGRAM.....3  
    4.1 Field Exploration & Prospecting.....3  
    4.2 Boring/Test Pit Locations.....4  
    4.3 Sample Collection.....4  
    4.4 Boring Log Soils and Soil Layering.....5  
5.0 LABORATORY TESTING.....5  
    5.1 Methods.....5  
    5.2 Gradations.....6  
    5.3 Plasticity Index (Atterburg Limits).....6  
    5.4 LA Abrasion (LAR).....6  
6.0 SITES & DRILLING EXPLORATION RESULTS.....6  
    6.1 #3 Red Shirt Table NW Qal Alluvium & Qt Terrace Deposits.....7  
    6.2 #5 Gravel Deposits W of Rockyford (Cuny Table).....9  
    6.3 #6 Gravel Deposits between Rockyford & Kyle.....11  
    6.4 #9 Gravel Deposits between Kyle & SW of Potato Creek (South) .....13  
    6.5 #10 Gravel Deposits E of Potato Creek.....15  
    6.6 #15 Qal Alluvium & Qt Terrace SW of Rockyford.....18  
    6.7 #17 Gravel Deposits NE of Kyle.....20  
    6.8 #18 Unidentified Pit N of Oglala.....21  
    6.9 #22 Qt Terrace Deposits N of Sharps Corner.....22  
    6.10 #24 Old Rockyford Pit.....23  
7.0 RANKING.....24  
    7.1 Site Rankings by Gravel Percentage Below Overburden & Overburden Depth.....24  
    7.2 Site Rankings by LA Abrasion Results.....25  
    7.3 Estimated Quantities and Ranking.....25  
    7.4 Total Site Ranking.....26  
8.0 SITE SUMMARY & DISCUSSION.....27  
    8.1 #3 Red Shirt Table NW Qal Alluvium & Qt Terrace Deposits.....27  
    8.2 #5 Gravel Deposits W of Rockyford (Cuny Table).....28  
    8.3 #6 Gravel Deposits between Rockyford & Kyle.....28  
    8.4 #9 Gravel Deposits between Kyle & SW of Potato Creek (South) .....29  
    8.5 #10 Gravel Deposits E of Potato Creek.....29  
    8.6 #15 Qal Alluvium & Qt Terrace SW of Rockyford.....30  
    8.7 #17 Gravel Deposits NE of Kyle.....31  
    8.8 #18 Unidentified Pit N of Oglala.....31  
    8.9 #22 Qt Terrace Deposits N of Sharps Corner.....32  
    8.10 #24 Old Rockyford Pit.....32  
9.0 LIMITATIONS.....33

APPENDIX A  
    Reservation Site Location Map  
    Boring Location Maps  
    Boring Logs  
    Gradation Test Results (18)  
    LA Abrasion Test Results (9)

APPENDIX B  
    Geotechnical Report Limitations and Guidelines for Use

## **1.0 INTRODUCTION**

It is our understanding that the Oglala Sioux Tribe Department of Transportation (OSTDOT) seeks ongoing sources of local gravel for use as gravel surfacing on Tribal and residential roads, primarily within Oglala and western Jackson counties. It is also our understanding that haul distances to where gravel is needed must be taken into account. For these reasons, strategic geographic distribution of gravel sources is also taken into account when selecting sites for exploration during Phase II of this project. Please refer to the Reservation Site Location Map in Appendix A for the approximate site locations.

To assist in planning and design, you have authorized American Engineering Testing, Inc. (AET) to conduct a geotechnical exploration study, including drilling, sample collection, and laboratory testing of the top ten (10) site selections for Phase II of the project. This Phase II report presents the results of the above exploration, laboratory testing and recommendations on the potential gravel sources explored.

## **2.0 SCOPE OF SERVICES**

AET's services were performed in general accordance with KLJ's Task Order No. 10617143, dated October 5, 2017. The authorized scope consists of the following for Phase II of the study:

- Field exploration drilling program of ten (10) potential gravel pit sites based upon the gained data during the desktop/field investigation of Phase I.
- Laboratory testing performed on bulk soil boring samples of the ten (10) potential gravel pit sites to include: gradation sieve analysis, Atterburg Limits and LA Abrasion tests.
- Recommendations for sites based upon gained field and laboratory data to determine the quality and estimate the quantity of the top ten (10) sites.

## **3.0 PROJECT INFORMATION**

It is our understanding that the Oglala Sioux Tribe Department of Transportation seeks ongoing sources of local gravel for use as gravel surfacing on Tribal and residential roads, primarily within Oglala and western Jackson Counties. A Phase I desktop and subsequent field exploration study within this area was performed between December 2017 and June 2018.

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The first portion of Phase I included a desktop-based/GIS investigation and literature review to determine twenty (20) potential gravel pit sites across Oglala and western Jackson counties. Once authorized for site access, the second half of Phase I consisted of site visits for exploration and prospecting of the sites. The details, methods, results and conclusions of the desktop and field investigations to select the top ten (10) sites for exploration drilling are outlined in AET Report No. 17-03169, submitted on July 2, 2018. Also included in the Phase I report are details concerning deposit types, trends and geology of gravel deposits within the study area. This Phase II report outlines the methods and results of our exploration drilling program, laboratory results of the obtained boring bulk samples and our opinions regarding the estimated quantity and quality of the gravel deposits encountered at the ten (10) selected sites.

The previously stated information represents our understanding of the project. This information is an integral part of our review. It is important that you contact us if there are changes from that described so that we can evaluate whether modifications to our recommendations are appropriate.

## **4.0 EXPLORATION DRILLING PROGRAM**

### **4.1 Field Exploration & Prospecting**

Upon confirmation of permission to access Tribal lands for gravel prospecting, twenty-four (24) sites were visited between May 21 and June 7, 2018. In general, the methods involved were maintained for all sites. The same GIS database created during the desktop study was transferred to a Samsung Galaxy tablet using the ArcGIS Collector application for use in the field. This application not only allowed for real-time GPS based placement on the customized map for reference while prospecting, but also for point and polygon data collection of sample locations, potential boring/test pit locations and areas of interest. AOI's (areas of interest), represent an interpreted general area in which a gravel pit could be located with regards to practical access, topography, minimal overburden and the best interpreted gravel concentration. In general, AOI's were selected in the field based upon gravel being visible at surface, indicated by surface/land features, visible in road cuts or stream cutbank exposures, confirmation of GIS geologic map accuracy, or anticipated to be in the greatest concentration based upon data and gained knowledge of the area.

Existing or historic gravel pits in the vicinity were also useful for considering trends and occurrences of deposits at each site. In many cases geologically older deposits (for example, the “Medicine Root” gravels), typically form high points in the landscape. This is due to differential weathering in which the softer, more erodible sediments or formations erode away faster than the gravels, leaving the less erodible gravel deposit “capping” high areas.

#### **4.2 Boring/Test Pit Locations**

Boring and/or test pit locations were determined within and around each AOI, with consideration for practical drill rig access and representative coverage of the AOI. In some cases, drilling depths were altered for individual boring location candidates based upon gained knowledge of the site with the intention of keeping practical drilling depths and cost to a minimum. For example, in the event no gravel was encountered within the upper 20 feet of a boring, the boring would then be terminated. Alternatively, if consistent gravel deposits were being encountered at 25 feet, the boring would in some cases be extended to a depth of 30 feet.

#### **4.3 Sample Collection**

Continuous sample drilling methods were performed for each boring using 4.25-inch hollow stem auger and a 3-inch diameter, 5-foot long continuous barrel sampler. A representative 1-quart sized sample was collected from each 5-foot sample interval in all borings. Additionally, a minimum of 2 to 4 bulk boring samples were taken at each site and collected in 50lb bags.

Bulk boring samples were collected only in gravel bearing/dominant intervals, typically requiring a 10 to 15-foot interval length to obtain a sufficient quantity of sample. This was also performed in order to get an “out of the ground” representation of the gravel bearing deposits without the influence of gravel-devoid overburden. In most cases, multiple samples were combined at the time of testing to ensure a sufficient sample size for gradation and/or LA Abrasion test sample size requirements.

#### **4.4 Boring Log Soils and Soil Layering**

Continuous sampling of borings allows for a relatively accurate measurement of the interbedded nature common of the gravel deposits within the study. During sample collection, bulk samples were collected within gravel dominant intervals. However, these intervals often include lenses of non-gravel dominant sands, silts and clays. These non-gravel dominant intervals/lenses sometimes contain no gravel or lesser quantities of gravel (for example gravelly sand, silty sand with a little gravel, etc). Therefore, bulk samples represent a mixing of the interbedded gravels and soils within the gravel dominant intervals. Also note that because of the interbedded nature of the site gravel deposits, the USCS soil classification for bulk samples found on the attached gradation and LA Abrasion lab test results may differ with the individual soil classifications found within those intervals on the associated boring logs. For the majority of sites, the corresponding gradation and LA Abrasion test result sheets result in classifications with higher sand and/or silt content, for example, silty sand with gravel, gravelly sand with silt, gravelly silt, etc.

### **5.0 LABORATORY TESTING**

#### **5.1 Methods**

Representative bulk samples were submitted for lab testing to include gradation, Plasticity Index (Atterberg Limits), and LA Abrasion (LAR) tests for each drilled site. Note, no samples were selected for Site #5 (Gravel Deposits W of Rockyford, Cuny Table), due to a lack of gravel dominant soils. At Site #5, only a minor amount of silty gravel lenses approximately 0.5 feet thick were encountered in some borings.

For reference, SD DOT specification ranges/limits for gravel surfacing are included on the gradation test result sheets. Note, an asterisk present on a test result number indicates the particular result is higher or lower than the specification range. The individual gradation and LAR test results can be found attached in Appendix A and the LAR and Atterberg Limit results can also be found on the gradation test result sheets.

## **5.2 Gradations (ASTM D4318)**

A total of eighteen (18) gradations were performed on bulk samples taken in the gravel dominant intervals, often spanning a depth range of 10 to 15 feet. In some cases, depth intervals were shorter due to a lower thickness of the gravel dominant interval and were combined with other boring bulk samples to attain a sufficient sample amount for testing. Also note, as previously mentioned, the classification indicated on the gradation test results may not directly match that of the individual soils and soil layers found on the attached boring logs because the bulk samples represent a mixing of the site soils and soil layering.

## **5.3 Plasticity Index (ASTM D6913/D6913M)**

A total of eighteen (18) Plasticity Index (Atterberg), tests were performed; one for each gradation sample. In some cases, the lack of cohesive or plastic silt/clay content resulted in a non-plastic test result, displayed as NP on the test sheet. The results of the Plasticity Index tests can be found on each gradation sheet within Appendix A.

## **5.4 LA Abrasion (ASTM C131/C131M)**

A total of nine (9) LA Abrasion (LAR), tests were performed for the study; one for each site. Note, no test was performed on Site #5 due to the previously mentioned lack of gravel at the site. The LAR test can be described as the resistance to degradation of the sample by abrasion and impact and is expressed as a percentage of sample loss during the test. The test results are included in Appendix A as both individual test sheets and are also displayed as the percent loss included on the corresponding gradation result sheet for which the test was performed.

## **6.0 SITES & DRILLING EXPLORATION RESULTS**

For reference, the following section outlines the individual sites selected for further exploration in Phase II (as stated previously in Phase I of this study, AET Report No. 17-03169). The general findings and descriptions of the soils encountered during our drilling exploration are included herein, along with tables for calculated gravel percentages. A summary of laboratory results with conclusions and opinions for each site are then included in section 8.0.

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### ***Gravel Percentage***

Gravel percentages were calculated for individual borings at each site. The percentage was calculated by dividing the total gravel dominant interval footage by the total boring depth. The tables herein show this data for the individual borings for each site. Please note, these percentages are lower due to the inclusion of overburden in the calculation when compared to the subsequent gravel percentage below overburden. The tables also include the depth of overburden at each boring and the gravel percent below overburden.

### **6.1 #3 Red Shirt Table NW Qal Alluvium & Qt Terrace Deposits**

The site is split into two general areas; that of the lower lying Cheyenne River floodplain to the north and a small section of the northern edge of the higher, Red Shirt Table to the south. Due to the location of residences and a cemetery within the only area containing potential gravel on this section of Tribal land on Red Shirt Table, the southern area was not explored.

The gravels of the modern Cheyenne River floodplain are exposed at surface as former gravel bars on the inside bend of the current meandering river. Gravels containing cobble-sized particles can be seen within a large area on the western half of the southern half of Section 27. This area of exposed gravel was mapped as the AOI for the area, totaling approximately 8 acres (see Appendix A). These gravel bars occur at an elevation approximately 10 feet above the current river level, with a few scattered trees and little to no overburden. If gravel persists deeper than 10 feet, dewatering during pit development may be necessary. Test pit locations were selected within the extents of the AOI, as well as within the southwest quarter of section 27 where it is interpreted more gravels may be present, but with the presence of overburden. It should also be noted that due to larger aggregate (grain) size (visually), crushing of cobble-sized gravel would be necessary during processing.

This is the only site in which undeveloped Cheyenne River deposits occurred for this project. According to Halford, 2016, in regard to the Cheyenne River gravels: “Fortunately, the sand and gravel at Red Shirt generally falls within the grain size ranges and percent distributions that are applicable to most South Dakota Standard specifications. Therefore, potential uses would include road sub-base, service gravel, aggregate for asphalt surface treatments, aggregate for asphalt concrete and fine aggregates for use in Portland cement concrete and filter blank material.”

Potential barriers to development may include proximity to both the Red Shirt School (approximately 1 mile southeast of AOI), and Tatanka Park (approximately ½ mile east of AOI). All gravels are located within Tribal land.

### ***Test Pit Exploration***

Test pits were determined to be more practical at the site due to the lack of overburden and the larger grain size of the gravels that would create difficulties and bias during drilling/sampling. A total of twelve (12) test pits were performed using a backhoe provided by the OST DOT. Test pits were terminated at approximately 7 to 10 feet below grade when water was encountered, causing caving.



**Photo 1: Test Pit TP-3**

In general, beneath topsoil, the soils consisted of predominantly sandy gravel with cobbles with 0.5 to 1.5-foot-thick alternating layers of gravelly sand (see above photo). Test Pits TP-1 to TP-8 were performed within the approximately 9.6-acre AOI. Test Pits TP-9 to TP-12 were performed further south where additional gravel was encountered, but with approximately 4 to 7 feet of silty sand and/or sandy silt overburden above the gravels. No gravel bearing soil was encountered in TP-9. Additionally, please note, test pits TP-9 to TP-12 are not included in the site averages in the table below, so as to only represent the primary AOI to the north. Within Test Pits TP-1 to TP-8, the resulting total gravel below overburden is 84.9%, the highest of all sites.

**Table 1: Site #3 Gravel Percentage**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>TP-1</b>     | 7.0                 | 6.3                                  | 0.2                            | 90.0%                 | 92.6%                            |
| <b>TP-2</b>     | 8.0                 | 5.0                                  | 1.5                            | 62.5%                 | 76.9%                            |
| <b>TP-3</b>     | 8.0                 | 3.5                                  | 2.0                            | 43.8%                 | 58.3%                            |
| <b>TP-4</b>     | 6.5                 | 6.5                                  | 0.0                            | 100.0%                | 100.0%                           |
| <b>TP-5</b>     | 9.0                 | 6.5                                  | 1.5                            | 72.2%                 | 86.7%                            |
| <b>TP-6</b>     | 6.0                 | 6.0                                  | 0.0                            | 100.0%                | 100.0%                           |
| <b>TP-7</b>     | 9.0                 | 6.5                                  | 1.5                            | 72.2%                 | 86.7%                            |
| <b>TP-8</b>     | 9.0                 | 5.3                                  | 2.2                            | 58.9%                 | 77.9%                            |
| <b>TP-9</b>     | 9.0                 | 0.0                                  | *7.0                           | *00.00%               | *00.0%                           |
| <b>TP-10</b>    | 9.5                 | 2.3                                  | *7.0                           | *24.2%                | *92.0%                           |
| <b>TP-11</b>    | 10.0                | 3.5                                  | *5.0                           | *35.0%                | *70.0%                           |
| <b>TP-12</b>    | 9.5                 | 7.0                                  | *1.5                           | *73.6%                | *87.5%                           |
| <b>Average:</b> |                     | <b>4.9</b>                           | <b>1.1</b>                     | <b>74.9%</b>          | <b>84.9%</b>                     |

\*not included in average

**6.2 #5 Gravel Deposits W of Rockyford (Cuny Table)**

Of the previously selected sections for this site, all but Section 25 fall within the BBR and/or BNP. A large, relatively old looking pit is located in the center of Section 14 but appears to be long abandoned due to overgrowth. Due to the BBR and BNP, Section 25 is the only consideration for further exploration.

The northeast corner of the northeast quarter of Section 25 contains evidence of surface gravel, as well as two abandoned, shallow pits from where gravel was excavated off an existing slope (see photo 2). However, USGS surface geology indicates “gravel deposits”, aka Medicine Root gravels approximately 1/8 mile to the north, although not on Section 25. This may be due to the presence of windblown “eolian” deposits overlying the gravels and does not discount the presence of underlying Medicine Root gravel deposits. Gravels can be seen outcropping along the sharp eastern ridgetops within the AOI. The AOI considered for further exploration where these features are seen covers approximately 11.3 acres.

Borings locations were selected for practical rig access on the eastern ridges, as well as completing a rectangular grid with borings to the west where gravels are not visible at surface, due to overburden. Although no gravel-related surface geology is indicated by geologic maps for the section, the underlying geology is likely Medicine Root gravel and has the potential to occur as interbedded gravel lenses which have proven to occur as much as >40’ thick, as seen at Medicine Root deposits near Potato Creek to the southeast (see Site 9).

An additional area on Section 25 has evidence of the same surface gravels located at a high point in the center of the north half of the section (see Appendix A). This AOI is approximately 3.6 acres in size. Boring data at this site can tie together the two sites, in which gravel existing between the large area between them can be inferred with moderate to high confidence. Trends of the deposit can also be determined with borings at this second location. The only potential barrier to pit development is the total 1/8-mile haul distance north to BIA 34 on T-677, which crosses the BBR and BNP.

### ***Drilling Exploration***

A total of eight (8) borings were performed, six (6) within the eastern AOI and two (2) within the western AOI. Of all sites explored in this study, Site #5 contains the least amount of gravel based upon our soil borings. In general, below topsoil, the soils encountered consisted of anywhere from 1 to 8 feet of silty sand eolian deposits before encountering silty sand or silty gravel of the underlying Medicine Root Gravel Deposits. However, when encountered, the silty gravel of the Medicine Root presents as thin 0.5 to 1-foot thick layers.

Only in one instance (Boring B-4), was a thicker layer (3 feet thick), of silty gravel encountered. As anticipated, Medicine Root gravels were encountered at the site, however, not with nearly sufficient quantity or consistency to warrant future development.

**Table 2: Site #5 Gravel Percentage**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 20.0                | 0.9                                  | 9.2                            | 4.5%                  | 8.3%                             |
| <b>B-2</b>      | 20.0                | 0.4                                  | 9.0                            | 2.0%                  | 3.6%                             |
| <b>B-3</b>      | 20.0                | 1.0                                  | 1.7                            | 5.0%                  | 5.5%                             |
| <b>B-4</b>      | 20.0                | 3.0                                  | 6.0                            | 15.0%                 | 21.4%                            |
| <b>B-5</b>      | 20.0                | 0.9                                  | 9.8                            | 4.5%                  | 8.8%                             |
| <b>B-6</b>      | 20.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-7</b>      | 20.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-8</b>      | 20.0                | 0.4                                  | 5.9                            | 2.0%                  | 2.8%                             |
| <b>Average:</b> |                     | <b>0.8</b>                           | <b>6.9</b>                     | <b>4.1%</b>           | <b>6.3%</b>                      |

### **6.3 #6 Gravel Deposits between Rockyford & Kyle**

Two AOI’s exist within the site for future exploration. The AOI within the southwest corner of Section 17 will be described first, as it is of higher priority due to shorter haul distance and proven gravel abundance (seen at small existing pits and road cut exposures). According to USGS surface geology, the entire deposit encompasses high ridgetops over an area spanning multiple sections. The USGS records the deposit as “Gravel Deposits” aka “Medicine Root”, with numerous USDA “NHhill Gravelly Loam” occurrences around the perimeter of the central Medicine Root.

#### ***Northern AOI***

According to GIS geology and soil data, the northern AOI presents the same conditions for gravel. This area was selected in the same manner as the southern AOI, although it is located off-road ¼ mile west from T-557. Seven (7) boring locations were selected for this 21-acre AOI. The topographic relief at this AOI is also much greater and may present additional challenges during development. Primarily due to access and haul distances, only the southern AOI was explored further at this time.

### ***Southern AOI***

The southern AOI is characterized by a high ridgetop, in which a private ranch road junctions with Tribal Unpaved T-102, T-557 and T-550. The owner of the ranch road through Section 19 has created a small gravel pit on Tribal land within Section 17. At the time of our visit, landowner Mr. Todd O'Brian gave verbal permission to use his road for access to Sections 17 and 8. He also verbally indicated that if the deposit were developed, he would grant access for compensation. Although a significantly longer 5-mile haul distance, the deposit can be accessed via T-102 and/or T-555 to the southeast through multiple allotted sections before reaching BIA 2.

On the southern AOI of Section 17, gravel is exposed on roadcuts and on the small pit created by Mr. O'Brian. The 7.7-acre AOI outlines the extents of the area where gravel is known to be present, overburden is anticipated to be minimal and access is high due to existing roads (see Appendix A). It should also be noted that an abandoned pit is located in the very southwest corner of section 17 and spans into the adjacent allotted land.

### ***Drilling Exploration***

A total of ten (10) borings were drilled to depths of 20 to 25 feet; seven (7) within the AOI and three (3) additional boring locations north of the AOI to investigate overburden depths. Based upon site characteristics, roadcuts to the north and our borings, overburden depth increases to the north. In general, below topsoil in the borings outside of the AOI (B-1 to B-3), overburden depth varied from approximately 12 to 17 feet.

Below topsoil in borings within the AOI (B-4 to B-10), overburden varied from approximately 1 to 10 feet, averaging approximately 3 feet. In the table below, borings B-1 to B-3 are not included in the site averages. Below overburden the gravel bearing intervals consisted of varying layers of silty gravel with sand, silt, sandy gravel, sandy fat clay, sand with a little gravel and/or clayey gravel. The average gravel percent below overburden calculated is 36.7%.

**Table 3: Site #6 Gravel Percentage**

| Boring          | Depth (feet) | Gravel Dominant Total Footage | Overburden Depth (Feet) | Total Gravel % | Gravel % Below Overburden |
|-----------------|--------------|-------------------------------|-------------------------|----------------|---------------------------|
| B-1             | 20.0         | 0.0                           | *17.7                   | *00.0%         | *00.0%                    |
| B-2             | 20.0         | 0.0                           | *17.4                   | *00.0%         | *00.0%                    |
| B-3             | 25.0         | 9.2                           | *11.0                   | *35.8%         | *65.7%                    |
| B-4             | 25.0         | 10.2                          | 1.6                     | 40.8%          | 43.6%                     |
| B-5             | 25.0         | 1.2                           | 1.7                     | 4.8%           | 5.2%                      |
| B-6             | 25.0         | 13.0                          | 2.4                     | 52.0%          | 57.5%                     |
| B-7             | 25.0         | 14.4                          | 10.1                    | 57.6%          | 96.6%                     |
| B-8             | 20.0         | 3.2                           | 0.9                     | 16.0%          | 16.8%                     |
| B-9             | 20.0         | 0.0                           |                         | 0.0%           | 0.0%                      |
| B-10            | 25.0         | 8.8                           | 1.2                     | 35.2%          | 37.0%                     |
| <b>Average:</b> |              | <b>6.00</b>                   | <b>3.0</b>              | <b>29.5%</b>   | <b>36.7%</b>              |

\*not included in average

#### 6.4 #9 Gravel Deposits between Kyle & SW of Potato Creek (South)

Originally encompassing a large area from the desktop survey, the determined section and resulting AOI for Site #9 is limited to the southwest quarter of Section 36 (see Appendix A). As seen at Site #6, Medicine Root gravel deposits and resulting NHill Gravelly Loam are indicated within almost the entire quarter section. The area is also similar to Site #6 in that the deposit results in a high point/ridge transected by an unpaved county road (May Road). Haul distance is 1 mile south to BIA 2, mostly across private land. The landowner (Mr. Bert May), was very helpful and granted verbal permission at the time of our visit to explore his large private pit located immediately adjacent to the north on the north half of Section 36.

The “May Pit” is possibly the deepest and most revealing pit seen during this project. It is over 40-feet vertical in areas and exposes a large area of the characteristic, interbedded Medicine Root gravel deposits. In particular, the approximately 300 feet wide south wall of the excavation proved useful in measuring the occurrence and abundance of the ancient alluvial, interbedded gravel lenses. A total of 3 stratigraphic columns were measured and documented along the south wall at 100-foot intervals (see figure 1). It should also be noted that in visiting with Mr. May, the lowest extents of the gravels are not known, as they still prevail at the bottom of the pit. On average, the south wall revealed 8 to 13 feet of sandy silt overburden until encountering gravel.

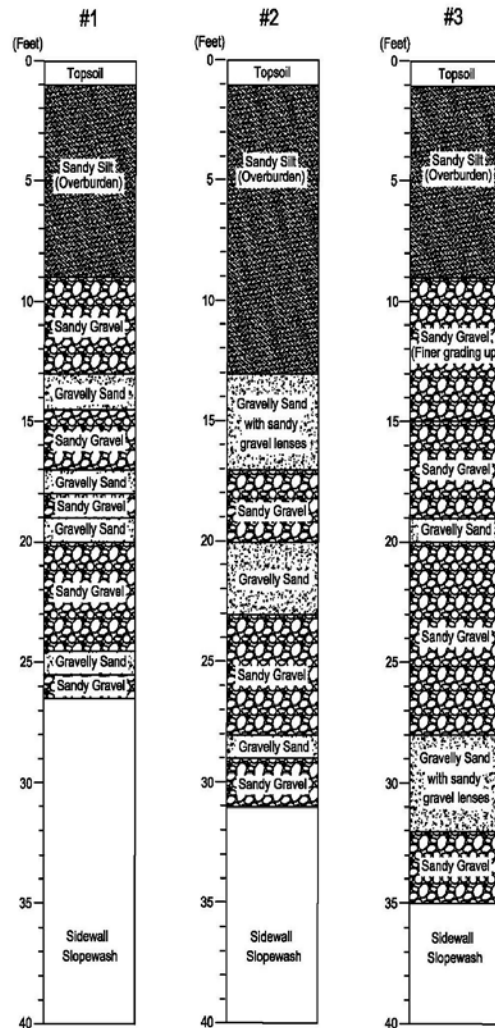


Figure 1: Stratigraphic columns #1-3 along south wall of “May Pit”

The AOI determined within the southwest quarter of Section 36 covers approximately 54 acres of hilltops encompassing the deposit. The measured south wall of the “May Pit” is located 400 feet north of the northern extents of the AOI within the same deposit.

### ***Drilling Exploration***

A total of eleven (11) borings were located along the accessible central ridgeline within reasonable distance from May Road and centered within the deposit. The borings ranged in depth of 25 to 30 feet. As can be seen in the table below, overburden depth was variable, ranging anywhere from approximately 1 to 14 feet. In general, below topsoil the overburden whether eolian or Medicine Root, typically consisted of silt with sand and/or silty sand. Once encountered, the gravel dominant intervals generally consisted of silty gravel, sandy gravel and/or silty sand with gravel, with lenses of silt and/or sand. On average, the gravel percentage below overburden at Site #9 is 51.9%.

**Table 4: Site #9 Gravel Percentage**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 25.0                | 16.8                                 | 6.0                            | 67.2%                 | 88.4%                            |
| <b>B-2</b>      | 25.0                | 2.5                                  | 12.5                           | 10.0%                 | 20.0%                            |
| <b>B-3</b>      | 30.0                | 15.0                                 | 14.0                           | 50.0%                 | 93.8%                            |
| <b>B-4</b>      | 25.0                | 14.9                                 | 5.6                            | 59.6%                 | 76.8%                            |
| <b>B-5</b>      | 25.0                | 9.1                                  | 1.2                            | 36.4%                 | 38.2%                            |
| <b>B-6</b>      | 25.0                | 10.7                                 | 14.3                           | 42.8%                 | 100.0%                           |
| <b>B-7</b>      | 25.0                | 10.7                                 | 1.0                            | 42.8%                 | 44.6%                            |
| <b>B-8</b>      | 25.0                | 10.0                                 | 1.0                            | 40.0%                 | 41.7%                            |
| <b>B-9</b>      | 25.0                | 10.0                                 | 1.3                            | 40.0%                 | 42.2%                            |
| <b>B-10</b>     | 25.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-11</b>     | 25.0                | 5.9                                  | 1.7                            | 23.6%                 | 25.3%                            |
| <b>Average:</b> |                     | <b>9.6</b>                           | <b>5.9</b>                     | <b>37.5%</b>          | <b>51.9%</b>                     |

### **6.5 #10 Gravel Deposits E of Potato Creek**

The Medicine Root gravel deposits are located primarily on the north side of BIA 2 within Section 2 and on the south side of BIA 2 within the west half of Section 11 (see Appendix A). The two will be referred to as the north and south areas. Just as with Sites #8 & 9, the same Medicine Root and NHill Gravelly Loam deposit type exists according to USGS and USDA maps. It is our understanding that Site #10 is strategically located for future BIA 2 projects.

### ***North Area***

The north AOI is located within the south half of Section 2 and is adjacent to BIA 2. Haul distances would be minimal. The AOI was mapped along the extents of the highpoint to include the repeating ridge/valley spurs to the north. Total practical mining extents total approximately 44 acres. It should be noted that on one of the ridge spurs to the north, a very small abandoned gravel pit on the order of 10 to 12 feet deep was evident with ~20-foot tall trees and overgrowth present within the excavation extents. Exposed surface gravels were more notable within the ridgetops of the north AOI than the south AOI.

### ***Drilling Exploration***

A total of eight (8) borings were performed within the north area of Site #10. Below topsoil, an average of approximately 12 feet of sand and/or silt overburden was encountered overlying sandy gravel, clayey gravel, sand with gravel, silty sand, silt with sand and/or sandy lean clay with gravel of the Medicine Root gravel deposits. Borings B-5 and B-6 have the best combination of minimal overburden and gravel percentage encountered within the northern area. It is our opinion that if gravel pits are planned in the north area, locations near Borings B-5 and B-6 will be optimum.

**Table 5: Site #10 (North Area) Gravel Percentage**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 25.0                | 10.1                                 | 14.9                           | 40.4%                 | 100.0%                           |
| <b>B-2</b>      | 25.0                | 10.1                                 | 14.9                           | 40.4%                 | 100.0%                           |
| <b>B-3</b>      | 40.0                | 12.0                                 | 17.9                           | 30.0%                 | 54.3%                            |
| <b>B-4</b>      | 25.0                | 12.3                                 | 4.8                            | 49.2%                 | 60.9%                            |
| <b>B-5</b>      | 25.0                | 16.5                                 | 7.9                            | 66.0%                 | 96.5%                            |
| <b>B-6</b>      | 25.0                | 15.1                                 | 9.9                            | 60.4%                 | 100.0%                           |
| <b>B-7</b>      | 40.0                | 15.8                                 | 14.2                           | 39.5%                 | 61.2%                            |
| <b>B-8</b>      | 25.0                | 11.6                                 | 12.7                           | 46.4%                 | 94.3%                            |
| <b>Average:</b> |                     | <b>12.9</b>                          | <b>12.2</b>                    | <b>46.5%</b>          | <b>83.4%</b>                     |

***South Area***

The approximate 33-acre south AOI is located within the western half of Section 11 and is also adjacent to BIA 2. Haul distances would be equally minimal. The initial AOI for the area was mapped along the extents of the highpoint, straddling a U-shaped valley where surface gravels were visible in the southwest portion of the area. However, it is our opinion Medicine Root gravel deposits may exist within the majority of the section. At the time of our visit, Ms. Tonia Ecoffey with the OST DOT staked corners for a recently permitted pit on the east side of the northwest quarter of Section 11, named the “Cell Tower Pit”. A large cell tower is located between the permitted pit and BIA 2. Six (6) boring locations were selected within the central, flat portion of the southern area. Some exposed surface gravels were evident on the southern half of the AOI near the ridge edges.

***Drilling Exploration***

A total of six (6) soil borings were performed within the south area of Site #10. Below topsoil, an average of approximately 12 feet of sand and/or silt overburden was encountered overlying sandy gravel, silty gravel, clayey gravel, sand with gravel, silty sand, silt with sand and/or gravelly lean clay of the Medicine Root gravel deposits. In general, the contrast of overburden and gravel percent below overburden is relatively variable in the south area. B-13 had the lowest amount of overburden, with moderate gravel percentage below overburden. The other borings had high gravel percentage, but with approximately 10 to 16 feet of overburden.

**Table 6: Site #10 (South Area) Gravel Percentage**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-9</b>      | 15.0                | 0.0                                  | 11.0                           | 0.0%                  | 0.0%                             |
| <b>B-10</b>     | 25.0                | 7.5                                  | 15.8                           | 30.0%                 | 81.5%                            |
| <b>B-11</b>     | 25.0                | 14.8                                 | 9.9                            | 59.2%                 | 98.0%                            |
| <b>B-12</b>     | 25.0                | 10.3                                 | 14.7                           | 41.2%                 | 100.0%                           |
| <b>B-13</b>     | 25.0                | 12.0                                 | 5.7                            | 48.0%                 | 62.2%                            |
| <b>B-14</b>     | 25.0                | 10.9                                 | 13.6                           | 43.6%                 | 95.6%                            |
| <b>Average:</b> |                     | <b>9.3</b>                           | <b>11.8</b>                    | <b>37.0%</b>          | <b>72.9%</b>                     |

## **6.6 #15 Qal Alluvium & Qt Terrace W of Oglala**

A number of sections are located at Site #15, which is an area characterized by the modern White River floodplain and older, upper White River terrace deposits. 2 AOI's were determined for this site, which will be called AOI #1 and #2.

### ***AOI #1***

Located in the western half of Section 35, the site is characterized by multiple low and isolated hills displaying gravel scree slopes. From our assessment of the area, the scree slopes are formed from erosion of the uppermost NHill Gravelly Loam, which overlies Quaternary White River alluvium. As seen with other sites, gravel scree slopes can give the false impression of a large gravel quantity due to fines washing away from the surface slope gravels. No surface exposure of this alluvium was visible. The site appears to have a large quantity of gravel due to the scree slopes, but the gravel quantity is likely low per acre.

### ***AOI #2***

Located in the northeast corner of Section 5, AOI #2 is defined by a ridgeline situated atop a sharp cutbank along Fog Creek. Multiple interbedded lenses of gravel are visible within the cutbank from directly below topsoil and extending to the bottom of the exposure. 2 stratigraphic cross sections were spaced evenly within the approximate 200-foot-wide exposure and measured (see Figure 2). The practical extents for a pit location and further exploration with test borings was setback in an area south of the cutbank.

Boring locations were determined in the field based on existing topography, proximity to the cutbank and practical drill rig access while maintaining a boring "grid" (see Appendix A). An unnamed improved trail can be used to directly access the area, which is approximately 500 feet west of Oglala County Road 2003.

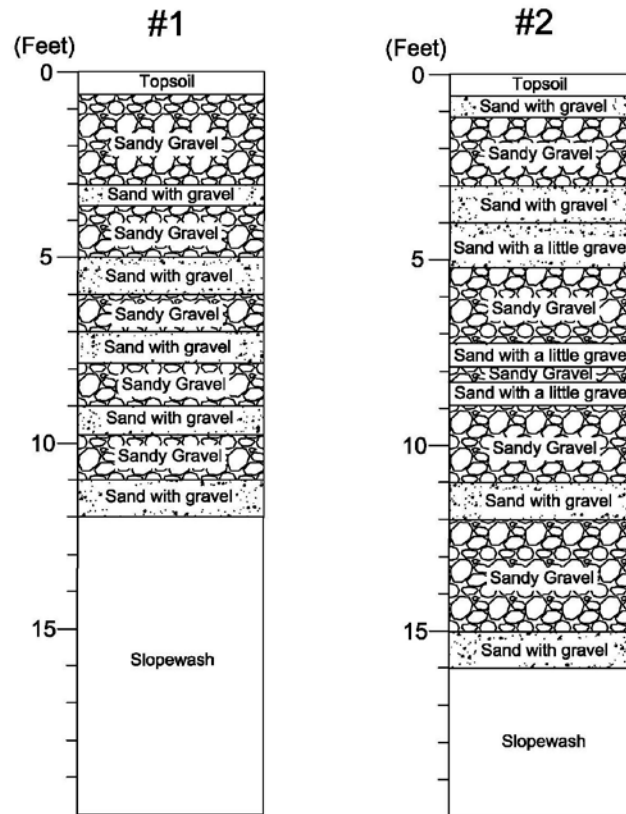


Figure 2: Stratigraphic columns #1-2 on cutbank at AOI #2

AOI #1 may be of future interest but due to the layout, interpreted low deposit thickness and scattered distribution makes it significantly less economic to develop when compared with AOI #2.

### ***Drilling Exploration***

A total of eight (8) soil borings to a depth of 25 feet were performed within the approximately 2.6-acre AOI (AOI #2). Below topsoil, an average of approximately 8 feet of silty sand and/or sandy silt overburden was encountered overlying sandy gravel, silty gravel, clayey gravel, sand with gravel, silty sand and/or sandy silt Quaternary terrace deposits until the final depth explored. In one instance, in Boring B-6, claystone of the White River Group was encountered underlying the gravel terrace deposits at a depth of approximately 15 feet below grade. The average gravel percentage below overburden measured was 46.3%

**Table 7: Site #15 Gravel Percentages**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 25.0                | 10.6                                 | 13.6                           | 42.4%                 | 93.0%                            |
| <b>B-2</b>      | 25.0                | 1.2                                  | 9.2                            | 4.8%                  | 7.6%                             |
| <b>B-3</b>      | 25.0                | 2.8                                  | 8.8                            | 11.2%                 | 17.3%                            |
| <b>B-4</b>      | 25.0                | 13.2                                 | 5.0                            | 52.8%                 | 66.0%                            |
| <b>B-5</b>      | 25.0                | 9.1                                  | 7.4                            | 36.4%                 | 51.7%                            |
| <b>B-6</b>      | 25.0                | 4.8                                  | 10.2                           | 19.2%                 | 32.4%                            |
| <b>B-7</b>      | 25.0                | 7.7                                  | 6.2                            | 30.8%                 | 41.0%                            |
| <b>B-8</b>      | 25.0                | 12.4                                 | 4.8                            | 49.6%                 | 61.4%                            |
| <b>Average:</b> |                     | <b>7.7</b>                           | <b>8.2</b>                     | <b>30.9%</b>          | <b>46.3%</b>                     |

### **6.7 #17 Gravel Deposits NE of Kyle**

The Medicine Root and NHill Gravelly Loam deposits at Site #17 are located on the west half of Section 7, approximately 1-2 miles north of BIA 2 via unpaved BIA 19. The existing “Sherelda Pit” is located on the northwest quarter of Section 7 and is characterized as mid-level ridges adjacent to the higher ridge to the north and flat lands to the south. Within this area of mid-level ridges of which the existing pit occupies, NHill Gravelly Loam scree slopes can be seen on the ridge edges.

According to GIS surface geology, the “Sherelda Pit” is not located within any documented deposits. Immediately southeast of the pit, evidence exists of a long-overgrown gravel pit approximately 10 acres in size, which also occurs on the mid-level shelf for the area. Both of these pits show surface evidence as occurring within NHill Gravelly Loam. According to the GIS surface geology data, a Medicine Root gravel deposit exists to the northeast of the existing pits. It is interpreted, as with other locations, that the NHill Gravelly Loam in the area is thin and erosional, derived from the upper Medicine Root gravel deposit.

For this reason, it was our opinion that soil borings be located to the northeast of the Sherelda Pit on the upper ridge where the Medicine Root gravel deposit exists according to GIS surface geology data. An AOI where gravel is most probable was selected in the field (see Appendix A).

### ***Drilling Exploration***

A total of seven (7) soil borings were drilled to depths of 15 to 25 feet below grade within the approximately 15.2-acre AOI. All borings contained no gravel, with the exception of B-1. Beneath topsoil in Boring B-1, underlying 1 foot of silty sand overburden, the gravel dominant interval consisted of approximately 20 feet of sandy gravel until encountering silt at 22 feet below grade. In all other borings, only silt and lean clay eolian deposits were encountered until the final depths drilled. In some borings, drilling was terminated at 15 feet if no gravel had been encountered.

**Table 8: Site #17 Gravel Percentages**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 25.0                | 19.1                                 | 2.2                            | 76.4%                 | 83.8%                            |
| <b>B-2</b>      | 15.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-3</b>      | 25.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-4</b>      | 15.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-5</b>      | 15.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-6</b>      | 15.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-7</b>      | 25.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>Average:</b> |                     | <b>2.7</b>                           | <b>2.2</b>                     | <b>10.9%</b>          | <b>12.0%</b>                     |

### **6.8 #18 Unidentified Pit N of Oglala**

Approximately 1 mile east of BIA 41 along BIA 13 is a small 1-acre pit atop the hills approximately ¼ mile north of BIA 13. Sidewall exposure of a minor abandoned excavation shows approximately 10 feet of interbedded gravel directly below topsoil. Along the hill edges surrounding the excavation, surface gravels are evident in an area covering approximately 9.1 acres. GIS surface geology identifies NHill Gravelly Loam and Quaternary White River Terrace deposits within the area. Given the thickness of the gravel seen in the abandoned excavation, the gravel is likely to be predominantly White River Terrace deposits. Seven (7) proposed boring locations were selected within this area with regards to drill rig or backhoe access (see Appendix A).

***Drilling Exploration***

A total of seven (7) soil borings were drilled to approximately 15 to 25 feet below grade within the 9.1-acre AOI. Below topsoil, an average of 3.3 feet of silty sand overburden was encountered. In some cases, gravel dominant soils were encountered directly below topsoil. The gravel dominant intervals primarily consisted of silty gravel with sand, sandy gravel and/or clayey gravel with layers/lenses of silty sand, silty lean clay and/or silt. The average gravel percent below overburden encountered for Site #18 was 65.9%.

**Table 9: Site #18 Gravel Percentages**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 15.0                | 10.0                                 | 3.5                            | 66.7%                 | 87.0%                            |
| <b>B-2</b>      | 25.0                | 18.9                                 | 2.0                            | 75.6%                 | 82.2%                            |
| <b>B-3</b>      | 15.0                | 7.6                                  | 1.4                            | 50.7%                 | 55.9%                            |
| <b>B-4</b>      | 20.0                | 13.2                                 | 1.2                            | 66.0%                 | 70.2%                            |
| <b>B-5</b>      | 20.0                | 5.2                                  | 7.5                            | 26.0%                 | 41.6%                            |
| <b>B-6</b>      | 20.0                | 9.2                                  | 6.3                            | 46.0%                 | 67.2%                            |
| <b>B-7</b>      | 15.0                | 8.0                                  | 1.1                            | 53.3%                 | 57.6%                            |
| <b>Average:</b> |                     | <b>10.3</b>                          | <b>3.3</b>                     | <b>54.9%</b>          | <b>65.9%</b>                     |

**6.9 #22 Terrace Deposits N of Sharps Corner**

Coincidentally, at the time of our desktop site selection process, a new gravel pit (“Alicia’s Pit), had been recently permitted for the OST DOT within the northeast quarter of Section 20, adjacent and west of BIA 27. Evidence existed in the northern extents of the area where surface exploration with test pits and minor grading had taken place, which we understand resulted in low gravel and high silt/sand content.

At the time of our field work, more test pit exploration was actively taking place in the southern area of the permit within the inside point bar along a meander of the unnamed tributary of Porcupine Creek (see Appendix A). This tributary is sourced from the same badland formation hills to the west as is the tributary for Site #21. Observations of the gravel and deposition characteristics were visually identical to those at the Tibby Pit of Site #21 to the west, when seen on the cutbanks of the unnamed tributary adjacent to the permit area/point bar.

To the west within the permit, the landscape transitions to an upper terrace adjacent to the small floodplain containing the tributary and point bar. The site access road is located on this terrace. Gravel may exist within this terrace area although based on field observations, significant overburden removal would be required (on the order of >10 feet).

### ***Drilling Exploration***

A total of four (4) borings were drilled to 20 feet below grade within the approximately 3.5-acre AOI. The Quaternary terrace deposit overburden soils consisted of varying layers of silty sand, silty lean clay and/or sandy silt. Beneath the average of 1.8 feet of overburden, the gravel dominant intervals consisted of silty gravel and/or sandy gravel with varying layers and lenses of sandy lean clay, silty sand and/or sandy silt. On average, the gravel percent below overburden at Site #18 was 34.2%. It should be noted that no gravel was encountered within Boring B-1.

**Table 10: Site #22 Gravel Percentages**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 20.0                | 0.0                                  |                                | 0.0%                  | 0.0%                             |
| <b>B-2</b>      | 20.0                | 4.9                                  | 0.0                            | 24.5%                 | 24.5%                            |
| <b>B-3</b>      | 20.0                | 5.5                                  | 4.0                            | 27.5%                 | 34.4%                            |
| <b>B-4</b>      | 20.0                | 14.4                                 | 1.5                            | 72.0%                 | 77.8%                            |
| <b>Average:</b> |                     | <b>6.2</b>                           | <b>1.8</b>                     | <b>31.0%</b>          | <b>34.2%</b>                     |

### **6.10 #24 Area S of “Rockyford Pit”**

At the time of our field work, it was determined that the prominent hill south of the now abandoned “Rockyford Pit” on the western half of Section 17 may contain gravel deposits. This site was not originally selected during the time of our desktop survey due to the current GIS data showing the entire area as being within allotted land. It is our understanding that Section 17 has recently been obtained by the Tribe through the land buyback program.

The abandoned Rockyford Pit covers a disturbed area measuring approximately 25 acres with graded gravels and remnant stockpiles. The selected AOI of the prominent terrace/hill to the south measures approximately 36 acres (see Appendix A). A pothole bulk hand sample was taken

on top of the hill within the center of the AOI, where 3 feet of silt overburden was encountered before reaching sandy gravel and gravelly sand to a depth of 5 feet.

### ***Drilling Exploration***

A total of seven (7) borings were drilled to a depth of 20 feet within the approximately 36.0-acre AOI. Below topsoil, an average of approximately 10 feet of silty sand and/or sand overburden was encountered. Beneath overburden, the gravel dominant intervals consisted primarily of silty gravel and/or sandy gravel with some layers and lenses of silty sand and/or silt. Beneath the gravel bearing interval, fat clay claystone of the White River Group was encountered until the final depth drilled in most borings. It should be noted that in Boring B-5 no gravel was encountered and that in Borings B-1, B-2 and B-3 only minimal lenses of silty gravel were encountered. For these reasons, only Borings B-4, B-6 and B-7 were averaged in the table below. On average for these borings, the gravel percent below overburden at Site #24 was 48.0%.

**Table 11: Site #24 Gravel Percentages**

| <b>Boring</b>   | <b>Depth (feet)</b> | <b>Gravel Dominant Total Footage</b> | <b>Overburden Depth (Feet)</b> | <b>Total Gravel %</b> | <b>Gravel % Below Overburden</b> |
|-----------------|---------------------|--------------------------------------|--------------------------------|-----------------------|----------------------------------|
| <b>B-1</b>      | 20.0                | *2.2                                 | *9.6                           | *11.0%                | *21.2%                           |
| <b>B-2</b>      | 20.0                | *0.7                                 | *12.4                          | *3.5%                 | *9.2%                            |
| <b>B-3</b>      | 20.0                | *1.1                                 | *12.3                          | *5.5%                 | *14.3%                           |
| <b>B-4</b>      | 25.0                | 5.9                                  | 10.0                           | 23.6%                 | 39.3%                            |
| <b>B-5</b>      | 20.0                | *0.0                                 | *                              | *0.0%                 | *0.0%                            |
| <b>B-6</b>      | 20.0                | 4.8                                  | 9.2                            | 24.0%                 | 44.4%                            |
| <b>B-7</b>      | 20.0                | 8.8                                  | 5.4                            | 44.0%                 | 60.3%                            |
| <b>Average:</b> |                     | <b>6.5</b>                           | <b>8.2</b>                     | <b>30.5%</b>          | <b>48.0%</b>                     |

\*not included in average

## **7.0 RANKING**

### **7.1 Site Rankings by Gravel Percentage and Overburden depth**

Average gravel percentages below overburden and overburden depth were calculated for individual borings at each site. The percentage was calculated by dividing the total gravel dominant interval footage by the boring depth below overburden. The following table shows this data averaged from the soil borings (found in Section 6.0), and subsequent rankings for each site.

**Table 12: Average Gravel % Below Overburden and Overburden Depth Rankings**

| Site        | Avg. Gravel % Below Overburden | Avg. Overburden Depth (feet) | Avg. Gravel % Below Overburden Rank | Avg. Overburden Depth Rank |
|-------------|--------------------------------|------------------------------|-------------------------------------|----------------------------|
| #3          | 84.9%                          | 1.1                          | 1                                   | 1                          |
| #5          | 6.3%                           | 6.9                          | 11                                  | 7                          |
| #6          | 29.8%                          | 6.2                          | 9                                   | 6                          |
| #9          | 51.9%                          | 5.9                          | 5                                   | 5                          |
| #10 (North) | 83.4%                          | 12.2                         | 2                                   | 11                         |
| #10 (South) | 72.9%                          | 11.8                         | 3                                   | 10                         |
| #15         | 46.3%                          | 8.2                          | 6                                   | 8                          |
| #17         | 12.0%                          | 2.2                          | 10                                  | 3                          |
| #18         | 65.9%                          | 3.3                          | 4                                   | 4                          |
| #22         | 34.2%                          | 1.8                          | 8                                   | 2                          |
| #24         | 36.7%                          | 9.8                          | 7                                   | 9                          |

## 7.2 Site Rankings by LAR Results

The table below summarizes the LAR results and subsequent ranking for each site. The LAR test result sheets for each sample can also be found in Appendix A at the end of this report.

**Table 15: LAR (% Loss) and Site Ranking**

| Site | LAR (% Loss) | Rank |
|------|--------------|------|
| #3   | 30.0%        | 3    |
| #5   | NA           | 10   |
| #6   | 36.5%        | 5    |
| #9   | 34.0%        | 4    |
| #10* | 29.9%        | 2    |
| #15  | 44.0%        | 7    |
| #17  | 27.6%        | 1    |
| #18  | 44.3%        | 8    |
| #22  | 47.1%        | 9    |
| #24  | 39.0%        | 6    |

\*Site #10 North & South combined for LAR

## 7.3 Estimated Quantities

The table below summarizes the approximate acre-feet and U.S. short tons of gravel resources estimated within the AOI (area of interest), for each site. The AOI extents can be seen as the

green area encompassing the boring locations and be found on the individual boring location maps in Appendix A. Quantities were estimated using conversions based upon the total gravel dominant footage average at each site, using an assumed density of 120lbs per cubic foot for gravel dominant intervals. To determine acre-feet, the acreage of the AOI was multiplied by the average gravel dominant footage calculated from the boring logs at each site. U.S. short ton quantities were then converted from the acre-feet values using the assumed density of 120lbs per cubic foot for gravel dominant intervals and where 1 acre-foot = 43,560 cubic feet.

**Table 16: Estimated Gravel Resource Quantities**

| Site        | AOI Acres | Approx. Acre-Foot Gravel | Approx. U.S. Short Tons |
|-------------|-----------|--------------------------|-------------------------|
| #3          | 9.6       | 46.91                    | 122,616                 |
| #5          | 14.9      | 12.29                    | 32,128                  |
| #6          | 7.7       | 46.20                    | 120,748                 |
| #9          | 54.0      | 518.40                   | 1,354,890               |
| #10 (North) | 44.0      | 569.25                   | 1,487,792               |
| #10 (South) | 33.0      | 305.25                   | 797,801                 |
| #15         | 2.6       | 20.09                    | 52,494                  |
| #17         | 1.0       | 19.10                    | 49,920                  |
| #18         | 9.1       | 93.73                    | 244,973                 |
| #22         | 3.5       | 21.70                    | 56,715                  |
| #24         | 13.1      | 85.15                    | 222,548                 |

#### 7.4 Total Ranking

Within section 7.0 of this report, multiple rankings were presented based upon boring log measurements, laboratory tests and site characteristics. These include gravel percent below overburden, overburden depth, LAR percent loss and estimated tonnage. A rank was designated to each site for each of these values. These four (4) values were then averaged for an average total rank value, which was then adjusted. In two cases, the average total rank was exactly the same for multiple sites. Sites #9 and #10 (North) tied for a rank of 2<sup>nd</sup>. Sites #6, #22 and #24 tied for a rank of 6<sup>th</sup>. The above results can be found in the following table.

**Table 17: Total Site Ranking**

| Site        | Avg. Gravel % Below Overburden | Avg. Overburden Depth (feet) | LA Abrasion % Loss | Approx. U.S. Short Tons | Avg. Gravel % Below Overburden Rank | Avg. Overburden Depth Rank | LA Abrasion % Loss Rank | Approx. Tonnage Rank | Avg. Total Rank | Avg. Total Rank (Adjusted) |
|-------------|--------------------------------|------------------------------|--------------------|-------------------------|-------------------------------------|----------------------------|-------------------------|----------------------|-----------------|----------------------------|
| #3          | 84.9%                          | 1.1                          | 30.0%              | 122,616                 | 1                                   | 1                          | 3                       | 6                    | 2.75            | 1                          |
| #5          | 6.3%                           | 6.9                          | NA                 | 32,128                  | 11                                  | 7                          | 10                      | 11                   | 9.75            | 8                          |
| #6          | 29.8%                          | 6.2                          | 36.5%              | 120,748                 | 9                                   | 6                          | 5                       | 7                    | 6.75            | 6                          |
| #9          | 51.9%                          | 5.9                          | 34.0%              | 1,354,890               | 5                                   | 5                          | 4                       | 2                    | 4.00            | 2                          |
| #10 (North) | 83.4%                          | 12.2                         | 29.9%              | 1,487,792               | 2                                   | 11                         | 2                       | 1                    | 4.00            | 2                          |
| #10 (South) | 72.9%                          | 11.8                         | 29.9%              | 797,801                 | 3                                   | 10                         | 2                       | 3                    | 4.50            | 3                          |
| #15         | 46.3%                          | 8.2                          | 44.0%              | 52,494                  | 6                                   | 8                          | 7                       | 9                    | 7.50            | 7                          |
| #17         | 12.0%                          | 2.2                          | 27.6%              | 49,920                  | 10                                  | 3                          | 1                       | 10                   | 6.00            | 5                          |
| #18         | 65.9%                          | 3.3                          | 44.3%              | 244,973                 | 4                                   | 4                          | 8                       | 4                    | 5.00            | 4                          |
| #22         | 34.2%                          | 1.8                          | 47.1%              | 56,715                  | 8                                   | 2                          | 9                       | 8                    | 6.75            | 6                          |
| #24         | 36.7%                          | 9.8                          | 39.0%              | 222,548                 | 7                                   | 9                          | 6                       | 5                    | 6.75            | 6                          |

Please note, the variables used for ranking are not weighted. It could be interpreted that certain variables are more important than others. For example, gravel percentage below overburden may be more important than average overburden depth or that estimated tonnage is more important than overburden depth. We have decided not to use a weighted ranking system as no standard for such interpretation exists, but to use the simple average rank of the aforementioned variables. This method allows for making additional interpretation, while including the guidance of our recommendations on the best sites when deciding gravel pit locations. The following section discusses the ranked variables, laboratory results and our subsequent opinions for each site.

## 8.0 SITE SUMMARY & DISCUSSION

### 8.1 Site #3 Red Shirt Table NW Qal Alluvium & Qt Terrace Deposits

A total of four (4) gradation and Plasticity Index tests were performed on test pit bulk samples. With a few exceptions, gradation limits were nearly within SD DOT specification for gravel surfacing. All samples were outside specification for the percent passing the 3/4" sieve, which was to be expected given the presence of oversize material/cobbles at the site. TP-1 & TP-7 and TP-2 & TP-3 had marginally low results for percent passing the No. 40 sieve, at 10% (limits 13-35%). Additionally, all Plasticity Index tests were out of specification, with two being non-plastic and two marginally low at a value of 3 (limits 4-12). The LA Abrasion test performed on the combined sample from TP-2 and TP-3 was within specification at 30.0% loss (ranking 3<sup>rd</sup> best of the study).

In general, it is our opinion low to moderate processing would be required of the gravels at Site #3. The oversized material could be separated or crushed and overburden from south of the primary

AOI could be used to introduce more silt/clay fines for raising the naturally low Plasticity Limit. As previously mentioned, the resulting total gravel percent below overburden is 84.9%, the highest of all sites within this study. As previously mentioned, the LA Abrasion result of 30.0% loss makes Site #3 the 3<sup>rd</sup> most durable gravel tested in this study. It is our opinion that the primary AOI would require minimal overburden removal and is appropriate in size (9.6 acres), for the small-scale 10-acre mining permit.

According to quantity estimates from our test pits, there are approximately 47 acre-feet of gravel resources within the 9.6-acre AOI at Site #3, equivalent to approximately 122,000 U.S. short tons. Note, test pits were terminated between 7 to 10 feet due to caving/water, and gravel deposits were still present within the bottom of test pits. Therefore, if deeper excavations can be made during development, it is likely our estimated quantity is modest. Although ranked #1 in the average total rank, it is our overall opinion that Site #3 is the second-best gravel resource location within the study.

### **8.2 Site #5 Gravel Deposits W of Rockyford (Cuny Table)**

Of all sites explored in this study, Site #5 contains the least amount of gravel based upon our soil borings. As anticipated, Medicine Root gravels were encountered at the site, however, not with nearly sufficient quantity to warrant future development. When encountered, the silty gravel of the Medicine Root presents as few, thin 0.5 to 1-foot thick layers beneath 8 to 10 feet of overburden. Due to this, laboratory testing was not performed for Site #5 and we do not recommend seeking gravel pit permitting for the site.

### **8.3 Site #6 Gravel Deposits between Rockyford & Kyle**

Two gradation tests were performed on combined bulk samples from B-6 and B-7/B-10. For the sample from B-6, the percent passing ¾", No. 4 and No.8 sieves were out of specification limits, but marginal. For the combined B-7 and B-10 sample all gradation limits were within specification with exception of the percent passing ¾" sieve at 93% (100% limit). Both Plasticity Index tests resulted in a value of 1, not within SD DOT gravel surfacing specification. Additionally, the LA Abrasion result passes specification at 36.5% loss.

It is our opinion that should a gravel pit be planned at Site #6, the optimum location would be within the extents of an area encompassing Borings B-4, B-5, B-6 and B-7. Almost all factors considered are moderate; 8 feet of average overburden, an average of 29.8% gravel below overburden, a high passing LA Abrasion result and modest estimated tonnage. Additionally, access to the site would require negotiations with Todd O’Brian as the road to the site passes through his property south of the site. Based upon these factors and the ranking system used, it is our opinion Site #6 is tied with Site #22 and #24 for the rank of 6<sup>th</sup> in the study.

#### **8.4 Site #9 Gravel Deposits between Kyle & SW of Potato Creek (South)**

A total of two (2) gradation and Plasticity Index tests were performed for Site #9. For the gradation on B-1 & B-3, the percent passing the ¾” and No. 40 sieves were marginally out of specification for SD DOT gravel surfacing. For the gradation on B-8 & B-9, only the percent passing the ¾” sieve was out of specification, at 91% passing. The Plasticity Index of both samples were out of specification, with values of 1 and 2, respectively. The LA Abrasion performed on both samples combined resulted in a 34.0% loss, within the 40% maximum specification.

Based upon the distribution of overburden and estimated gravel percentage found in our borings, it is our opinion that if a future pit is proposed it should be located within the extents of Borings B-1 to B-9. Some mixing may occur with overburden, which could raise the low Plasticity Index with the introduction of overlying clay. According to our boring estimates, B-1 contained the most gravel with moderate overburden. With moderate overburden, moderate gravel percent below overburden, passing LA Abrasion result, near-passing gradation specifications, the largest area (if not combining the north and south areas of Site #10), and thus second highest estimated tonnage, it is our opinion that Site #9 is the third best location of the study.

#### **8.5 Site #10 Gravel Deposits E of Potato Creek**

Three (3) gradation samples were performed for Site #10, one in the north area and two in the south. Gradation results were nearly within SD DOT specification for gravel surfacing, with the exception of 97% passing the ¾” sieve (limit 100%), 70% passing the No. 8 sieve (limits 50-78%), and 38% passing the No. 40 sieve (limits 13-35%) for the north area. The Plasticity Index

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result was unfortunately non-plastic (NP), for the north area. In the south area (B-11 & B-12), gradation results were better, with the only limits marginally out of range being 98% passing the ¾” sieve (limit 100%), and 16.8% passing the No. 200 sieve (limits 4-15%). The Plasticity Index for B-11 & B-12 was within specification. The gradation for B-14 was nearly within specification, with only one marginal exception being 94% passing the ¾” sieve (limit 100%). The Plasticity Index for B-14 was marginally outside of specification, being 3 (limits 4-12). All three (3) gradation samples were combined to perform the LA Abrasion test for Site #10. The resulting percent loss was 29.9%, being the second best (lowest), result of the study.

Overall, it is our opinion Site #10 is the top candidate location of the study. This is primarily due to the general abundance and consistency of the Medicine Root gravel deposits encountered between borings, proximity to BIA 2, ease of access as the majority of the area is relatively flat and that the LA Abrasion results are the second highest ranking of the sites sampled and tested. The largest drawback at Site #10 is the average overburden depth, being approximately 12 feet (although it is beneficially consistent in the north). It should be noted that the AOI selected for the north area is focused toward the north, but it is our opinion the same gravels exist between the entire area between the north and south sites. Because of this, our quantity estimates are modest for the site.

Due to the general consistency of overburden and gravel percentage seen in the north area, when compared to the variability in the south area, it is our opinion future pits may be preferable in the north area. However, this is not to discount the south area, as both contain moderate to high gravel percentage and the southern area has gradation results closer to SD DOT gravel surfacing specifications. Borings B-5 and B-6 have the best combination of minimal overburden and gravel percentage encountered within the northern area. As previously mentioned, it is our opinion that if gravel pits are planned in the north area, locations near Borings B-5 and B-6 may be optimum.

### **8.6 Site #15 Qal Alluvium & Qt Terrace W of Oglala**

Overall, Site #15 has low to moderate gravel percentage below overburden. This lower percentage is primarily due to the presence of thicker non-gravel dominant layers within the gravel bearing intervals when compared to other sites. Additionally, the AOI sampled is

relatively small (less than 3 acres), although deposits may prevail further south, and the haul distance to BIA 2 is moderate (2.3 miles) along a flood/washout prone road. Although the gradation results were nearly within DOT specification limits (with the exception of 90% passing the ¾” sieve), the LAR test resulted in a non-passing value of 44%, with a non-plastic Plasticity Index result. It is our opinion that Site #15 ranks 7<sup>th</sup> given these factors and should be considered a low priority site.

### **8.7 Site #17 Gravel Deposits NE of Kyle**

Site #17 is unique within this study in that a large quantity of gravel with minimal overburden was encountered in a single boring, yet completely devoid within the rest. Additionally, the sample tested from Site #17 has the best (lowest), LAR result of any site, at 27.6% loss and the plasticity index falls within SD DOT specifications for gravel surfacing. The only limits outside the SD DOT specification are the gradation percent passing ¾”, No. 4 and No. 8 sieves, yet, are all marginal.

Based upon our lab tests on Boring B-1, Site #17 has one of the best “out of ground” results for SD DOT gravel surfacing specifications within the study. Although it cannot be correlated with other borings for estimated quantities, it is our opinion that the existing Sherelda Pit should expand east toward B-1 if permitting is possible. Given the site topography of the undeveloped area surrounding B-1, we estimate a minimum of approximately 1 additional acre that is likely to contain sufficient gravel. Using only the gravel percentage of B-1 and estimated 1-acre area, there could be up to an additional 19.1 acre-feet, or approximately 50,000 US short tons of gravel. Given these factors, Site #17 ranks 5<sup>th</sup> for the study.

### **8.8 Site #18 Unidentified Pit N of Oglala**

The AOI for Site #18 was approximately 9.1 acres, which would be appropriately sized for a standard small scale 10-acre permit. Another benefit is that it has relatively minimal overburden depth. However, based upon on lab test results, the LAR falls outside the SD DOT specification for gravel surfacing at 44.3% loss. Plasticity Index results do fall with specification for the two samples tested. As for the gradations (two samples were tested), sieve results were marginally out of specification for the ¾”, No. 8 and No. 200, and again the ¾”, No. 40 and No. 200 sieves, respectively. The No. 200 sieve limits were nearly double the specification limit max in both

gradations, confirming a high silt content at the site. According to our total ranking determination, Site #18 ranks as #4. Given the high, out of specification LA Abrasion result, it could be argued that Site #18 does not rank at all. However, it is our opinion that given that it is closest to some of the southern areas in most need of gravels in the study area near Oglala and Pine Ridge (where deposits are rare), it may still be considered for development.

### **8.9 Site #22 Terrace Deposits N of Sharps Corner**

In general, the soils and soil layering at Site #18 are highly variable according to our borings. For example, Boring B-4 consisted of predominantly gravel dominant soils whereas none were encountered in B-1. Additionally, the LAR result for Site #18 was outside of SD DOT gravel surfacing specifications at 47.1% loss, the highest observed within this study. Of the gradation sieve sizes on the two samples tested, the ¾”, No. 8, No. 40 and No. 200 limits were moderately to well outside SD DOT gravel surfacing specifications. However, plasticity Limits for both samples were within specification.

Overall, it is our opinion the “out of ground” condition of gravels at Site #18 and similar deposits are unlikely to meet or be close to meeting SD DOT gravel surfacing specifications and would require significant processing to do so. Primarily, due to the results of our LAR test, the gravels encountered are not durable. One benefit of Site #22 is the almost non-existent haul distance, as the site is located adjacent to BIA 27 in close proximity to Sharps Corner. According to our total site ranking system, Site #22 ties with Sites #24 and #6 for a rank of 6<sup>th</sup>.

### **8.10 Site #24 Area S of “Rockyford Pit”**

At Site #24 the gravel dominant interval is only significant in Borings B-4, B-6 and B-7, which are located on the eastern extents of the AOI. When only these borings are averaged, the gravel below overburden is 48.0%, with an average overburden depth of 8.2 feet. Given the location of two archaeological sites near the northwest of the AOI, this is a favorable outcome if any gravel pit is to be developed here. If developed it is our opinion the pit should be located within the eastern extents of the AOI, centered around Borings B-4, B-6 and B-7. When adjusted to the eastern extents, the site is estimated to encompass approximately 13.1 acres; an ideal size for the

standard 10-acre small scale mining permit. Haul distance is also minimal, being approximately  $\frac{3}{4}$  mile east of BIA 2 and inherently close to the highway junctions around Rockyford.

A single sample was combined from Borings B-4 and B-7 for lab testing. The LAR value of 39.0% loss is within the SD DOT limit for gravel surfacing, although marginal with the limit being 40.0%. The Plasticity Index is also within specification. For the gradation, the percent passing all but the  $\frac{3}{4}$ " sieve are within the SD DOT specification as well. Based upon this sample, some processing for oversize material of the “out of ground” gravels at Site #24 would be minimal to meet SD DOT specifications for gravel surfacing. According to our total site ranking system, Site #24 ties with Sites #22 and #6 for a rank of 6<sup>th</sup>.

## **9.0 LIMITATIONS**

Within the limitations of scope, budget, and schedule, our services have been conducted according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, either expressed or implied, is intended. Important information regarding risk management and proper use of this report is given in Appendix B entitled “Geotechnical Report Limitations and Guidelines for Use”.

**Report of Geotechnical Exploration and Review**

OST Gravel Pit Exploration – Phase II

Pine Ridge Indian Reservation, South Dakota

November 7, 2019

Report No. 17-20132

AMERICAN  
ENGINEERING  
TESTING, INC.

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# **Appendix A**

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AET Project No. 17-20132

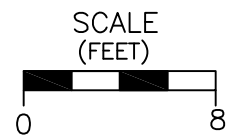
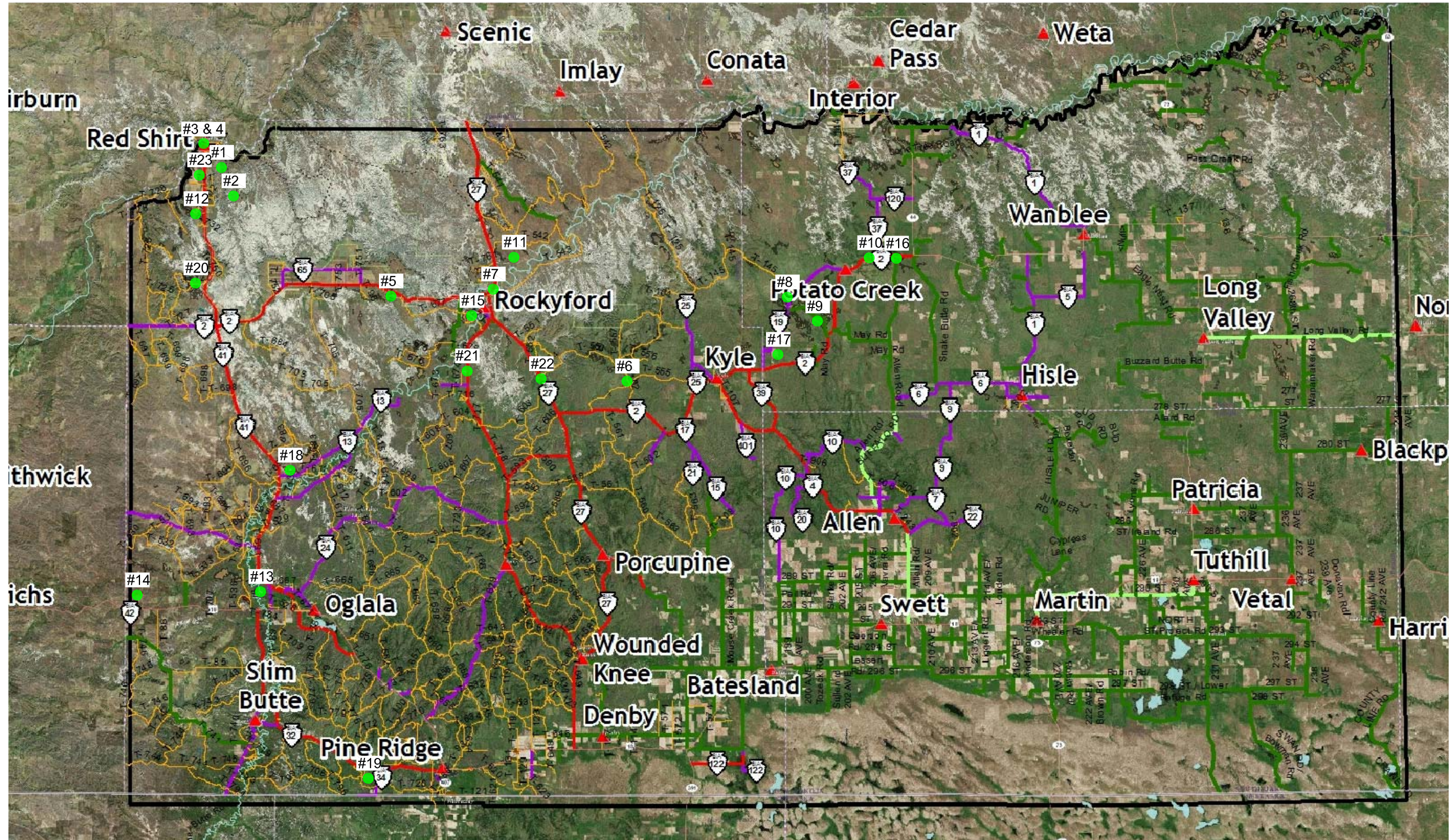
Reservation Site Location Map

Boring Location Maps

Boring Logs

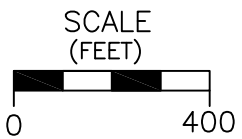
Gradation Test Results (18)

LAR Test Results (9)



|   |                 |                         |  |
|---|-----------------|-------------------------|--|
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| SUBJECT:<br>RESERVATION SITE SELECTIONS MAP |                 | DATE:                   |  |
| SCALE:<br>1 INCH = 8 MILES                  | DRAWN BY:<br>JR | REVIEWED BY:<br>WF      |  |

# #3 RED SHIRT TABLE NW QAL ALLUVIUM & QT TERRACE DEPOSITS



- |                  |                                 |                      |
|------------------|---------------------------------|----------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                      |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam  |
| Allotted         | Quaternary Terrace Deposits     | AOI                  |
| Private          | Quaternary Alluvium             | UPDATED AOI BOUNDARY |

PROJECT: OST GRAVEL PIT EXPLORATION – SITE #3  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
TEST PIT LOCATION MAP

DATE:  
NOVEMBER 6, 2019

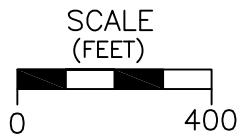
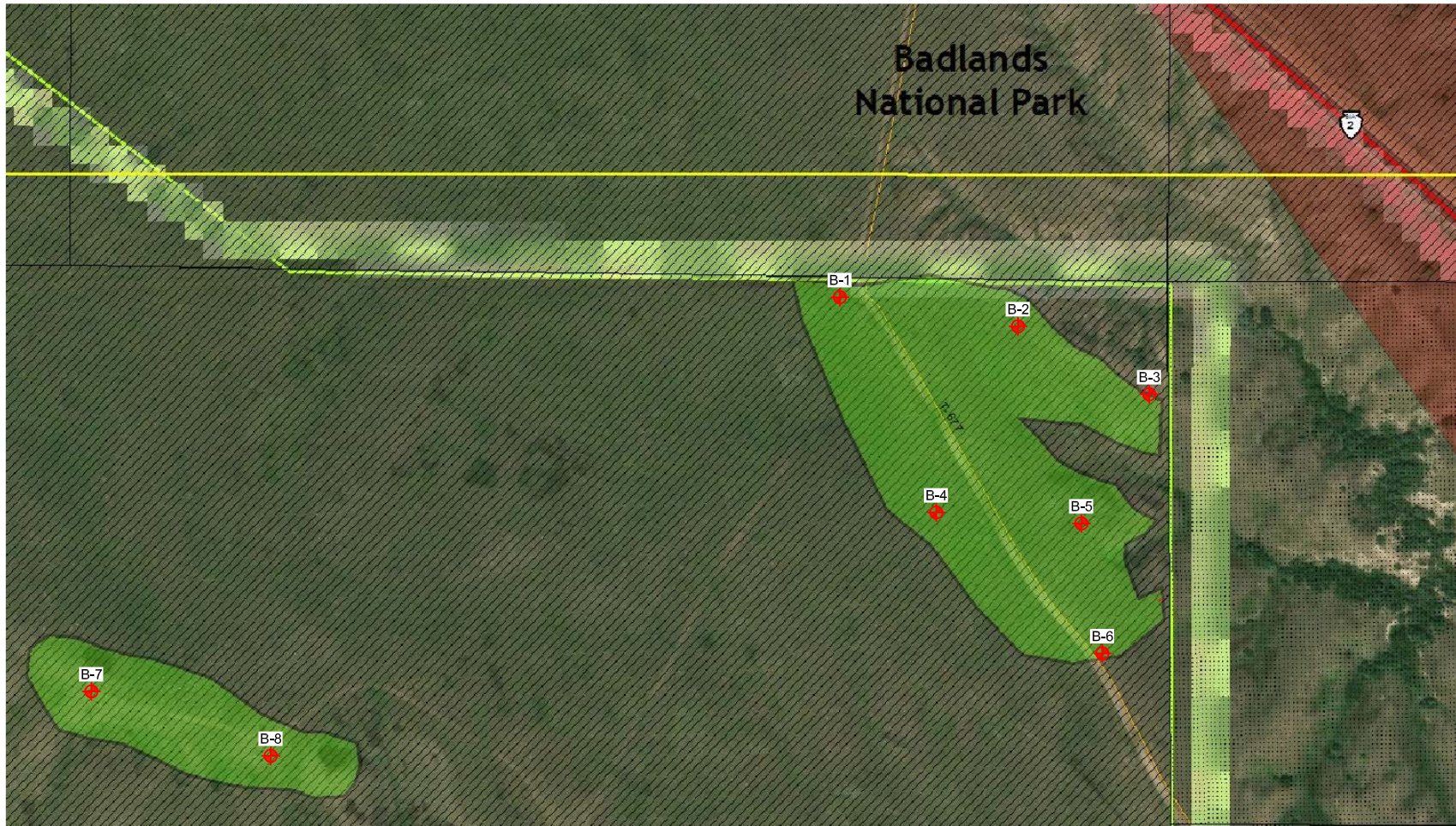
SCALE:  
1 INCH = 400 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF



# #5 GRAVEL DEPOSITS W OF ROCKYFORD (CUNY TABLE)



- |                  |                                 |                     |
|------------------|---------------------------------|---------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                     |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam |
| Allotted         | Quaternary Terrace Deposits     | AOI                 |
| Private          | Quaternary Alluvium             |                     |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #5  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

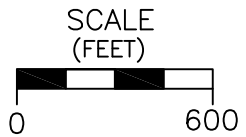
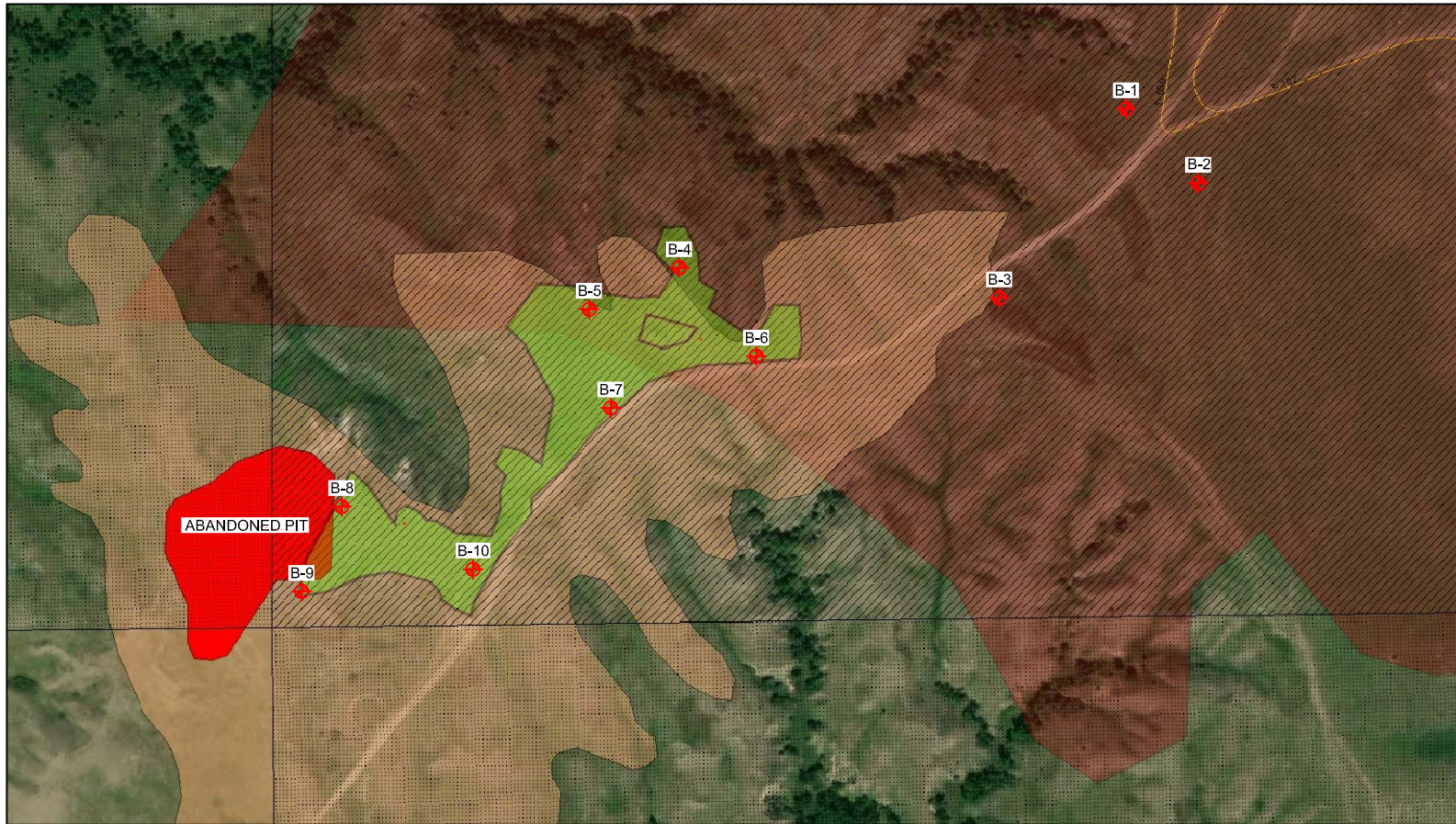
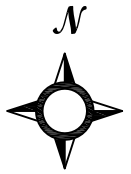
DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 400 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF

# #6 GRAVEL DEPOSITS BETWEEN ROCKYFORD & KYLE



| Land Type | Surface Geology                 |                     |
|-----------|---------------------------------|---------------------|
| Tribal    | "Medicine Root" Gravel Deposits | NHill Gravelly Loam |
| Allotted  | Quaternary Terrace Deposits     | AOI                 |
| Private   | Quaternary Alluvium             |                     |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #6  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

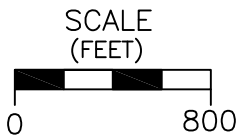
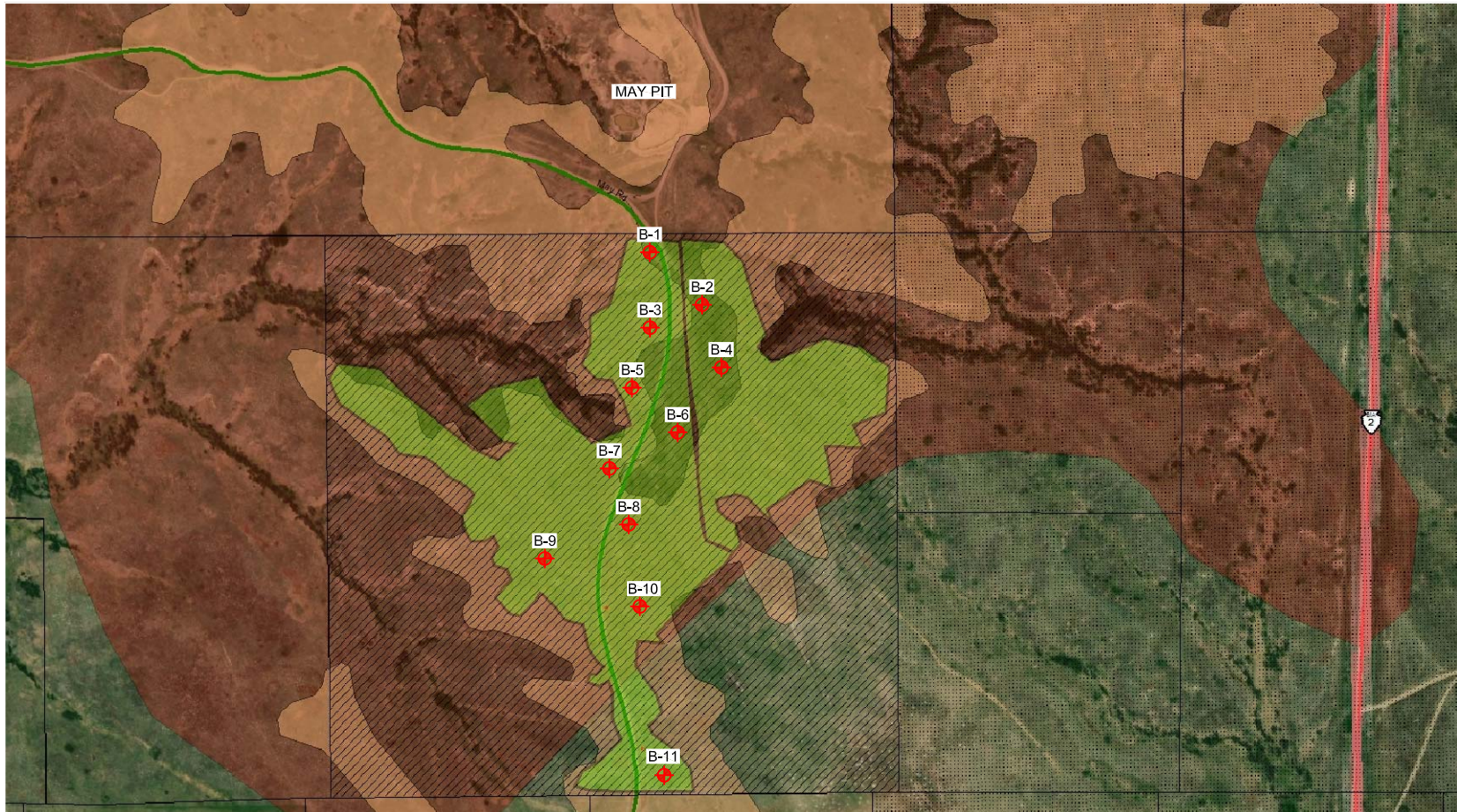
DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 600 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF

# #9 GRAVEL DEPOSITS BETWEEN KYLE & SW OF POTATO CREEK (S)



- |                  |                                 |                     |
|------------------|---------------------------------|---------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                     |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam |
| Allotted         | Quaternary Terrace Deposits     | AOI                 |
| Private          | Quaternary Alluvium             |                     |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #9  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

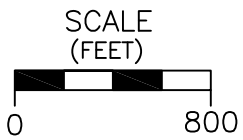
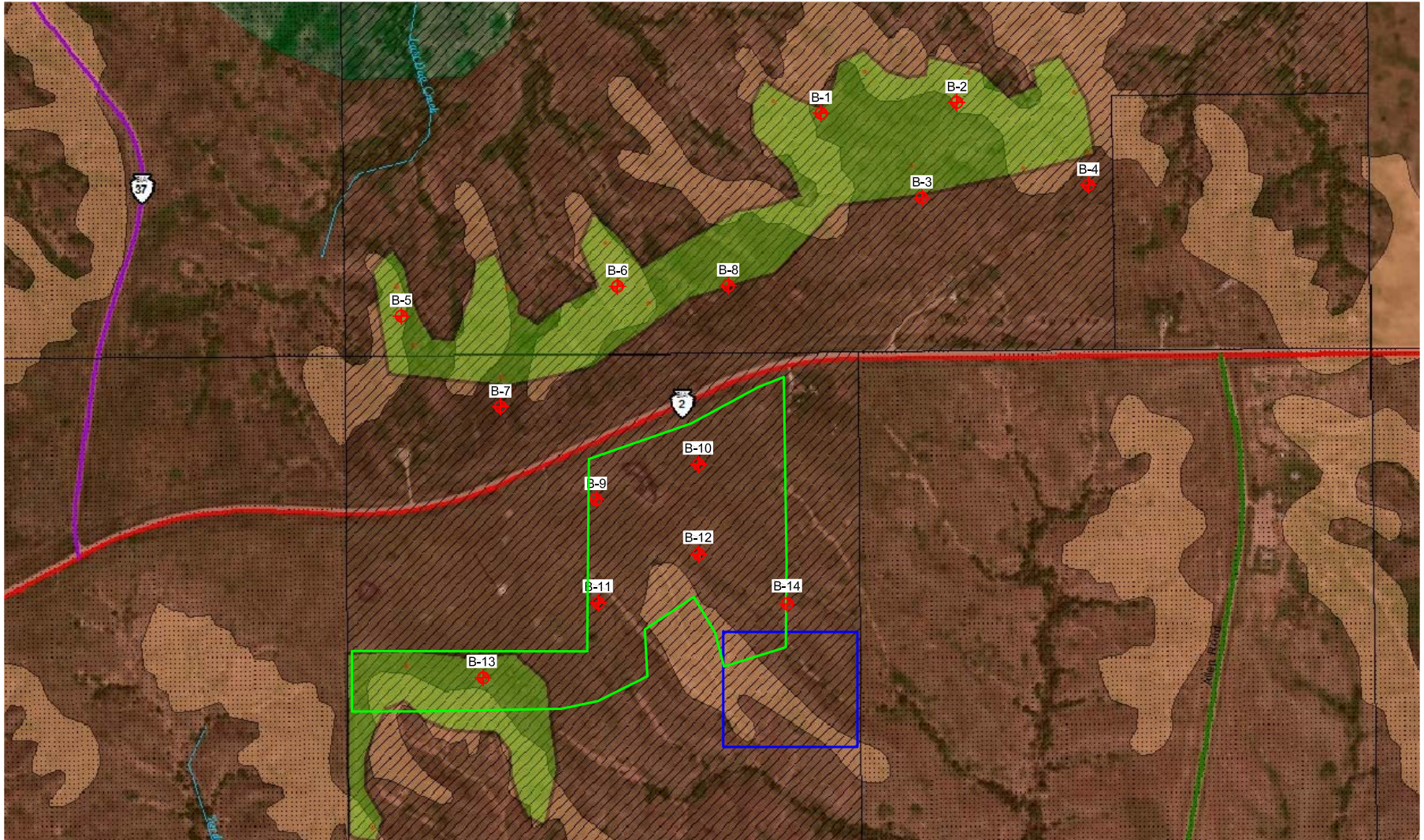
DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 800 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF

# #10 GRAVEL DEPOSITS E OF POTATO CREEK



| Land Type | Surface Geology                 |                         |
|-----------|---------------------------------|-------------------------|
| Tribal    | "Medicine Root" Gravel Deposits | NHill Gravelly Loam     |
| Allotted  | Quaternary Terrace Deposits     | AOI                     |
| Private   | Quaternary Alluvium             | PROPOSED DOT GRAVEL PIT |
|           |                                 | UPDATED AOI BOUNDARY    |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #10  
PINE RIDGE INDIAN RESERVATION

PROJECT NO. 17-20132

SUBJECT: BORING LOCATION MAP

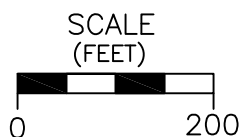
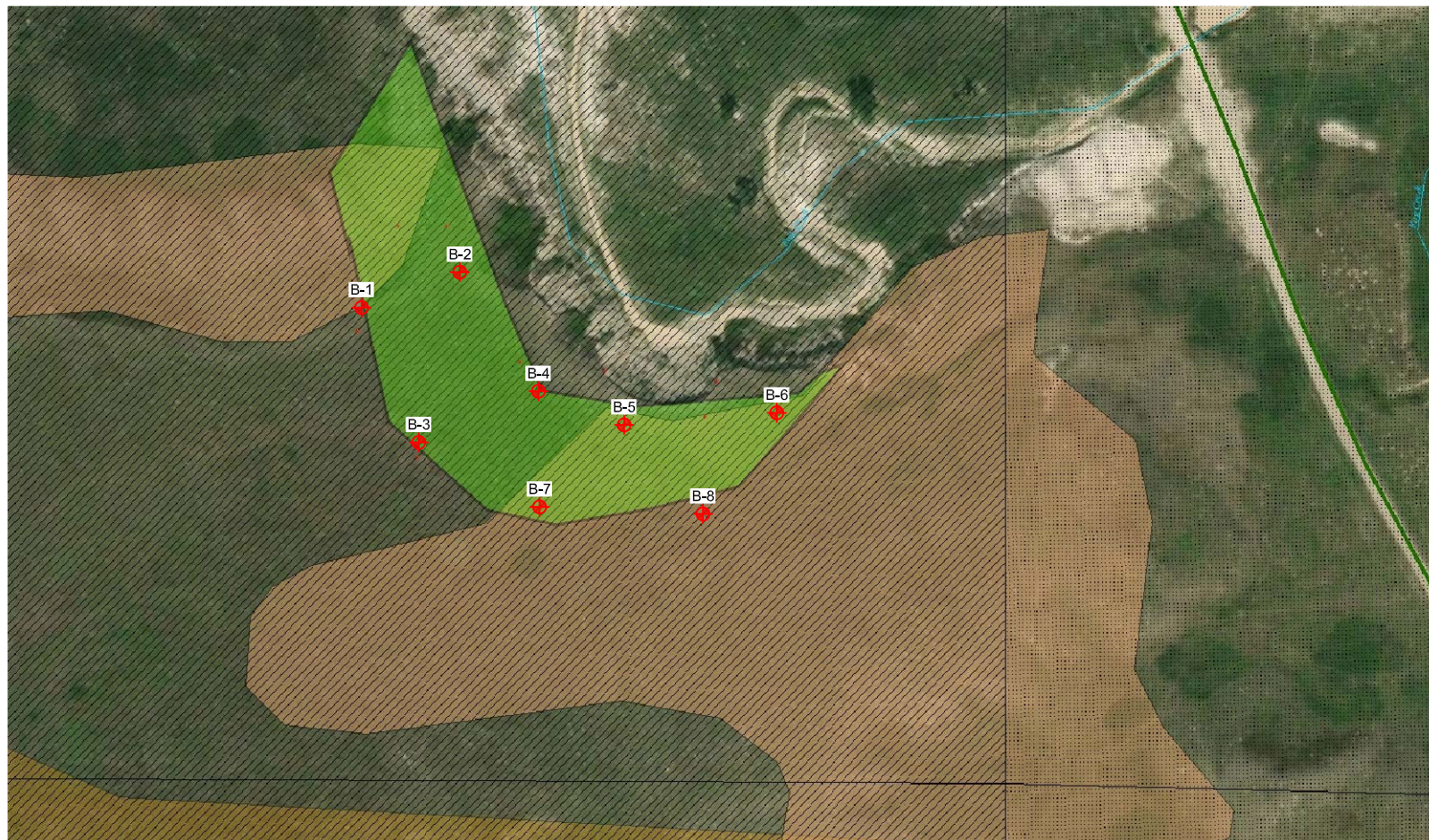
DATE: NOVEMBER 6, 2019

SCALE: 1 INCH = 800 FEET

DRAWN BY: JR

REVIEWED BY: WF

# #15 QAL ALLUVIUM & QT TERRACE DEPOSITS SW OF ROCKYFORD



- |                  |                                 |                     |
|------------------|---------------------------------|---------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                     |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam |
| Allotted         | Quaternary Terrace Deposits     | AOI                 |
| Private          | Quaternary Alluvium             |                     |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #15  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

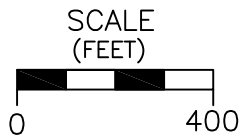
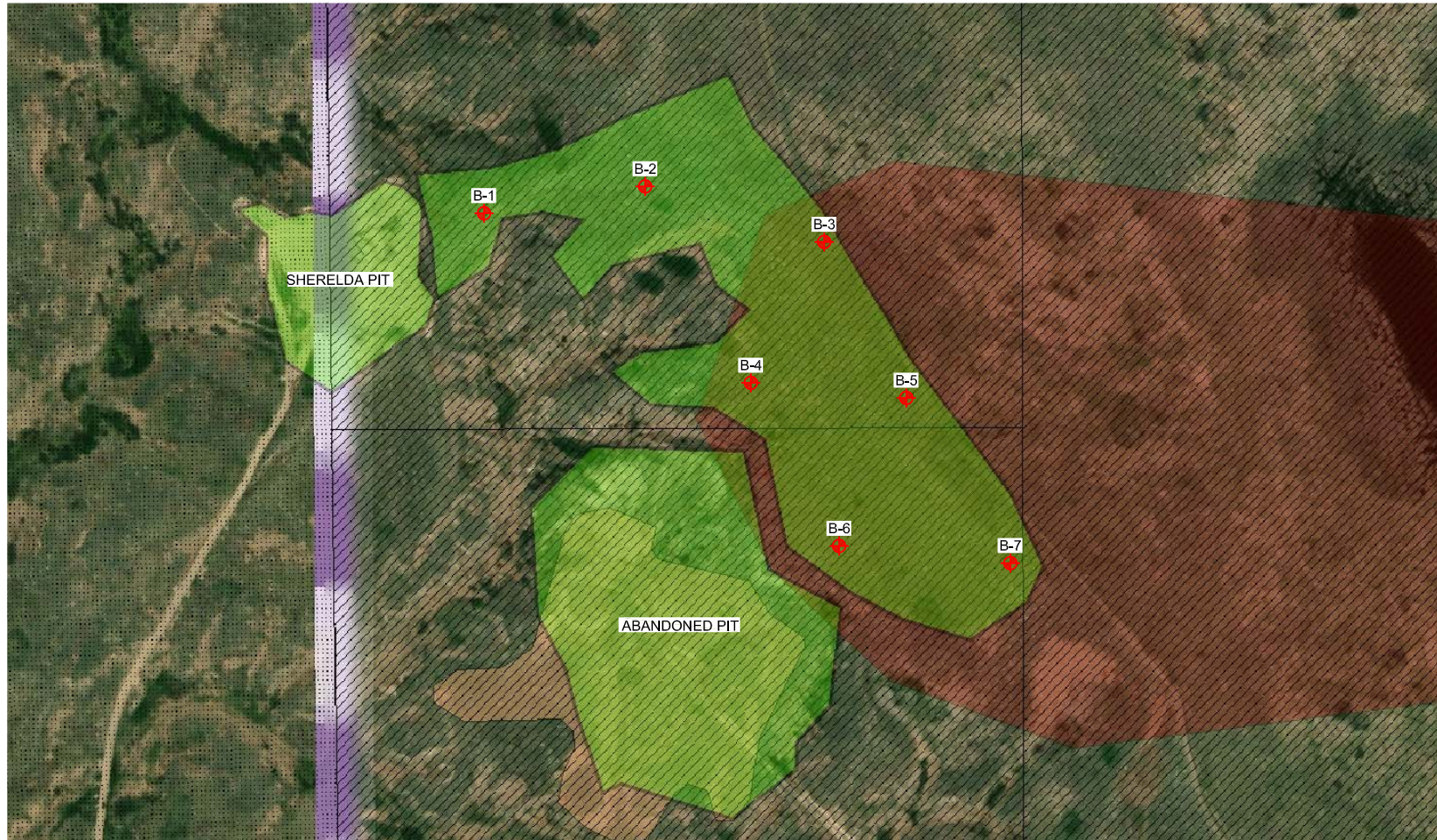
DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 200 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF

# #17 GRAVEL DEPOSITS NE OF KYLE



- |                  |                                 |                     |
|------------------|---------------------------------|---------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                     |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam |
| Allotted         | Quaternary Terrace Deposits     | AOI                 |
| Private          | Quaternary Alluvium             |                     |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #17  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

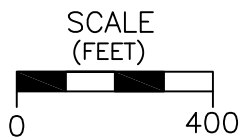
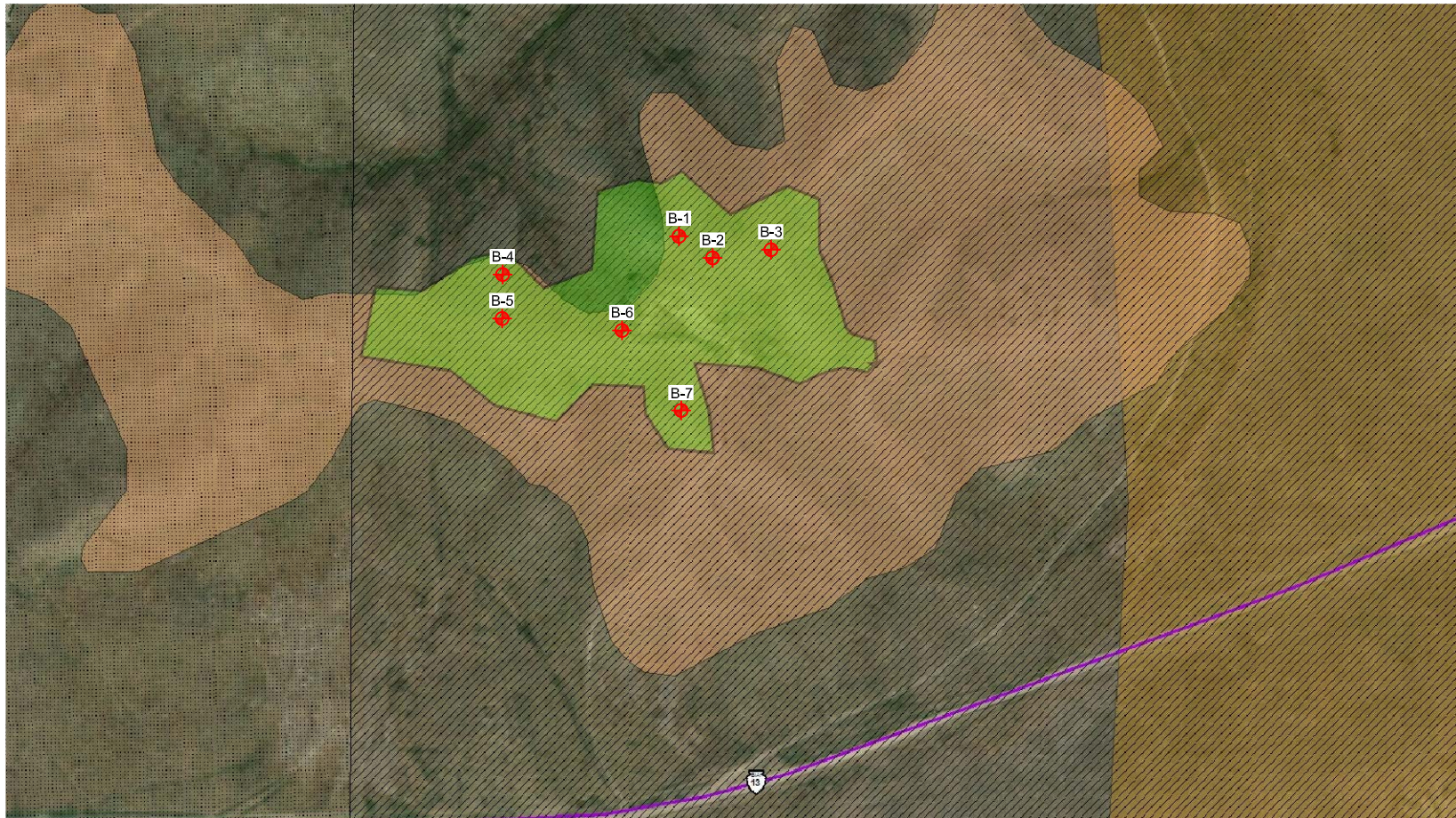
DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 400 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF

# #18 UNIDENTIFIED PIT N OF OGLALA



- |                  |                                 |                     |
|------------------|---------------------------------|---------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                     |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam |
| Allotted         | Quaternary Terrace Deposits     | AOI                 |
| Private          | Quaternary Alluvium             |                     |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #18  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

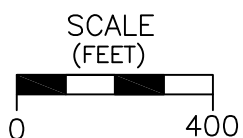
DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 400 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF

# #22 QT TERRACE DEPOSITS N OF SHARPS CORNER



- | Land Type |          | Surface Geology |                                 |
|-----------|----------|-----------------|---------------------------------|
|           | Tribal   |                 | "Medicine Root" Gravel Deposits |
|           | Allotted |                 | Quaternary Terrace Deposits     |
|           | Private  |                 | Quaternary Alluvium             |
|           |          |                 | NHill Gravelly Loam             |
|           |          |                 | AOI                             |

PROJECT: OST GRAVEL PIT EXPLORATION – SITE #22  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

DATE:  
NOVEMBER 6, 2019

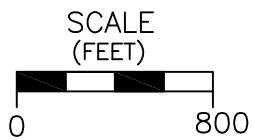
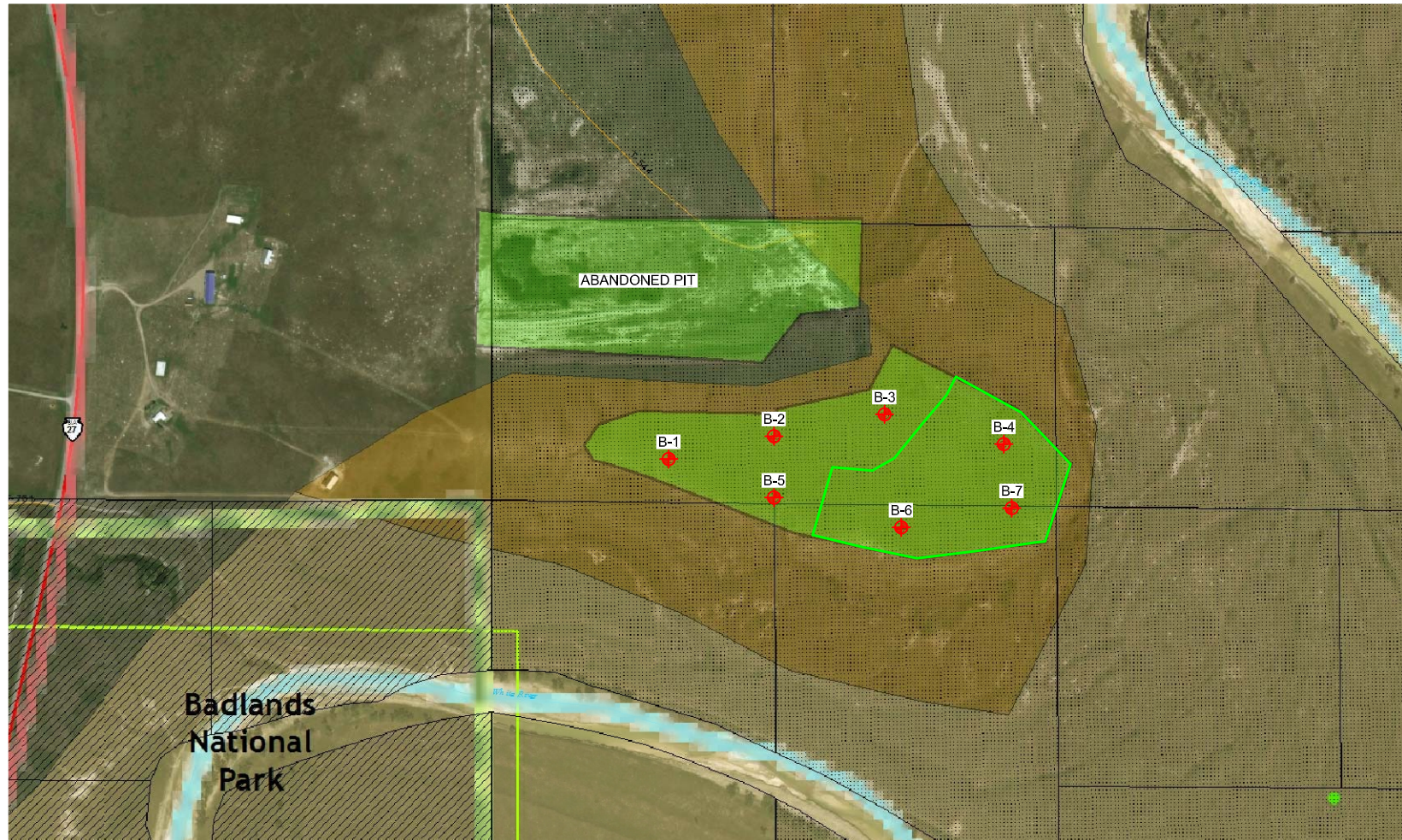
SCALE:  
1 INCH = 400 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF



# #24 ROCKYFORD PIT



- |                  |                                 |                      |
|------------------|---------------------------------|----------------------|
| <b>Land Type</b> | <b>Surface Geology</b>          |                      |
| Tribal           | "Medicine Root" Gravel Deposits | NHill Gravelly Loam  |
| Allotted         | Quaternary Terrace Deposits     | AOI                  |
| Private          | Quaternary Alluvium             | UPDATED AOI BOUNDARY |



PROJECT: OST GRAVEL PIT EXPLORATION – SITE #24  
PINE RIDGE INDIAN RESERVATION

PROJECT NO.  
17-20132

SUBJECT:  
BORING LOCATION MAP

DATE:  
NOVEMBER 6, 2019

SCALE:  
1 INCH = 800 FEET

DRAWN BY:  
JR

REVIEWED BY:  
WF



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132** LOG OF BORING NO. **TP-1 (p. 1 of 1)**  
 PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION   | GEOLOGY                                      | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------|--|--|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|
|               |  |  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |
| 1             | <b>TOPSOIL</b> , Sandy Lean Clay with gravel and organics, brown<br><b>SANDY GRAVEL</b> , brown (GP)   | <b>TOPSOIL</b><br><b>QUATERNARY ALLUVIUM</b> |   |    |             |         |                          |     |    |    |        |  |
| 2             |  |  |   |    |             |         |                          |     |    |    |        |  |
| 3             | <b>SILTY SAND</b> , brown (SM)<br><b>SANDY GRAVEL</b> , brown (GP)<br><b>SILTY SAND</b> , brown (SM)<br><b>SANDY GRAVEL</b> with cobbles, brown (GP) |  |   |    |             |         |                          |     |    |    |        |  |
| 4             |  |  |   |    |             |         |                          |     |    |    |        |  |
| 5             |  |  |   |    |             |         |                          |     |    |    |        |  |
| 6             |  |  |   |    |             |         |                          |     |    |    |        |  |
| 7             | Bottom of Test Pit due to Water/Caving   |  |   |    |             |         |                          |     |    |    |        |  |

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>7.0</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>15:00</b> | <b>7.0</b>    | <b>NA</b>    | <b>7.0</b>    | <b>NA</b>            | <b>7.0</b>  |  |
|                                       |                 |                          |              |               |              |               |                      |             |  |
|                                       |                 |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |             |  |

AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION                                    | GEOLOGY                                      | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|---|--|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |   |  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, dark brown<br><b>GRAVELLY SAND</b> , brown (SP) | <b>TOPSOIL</b><br><b>QUATERNARY ALLUVIUM</b> |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 3             |   |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |   |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |   |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             | <b>GRAVELLY SAND</b> with a few cobbles, brown (SP)   |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |   |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
|               | Bottom of Test Pit due to Water/Caving  |  |   |    |             |         |                          |     |    |    |        |  |  |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:            | DRILLING METHOD         | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|-------------------|-------------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                   |                         | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>8.0</b>        | <b>Backhoe</b>          | <b>1/17/19</b>           | <b>15:35</b> | <b>8.0</b>    | <b>NA</b>    | <b>7.5</b>    | <b>NA</b>            | <b>7.5</b>  |  |
| BORING COMPLETED: | <b>1/17/19</b>          |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b>     | LG: <b>Rig: Backhoe</b> |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |
|               | <b>TOPSOIL</b> , Sandy Lean Clay with organics, brown        | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |
| 1             | <b>CLAYEY SAND</b> , light brown (SC)                        | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |
| 2             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 4             | <b>GRAVELLY SAND</b> , brown (SP)                            |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 5             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 6             | <b>GRAVELLY SAND</b> , brown (SP)                            |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 7             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 8             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    |             |         |                          |     |    |    |        |  |  |
|               | Bottom of Test Pit due to Water/Caving                       |                     |   |    |             |         |                          |     |    |    |        |  |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>8.0</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>16:10</b> | <b>8.0</b>    | <b>NA</b>    | <b>7.0</b>    | <b>NA</b>            | <b>7.5</b>  |  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132** LOG OF BORING NO. **TP-4 (p. 1 of 1)**  
 PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |
| 1             | <b>SILTY GRAVEL</b> with cobbles, brown (GM)                 | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |
| 2             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 3             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    | BAG         |         |                          |     |    |    |        |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |
|               | Bottom of Test Pit due to Water/Caving                       |                     |   |    |             |         |                          |     |    |    |        |  |

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |             |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|--|-------------|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL |  | WATER LEVEL |
| <b>6.5</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>14:45</b> | <b>6.5</b>    | <b>NA</b>    | <b>6.0</b>    | <b>NA</b>            |  | <b>6.0</b>  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |  |             |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |  |             |

AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |
| 1             | TOPSOIL, Sandy Lean Clay with organics, brown                | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |
|               | GRAVELLY SAND, brown (SP)                                    | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |
| 2             | SANDY GRAVEL with cobbles, brown (GP)                        |                     |   |    |             |         |                          |     |    |    |        |  |
| 3             | GRAVELLY SAND, brown (SP)                                    |                     |   |    |             |         |                          |     |    |    |        |  |
|               | SANDY GRAVEL with cobbles, brown (GP)                        |                     |   |    |             |         |                          |     |    |    |        |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 7             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 8             | GRAVELLY SAND, brown (SP)                                    |                     |   |    |             |         |                          |     |    |    |        |  |
|               | SANDY GRAVEL with cobbles, brown (GP)                        |                     |   |    |             |         |                          |     |    |    |        |  |
| 9             | Bottom of Test Pit due to Water/Caving                       |                     |   |    |             |         |                          |     |    |    |        |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |             |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|--|-------------|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL |  | WATER LEVEL |
| <b>9.0</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>16:40</b> | <b>9.0</b>    | <b>NA</b>    | <b>8.0</b>    | <b>NA</b>            |  | <b>8.5</b>  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |  |             |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |  |             |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |
| 1             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 | QUATERNARY ALLUVIUM |   |    | BAG         |         |                          |     |    |    |        |
| 2             |  |                     |   |    |             |         |                          |     |    |    |        |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |
|               | Bottom of Test Pit due to Water/Caving                       |                     |   |    |             |         |                          |     |    |    |        |

AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>6.0</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>14:25</b> | <b>6.0</b>    | <b>NA</b>    | <b>6.0</b>    | <b>NA</b>            | <b>5.7</b>  |  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |
|               | <b>TOPSOIL</b> , Sandy Lean Clay with organics, brown        | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |
| 1             | <b>GRAVELLY SAND</b> , brown (SP)                            | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |
| 2             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    |             |         |                          |     |    |    |        |  |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |
| 5             | <b>GRAVELLY SAND</b> , brown (SP)                            |                     |   |    |             |         |                          |     |    |    |        |  |
| 6             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    |             |         |                          |     |    |    |        |  |
| 7             | <b>GRAVELLY SAND</b> , brown (SP)                            |                     |   |    |             |         |                          |     |    |    |        |  |
| 8             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)                 |                     |   |    |             |         |                          |     |    |    |        |  |
| 9             | Bottom of Test Pit due to Water/Caving                       |                     |   |    |             |         |                          |     |    |    |        |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |             |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|--|-------------|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL |  | WATER LEVEL |
| <b>9.0</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>17:10</b> | <b>9.0</b>    | <b>NA</b>    | <b>8.0</b>    | <b>NA</b>            |  | <b>8.5</b>  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |  |             |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |  |             |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-8 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION    | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |
|---------------|---|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|
|               |   |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |
|               | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown           | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |
| 1             | <b>SANDY LEAN CLAY</b> , brown (CL)                             | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |
| 2             |   |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 3             | <b>SANDY GRAVEL</b> with cobbles and a few boulders, brown (GP) |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 4             |   |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 5             |   |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 6             |   |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 7             | <b>SAND</b> with gravel, brown-gray (SP)                        |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 8             |   |                     |   |    |             |         |                          |     |    |    |        |  |  |
| 9             | <b>SANDY GRAVEL</b> with cobbles and a few boulders, brown (GP) |                     |   |    |             |         |                          |     |    |    |        |  |  |
|               | Bottom of Test Pit due to Water/Caving                          |                     |   |    |             |         |                          |     |    |    |        |  |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>9.0</b>                            | <b>Backhoe</b>  | <b>1/17/19</b>           | <b>14:00</b> | <b>9.0</b>    | <b>NA</b>    | <b>9.0</b>    | <b>NA</b>            | <b>8.8</b>  |  |
|                                       |                 |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/17/19</b>      |                 |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-9 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION                          | GEOLOGY                                      | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------|---|--|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|
|               |   |  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown<br><b>SILTY SAND</b> , tan (SM) | <b>TOPSOIL</b><br><b>QUATERNARY ALLUVIUM</b> |   |    |             |         |                          |     |    |    |        |  |
| 2             |   |  |   |    |             |         |                          |     |    |    |        |  |
| 3             |   |  |   |    |             |         |                          |     |    |    |        |  |
| 4             |   |  |   |    |             |         |                          |     |    |    |        |  |
| 5             |   |  |   |    |             |         |                          |     |    |    |        |  |
| 6             |   |  |   |    |             |         |                          |     |    |    |        |  |
| 7             | <b>GRAVELLY SAND</b> with a few cobbles, brown (SP)                                   |  |   |    |             |         |                          |     |    |    |        |  |
| 8             |   |  |   |    |             |         |                          |     |    |    |        |  |
| 9             | Bottom of Test Pit due to Water/Caving  |  |   |    |             |         |                          |     |    |    |        |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |             |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|--|-------------|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL |  | WATER LEVEL |
| <b>9.0</b>                            | <b>Backhoe</b>  | <b>1/31/19</b>           | <b>13:10</b> | <b>9.0</b>    | <b>NA</b>    | <b>9.0</b>    | <b>NA</b>            |  | <b>9.0</b>  |
|                                       |                 |                          |              |               |              |               |                      |  |             |
| BORING COMPLETED: <b>1/31/19</b>      |                 |                          |              |               |              |               |                      |  |             |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |  |             |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-10 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION       | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
|               | <b>TOPSOIL</b> , Silty Lean Clay with organics, tan                | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |  |
| 1             | <b>SILTY SAND</b> , brown-tan (SM)                                 | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             | <b>SANDY SILT</b> , brown (ML)                                     |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             | <b>SANDY GRAVEL</b> , brown (GP)                                   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SILTY SAND</b> , brown (SM)<br><b>SANDY GRAVEL</b> , brown (GP) |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
|               | Bottom of Test Pit due to Water/Caving                             |                     |   |    |             |         |                          |     |    |    |        |  |  |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |             |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|--|-------------|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL |  | WATER LEVEL |
| <b>9.5</b>                            | <b>Backhoe</b>  | <b>1/31/19</b>           | <b>14:00</b> | <b>9.5</b>    | <b>NA</b>    | <b>9.0</b>    | <b>NA</b>            |  | <b>9.5</b>  |
|                                       |                 |                          |              |               |              |               |                      |  |             |
| BORING COMPLETED: <b>1/31/19</b>      |                 |                          |              |               |              |               |                      |  |             |
| DR: <b>JR</b> LG: RIG: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |  |             |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-11 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION                          | GEOLOGY                                      | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |
|---------------|---|--|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|
|               |   |  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown<br><b>SANDY SILT</b> , tan (ML) | <b>TOPSOIL</b><br><b>QUATERNARY ALLUVIUM</b> |   |    |             |         |                          |     |    |    |        |  |  |
| 2             |   |  |   |    |             |         |                          |     |    |    |        |  |  |
| 3             |   |  |   |    |             |         |                          |     |    |    |        |  |  |
| 4             |   |  |   |    |             |         |                          |     |    |    |        |  |  |
| 5             | <b>SANDY GRAVEL</b> , brown (GP)  |  |   |    |             |         |                          |     |    |    |        |  |  |
| 6             |   |  |   |    |             |         |                          |     |    |    |        |  |  |
| 7             | <b>GRAVELLY SAND</b> , brown (SP)   |  |   |    |             |         |                          |     |    |    |        |  |  |
| 8             |   |  |   |    |             |         |                          |     |    |    |        |  |  |
| 9             | <b>SANDY GRAVEL</b> , brown (GP)  |  |   |    |             |         |                          |     |    |    |        |  |  |
| 10            | Bottom of Test Pit due to Water/Caving  |  |   |    |             |         |                          |     |    |    |        |  |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>10.0</b>                           | <b>Backhoe</b>  | <b>1/31/19</b>           | <b>15:15</b> | <b>10.0</b>   | <b>NA</b>    | <b>9.5</b>    | <b>NA</b>            | <b>9.5</b>  |  |
|                                       |                 |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/31/19</b>      |                 |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **TP-12 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #3**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION                          | GEOLOGY                        | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|---|--------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |   |                                |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown<br><b>SANDY SILT</b> , tan (ML) | TOPSOIL<br>QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SANDY GRAVEL</b> , brown (GP)  |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 3             |   |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             | <b>SILTY SAND</b> , tan (SM)  |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             | <b>SANDY GRAVEL</b> with cobbles, brown   |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |   |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             | <b>SILTY SAND</b> , tan (SM)  |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SANDY GRAVEL</b> with cobbles, brown (GP)  |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |   |                                |   |    |             |         |                          |     |    |    |        |  |  |  |
|               | Bottom of Test Pit due to Water/Caving  |                                |   |    |             |         |                          |     |    |    |        |  |  |  |

BAG



AET\_CORP 17-20132 SITE #3.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                | DRILLING METHOD | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------------------|-----------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|                                       |                 | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>9.5</b>                            | <b>Backhoe</b>  | <b>1/31/19</b>           | <b>12:30</b> | <b>9.5</b>    | <b>NA</b>    | <b>9.0</b>    | <b>NA</b>            | <b>9.0</b>  |  |
| BORING COMPLETED: <b>1/31/19</b>      |                 |                          |              |               |              |               |                      |             |  |
| DR: <b>JR</b> LG: Rig: <b>Backhoe</b> |                 |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with sand and trace roots, brown (ML)              | EOLIAN<br>DEPOSITS                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   | <b>SILTY SAND</b> tan (SM)                                     | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                        |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  | <b>SILTY SAND</b> , tan (SM)                                   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                        |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  | <b>SILTY SAND</b> , tan (SM)                                   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |  |  |   |    | M              | CS         | 60                       |     |    |    |        |  |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/15/19</b>           | <b>9:42</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/15/19</b>          |                  |                          |             |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY                       | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |  |  |
|---------------------|--|-------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|--|--|--|
|                     |  |                               |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL                       |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
|                     | <b>SAND</b> with silt, tan (SW-SM)                             | EOLIAN DEPOSITS               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 2                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 3                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 4                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 5                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 6                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 7                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 8                   | <b>SILTY SAND</b> , tan (SM)                                   | MEDICINE ROOT GRAVEL DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 9                   | <b>SILTY GRAVEL</b> with sand, tan (GM)                        |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 10                  | <b>SILTY SAND</b> , tan (SM)                                   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 11                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 12                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 13                  | <b>SILTY SAND</b> with a little gravel, tan (SM)               |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 14                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 15                  | <b>SILTY SAND</b> , tan (SM)                                   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 16                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 17                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 18                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 19                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |
| 20                  | Bottom of Boring   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/15/19</b>           | <b>11:53</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/15/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |  |  |
| 1             | TOPSOIL, Silty Lean Clay with organics, brown    | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 2             | SILTY SAND, brown (SM)                           | EOLIAN DEPOSITS               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 2             | SILTY GRAVEL with sand, tan (GM)                 | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 3             | SILTY SAND, tan (SM)                             |                               | M |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 8             | SILTY GRAVEL with sand, tan (GM)                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 9             | SILTY SAND, tan (SM)                             |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 20            | Bottom of Boring                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                    | DRILLING METHOD | WATER LEVEL MEASUREMENTS |       |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---------------------------|-----------------|--------------------------|-------|---------------|--------------|---------------|----------------------|-------------|--|
|                           |                 | DATE                     | TIME  | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| 20.0                      | 4.25" HSA       | 7/15/19                  | 13:00 | 20.0          | 20.0         | NA            | NA                   | None        |  |
| BORING COMPLETED: 7/15/19 |                 |                          |       |               |              |               |                      |             |  |
| DR: ES LG: BB Rig: RC-2   |                 |                          |       |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY SAND</b> with trace organics, brown (SM)              | EOLIAN DEPOSITS               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             | <b>SILTY GRAVEL</b> with sand, tan (GM)                        | MEDICINE ROOT GRAVEL DEPOSITS |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             | <b>SILTY SAND</b> , tan (SM)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    | M           | CS      | 60                       |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    | M           | CS      | 60                       |     |    |    |        |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/15/19</b>           | <b>10:36</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/15/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|---|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |   |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, dark brown | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> with a little gravel, tan (SM)      | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 8                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SILTY GRAVEL</b> with sand, tan (GM)               |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  | <b>SILTY SAND</b> , tan (SM)                          |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 13                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 19                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring                                      |  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/12/19</b>           | <b>9:47</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/12/19</b>          |                  |                          |             |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION  | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
|                     | <b>TOPSOIL</b> , Silty Sand with organics, brown  | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 1                   | <b>SILTY SAND</b> with trace organics, brown (SM) | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   |   |  | M | CS | 60             |            |                          |     |    |    |        |  |  |  |  |
| 3                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  | <b>SILTY SAND</b> , brown (SM)                    |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| Bottom of Boring    |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/12/19</b>           | <b>10:35</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/12/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY           | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |  |
|---------------------|--|-------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|--|--|
|                     |  |                   |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL           |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 2                   | <b>SILTSTONE</b> , Silt, brown-tan (ML)                        | WHITE RIVER GROUP |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |
| 3                   |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 4                   |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 5                   |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 6                   |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 7                   |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 8                   |  |                   |   |    |                | M          | CS                       | 60  |    |    |        |  |  |  |  |  |  |
| 9                   |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 10                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 11                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 12                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 13                  |  |                   |   |    |                | M          | CS                       | 60  |    |    |        |  |  |  |  |  |  |
| 14                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 15                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 16                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 17                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 18                  |  |                   |   |    |                | M          | CS                       | 60  |    |    |        |  |  |  |  |  |  |
| 19                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 20                  |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| Bottom of Boring    |  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/12/19</b>           | <b>12:40</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/12/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #5;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY                       | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |  |  |  |
|---------------------|---|-------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|--|--|--|--|
|                     |   |                               |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown | TOPSOIL                       |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 2                   | <b>SILTY SAND</b> , brown (SM)                        | EOLIAN DEPOSITS               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 3                   |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 4                   | <b>SAND</b> , tan (SW)                                | MEDICINE ROOT GRAVEL DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 5                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 6                   | <b>SILTY GRAVEL</b> with sand, tan (GM)               |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 7                   | <b>SAND</b> , tan (SW)                                |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 8                   | <b>SILTSTONE</b> , Silt, brown-tan (ML)               | WHITE RIVER GROUP             |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 9                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 10                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 11                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 12                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 13                  |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 14                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 15                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 16                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 17                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 18                  |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 19                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| 20                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |
| Bottom of Boring    |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |  |  |

AET CORP 17-20132 SITE #5.GPJ AET+CPT+WELL.GDT 8/6/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/12/19</b>           | <b>14:00</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>7/12/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             | <b>SILT</b> , tan (ML)                                       |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            | <b>SILTY SAND</b> , tan (SM)                                 | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>2/13/19</b>           | <b>14:00</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/13/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with trace organics, brown-tan (ML)              | EOLIAN<br>DEPOSITS                     |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SILT</b> , tan (ML)                                       |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  | <b>SILTY SAND</b> , tan (SM)                                 | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>2/13/19</b>           | <b>13:05</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING<br>COMPLETED: <b>2/13/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET    | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |
|------------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|
|                  |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |
| 1                | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                       |   |    | CS          | 60      |                          |     |    |    |        |
| 2                |  |                               |   |    |             |         |                          |     |    |    |        |
| 3                |  |                               |   |    |             |         |                          |     |    |    |        |
| 4                | <b>LEAN CLAY</b> with sand and trace organics, brown (CL)    | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |
| 5                |  |                               |   |    |             |         |                          |     |    |    |        |
| 6                | <b>LEAN CLAY</b> with sand, brown (CL)                       |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 7                |  |                               |   |    |             |         |                          |     |    |    |        |
| 8                |  |                               |   |    |             |         |                          |     |    |    |        |
| 9                | <b>CLAYEY SAND</b> with a little gravel, tan (SC)            |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 10               |  |                               |   |    |             |         |                          |     |    |    |        |
| 11               | <b>GRAVELLY LEAN CLAY</b> , brown (GC)                       |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 12               |  |                               |   |    |             |         |                          |     |    |    |        |
| 13               | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 14               |  |                               |   |    |             |         |                          |     |    |    |        |
| 15               |  |                               |   |    |             |         |                          |     |    |    |        |
| 16               | with cobbles from 18.7-19.0'                                 |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 17               |  |                               |   |    |             |         |                          |     |    |    |        |
| 18               |  |                               |   |    |             |         |                          |     |    |    |        |
| 19               | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 20               |  |                               |   |    |             |         |                          |     |    |    |        |
| 21               | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    | CS          | 60      |                          |     |    |    |        |
| 22               |  |                               |   |    |             |         |                          |     |    |    |        |
| 23               | <b>SILTSTONE</b> , Silt, tan (ML)                            | ARIKAREE GROUP                |   |    | CS          | 60      |                          |     |    |    |        |
| 24               |  |                               |   |    |             |         |                          |     |    |    |        |
| 25               |  |                               |   |    |             |         |                          |     |    |    |        |
| Bottom of Boring |  |                               |   |    |             |         |                          |     |    |    |        |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/13/19</b>           | <b>15:21</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/13/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|--|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Clayey Gravel with sand, brown              | TOPSOIL                                |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             | <b>FAT CLAY</b> , tan (CH)                                   |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             | <b>SILT</b> , tan (ML)                                       |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SANDY GRAVEL</b> , tan-brown (GP)                         |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 9             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 14            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            | <b>SILTSTONE</b> , Silt, tan (ML)                            | ARIKAREE<br>GROUP                      |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 19            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 24            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring   |  |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/12/19</b>           | <b>15:36</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/12/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Clayey Gravel with sand, brown-tan          | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 2                   | <b>SAND</b> with a little gravel, tan (SP)                   | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 6                   | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 7                   | <b>SANDY FAT CLAY</b> , brown-tan (CH)                       |  |   |    |                | CS         | 60                       |     |    |    |        |  |  |  |  |  |
| 8                   | <b>SANDY FAT CLAY</b> with gravel, brown-tan (CH)            |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 10                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 12                  |  |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 15                  | <b>FAT CLAY</b> , brown-tan (CH)                             |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 16                  | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 17                  | <b>FAT CLAY</b> , brown-tan (CH)                             |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 18                  | <b>SANDY LEAN CLAY</b> with gravel, tan (CL)                 |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 20                  | <b>SILTSTONE</b> , Silt, tan (ML)                            | ARIKAREE<br>GROUP                      |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 22                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 23                  |  |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |
| 24                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |
| 25                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/13/19</b>           | <b>9:52</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>2/13/19</b>          |                  |                          |             |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|--|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Clayey Gravel, brown                        | TOPSOIL                                |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 3             | <b>SAND</b> , tan (SP)                                       | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 4             | <b>SANDY GRAVEL</b> , tan (GP)<br><b>SAND</b> , tan (SP)     |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             | <b>SAND</b> with gravel, tan (SP)                            |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             |  |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 9             |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            |  |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 13            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            | <b>CLAYEY GRAVEL</b> with sand, tan (GC)                     |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            | <b>SAND</b> , tan (SP)                                       |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 19            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23            | <b>SILTSTONE</b> , tan (ML)                                  | ARIKAREE<br>GROUP                      |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 24            |  |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25            | Bottom of Boring   |  |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/12/19</b>           | <b>14:41</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING COMPLETED: <b>2/12/19</b>             |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Clayey Gravel with sand and organics, brown | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY SAND</b> with trace organics, tan (SM)              | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            | <b>SANDY GRAVEL</b> , tan (GP)                               | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            | <b>SAND</b> , tan (SP)                                       |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/13/19</b>           | <b>11:00</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/13/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Clayey Gravel with sand and organics, brown | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>SANDY GRAVEL</b> with clay, tan (GP)                      | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 4             | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            | <b>SILTSTONE</b> , Silt, tan-brown (ML)                      | ARIKAREE FORMATION            |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>2/14/19</b>           | <b>12:43</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>2/14/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-9 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY            | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|--------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                    |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Clayey Gravel with sand and organics, brown | TOPSOIL            |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>SANDY SILT</b> with trace organics, tan (ML)              | EOLIAN DEPOSITS    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 3             |  |                    |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 4             |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             | <b>SANDY SILT</b> , tan (ML)                                 |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             |  |                    |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 9             |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            | <b>SILTSTONE</b> , Silt, tan (ML)                            | ARIKAREE FORMATION |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19            |  |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            | Bottom of Boring   |                    |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>2/14/19</b>           | <b>14:00</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>2/14/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-10 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #6**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION      | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|---|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |   |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Gravelly Lean Clay with sand and organics, brown | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>CLAYEY GRAVEL</b> with sand and trace organics, tan-brown (GC) | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 3             |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 4             |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             | <b>CLAYEY GRAVEL</b> with sand, tan-brown (GC)                    |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             | <b>SANDY GRAVEL</b> , tan (GP)                                    |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 9             |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            | <b>GRAVELLY SAND</b> , tan (SP)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            | <b>SILTY SAND</b> , tan (SM)<br><b>GRAVELLY SAND</b> , tan (SP)   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            | <b>SILTSTONE</b> , Silt, tan (SM)                                 | ARIKAREE GROUP                |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 24            |   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25            | Bottom of Boring  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #6.GPJ AET+CPT+WELL.GDT 2/19/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/14/19</b>           | <b>11:45</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/14/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, tan   | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> , tan-brown (SM)               | EOLIAN<br>DEPOSITS                     |   |    |                |            |                          |     |    |    |        |  |  |  |
| 3                   |  |  | M |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   | <b>SANDY GRAVEL</b> , tan (GP)                   | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |  | M |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 8                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   | <b>SILTY SAND</b> , tan (SM)                     |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SANDY GRAVEL</b> , tan (GP)                   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 24                  | <b>SANDY SILT</b> , tan (ML)                     |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  | Bottom of Boring                                 |  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/9/19</b>            | <b>12:10</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING COMPLETED: <b>7/9/19</b>              |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |





# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-10 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION         | GEOLOGY  | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics,<br>brown |  TOPSOIL            |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> , brown-tan (ML)                             |  EOLIAN<br>DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 3                   |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 8                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 18                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 24                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/11/19</b>           | <b>12:57</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING<br>COMPLETED: <b>7/11/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-11 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION         | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics,<br>brown | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> , brown-tan (ML)                             | EOLIAN<br>DEPOSITS                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 3                   | <b>SILTY GRAVEL</b> with sand, tan (GM)                  | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   | <b>SILTY SAND</b> , tan (SM)                             |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 8                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  | <b>SILTY SAND</b> with a little gravel, tan (SM)         |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  | <b>SILT</b> , brown (ML)                                 |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 24                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/11/19</b>           | <b>14:03</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING<br>COMPLETED: <b>7/11/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with sand, brown (ML)                     | EOLIAN<br>DEPOSITS                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   | <b>SAND</b> , tan (SW)                                | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 8                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  | <b>SANDY GRAVEL</b> , tan (GP)                        |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 14                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  | <b>SAND</b> , tan (SW)                                |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 18                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 24                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring                                      |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/9/19</b>            | <b>13:32</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING COMPLETED: <b>7/9/19</b>              |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY                       | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|-------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |                               |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown | TOPSOIL                       |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with sand, tan-brown (ML)                 | EOLIAN DEPOSITS               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 3                   |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 4                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   | <b>SILTY SAND</b> , tan (SM)                          | MEDICINE ROOT GRAVEL DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 9                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 13                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  | <b>SANDY GRAVEL</b> , tan (GP)                        |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 18                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |   |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 23                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 24                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 26                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 27                  | <b>SAND</b> , tan (SW)                                |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 28                  | <b>SANDY GRAVEL</b> , tan (GP)                        |                               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 29                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 30                  | Bottom of Boring                                      |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>30.0</b>                                  | <b>4.25" HSA</b> | <b>7/9/19</b>            | <b>15:34</b> | <b>30.0</b>   | <b>30.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/9/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY                       | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|-------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |                               |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown | TOPSOIL                       |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> , brown (ML)                              | EOLIAN DEPOSITS               |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   | <b>SILTY GRAVEL</b> with sand, tan (GM)               | MEDICINE ROOT GRAVEL DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 7                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  | <b>SAND</b> , tan (SW)                                |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  | <b>SILTY GRAVEL</b> with sand, tan (GM)               |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 24                  |   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring                                      |                               |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|-------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME        | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/11/19</b>           | <b>9:50</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |             |               |              |               |                      |             |  |
| BORING COMPLETED: <b>7/11/19</b>             |                  |                          |             |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | TOPSOIL, Silty Lean Clay with organics, brown    | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | SANDY GRAVEL, tan (GP)                           | MEDICINE ROOT GRAVEL DEPOSITS |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 4             | SAND, tan (SW)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             | SANDY GRAVEL, tan (GP)                           |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            | SAND, tan (SW)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            | SILTY SAND, tan (SM)                             |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            | SANDY GRAVEL, tan (GP)                           |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            | SILT, tan (ML)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23            |  |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25            | Bottom of Boring                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/10/19</b>           | <b>14:36</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/10/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILTY SAND</b> with a little gravel, tan (SM)      | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 9                   |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 14                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  | <b>SILTY GRAVEL</b> with sand, tan (GM)               |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 18                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |   |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 24                  |   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring                                      |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/11/19</b>           | <b>10:56</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING COMPLETED: <b>7/11/19</b>             |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |  |  |
| 1             | TOPSOIL, Silty Lean Clay with organics, brown    | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 2             | SANDY GRAVEL, tan (GP)                           | MEDICINE ROOT GRAVEL DEPOSITS |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 4             | SAND, tan (SW)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 7             | CLAYSTONE, Silty Lean Clay, brown (CL)           |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |  |  |
| 8             | SILTY GRAVEL with sand, tan (GM)                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 13            | SANDY GRAVEL, tan (GP)                           |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 16            | SILTY SAND with a little gravel, tan (SM)        |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 17            | SAND with gravel, tan (SW)                       |                               |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 23            |  |                               |   |    | M           | CS      | 60                       |     |    |    |        |  |  |  |  |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |
| 25            | Bottom of Boring                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/10/19</b>           | <b>13:11</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>7/10/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION         | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics,<br>brown | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY GRAVEL</b> with sand, tan (GM)                  | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  | <b>SILT</b> , tan (ML)                                   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 18                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  |  |  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 24                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  | <b>Bottom of Boring</b>                                  |  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/10/19</b>           | <b>11:54</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING<br>COMPLETED: <b>7/10/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-9 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #9;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | TOPSOIL, Silty Lean Clay with organics, brown    | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | SILTY SAND, tan (SM)                             | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 3             | SANDY GRAVEL, tan (GP)<br>SAND, tan (SW)         |                               | M |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 4             | SANDY GRAVEL, tan (GP)                           |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 9             | SILTY GRAVEL, tan (GM)<br>SANDY GRAVEL, tan (GP) |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            | SILTY GRAVEL with sand, tan (GM)                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            | SILT, tan (ML)                                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25            | Bottom of Boring                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #9.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/11/19</b>           | <b>14:07</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>7/11/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET    | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|------------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|                  |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2                | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 3                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 4                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8                | <b>SILT</b> , tan (ML)                                       |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 9                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12               | <b>SAND</b> with gravel, tan (SP)                            | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 13               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15               | <b>SANDY GRAVEL</b> with silt, tan (GP)                      |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 24               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| Bottom of Boring |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/11/19</b>           | <b>12:56</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/11/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-10 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, tan-brown          | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             | <b>SILT</b> , tan (ML)                                       |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            | <b>SANDY FAT CLAY</b> , brown (CH)                           | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            | <b>SAND</b> , tan (SP)                                       |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            | <b>SANDY FAT CLAY</b> , brown (CH)                           |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            | <b>SANDY GRAVEL</b> , yellow-tan (GP)                        |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            | <b>SAND</b> , tan (SP)                                       |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 19            | <b>SANDY GRAVEL</b> , yellow-tan (GP)                        |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            | <b>SAND</b> , tan (SP)                                       |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21            | <b>SANDY GRAVEL</b> , yellow-tan (GP)                        |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/17/19</b>           | <b>11:25</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/17/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-11 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET    | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION         | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|------------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|                  |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                | <b>TOPSOIL</b> , Silty Lean Clay with organics, tan-brown            | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2                | <b>SILT</b> with trace organics, tan (ML)                            | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5                | <b>SILT</b> , tan (ML)   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6                |  | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 7                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9                | <b>SILTY SAND</b> with gravel, tan (SM)                              |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10               | <b>SANDY GRAVEL</b> , tan (GP)                                       |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 11               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14               |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 15               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17               | <b>FAT CLAY</b> , green-brown (CH)<br><b>SANDY GRAVEL</b> , tan (GP) |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18               |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 19               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22               |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 23               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| Bottom of Boring |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/31/19</b>           | <b>11:50</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/31/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-12 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 3             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             | <b>SILT</b> , tan (ML)                                       |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            | <b>SILTY GRAVEL</b> with sand, tan (GM)                      | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/17/19</b>           | <b>13:30</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/17/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-13 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            | <b>SANDY GRAVEL</b> with cobbles, tan (GP)                   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            | <b>GRAVELLY LEAN CLAY</b> , tan (CL)                         |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            | <b>SILT</b> with sand, tan (ML)                              |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 24            | <b>SILT</b> , tan (ML)                                       |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/31/19</b>           | <b>14:43</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/31/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-14 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN<br>DEPOSITS                     |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   | <b>SILT</b> , tan (ML)                                       | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 7                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SILTY SAND</b> , tan (SM)                                 |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  | <b>SILTY SAND</b> , tan (SM)                                 |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 19                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 23                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 24                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| Bottom of Boring    |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/18/19</b>           | <b>11:25</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>1/18/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN<br>DEPOSITS                     |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |  |  |   |    | CS             | 22         |                          |     |    |    |        |  |  |  |  |
| 9                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  | <b>SILTY SAND</b> , tan (SM)                                 | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  |  |  |   |    | CS             | 31         |                          |     |    |    |        |  |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |  |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 19                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |  |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 23                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 24                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/11/19</b>           | <b>13:56</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>2/11/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with silt and organics, tan       | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SAND</b> , tan (SW)                                       | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            | <b>SANDY GRAVEL</b> with a few cobbles, tan (GP)             |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            | <b>SILT</b> , tan (ML)                                       |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            | <b>SANDY GRAVEL</b> with a few cobbles, tan (GP)             |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 26            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 27            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 28            | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 29            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 30            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 31            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 32            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 33            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 34            | <b>SILTSTONE</b> , Silt, gray to tan (ML)                    | ARIKAREE GROUP                |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 35            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 36            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 37            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 38            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 39            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 40            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
| <b>40.0</b>                                  | <b>4.25" HSA</b> | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
|  |                  | <b>2/7/19</b>            | <b>13:40</b> | <b>40.0</b>   | <b>40.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/7/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             | <b>SILTY GRAVEL</b> , tan (GM)                               | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             | <b>CLAYEY GRAVEL</b> , brown (GC)                            |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 8             | <b>SANDY GRAVEL</b> with silt, tan (GP)                      |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            | <b>SAND</b> , tan (SP)                                       |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            | <b>SILT</b> , tan (ML)<br><b>SANDY GRAVEL</b> , tan (GP)     |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/11/19</b>           | <b>11:05</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/11/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, brown-tan          | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19            | <b>SANDY LEAN CLAY</b> with gravel, tan (CL)                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            | <b>SANDY LEAN CLAY</b> with gravel, tan (CL)                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            | <b>SILTY GRAVEL</b> with sand and sand lenses, tan (GM)      |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/1/19</b>            | <b>13:30</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>2/1/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET    | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|------------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|                  |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                | <b>TOPSOIL</b> , Lean Clay with organics, brown-tan          | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2                | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5                | <b>SILT</b> , tan (ML)                                       |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 6                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8                | <b>SANDY GRAVEL</b> with silt, tan (GP)                      | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 9                |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17               |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 18               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20               |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 21               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23               |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 24               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25               |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| Bottom of Boring |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/1/19</b>            | <b>12:06</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>2/1/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Lean Clay with organics, brown              | TOPSOIL                                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with sand and organics, tan (ML)                 | EOLIAN<br>DEPOSITS                     |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SANDY GRAVEL</b> with silt, tan (GP)                      | MEDICINE<br>ROOT<br>GRAVEL<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 6                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   | <b>SANDY GRAVEL</b> , tan (GP)                               |  |   |    | CS             | 42         |                          |     |    |    |        |  |  |  |
| 10                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  | <b>SANDY GRAVEL</b> with a few cobbles, tan (GP)             |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 13                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  | <b>SANDY GRAVEL</b> with a few cobbles, tan (GP)             |  |   |    | CS             | 33         |                          |     |    |    |        |  |  |  |
| 17                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  | <b>SANDY GRAVEL</b> with a few cobbles, tan (GP)             |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 20                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  | <b>FAT CLAY</b> , brown (CH)                                 |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 24                  | <b>SANDY GRAVEL</b> with a few cobbles, tan (GP)             |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 25                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 26                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 27                  | <b>SILTY SAND</b> , tan (SM)                                 |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 28                  | <b>SILTSTONE</b> , Silt, tan (ML)                            | ARIKAREE<br>GROUP                      |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 29                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 30                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 31                  | <b>SILTSTONE</b> , Silt with sand, tan (ML)                  |  |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 32                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 33                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 34                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 35                  | Bottom of Boring   |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 36                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 37                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 38                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 39                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 40                  |  |  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
| <b>40.0</b>                                  | <b>4.25" HSA</b> | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
|  |                  | <b>2/8/19</b>            | <b>12:50</b> | <b>40.0</b>      | <b>40.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>2/8/19</b>           |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Lean Clay with organics, brown-tan          | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             | <b>SILT</b> , tan (ML)                                       |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |
| 7             |  | MEDICINE ROOT GRAVEL DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |
| 13            | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 19            | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>2/1/19</b>            | <b>10:51</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>2/1/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-9 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #10**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|-------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                               |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Lean Clay with organics, brown-tan          | TOPSOIL                       |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS               |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  | <b>FAT CLAY</b> , tan-brown (CH)                             | MEDICINE ROOT GRAVEL DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  | <b>SILTY SAND</b> , tan (SM)                                 |                               |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 13                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |                               |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | Bottom of Boring   |                               |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #10.GPJ AET+CPT+WELL.GDT 2/12/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|-------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME        | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/17/19</b>           | <b>9:50</b> | <b>15.0</b>   | <b>15.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/17/19</b>             |                  |                          |             |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY          | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |
|---------------|--|------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|--|
|               |  |                  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Sand with organics, brown | TOPSOIL          |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 2             | <b>SILT</b> with trace organics, brown-tan (ML)  | EOLIAN DEPOSITS  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 3             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 4             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 5             | <b>SILT</b> , tan (ML)                           |                  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 6             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 7             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 8             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 9             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 10            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 11            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 12            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 13            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 14            | <b>SILTY GRAVEL</b> with sand, tan (GM)          | TERRACE DEPOSITS |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 15            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 16            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 17            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 18            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 19            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 20            | <b>SANDY GRAVEL</b> , tan (GP)                   |                  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 21            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 22            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 23            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 24            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 25            | <b>SILTY SAND</b> , tan (SM)                     |                  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 25            | Bottom of Boring                                 |                  |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |

AET CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/18/19</b>           | <b>13:33</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>7/18/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION                           | GEOLOGY             | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|---------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |                     |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown                           | TOPSOIL             |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with sand and trace organics, brown (ML)                       | EOLIAN<br>DEPOSITS  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   | <b>SILT</b> , tan (ML)   |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 6                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  | <b>SILTY GRAVEL</b> with sand, tan (GM)<br>with concretion from 10.0-10.4' | TERRACE<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 11                  | <b>SILTY SAND</b> with trace gravel, tan (SM)                              |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 24                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/17/19</b>           | <b>14:07</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/17/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|---------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |                     |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>SILT</b> with organics, brown                 | TOPSOIL             |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with trace organics, tan (ML)        | EOLIAN<br>DEPOSITS  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   |  |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 9                   | <b>SILTY GRAVEL</b> with sand, tan (GM)          | TERRACE<br>DEPOSITS |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  | <b>SILTY SAND</b> , tan (SM)                     |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 13                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |  |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 18                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |  |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 24                  |  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring                                 |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/18/19</b>           | <b>9:59</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/18/19</b>          |                  |                          |             |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION  | GEOLOGY             | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|---------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |                     |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown  | TOPSOIL             |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace organics, brown (SM) | TERRACE<br>DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   | <b>SILTY SAND</b> , tan (SM)                      |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   | <b>SANDY GRAVEL</b> , tan (GP)                    |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |   |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 8                   |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 13                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 14                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 18                  | <b>SILTY SAND</b> , tan (SM)                      |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |   |                     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 23                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 24                  |   |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring                                  |                     |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/17/19</b>           | <b>15:42</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/17/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH IN FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY          | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                  |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Sand with organics, brown | TOPSOIL          |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with sand and trace roots (ML)       | EOLIAN DEPOSITS  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SILTY GRAVEL</b> with sand, tan (GM)          | TERRACE DEPOSITS |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 9             |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            | <b>SILTY SAND</b> , tan (SM)                     |                  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 14            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            | <b>SILTY GRAVEL</b> with sand (GM)               |                  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 19            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            | <b>SILTY SAND</b> , tan (SM)                     |                  |   | M  | CS          | 60      |                          |     |    |    |        |  |  |  |
| 22            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24            |  |                  |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring                                 |                  |   |    |             |         |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/17/19</b>           | <b>12:38</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/17/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION     | GEOLOGY                 | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|--|-------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |  |                         |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown     | TOPSOIL                 |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILT</b> with trace roots, brown (ML)             | EOLIAN<br>DEPOSITS      |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   | <b>SILT</b> , tan (ML)                               |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 8                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 9                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  | <b>SAND</b> , tan (SP)                               | TERRACE<br>DEPOSITS     |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  | <b>SANDY GRAVEL</b> , tan (GP)                       |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  | <b>SAND</b> , tan (SW)                               |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  | <b>SILTY GRAVEL</b> with sand, tan (GM)              |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 14                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  | <b>CLAYSTONE</b> , Silty Lean Clay, green-brown (CL) | WHITE<br>RIVER<br>GROUP |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 17                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 21                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 22                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 23                  |  |                         |   |    | M              | CS         | 60                       |     |    |    |        |  |  |  |  |
| 24                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 25                  | Bottom of Boring                                     |                         |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|-------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME        | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/17/19</b>           | <b>9:48</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/17/19</b>          |                  |                          |             |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION      | GEOLOGY          | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|---|------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |   |                  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown | TOPSOIL          |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY LEAN CLAY</b> with trace roots, tan (CL)     | EOLIAN DEPOSITS  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   | <b>SILTY GRAVEL</b> with sand, tan (GM)               | TERRACE DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 8                   |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |   |                  |   |    | M              | CS         | 60                       |     |    |    |        |  |  |  |
| 14                  | <b>SILTY SAND</b> , tan (SM)                          |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |   |                  |   |    | M              | CS         | 60                       |     |    |    |        |  |  |  |
| 18                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  |   |                  |   |    | M              | CS         | 60                       |     |    |    |        |  |  |  |
| 24                  |   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  | Bottom of Boring                                      |                  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/17/19</b>           | <b>11:34</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/17/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #15;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY          | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown               | TOPSOIL          |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with sand, trac gravel and trace roots, brown (ML) | TERRACE DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SANDY GRAVEL</b> , tan (GP)                                 |                  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 6                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SAND</b> , tan (SW)   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                        |                  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 13                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  | <b>SILTY SAND</b> , tan (SM)                                   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                        |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | <b>SILTY SAND</b> with a little gravel, tan (SM)               |                  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 21                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 24                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  | Bottom of Boring   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #15.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/17/19</b>           | <b>11:10</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/17/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                       | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |
|---------------|--|-------------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|--|
|               |  |                               |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, tan-brown    | TOPSOIL                       |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 2             | <b>SILTY SAND</b> , tan (SM)                                 | EOLIAN DEPOSITS               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 3             | <b>SANDY GRAVEL</b> , tan (GP)                               | MEDICINE ROOT GRAVEL DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 4             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 5             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 6             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 7             |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 8             | <b>LEAN CLAY</b> , tan (CL)                                  |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 9             | <b>SANDY GRAVEL</b> , tan (GP)                               |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 10            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 11            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 12            |  |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |  |  |
| 13            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 14            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 15            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 16            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 17            |  |                               |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |  |  |
| 18            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 19            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 20            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 21            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 22            | with cobble lense from 21.2-21.8<br><b>SILT</b> , tan (ML)   |                               |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |  |
| 23            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 24            |  |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 25            | Bottom of Boring   |                               |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/16/19</b>           | <b>14:20</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/16/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY         | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|-----------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                 |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown        | TOPSOIL         |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             | <b>SILT</b> , tan (ML)                                       |                 |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 8             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                 |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 14            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            | Bottom of Boring   |                 |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/16/19</b>           | <b>12:55</b> | <b>15.0</b>   | <b>15.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/16/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY            | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                    |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown        | TOPSOIL            |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SILT</b> , tan (ML)                                       |                    |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 6                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 24                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  | Bottom of Boring   |                    |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/15/19</b>           | <b>13:35</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>1/15/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY            | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                    |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics,<br>brown     | TOPSOIL            |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 3                   | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 4                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   | <b>SILT</b> , tan (ML)                                       |                    |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 7                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                    |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 13                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | Bottom of Boring   |                    |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/16/19</b>           | <b>12:00</b> | <b>15.0</b>      | <b>15.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>1/16/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY            | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|--------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                    |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown-tan    | TOPSOIL            |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SILT</b> , tan (ML)                                       |                    |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 6                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |                    |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | Bottom of Boring   |                    |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/15/19</b>           | <b>14:00</b> | <b>15.0</b>      | <b>15.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>1/15/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY         | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|-----------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                 |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown        | TOPSOIL         |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>LEAN CLAY</b> , brown (CL)                                | EOLIAN DEPOSITS |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 3             |  |                 |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 4             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             | <b>SILT</b> , tan (ML)                                       |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                 |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 8             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 9             |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 13            |  |                 |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 14            |  |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            | Bottom of Boring   |                 |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/16/19</b>           | <b>10:40</b> | <b>15.0</b>   | <b>15.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/16/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |




# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #17**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY   | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |
|---------------|--|---|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|--|
|               |  |   |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with organics, brown        |  TOPSOIL |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 2             | <b>SILT</b> with trace organics, tan (ML)                    | EOLIAN DEPOSITS   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 3             |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 4             |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 5             | <b>SILT</b> , tan (ML)                                       |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 6             |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 7             |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 8             |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 9             |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 10            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 11            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 12            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 13            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 14            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 15            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 16            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 17            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 18            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 19            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 20            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 21            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 22            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 23            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 24            |  |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |
| 25            | Bottom of Boring   |   |   |    |             |         |                          |     |    |    |        |  |  |  |  |  |

AET\_CORP 17-20132 SITE #17.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/15/19</b>           | <b>12:10</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/15/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, tan | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY SAND</b>  | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |  |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             | <b>SANDY GRAVEL</b> with silt and cobbles, tan (GP)          |                     |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             | <b>SILTY LEAN CLAY</b> , tan (CL)                            |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            | <b>SILTY GRAVEL</b> with sand and a few cobbles, tan (GM)    |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            | Bottom of Boring   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/9/19</b>            | <b>16:00</b> | <b>15.0</b>   | <b>15.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/9/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, tan | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY SAND</b> , tan (SM)                                 | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |  |
| 3             | <b>SANDY GRAVEL</b> , tan (GP)                               |                     |   |    |             | CS      | 60                       |     |    |    |        |  |  |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             | <b>SILTY SAND</b> , tan (SM)                                 |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             | <b>SILTY GRAVEL</b> with sand and clay, tan (GM)             |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            | <b>CLAYEY GRAVEL</b> , tan (GC)                              |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 18            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 21            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 22            | <b>SAND</b> , tan (SP)                                       |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 23            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 24            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 25            | Bottom of Boring   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>1/10/19</b>           | <b>10:52</b> | <b>25.0</b>   | <b>25.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/10/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION         | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with gravel and organics, brown-tan | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY GRAVEL</b> with sand, tan (GM)                              | QUATERNARY ALLUVIUM |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 8             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             | <b>SILTY SAND</b> with trace gravel, tan (SM)                        |                     |   |    | CS          | 12      |                          |     |    |    |        |  |  |  |
| 10            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 14            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            | Bottom of Boring   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/14/19</b>           | <b>11:20</b> | <b>15.0</b>   | <b>15.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/14/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION                  | GEOLOGY                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|---|------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |   |                        |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand, a little gravel and organics, tan | TOPSOIL                |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY GRAVEL</b> with sand, tan (GM)                                       | QUATERNARY<br>ALLUVIUM |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SILTY GRAVEL</b> with clay and sand, tan (GM)                              |                        |   |    |                | CS         | 12                       |     |    |    |        |  |  |  |
| 6                   |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | <b>SILTY LEAN CLAY</b> , tan (ML)   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  | <b>FAT CLAY</b> , gray (CH)   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  | <b>SILTY LEAN CLAY</b> , tan (ML)   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  | with cobbles from 17.5 to 17.8'   |                        |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |
| 19                  |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | <b>SAND</b> , tan (SP)  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |
| Bottom of Boring    |   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>1/10/19</b>           | <b>14:10</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING COMPLETED: <b>1/10/19</b>             |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Gravel with sand and organics, tan    | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 2             | <b>SILTY SAND</b> , tan (SM)                                 | QUATERNARY ALLUVIUM |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 3             |  |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 7             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 8             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 9             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 10            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 11            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 12            | <b>SILT</b> with sand, tan (ML)                              |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 13            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 14            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 15            | <b>SILTY SAND</b> , tan (SM)                                 |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 16            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 17            | <b>CLAYEY GRAVEL</b> , tan (GC)                              |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |  |
| 18            | <b>SILTY SAND</b> , tan (SM)                                 |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 19            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |
| 20            | Bottom of Boring   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>1/10/19</b>           | <b>12:05</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/10/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION         | GEOLOGY             | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------|--|---------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|--|--|--|
|               |  |                     |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1             | <b>TOPSOIL</b> , Silty Lean Clay with gravel and organics, brown-tan | TOPSOIL             |   |    |             |         |                          |     |    |    |        |  |  |  |
| 2             | <b>SILTY SAND</b> , tan (SM)   | QUATERNARY ALLUVIUM |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 3             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 4             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 5             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 6             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 7             | <b>SILTY GRAVEL</b> with sand, tan (GM)                              |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 8             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 9             |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 10            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 11            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 12            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 13            |  |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 14            | <b>SILTY SAND</b> , tan (SM)   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 15            | <b>SILTY GRAVEL</b> with sand, tan (GM)                              |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 16            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 17            | <b>SILTY SAND</b> , tan (SM)   |                     |   |    | CS          | 60      |                          |     |    |    |        |  |  |  |
| 18            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 19            |  |                     |   |    |             |         |                          |     |    |    |        |  |  |  |
| 20            | Bottom of Boring   |                     |   |    |             |         |                          |     |    |    |        |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>1/14/19</b>           | <b>12:30</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |              |               |              |               |                      |             |  |
| BORING COMPLETED: <b>1/14/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #18**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION         | GEOLOGY                | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |  |  |
|---------------------|--|------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|--|--|
|                     |  |                        |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with gravel and organics, brown-tan | TOPSOIL                |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 2                   | <b>SILTY GRAVEL</b> with sand, tan (GM)                              | QUATERNARY<br>ALLUVIUM |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |
| 3                   |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 4                   |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 5                   |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 6                   | <b>SILT</b> with sand, tan (ML)                                      |                        |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |
| 7                   |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 8                   |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 9                   |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 10                  | <b>SILTY GRAVEL</b> , tan (GM)<br>with cobbles from 9.4 to 9.7'      |                        |   |    | CS             | 60         |                          |     |    |    |        |  |  |  |  |  |  |
| 11                  |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 12                  |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 13                  |  |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 14                  | <b>SILT</b> with a little sand, tan (ML)                             |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |
| 15                  | Bottom of Boring   |                        |   |    |                |            |                          |     |    |    |        |  |  |  |  |  |  |

AET\_CORP 17-20132 SITE #18.GPJ AET+CPT+WELL.GDT 2/4/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>15.0</b>                                  | <b>4.25" HSA</b> | <b>1/14/19</b>           | <b>14:20</b> | <b>15.0</b>      | <b>15.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING COMPLETED: <b>1/14/19</b>             |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #22**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION  | GEOLOGY                           | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |
|---------------------|---|-----------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|
|                     |   |                                   |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |
| 1                   | <b>SANDY SILT</b> , tan, (ML)<br><br>with silty gravel with sand lenses<br><br>with a little gravel | QUATERNARY<br>TERRACE<br>DEPOSITS |   |    |                | CS         | 60                       |     |    |    |        |  |
| 2                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 3                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 4                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 5                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 6                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 7                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 8                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 9                   |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 10                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 11                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 12                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 13                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 14                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 15                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 16                  | <b>LEAN TO FAT CLAY</b> , gray-brown (CL-CH)  |                                   |   |    |                | CS         | 60                       |     |    |    |        |  |
| 17                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 18                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 19                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| 20                  |   |                                   |   |    |                |            |                          |     |    |    |        |  |
| Bottom of Boring    |   |                                   |   |    |                |            |                          |     |    |    |        |  |

AET\_CORP 17-20132 SITE #22.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>1/7/19</b>            | <b>12:30</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING COMPLETED: <b>1/7/19</b>              |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #22**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                     | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |
|---------------|--|-----------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|
|               |  |                             |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |
| 1             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      | QUATERNARY TERRACE DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |
| 2             |  |                             |   |    |             |         |                          |     |    |    |        |
| 3             |  |                             |   |    |             |         |                          |     |    |    |        |
| 4             |  |                             |   |    |             |         |                          |     |    |    |        |
| 5             | <b>SANDY SILT</b> , tan (ML)                                 |                             |   |    |             |         |                          |     |    |    |        |
| 6             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 7             | <b>SANDY SILT</b> , tan (ML)                                 |                             |   |    |             |         |                          |     |    |    |        |
| 8             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                             |   |    |             |         |                          |     |    |    |        |
| 8             | <b>SANDY SILT</b> , tan (ML)                                 |                             |   |    |             |         |                          |     |    |    |        |
| 9             |  |                             |   |    |             |         |                          |     |    |    |        |
| 10            |  |                             |   |    |             |         |                          |     |    |    |        |
| 11            |  |                             |   |    |             |         |                          |     |    |    |        |
| 12            | <b>LEAN CLAY</b> , brown (CL)                                |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 13            | <b>SILTY SAND</b> , tan (SM)                                 |                             |   |    |             |         |                          |     |    |    |        |
| 14            |  |                             |   |    |             |         |                          |     |    |    |        |
| 15            |  |                             |   |    |             |         |                          |     |    |    |        |
| 16            | <b>SILTY LEAN CLAY</b> , gray-tan (CL)                       |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 17            |  |                             |   |    |             |         |                          |     |    |    |        |
| 18            | <b>SILTY SAND</b> , tan (SM)                                 |                             |   |    |             |         |                          |     |    |    |        |
| 19            |  |                             |   |    |             |         |                          |     |    |    |        |
| 20            | Bottom of Boring   |                             |   |    |             |         |                          |     |    |    |        |

AET\_CORP 17-20132 SITE #22.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>1/7/19</b>            | <b>13:20</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/7/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #22**

| DEPTH IN FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                     | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS |     |    |    |        |
|---------------|--|-----------------------------|---|----|-------------|---------|--------------------------|-----|----|----|--------|
|               |  |                             |   |    |             |         | WC                       | DEN | LL | PL | %-#200 |
| 1             | <b>SILTY SAND</b> , brown-tan (SM)                           | QUATERNARY TERRACE DEPOSITS |   |    | CS          | 60      |                          |     |    |    |        |
| 2             |  |                             |   |    |             |         |                          |     |    |    |        |
| 3             |  |                             |   |    |             |         |                          |     |    |    |        |
| 4             |  |                             |   |    |             |         |                          |     |    |    |        |
| 5             | <b>SILTY GRAVEL</b> , tan (GM)                               |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 6             | <b>SILTY SAND</b> , brown-tan (SM)                           |                             |   |    |             |         |                          |     |    |    |        |
| 7             | <b>SANDY GRAVEL</b> with silt, tan (GP)                      |                             |   |    |             |         |                          |     |    |    |        |
| 8             | <b>SILTY GRAVEL</b> with sand, tan (GM)                      |                             |   |    |             |         |                          |     |    |    |        |
| 9             | <b>SANDY SILT</b> , tan (ML)                                 |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 10            |  |                             |   |    |             |         |                          |     |    |    |        |
| 11            |  |                             |   |    |             |         |                          |     |    |    |        |
| 12            |  |                             |   |    |             |         |                          |     |    |    |        |
| 13            | <b>LEAN TO FAT CLAY</b> , brown (CL-CH)                      |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 14            |  |                             |   |    |             |         |                          |     |    |    |        |
| 15            | <b>SILTY SAND</b> , tan (SM)                                 |                             |   |    | CS          | 60      |                          |     |    |    |        |
| 16            |  |                             |   |    |             |         |                          |     |    |    |        |
| 17            |  |                             |   |    |             |         |                          |     |    |    |        |
| 18            | Bottom of Boring   |                             |   |    |             |         |                          |     |    |    |        |
| 19            |  |                             |   |    |             |         |                          |     |    |    |        |
| 20            |  |                             |   |    |             |         |                          |     |    |    |        |

AET\_CORP 17-20132 SITE #22.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>1/7/19</b>            | <b>13:20</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>1/7/19</b>              |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #22**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: <u>    --    </u><br>MATERIAL DESCRIPTION | GEOLOGY                           | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |
|---------------------|--|-----------------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|
|                     |  |                                   |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |
| 1                   | <b>SILTY LEAN CLAY</b> , brown (CL)                          | QUATERNARY<br>TERRACE<br>DEPOSITS |   |    | CS             | 60         |                          |     |    |    |        |
| 2                   | <b>SILTY GRAVEL</b> with sand, brown-tan (GM)                |                                   |   |    |                |            |                          |     |    |    |        |
| 3                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 4                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 5                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 6                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 7                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 8                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 9                   |  |                                   |   |    |                |            |                          |     |    |    |        |
| 10                  | <b>SANDY GRAVEL</b> with silt, tan-brown (GP)                |                                   |   |    |                |            |                          |     |    |    |        |
| 11                  |  |                                   |   |    |                |            |                          |     |    |    |        |
| 12                  |  |                                   |   |    |                |            |                          |     |    |    |        |
| 13                  |  |                                   |   |    |                |            |                          |     |    |    |        |
| 14                  |  |                                   |   |    |                |            |                          |     |    |    |        |
| 15                  |  |                                   |   |    |                |            |                          |     |    |    |        |
| 16                  | <b>SANDY LEAN CLAY</b> , brown (CL)                          |                                   |   |    |                |            |                          |     |    |    |        |
| 17                  | <b>SANDY GRAVEL</b> , brown (GP)                             |                                   |   |    |                |            |                          |     |    |    |        |
| 17                  | <b>SANDY LEAN CLAY</b> , brown (CL)                          |                                   |   |    |                |            |                          |     |    |    |        |
| 17                  | <b>SANDY GRAVEL</b> , brown (GP)                             |                                   |   |    |                |            |                          |     |    |    |        |
| 18                  | <b>SILTY SAND</b> , tan (SM)                                 |                                   |   |    |                |            |                          |     |    |    |        |
| 19                  |  |                                   |   |    |                |            |                          |     |    |    |        |
| 20                  | Bottom of Boring   |                                   |   |    |                |            |                          |     |    |    |        |

AET\_CORP 17-20132 SITE #22.GPJ AET+CPT+WELL.GDT 1/30/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
| <b>20.0</b>                                  | <b>4.25" HSA</b> | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
|  |                  | <b>1/7/19</b>            | <b>15:00</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>1/7/19</b>           |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION  | GEOLOGY                 | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|---|-------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |   |                         |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown  | TOPSOIL                 |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace organics, brown (SM) | TERRACE<br>DEPOSITS     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   | <b>SILTY SAND</b> , tan (SM)                      |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |   |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 9                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SILTY GRAVEL</b> with sand, tan (GM)           |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  | <b>SILTY SAND</b> , tan (SM)                      |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  | <b>SILTY GRAVEL</b> with sand, tan (GM)           |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |   |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 14                  | <b>CLAYSTONE</b> , Fat Clay, brown (CH)           | WHITE<br>RIVER<br>GROUP |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |   |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 19                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring                                  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/16/19</b>           | <b>11:38</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING<br>COMPLETED: <b>7/16/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION  | GEOLOGY           | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |  |
|---------------------|---|-------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|--|
|                     |   |                   |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown  | TOPSOIL           |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace organics, brown (SM) | TERRACE DEPOSITS  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 3                   |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 4                   |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 5                   |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 6                   |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 7                   |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 8                   | <b>SILTY SAND</b> , tan (SM)                      |                   |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 9                   |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 10                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 11                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 12                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 13                  | <b>SILTY GRAVEL</b> with sand (GM)                |                   |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |  |
| 14                  | <b>CLAYSTONE</b> , Fat Clay, brown (CH)           | WHITE RIVER GROUP |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 15                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 16                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 17                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 18                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 19                  |   |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |
| 20                  | Bottom of Boring                                  |                   |   |    |                |            |                          |     |    |    |        |  |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|--------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME         | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/16/19</b>           | <b>10:24</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
| BORING COMPLETED: <b>7/16/19</b>             |                  |                          |              |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY          | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                  |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL          |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace roots, brown (SM)                 | TERRACE DEPOSITS |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SILTY SAND</b> , tan (SM)                                   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |                  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 8                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  | <b>SILTY GRAVEL</b> with sand, tan (GM)                        |                  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 14                  | <b>SILT</b> , brown (ML)                                       |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |                  |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 18                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |                  |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring   |                  |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |             |               |              |               |                      |             | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|--|------------------|--------------------------|-------------|---------------|--------------|---------------|----------------------|-------------|--|
|  |                  | DATE                     | TIME        | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |  |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/16/19</b>           | <b>9:07</b> | <b>20.0</b>   | <b>20.0</b>  | <b>NA</b>     | <b>NA</b>            | <b>None</b> |  |
|  |                  |                          |             |               |              |               |                      |             |  |
|  |                  |                          |             |               |              |               |                      |             |  |
| BORING COMPLETED: <b>7/16/19</b>             |                  |                          |             |               |              |               |                      |             |  |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |             |               |              |               |                      |             |  |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY                 | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|-------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                         |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL                 |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace roots, brown (SM)                 | TERRACE<br>DEPOSITS     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   | <b>SAND</b> , tan (SW)   |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 7                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SANDY GRAVEL</b> , tan (GP)                                 |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 11                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  | <b>CLAYSTONE</b> , Fat Clay, green (CH)                        | WHITE<br>RIVER<br>GROUP |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 17                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | with concretion 15.9-16.6'                                     |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 21                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 22                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 23                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 24                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 25                  | Bottom of Boring   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>25.0</b>                                  | <b>4.25" HSA</b> | <b>7/15/19</b>           | <b>17:07</b> | <b>25.0</b>      | <b>25.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/15/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION | GEOLOGY                 | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|-------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                         |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown | TOPSOIL                 |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace organics, brown     | TERRACE<br>DEPOSITS     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   | <b>SILTY SAND</b> with trace gravel, tan (SM)    |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 9                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  | <b>CLAYSTONE</b> , Fat Clay, brown (CH)          | WHITE<br>RIVER<br>GROUP |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 15                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring                                 |                         |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/16/19</b>           | <b>13:31</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
|  |                  |                          |              |                  |                 |                  |                         |                |   |
| BORING<br>COMPLETED: <b>7/16/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION  | GEOLOGY                 | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|---|-------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |   |                         |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Sand with organics, brown  | TOPSOIL                 |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> with trace roots, brown (SM)  | TERRACE<br>DEPOSITS     |   | M  | CS             | 41         |                          |     |    |    |        |  |  |  |
| 3                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   | <b>SILTY SAND</b> with a little gravel, tan (SM)  |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 6                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 7                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  | <b>SILTY SAND</b> , tan (SM)<br><b>SILTY GRAVEL</b> , tan (GM)  |                         |   | M  | CS             | 39         |                          |     |    |    |        |  |  |  |
| 11                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  | <b>SILTY SAND</b> , tan (SM)  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | <b>SILTY GRAVEL</b> , tan (GM)  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 16                  | <b>SILTY SAND</b> , tan (SM)  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  | <b>SILTY GRAVEL</b> , tan (GM)<br><b>SILT</b> , brown (ML)<br><b>CLAYSTONE</b> , Fat Clay, green (CH) | WHITE<br>RIVER<br>GROUP |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 18                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/16/19</b>           | <b>15:01</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/16/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |



# SUBSURFACE BORING LOG

AET JOB NO: **17-20132**

LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **OST DOT Gravel Study - Phase II; Site #24;**

| DEPTH<br>IN<br>FEET | SURFACE ELEVATION: _____<br>MATERIAL DESCRIPTION               | GEOLOGY                 | N | MC | SAMPLE<br>TYPE | REC<br>IN. | FIELD & LABORATORY TESTS |     |    |    |        |  |  |  |
|---------------------|--|-------------------------|---|----|----------------|------------|--------------------------|-----|----|----|--------|--|--|--|
|                     |  |                         |   |    |                |            | WC                       | DEN | LL | PL | %-#200 |  |  |  |
| 1                   | <b>TOPSOIL</b> , Silty Lean Clay with sand and organics, brown | TOPSOIL                 |   |    |                |            |                          |     |    |    |        |  |  |  |
| 2                   | <b>SILTY SAND</b> , brown (SM)                                 | TERRACE<br>DEPOSITS     |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 3                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 4                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 5                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 6                   | <b>SANDY GRAVEL</b> with sand, tan (GP)                        |                         |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 7                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 8                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 9                   |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 10                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 11                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 12                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 13                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 14                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 15                  | <b>CLAYSTONE</b> , Fat Clay, brown (CH)                        | WHITE<br>RIVER<br>GROUP |   | M  | CS             | 60         |                          |     |    |    |        |  |  |  |
| 16                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 17                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 18                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 19                  |  |                         |   |    |                |            |                          |     |    |    |        |  |  |  |
| 20                  | Bottom of Boring   |                         |   |    |                |            |                          |     |    |    |        |  |  |  |

AET CORP 17-20132 SITE #24.GPJ AET+CPT+WELL.GDT 8/5/19

| DEPTH:                                       | DRILLING METHOD  | WATER LEVEL MEASUREMENTS |              |                  |                 |                  |                         |                | NOTE: REFER TO<br>THE ATTACHED<br>SHEETS FOR AN<br>EXPLANATION OF<br>TERMINOLOGY ON<br>THIS LOG |
|--|------------------|--------------------------|--------------|------------------|-----------------|------------------|-------------------------|----------------|---|
|  |                  | DATE                     | TIME         | SAMPLED<br>DEPTH | CASING<br>DEPTH | CAVE-IN<br>DEPTH | DRILLING<br>FLUID LEVEL | WATER<br>LEVEL |   |
| <b>20.0</b>                                  | <b>4.25" HSA</b> | <b>7/15/19</b>           | <b>15:50</b> | <b>20.0</b>      | <b>20.0</b>     | <b>NA</b>        | <b>NA</b>               | <b>None</b>    |   |
| BORING<br>COMPLETED: <b>7/15/19</b>          |                  |                          |              |                  |                 |                  |                         |                |   |
| DR: <b>ES</b> LG: <b>BB</b> Rig: <b>RC-2</b> |                  |                          |              |                  |                 |                  |                         |                |   |

**Report No: MAT:19-23014-S1**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON

**CC:**
**Project:** OST DOT Gravel Study  
 Pine Ridge Reservation

Date of Issue: 10/29/2019

**Job No:** 17-20132

## Sample Details

**Sample ID** 19-23014-S1  
**Field Sample ID** Bulk TP-1 & 7 (Comb)  
**Date Sampled**  
**Source**  
**Material** Well Graded Sand with gravel and cobbles (SW)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #3  
**Date Submitted**

## Other Test Results

| Description       | Method         | Result | Limits |
|-------------------|----------------|--------|--------|
| Liquid Limit (%)  | AASHTO T 89-10 | N/A    |        |
| Plastic Limit (%) | AASHTO T 90-00 | 15     |        |
| Plasticity Index  | AASHTO T 90-00 | NP*    | 4 - 12 |

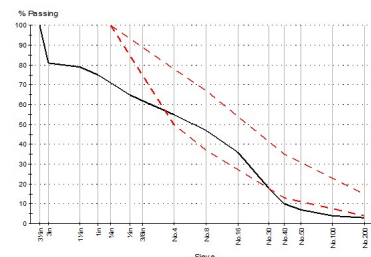
## Particle Size Distribution

**Method:** ASTM C 136, ASTM C 117

**Date Tested:**  
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 3½in (90.0mm)  | 100       |            |
| 3in (75.0mm)   | 81        |            |
| 1½in (37.5mm)  | 79        |            |
| 1in (25.0mm)   | 75        |            |
| ¾in (19.0mm)   | 71*       | 100        |
| ½in (12.5mm)   | 65        |            |
| 3/8in (9.5mm)  | 62        |            |
| No.4 (4.75mm)  | 55        | 50 - 78    |
| No.8 (2.36mm)  | 47        | 37 - 67    |
| No.16 (1.18mm) | 36        |            |
| No.30 (600µm)  | 18        |            |
| No.40 (425µm)  | 10*       | 13 - 35    |
| No.50 (300µm)  | 7         |            |
| No.100 (150µm) | 4         |            |
| No.200 (75µm)  | 3.0*      | 4.0 - 15.0 |

## Chart



## Comments

 NP = Non Plastic  
 \* = Result does not meet the specification

**Report No: MAT:19-23014-S3**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON      **CC:**

**Project:** OST DOT Gravel Study  
Pine Ridge Reservation

**Job No:** 17-20132

Date of Issue: 10/29/2019

**Sample Details**

**Sample ID** 19-23014-S3  
**Field Sample ID** Bulk TP-2 & 3 (Comb)  
**Date Sampled**  
**Source**  
**Material** Gravelly Well Graded Sand (SW)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #3  
**Date Submitted**

**Particle Size Distribution**

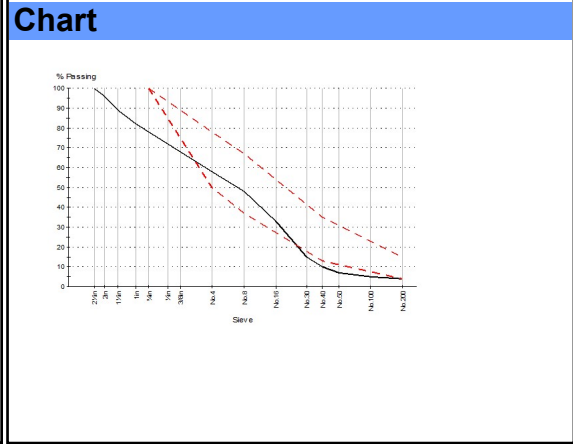
**Method:** ASTM C 136, ASTM C 117

**Date Tested:**  
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 2½in (63.0mm)  | 100       |            |
| 2in (50.0mm)   | 96        |            |
| 1½in (37.5mm)  | 89        |            |
| 1in (25.0mm)   | 82        |            |
| ¾in (19.0mm)   | 78*       | 100        |
| ½in (12.5mm)   | 72        |            |
| 3/8in (9.5mm)  | 68        |            |
| No.4 (4.75mm)  | 58        | 50 – 78    |
| No.8 (2.36mm)  | 48        | 37 – 67    |
| No.16 (1.18mm) | 33        |            |
| No.30 (600µm)  | 15        |            |
| No.40 (425µm)  | 10*       | 13 – 35    |
| No.50 (300µm)  | 7         |            |
| No.100 (150µm) | 5         |            |
| No.200 (75µm)  | 3.9*      | 4.0 – 15.0 |

**Other Test Results**

| Description               | Method         | Result | Limits |
|---------------------------|----------------|--------|--------|
| Liquid Limit (%)          | AASHTO T 89-10 | 17     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 14     |        |
| Plasticity Index          | AASHTO T 90-00 | 3*     | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 30.0   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S4**

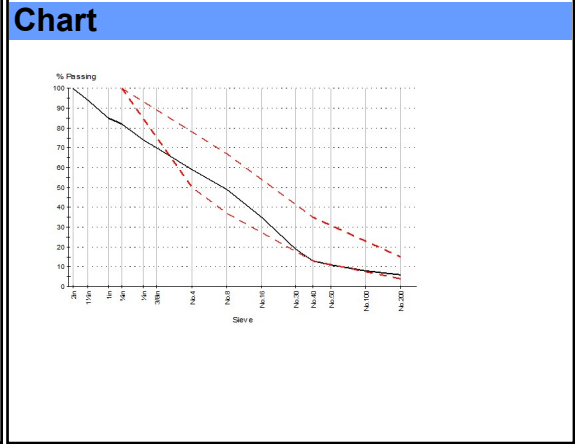
# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |   |
|------------------------|---|
| <b>Sample ID</b>       | 19-23014-S4                                 |
| <b>Field Sample ID</b> | Bulk TP-4 & 8 (Comb)                        |
| <b>Date Sampled</b>    |   |
| <b>Source</b>          |   |
| <b>Material</b>        | Gravelly Well Graded Sand with silt (SW-SM) |
| <b>Specification</b>   | Gravel Surfacing                            |
| <b>Sampling Method</b> |   |
| <b>Location</b>        | Site #3                                     |
| <b>Date Submitted</b>  |   |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 2in (50.0mm)               | 100                    |               |
| 1½in (37.5mm)              | 94                     |               |
| 1in (25.0mm)               | 85                     |               |
| ¾in (19.0mm)               | 82*                    | 100           |
| ½in (12.5mm)               | 74                     |               |
| 3/8in (9.5mm)              | 70                     |               |
| No.4 (4.75mm)              | 59                     | 50 – 78       |
| No.8 (2.36mm)              | 49                     | 37 – 67       |
| No.16 (1.18mm)             | 35                     |               |
| No.30 (600µm)              | 19                     |               |
| No.40 (425µm)              | 13                     | 13 – 35       |
| No.50 (300µm)              | 11                     |               |
| No.100 (150µm)             | 8                      |               |
| No.200 (75µm)              | 5.9                    | 4.0 – 15.0    |

| Other Test Results |                |        |        |
|--------------------|----------------|--------|--------|
| Description        | Method         | Result | Limits |
| Liquid Limit (%)   | AASHTO T 89-10 | 18     |        |
| Plastic Limit (%)  | AASHTO T 90-00 | 15     |        |
| Plasticity Index   | AASHTO T 90-00 | 3*     | 4 – 12 |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S2**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON      **CC:**

**Project:** OST DOT Gravel Study  
Pine Ridge Reservation

**Job No:** 17-20132

Date of Issue: 10/29/2019

**Sample Details**

**Sample ID** 19-23014-S2  
**Field Sample ID** Bulk TP-10, 11 & 12 (Comb)  
**Date Sampled**  
**Source**  
**Material** Well Graded Sand with silt and gravel (SW-SM)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #3  
**Date Submitted**

**Particle Size Distribution**

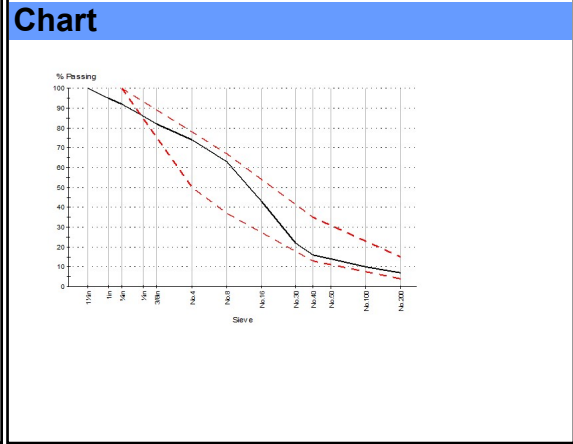
**Method:** ASTM C 136, ASTM C 117

**Date Tested:**  
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 1½in (37.5mm)  | 100       |            |
| 1in (25.0mm)   | 95        |            |
| ¾in (19.0mm)   | 92*       | 100        |
| ½in (12.5mm)   | 86        |            |
| 3/8in (9.5mm)  | 82        |            |
| No.4 (4.75mm)  | 74        | 50 – 78    |
| No.8 (2.36mm)  | 63        | 37 – 67    |
| No.16 (1.18mm) | 43        |            |
| No.30 (600µm)  | 22        |            |
| No.40 (425µm)  | 16        | 13 – 35    |
| No.50 (300µm)  | 14        |            |
| No.100 (150µm) | 10        |            |
| No.200 (75µm)  | 6.9       | 4.0 – 15.0 |

**Other Test Results**

| Description       | Method         | Result | Limits |
|-------------------|----------------|--------|--------|
| Liquid Limit (%)  | AASHTO T 89-10 | N/A    |        |
| Plastic Limit (%) | AASHTO T 90-00 | N/A    |        |
| Plasticity Index  | AASHTO T 90-00 | NP*    | 4 – 12 |



**Comments**

NP = Non Plastic  
 \* = Result does not meet the specification

**Report No: MAT:19-23014-S5**

# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

## Sample Details

|                        |                             |
|------------------------|-----------------------------|
| <b>Sample ID</b>       | 19-23014-S5                 |
| <b>Field Sample ID</b> | Bulk B-6                    |
| <b>Date Sampled</b>    |                             |
| <b>Source</b>          |                             |
| <b>Material</b>        | Silty Sand with gravel (SM) |
| <b>Specification</b>   | Gravel Surfacing            |
| <b>Sampling Method</b> |                             |
| <b>Location</b>        | Site #6                     |
| <b>Date Submitted</b>  |                             |

## Other Test Results

| Description       | Method         | Result | Limits |
|-------------------|----------------|--------|--------|
| Liquid Limit (%)  | AASHTO T 89-10 | 18     |        |
| Plastic Limit (%) | AASHTO T 90-00 | 17     |        |
| Plasticity Index  | AASHTO T 90-00 | 1*     | 4 – 12 |

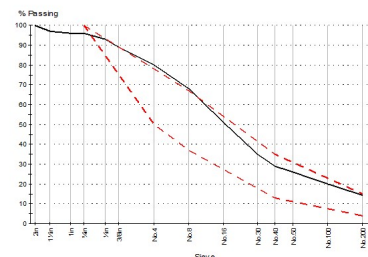
## Particle Size Distribution

**Method:** ASTM C 136, ASTM C 117

**Date Tested:**  
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 2in (50.0mm)   | 100       |            |
| 1½in (37.5mm)  | 97        |            |
| 1in (25.0mm)   | 96        |            |
| ¾in (19.0mm)   | 96*       | 100        |
| ½in (12.5mm)   | 93        |            |
| 3/8in (9.5mm)  | 89        |            |
| No.4 (4.75mm)  | 80*       | 50 – 78    |
| No.8 (2.36mm)  | 68*       | 37 – 67    |
| No.16 (1.18mm) | 51        |            |
| No.30 (600µm)  | 35        |            |
| No.40 (425µm)  | 29        | 13 – 35    |
| No.50 (300µm)  | 26        |            |
| No.100 (150µm) | 20        |            |
| No.200 (75µm)  | 14.2      | 4.0 – 15.0 |

## Chart



## Comments

\* = Result does not meet the specification

**Report No: MAT:19-23014-S6**

# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |                             |
|------------------------|-----------------------------|
| <b>Sample ID</b>       | 19-23014-S6                 |
| <b>Field Sample ID</b> | Bulk B-7 & 10 (Comb)        |
| <b>Date Sampled</b>    |                             |
| <b>Source</b>          |                             |
| <b>Material</b>        | Silty Sand with gravel (SM) |
| <b>Specification</b>   | Gravel Surfacing            |
| <b>Sampling Method</b> |                             |
| <b>Location</b>        | Site #6                     |
| <b>Date Submitted</b>  |                             |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 1½in (37.5mm)              | 100                    |               |
| 1in (25.0mm)               | 96                     |               |
| ¾in (19.0mm)               | 93*                    | 100           |
| ½in (12.5mm)               | 90                     |               |
| 3/8in (9.5mm)              | 86                     |               |
| No.4 (4.75mm)              | 75                     | 50 – 78       |
| No.8 (2.36mm)              | 64                     | 37 – 67       |
| No.16 (1.18mm)             | 51                     |               |
| No.30 (600µm)              | 38                     |               |
| No.40 (425µm)              | 31                     | 13 – 35       |
| No.50 (300µm)              | 27                     |               |
| No.100 (150µm)             | 20                     |               |
| No.200 (75µm)              | 13.7                   | 4.0 – 15.0    |

| Other Test Results        |                |        |        |
|---------------------------|----------------|--------|--------|
| Description               | Method         | Result | Limits |
| Liquid Limit (%)          | AASHTO T 89-10 | 19     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 17     |        |
| Plasticity Index          | AASHTO T 90-00 | 2*     | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 36.5   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S7**

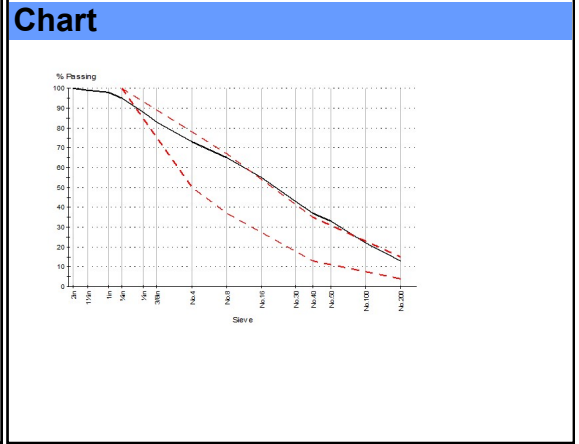
# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |                             |
|------------------------|-----------------------------|
| <b>Sample ID</b>       | 19-23014-S7                 |
| <b>Field Sample ID</b> | Bulk B-1 & 3 (Comb)         |
| <b>Date Sampled</b>    |                             |
| <b>Source</b>          |                             |
| <b>Material</b>        | Silty Sand with gravel (SM) |
| <b>Specification</b>   | Gravel Surfacing            |
| <b>Sampling Method</b> |                             |
| <b>Location</b>        | Site #9                     |
| <b>Date Submitted</b>  |                             |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 2in (50.0mm)               | 100                    |               |
| 1½in (37.5mm)              | 99                     |               |
| 1in (25.0mm)               | 98                     |               |
| ¾in (19.0mm)               | 95*                    | 100           |
| ½in (12.5mm)               | 88                     |               |
| 3/8in (9.5mm)              | 83                     |               |
| No.4 (4.75mm)              | 73                     | 50 – 78       |
| No.8 (2.36mm)              | 65                     | 37 – 67       |
| No.16 (1.18mm)             | 55                     |               |
| No.30 (600µm)              | 43                     |               |
| No.40 (425µm)              | 37*                    | 13 – 35       |
| No.50 (300µm)              | 33                     |               |
| No.100 (150µm)             | 22                     |               |
| No.200 (75µm)              | 13.1                   | 4.0 – 15.0    |

| Other Test Results        |                |        |        |
|---------------------------|----------------|--------|--------|
| Description               | Method         | Result | Limits |
| Liquid Limit (%)          | AASHTO T 89-10 | 17     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 16     |        |
| Plasticity Index          | AASHTO T 90-00 | 1*     | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 34.0   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S8**

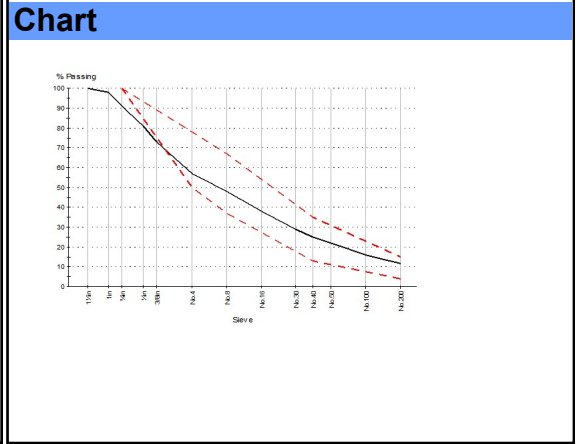
# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |   |
|------------------------|---|
| <b>Sample ID</b>       | 19-23014-S8                                 |
| <b>Field Sample ID</b> | Bulk B-8 & 9 (Comb)                         |
| <b>Date Sampled</b>    |   |
| <b>Source</b>          |   |
| <b>Material</b>        | Gravelly Well Graded Sand with silt (SW-SM) |
| <b>Specification</b>   | Gravel Surfacing                            |
| <b>Sampling Method</b> |   |
| <b>Location</b>        | Site #9                                     |
| <b>Date Submitted</b>  |   |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 1½in (37.5mm)              | 100                    |               |
| 1in (25.0mm)               | 98                     |               |
| ¾in (19.0mm)               | 91*                    | 100           |
| ½in (12.5mm)               | 81                     |               |
| 3/8in (9.5mm)              | 73                     |               |
| No.4 (4.75mm)              | 57                     | 50 – 78       |
| No.8 (2.36mm)              | 48                     | 37 – 67       |
| No.16 (1.18mm)             | 38                     |               |
| No.30 (600µm)              | 29                     |               |
| No.40 (425µm)              | 25                     | 13 – 35       |
| No.50 (300µm)              | 22                     |               |
| No.100 (150µm)             | 16                     |               |
| No.200 (75µm)              | 11.6                   | 4.0 – 15.0    |

| Other Test Results        |                |        |        |
|---------------------------|----------------|--------|--------|
| Description               | Method         | Result | Limits |
| Liquid Limit (%)          | AASHTO T 89-10 | 19     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 17     |        |
| Plasticity Index          | AASHTO T 90-00 | 2*     | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 34.0   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S11**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON

**CC:**
**Project:** OST DOT Gravel Study  
 Pine Ridge Reservation

Date of Issue:

10/29/2019

**Job No:** 17-20132

## Sample Details

**Sample ID** 19-23014-S11  
**Field Sample ID** Bulk B-3 & 6 (Comb)  
**Date Sampled**  
**Source**  
**Material** Silty Sand with gravel (SM)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #10

**Date Submitted**

## Other Test Results

| Description               | Method         | Result | Limits |
|---------------------------|----------------|--------|--------|
| Liquid Limit (%)          | AASHTO T 89-10 | 17     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | NP     |        |
| Plasticity Index          | AASHTO T 90-00 | NP*    | 4 - 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 29.9   | ≤40    |
| Grading Designation       |                |        |        |

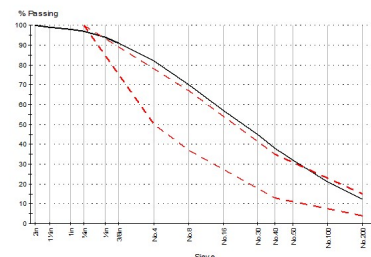
## Particle Size Distribution

**Method:** ASTM C 136, ASTM C 117

**Date Tested:**
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 2in (50.0mm)   | 100       |            |
| 1½in (37.5mm)  | 99        |            |
| 1in (25.0mm)   | 98        |            |
| ¾in (19.0mm)   | 97*       | 100        |
| ½in (12.5mm)   | 94        |            |
| 3/8in (9.5mm)  | 91        |            |
| No.4 (4.75mm)  | 82*       | 50 - 78    |
| No.8 (2.36mm)  | 70*       | 37 - 67    |
| No.16 (1.18mm) | 57        |            |
| No.30 (600µm)  | 45        |            |
| No.40 (425µm)  | 38*       | 13 - 35    |
| No.50 (300µm)  | 32        |            |
| No.100 (150µm) | 21        |            |
| No.200 (75µm)  | 12.4      | 4.0 - 15.0 |

## Chart



## Comments

NP = Non Plastic

\* = Result does not meet the specification

**Report No: MAT:19-23014-S9**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON

**CC:**
**Project:** OST DOT Gravel Study  
 Pine Ridge Reservation

Date of Issue:

10/29/2019

**Job No:** 17-20132

## Sample Details

**Sample ID** 19-23014-S9  
**Field Sample ID** Bulk B-11 & 12 (Comb)  
**Date Sampled**  
**Source**  
**Material** Gravelly Silty Sand (SM)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #10

**Date Submitted**

## Other Test Results

| Description               | Method         | Result | Limits |
|---------------------------|----------------|--------|--------|
| Liquid Limit (%)          | AASHTO T 89-10 | 20     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 16     |        |
| Plasticity Index          | AASHTO T 90-00 | 4      | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 29.9   | ≤40    |
| Grading Designation       |                |        |        |

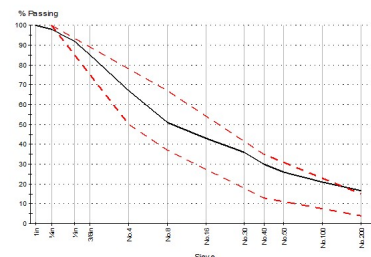
## Particle Size Distribution

**Method:** ASTM C 136, ASTM C 117

**Date Tested:**
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 1in (25.0mm)   | 100       |            |
| ¾in (19.0mm)   | 98*       | 100        |
| ½in (12.5mm)   | 92        |            |
| 3/8in (9.5mm)  | 85        |            |
| No.4 (4.75mm)  | 67        | 50 – 78    |
| No.8 (2.36mm)  | 51        | 37 – 67    |
| No.16 (1.18mm) | 43        |            |
| No.30 (600µm)  | 36        |            |
| No.40 (425µm)  | 30        | 13 – 35    |
| No.50 (300µm)  | 26        |            |
| No.100 (150µm) | 21        |            |
| No.200 (75µm)  | 16.8*     | 4.0 – 15.0 |

## Chart



## Comments

\* = Result does not meet the specification

**Report No: MAT:19-23014-S10**

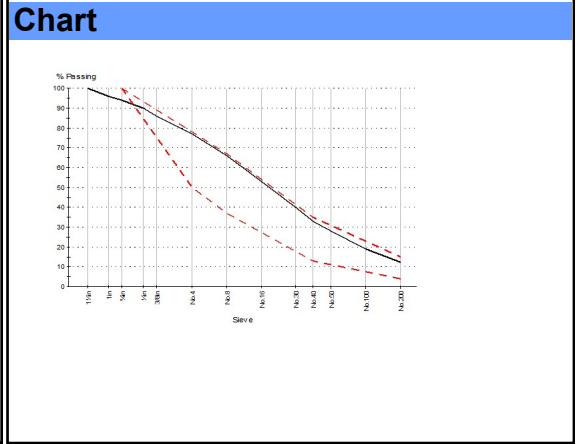
# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |                             |
|------------------------|-----------------------------|
| <b>Sample ID</b>       | 19-23014-S10                |
| <b>Field Sample ID</b> | Bulk B-14                   |
| <b>Date Sampled</b>    |                             |
| <b>Source</b>          |                             |
| <b>Material</b>        | Silty Sand with gravel (SM) |
| <b>Specification</b>   | Gravel Surfacing            |
| <b>Sampling Method</b> |                             |
| <b>Location</b>        | Site #10                    |
| <b>Date Submitted</b>  |                             |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 1½in (37.5mm)              | 100                    |               |
| 1in (25.0mm)               | 96                     |               |
| ¾in (19.0mm)               | 94*                    | 100           |
| ½in (12.5mm)               | 90                     |               |
| 3/8in (9.5mm)              | 86                     |               |
| No.4 (4.75mm)              | 77                     | 50 – 78       |
| No.8 (2.36mm)              | 66                     | 37 – 67       |
| No.16 (1.18mm)             | 53                     |               |
| No.30 (600µm)              | 40                     |               |
| No.40 (425µm)              | 33                     | 13 – 35       |
| No.50 (300µm)              | 28                     |               |
| No.100 (150µm)             | 19                     |               |
| No.200 (75µm)              | 12.5                   | 4.0 – 15.0    |

| Other Test Results        |                |        |        |
|---------------------------|----------------|--------|--------|
| Description               | Method         | Result | Limits |
| Liquid Limit (%)          | AASHTO T 89-10 | 16     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 13     |        |
| Plasticity Index          | AASHTO T 90-00 | 3*     | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 29.9   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S12**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON

**CC:**
**Project:** OST DOT Gravel Study  
 Pine Ridge Reservation

**Date of Issue:** 10/29/2019

**Job No:** 17-20132

## Sample Details

**Sample ID** 19-23014-S12  
**Field Sample ID** Bulk B-1, 7 & 8 (Comb)  
**Date Sampled**  
**Source**  
**Material** Gravelly Well Graded Sand with Silt (W-SM)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #15  
**Date Submitted**

## Other Test Results

| Description               | Method         | Result | Limits |
|---------------------------|----------------|--------|--------|
| Liquid Limit (%)          | AASHTO T 89-10 | N/A    |        |
| Plastic Limit (%)         | AASHTO T 90-00 | N/A    |        |
| Plasticity Index          | AASHTO T 90-00 | NP*    | 4 - 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 44.0*  | ≤40    |
| Grading Designation       |                |        |        |

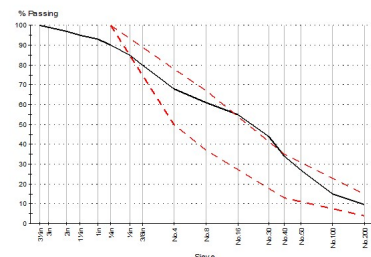
## Particle Size Distribution

**Method:** ASTM C 136, ASTM C 117

**Date Tested:**
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 3½in (90.0mm)  | 100       |            |
| 3in (75.0mm)   | 99        |            |
| 2in (50.0mm)   | 97        |            |
| 1½in (37.5mm)  | 95        |            |
| 1in (25.0mm)   | 93        |            |
| ¾in (19.0mm)   | 90*       | 100        |
| ½in (12.5mm)   | 85        |            |
| 3/8in (9.5mm)  | 80        |            |
| No.4 (4.75mm)  | 68        | 50 - 78    |
| No.8 (2.36mm)  | 61        | 37 - 67    |
| No.16 (1.18mm) | 55        |            |
| No.30 (600µm)  | 44        |            |
| No.40 (425µm)  | 34        | 13 - 35    |
| No.50 (300µm)  | 27        |            |
| No.100 (150µm) | 15        |            |
| No.200 (75µm)  | 9.7       | 4.0 - 15.0 |

## Chart



## Comments

 NP = Non Plastic  
 \* = Result does not meet the specification

**Report No: MAT:19-23014-S13**

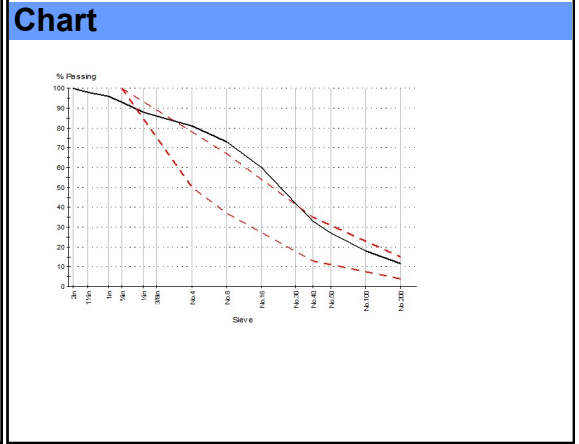
# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |                             |
|------------------------|-----------------------------|
| <b>Sample ID</b>       | 19-23014-S13                |
| <b>Field Sample ID</b> | Bulk B-1                    |
| <b>Date Sampled</b>    |                             |
| <b>Source</b>          |                             |
| <b>Material</b>        | Silty Sand with gravel (SM) |
| <b>Specification</b>   | Gravel Surfacing            |
| <b>Sampling Method</b> |                             |
| <b>Location</b>        | Site #17                    |
| <b>Date Submitted</b>  |                             |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 2in (50.0mm)               | 100                    |               |
| 1½in (37.5mm)              | 98                     |               |
| 1in (25.0mm)               | 96                     |               |
| ¾in (19.0mm)               | 93*                    | 100           |
| ½in (12.5mm)               | 88                     |               |
| 3/8in (9.5mm)              | 86                     |               |
| No.4 (4.75mm)              | 81*                    | 50 – 78       |
| No.8 (2.36mm)              | 73*                    | 37 – 67       |
| No.16 (1.18mm)             | 60                     |               |
| No.30 (600µm)              | 42                     |               |
| No.40 (425µm)              | 33                     | 13 – 35       |
| No.50 (300µm)              | 27                     |               |
| No.100 (150µm)             | 18                     |               |
| No.200 (75µm)              | 11.7                   | 4.0 – 15.0    |

| Other Test Results        |                |        |        |
|---------------------------|----------------|--------|--------|
| Description               | Method         | Result | Limits |
| Liquid Limit (%)          | AASHTO T 89-10 | 24     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 19     |        |
| Plasticity Index          | AASHTO T 90-00 | 5      | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 27.6   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S14**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON

**CC:**
**Project:** OST DOT Gravel Study  
 Pine Ridge Reservation

Date of Issue:

10/29/2019

**Job No:** 17-20132

## Sample Details

**Sample ID** 19-23014-S14  
**Field Sample ID** Bulk B-1 & 2 (Comb)  
**Date Sampled**  
**Source**  
**Material** Clayey Sand with gravel (SC)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #18  
**Date Submitted**

## Other Test Results

| Description               | Method         | Result | Limits |
|---------------------------|----------------|--------|--------|
| Liquid Limit (%)          | AASHTO T 89-10 | 25     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 17     |        |
| Plasticity Index          | AASHTO T 90-00 | 8      | 4 - 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 44.3*  | ≤40    |
| Grading Designation       |                |        |        |

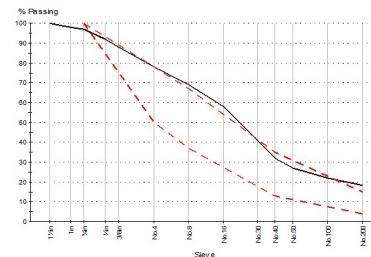
## Particle Size Distribution

**Method:** ASTM C 136, ASTM C 117

**Date Tested:**
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 1½in (37.5mm)  | 100       |            |
| 1in (25.0mm)   | 98        |            |
| ¾in (19.0mm)   | 97*       | 100        |
| ½in (12.5mm)   | 92        |            |
| 3/8in (9.5mm)  | 88        |            |
| No.4 (4.75mm)  | 78        | 50 - 78    |
| No.8 (2.36mm)  | 69*       | 37 - 67    |
| No.16 (1.18mm) | 58        |            |
| No.30 (600µm)  | 41        |            |
| No.40 (425µm)  | 32        | 13 - 35    |
| No.50 (300µm)  | 27        |            |
| No.100 (150µm) | 22        |            |
| No.200 (75µm)  | 18.4*     | 4.0 - 15.0 |

## Chart



## Comments

\* = Result does not meet the specification

**Report No: MAT:19-23014-S15**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON      **CC:**

**Project:** OST DOT Gravel Study  
Pine Ridge Reservation

**Job No:** 17-20132

Date of Issue: 10/29/2019

**Sample Details**

**Sample ID** 19-23014-S15  
**Field Sample ID** Bulk B-4 & 7 (Comb)  
**Date Sampled**  
**Source**  
**Material** Gravelly Clayey Sand (SC)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #18

**Date Submitted**

**Particle Size Distribution**

**Method:** ASTM C 136, ASTM C 117

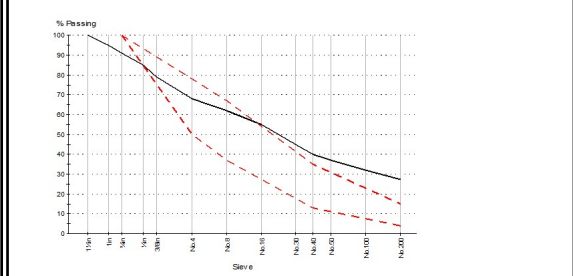
**Date Tested:**  
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 1½in (37.5mm)  | 100       |            |
| 1in (25.0mm)   | 95        |            |
| ¾in (19.0mm)   | 91*       | 100        |
| ½in (12.5mm)   | 85        |            |
| 3/8in (9.5mm)  | 79        |            |
| No.4 (4.75mm)  | 68        | 50 – 78    |
| No.8 (2.36mm)  | 62        | 37 – 67    |
| No.16 (1.18mm) | 55        |            |
| No.30 (600µm)  | 45        |            |
| No.40 (425µm)  | 40*       | 13 – 35    |
| No.50 (300µm)  | 37        |            |
| No.100 (150µm) | 32        |            |
| No.200 (75µm)  | 27.3*     | 4.0 – 15.0 |

**Other Test Results**

| Description       | Method         | Result | Limits |
|-------------------|----------------|--------|--------|
| Liquid Limit (%)  | AASHTO T 89-10 | 27     |        |
| Plastic Limit (%) | AASHTO T 90-00 | 19     |        |
| Plasticity Index  | AASHTO T 90-00 | 8      | 4 – 12 |

**Chart**



**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S16**

# Material Test Report

**Client:** KADRMAS LEE & JACKSON      **CC:**

**Project:** OST DOT Gravel Study  
Pine Ridge Reservation

**Job No:** 17-20132

Date of Issue: 10/29/2019

**Sample Details**

**Sample ID** 19-23014-S16  
**Field Sample ID** Bulk B-2 & 3 (Comb)  
**Date Sampled**  
**Source**  
**Material** Lean Clay with sand and gravel (CL)  
**Specification** Gravel Surfacing  
**Sampling Method**  
**Location** Site #22

**Date Submitted**

**Particle Size Distribution**

**Method:** ASTM C 136, ASTM C 117

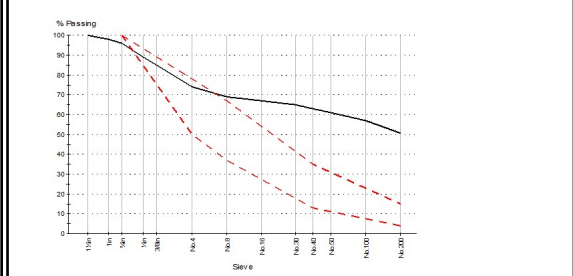
**Date Tested:**  
**Tested By:**

| Sieve Size     | % Passing | Limits     |
|----------------|-----------|------------|
| 1½in (37.5mm)  | 100       |            |
| 1in (25.0mm)   | 98        |            |
| ¾in (19.0mm)   | 96*       | 100        |
| ½in (12.5mm)   | 89        |            |
| 3/8in (9.5mm)  | 85        |            |
| No.4 (4.75mm)  | 74        | 50 – 78    |
| No.8 (2.36mm)  | 69*       | 37 – 67    |
| No.16 (1.18mm) | 67        |            |
| No.30 (600µm)  | 65        |            |
| No.40 (425µm)  | 63*       | 13 – 35    |
| No.50 (300µm)  | 61        |            |
| No.100 (150µm) | 57        |            |
| No.200 (75µm)  | 50.7*     | 4.0 – 15.0 |

**Other Test Results**

| Description               | Method         | Result | Limits |
|---------------------------|----------------|--------|--------|
| Liquid Limit (%)          | AASHTO T 89-10 | 33     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 21     |        |
| Plasticity Index          | AASHTO T 90-00 | 12     | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 47.1*  | ≤40    |
| Grading Designation       |                |        |        |

**Chart**



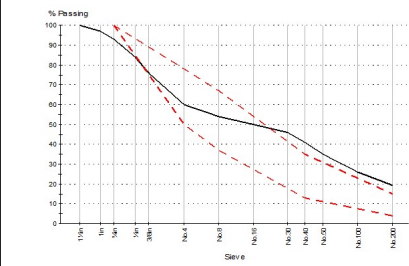
**Comments**

\* = Result does not meet the specification

**Report No: MAT:19-23014-S17**

# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |                          | Particle Size Distribution   |                        |
|------------------------|--------------------------|--|------------------------|
| <b>Sample ID</b>       | 19-23014-S17             | <b>Method:</b>   | ASTM C 136, ASTM C 117 |
| <b>Field Sample ID</b> | Bulk B-4                 | <b>Date Tested:</b>  |                        |
| <b>Date Sampled</b>    |                          | <b>Tested By:</b>  |                        |
| <b>Source</b>          |                          | <b>Sieve Size</b>  | <b>% Passing</b>       |
| <b>Material</b>        | Sandy Clayey Gravel (GC) |  | <b>Limits</b>          |
| <b>Specification</b>   | Gravel Surfacing         | 1½in (37.5mm)  | 100                    |
| <b>Sampling Method</b> |                          | 1in (25.0mm)   | 97                     |
| <b>Location</b>        | Site #22                 | ¾in (19.0mm)   | 93* 100                |
| <b>Date Submitted</b>  |                          | ½in (12.5mm)   | 84                     |
|                        |                          | 3/8in (9.5mm)  | 76                     |
|                        |                          | No.4 (4.75mm)  | 60 50 – 78             |
|                        |                          | No.8 (2.36mm)  | 54 37 – 67             |
|                        |                          | No.16 (1.18mm)   | 50                     |
|                        |                          | No.30 (600µm)  | 46                     |
|                        |                          | No.40 (425µm)  | 41* 13 – 35            |
|                        |                          | No.50 (300µm)  | 35                     |
|                        |                          | No.100 (150µm)   | 26                     |
|                        |                          | No.200 (75µm)  | 19.4* 4.0 – 15.0       |
| Other Test Results     |                          | Chart  |                        |
| <b>Description</b>     | <b>Method</b>            | <b>Result</b>  | <b>Limits</b>          |
| Liquid Limit (%)       | AASHTO T 89-10           | 24   |                        |
| Plastic Limit (%)      | AASHTO T 90-00           | 16   |                        |
| Plasticity Index       | AASHTO T 90-00           | 8  | 4 – 12                 |
|                        |                          |  |                        |

| Comments                                   |
|--|
| * = Result does not meet the specification |

**Report No: MAT:19-23014-S18**

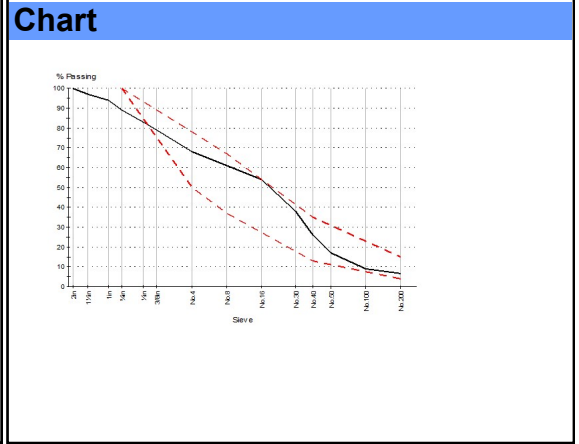
# Material Test Report

|  |            |                           |
|--|------------|---------------------------|
| <b>Client:</b> KADRMAS LEE & JACKSON                           | <b>CC:</b> | Date of Issue: 10/29/2019 |
| <b>Project:</b> OST DOT Gravel Study<br>Pine Ridge Reservation |            |                           |
| <b>Job No:</b> 17-20132  |            |                           |

| Sample Details         |   |
|------------------------|---|
| <b>Sample ID</b>       | 19-23014-S18                                |
| <b>Field Sample ID</b> | Bulk B-4 & 7 (Comb)                         |
| <b>Date Sampled</b>    |   |
| <b>Source</b>          |   |
| <b>Material</b>        | Gravelly Well Graded Sand with silt (SW-SM) |
| <b>Specification</b>   | Gravel Surfacing                            |
| <b>Sampling Method</b> |   |
| <b>Location</b>        | Site #24                                    |
| <b>Date Submitted</b>  |   |

| Particle Size Distribution |                        |               |
|----------------------------|------------------------|---------------|
| <b>Method:</b>             | ASTM C 136, ASTM C 117 |               |
| <b>Date Tested:</b>        |                        |               |
| <b>Tested By:</b>          |                        |               |
| <b>Sieve Size</b>          | <b>% Passing</b>       | <b>Limits</b> |
| 2in (50.0mm)               | 100                    |               |
| 1½in (37.5mm)              | 97                     |               |
| 1in (25.0mm)               | 94                     |               |
| ¾in (19.0mm)               | 89*                    | 100           |
| ½in (12.5mm)               | 83                     |               |
| 3/8in (9.5mm)              | 79                     |               |
| No.4 (4.75mm)              | 68                     | 50 – 78       |
| No.8 (2.36mm)              | 61                     | 37 – 67       |
| No.16 (1.18mm)             | 54                     |               |
| No.30 (600µm)              | 38                     |               |
| No.40 (425µm)              | 26                     | 13 – 35       |
| No.50 (300µm)              | 17                     |               |
| No.100 (150µm)             | 9                      |               |
| No.200 (75µm)              | 6.7                    | 4.0 – 15.0    |

| Other Test Results        |                |        |        |
|---------------------------|----------------|--------|--------|
| Description               | Method         | Result | Limits |
| Liquid Limit (%)          | AASHTO T 89-10 | 18     |        |
| Plastic Limit (%)         | AASHTO T 90-00 | 14     |        |
| Plasticity Index          | AASHTO T 90-00 | 4      | 4 – 12 |
| Nominal Maximum Size (mm) | ASTM C 131     |        |        |
| Los Angeles Value (%)     |                | 39.0   | ≤40    |
| Grading Designation       |                |        |        |



**Comments**

\* = Result does not meet the specification

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |                      |                |                           |
|--|----------------------|----------------|---------------------------|
| AASHTO T-96 - ASTM C131/C131M  |                      |                |                           |
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132                  |
| Client   | KLJ                  | Agg. Source    | Site #3                   |
| Date Sampled   | 1/31/2019            | Agg Type       | TP-10, 11 & 12 (Combined) |
| Date Submitted   | 3/18/2019            | Submitted By   | J. Reed                   |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Sieve Sizes (square openings)  |                   | Sample Portion Mass, g |
|--------------------------------|-------------------|------------------------|
| Passing Sieve                  | Retained On Sieve |                        |
| 1 1/2"                         | 1"                | 1248.9                 |
| 1"                             | 3/4"              | 1250.0                 |
| 3/4"                           | 1/2"              | 1250.7                 |
| 1/2"                           | 3/8"              | 1251.7                 |
| 3/8"                           | 1/4"              |                        |
| 1/4"                           | #4                |                        |
| #4                             | #8                |                        |
| Total Washed/Dried Sample Mass |                   | 5001.3                 |

Must meet limits in Table 1

| Charge Verification Table 2 |        |
|-----------------------------|--------|
| Charge #                    | Weight |
| 1                           | 415.7  |
| 2                           | 415.5  |
| 3                           | 415.6  |
| 4                           | 415.3  |
| 5                           | 415.5  |
| 6                           | 415.6  |
| 7                           | 415.7  |
| 8                           | 415.6  |
| 9                           | 415.7  |
| 10                          | 415.7  |
| 11                          | 415.6  |
| 12                          | 415.7  |
| Total                       | 4987.2 |

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |        |
|---------------------------------------|--------|
| Washed/Dried Wt Retained on #12 Sieve | 3499.1 |
| Percent Loss                          | 30.0%  |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |                      |                |                        |
|--|----------------------|----------------|------------------------|
| AASHTO T-96 - ASTM C131/C131M  |                      |                |                        |
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132               |
| Client   | KLJ                  | Agg. Source    | Site #6                |
| Date Sampled   | 2/13/2019            | Agg Type       | B-6, 7 & 10 (Combined) |
| Date Submitted   | 3/18/2019            | Submitted By   | J. Reed                |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Charge Verification<br>Table 2 |        |
|--------------------------------|--------|
| Charge #                       | Weight |
| 1                              | 415.7  |
| 2                              | 415.5  |
| 3                              | 415.6  |
| 4                              | 415.6  |
| 5                              | 415.6  |
| 6                              | 415.7  |
| 7                              | 415.7  |
| 8                              | 415.6  |
| 9                              | 415.6  |
| 10                             | 415.7  |
| 11                             | 415.7  |
| 12                             | 415.7  |
| Total                          | 4987.7 |

| Sieve Sizes (square openings)  |                   | Sample Portion<br>Mass, g |
|--------------------------------|-------------------|---------------------------|
| Passing Sieve                  | Retained On Sieve |                           |
| 1 1/2"                         | 1"                | 1251.3                    |
| 1"                             | 3/4"              | 1247.5                    |
| 3/4"                           | 1/2"              | 1242.7                    |
| 1/2"                           | 3/8"              | 1245.5                    |
| 3/8"                           | 1/4"              |                           |
| 1/4"                           | #4                |                           |
| #4                             | #8                |                           |
| Total Washed/Dried Sample Mass |                   | 4987.0                    |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |        |
|---------------------------------------|--------|
| Washed/Dried Wt Retained on #12 Sieve | 3167.7 |
| Percent Loss                          | 36.5%  |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

**Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR)  
AASHTO T-96 - ASTM C131/C131M**

|                |                      |                |                                |
|----------------|----------------------|----------------|--------------------------------|
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132                       |
| Client         | KLJ                  | Agg. Source    | Site #9                        |
| Date Sampled   | 7/9/2019             | Agg Type       | B-1, B-3, B-8 & B-9 (Combined) |
| Date Submitted | 8/27/2019            | Submitted By   | J. Reed                        |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Sieve Sizes (square openings)  |                   | Sample Portion Mass, g |
|--------------------------------|-------------------|------------------------|
| Passing Sieve                  | Retained On Sieve |                        |
| 1 1/2"                         | 1"                |                        |
| 1"                             | 3/4"              |                        |
| 3/4"                           | 1/2"              | 2500.8                 |
| 1/2"                           | 3/8"              | 2504.4                 |
| 3/8"                           | 1/4"              |                        |
| 1/4"                           | #4                |                        |
| #4                             | #8                |                        |
| Total Washed/Dried Sample Mass |                   | 5005.2                 |

| Charge Verification<br>Table 2 |        |
|--------------------------------|--------|
| Charge #                       | Weight |
| 1                              | 415.6  |
| 2                              | 415.5  |
| 3                              | 415.5  |
| 4                              | 415.5  |
| 5                              | 415.6  |
| 6                              | 415.4  |
| 7                              | 415.5  |
| 8                              | 415.6  |
| 9                              | 415.5  |
| 10                             | 415.6  |
| 11                             | 415.6  |
| 12                             |        |
| Total                          | 4570.9 |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |            |
|---------------------------------------|------------|
| Washed/Dried Wt Retained on #12 Sieve | 3300.8     |
| Percent Loss                          | <b>34%</b> |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

**Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR)  
AASHTO T-96 - ASTM C131/C131M**

|                |                      |                |  |
|----------------|----------------------|----------------|--|
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132                               |
| Client         | KLJ                  | Agg. Source    | Site #10                               |
| Date Sampled   | 2/11/2019            | Agg Type       | B-3, B-6, B-11, B-12 & B-14 (Combined) |
| Date Submitted | 3/18/2019            | Submitted By   | J. Reed                                |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Sieve Sizes (square openings)  |                   | Sample Portion Mass, g |
|--------------------------------|-------------------|------------------------|
| Passing Sieve                  | Retained On Sieve |                        |
| 1 1/2"                         | 1"                |                        |
| 1"                             | 3/4"              |                        |
| 3/4"                           | 1/2"              | 2503.8                 |
| 1/2"                           | 3/8"              | 2500.9                 |
| 3/8"                           | 1/4"              |                        |
| 1/4"                           | #4                |                        |
| #4                             | #8                |                        |
| Total Washed/Dried Sample Mass |                   | 5004.70                |

| Charge Verification<br>Table 2 |        |
|--------------------------------|--------|
| Charge #                       | Weight |
| 1                              | 415.6  |
| 2                              | 415.6  |
| 3                              | 415.6  |
| 4                              | 415.7  |
| 5                              | 415.6  |
| 6                              | 415.7  |
| 7                              | 415.5  |
| 8                              | 415.6  |
| 9                              | 415.7  |
| 10                             | 415.6  |
| 11                             | 415.5  |
| 12                             | 415.6  |
| Total                          | 4987.3 |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |        |
|---------------------------------------|--------|
| Washed/Dried Wt Retained on #12 Sieve | 3506.9 |
| Percent Loss                          | 29.9%  |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |                      |                |                           |
|--|----------------------|----------------|---------------------------|
| AASHTO T-96 - ASTM C131/C131M  |                      |                |                           |
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132                  |
| Client   | KLJ                  | Agg. Source    | Site #15                  |
| Date Sampled   | 7/18/2019            | Agg Type       | B-1, B-7 & B-8 (Combined) |
| Date Submitted   | 8/27/2019            | Submitted By   | J. Reed                   |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Charge Verification<br>Table 2 |        |
|--------------------------------|--------|
| Charge #                       | Weight |
| 1                              | 415.6  |
| 2                              | 415.5  |
| 3                              | 415.5  |
| 4                              | 415.5  |
| 5                              | 415.6  |
| 6                              | 415.4  |
| 7                              | 415.5  |
| 8                              | 415.6  |
| 9                              | 415.5  |
| 10                             | 415.6  |
| 11                             | 415.6  |
| 12                             | 415.5  |
| Total                          | 4986.4 |

| Sieve Sizes (square openings)  |                   | Sample Portion<br>Mass, g |
|--------------------------------|-------------------|---------------------------|
| Passing Sieve                  | Retained On Sieve |                           |
| 1 1/2"                         | 1"                | 1264.8                    |
| 1"                             | 3/4"              | 1263.3                    |
| 3/4"                           | 1/2"              | 1248.1                    |
| 1/2"                           | 3/8"              | 1250.2                    |
| 3/8"                           | 1/4"              |                           |
| 1/4"                           | #4                |                           |
| #4                             | #8                |                           |
| Total Washed/Dried Sample Mass |                   | 5026.4                    |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |            |
|---------------------------------------|------------|
| Washed/Dried Wt Retained on #12 Sieve | 2801.5     |
| Percent Loss                          | <b>44%</b> |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |                      |                |                |
|--|----------------------|----------------|----------------|
| AASHTO T-96 - ASTM C131/C131M  |                      |                |                |
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132       |
| Client   | KLJ                  | Agg. Source    | Site #17       |
| Date Sampled   | 7/18/2019            | Agg Type       | B-1 (Combined) |
| Date Submitted   | 3/18/2019            | Submitted By   | J. Reed        |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

| Grading Type | A | B | C | D |
|--------------|---|---|---|---|
|--------------|---|---|---|---|

| Sieve Sizes (square openings)  |                   | Sample Portion Mass, g |
|--------------------------------|-------------------|------------------------|
| Passing Sieve                  | Retained On Sieve |                        |
| 1 1/2"                         | 1"                |                        |
| 1"                             | 3/4"              |                        |
| 3/4"                           | 1/2"              |                        |
| 1/2"                           | 3/8"              |                        |
| 3/8"                           | 1/4"              |                        |
| 1/4"                           | #4                |                        |
| #4                             | #8                | 1564.0                 |
| Total Washed/Dried Sample Mass |                   | 1564                   |

Must meet limits in Table 1

| Charge Verification Table 2 |        |
|-----------------------------|--------|
| Charge #                    | Weight |
| 1                           | 415.7  |
| 2                           | 415.7  |
| 3                           | 415.7  |
| 4                           |        |
| 5                           |        |
| 6                           |        |
| 7                           |        |
| 8                           |        |
| 9                           |        |
| 10                          |        |
| 11                          |        |
| 12                          |        |
| Total                       | 1247.1 |

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |        |
|---------------------------------------|--------|
| Washed/Dried Wt Retained on #12 Sieve | 1132.3 |
| Percent Loss                          | 27.6%  |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |                      |                |                      |
|--|----------------------|----------------|----------------------|
| AASHTO T-96 - ASTM C131/C131M  |                      |                |                      |
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132             |
| Client   | KLJ                  | Agg. Source    | Site #18             |
| Date Sampled   | 1/9/2019             | Agg Type       | B-1 & B-2 (Combined) |
| Date Submitted   | 3/18/2019            | Submitted By   | J. Reed              |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Charge Verification<br>Table 2 |        |
|--------------------------------|--------|
| Charge #                       | Weight |
| 1                              | 415.6  |
| 2                              | 415.6  |
| 3                              | 415.7  |
| 4                              | 415.6  |
| 5                              | 415.7  |
| 6                              | 415.6  |
| 7                              | 415.7  |
| 8                              | 415.6  |
| 9                              | 415.7  |
| 10                             | 415.6  |
| 11                             | 415.7  |
| 12                             | 415.5  |
| Total                          | 4987.6 |

| Sieve Sizes (square openings)  |                   | Sample Portion<br>Mass, g |
|--------------------------------|-------------------|---------------------------|
| Passing Sieve                  | Retained On Sieve |                           |
| 1 1/2"                         | 1"                | 1248.5                    |
| 1"                             | 3/4"              | 1259.3                    |
| 3/4"                           | 1/2"              | 1258.8                    |
| 1/2"                           | 3/8"              | 1258.4                    |
| 3/8"                           | 1/4"              |                           |
| 1/4"                           | #4                |                           |
| #4                             | #8                |                           |
| Total Washed/Dried Sample Mass |                   | 5025.0                    |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |        |
|---------------------------------------|--------|
| Washed/Dried Wt Retained on #12 Sieve | 2798.9 |
| Percent Loss                          | 44.3%  |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |                      |                |                      |
|--|----------------------|----------------|----------------------|
| AASHTO T-96 - ASTM C131/C131M  |                      |                |                      |
| Project Name   | OST DOT Gravel Study | Project Number | 17-20132             |
| Client   | KLJ                  | Agg. Source    | Site #22             |
| Date Sampled   | 1/7/2019             | Agg Type       | B-2 & B-3 (Combined) |
| Date Submitted   | 3/18/2019            | Submitted By   | J. Reed              |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Charge Verification<br>Table 2 |        |
|--------------------------------|--------|
| Charge #                       | Weight |
| 1                              | 415.7  |
| 2                              | 415.6  |
| 3                              | 415.6  |
| 4                              | 415.4  |
| 5                              | 415.7  |
| 6                              | 415.6  |
| 7                              | 415.7  |
| 8                              | 415.5  |
| 9                              | 415.7  |
| 10                             | 415.6  |
| 11                             | 415.4  |
| 12                             | 415.6  |
| Total                          | 4987.1 |

| Sieve Sizes (square openings)  |                   | Sample Portion<br>Mass, g |
|--------------------------------|-------------------|---------------------------|
| Passing Sieve                  | Retained On Sieve |                           |
| 1 1/2"                         | 1"                | 1067.3                    |
| 1"                             | 3/4"              | 1028.6                    |
| 3/4"                           | 1/2"              | 1244.8                    |
| 1/2"                           | 3/8"              | 1245.8                    |
| 3/8"                           | 1/4"              |                           |
| 1/4"                           | #4                |                           |
| #4                             | #8                |                           |
| Total Washed/Dried Sample Mass |                   | 4586.5                    |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |        |
|---------------------------------------|--------|
| Washed/Dried Wt Retained on #12 Sieve | 2426.6 |
| Percent Loss                          | 47.1%  |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

| Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (LAR) |           |                |                      |
|--|-----------|----------------|----------------------|
| AASHTO T-96 - ASTM C131/C131M  |           |                |                      |
| Project Name   | Site #24  | Project Number | 17-20132             |
| Client   | KLJ       | Agg. Source    | Site #24             |
| Date Sampled   | 7/16/2019 | Agg Type       | B-4 & B-7 (Combined) |
| Date Submitted   | 8/27/2019 | Submitted By   | J. Reed              |

Wash and dry whole sample prior to selecting individual size portions

Highlight Grading Type Selected

|              |   |   |   |   |
|--------------|---|---|---|---|
| Grading Type | A | B | C | D |
|--------------|---|---|---|---|

| Charge Verification<br>Table 2 |               |
|--------------------------------|---------------|
| Charge #                       | Weight        |
| 1                              | 415.6         |
| 2                              | 415.5         |
| 3                              | 415.5         |
| 4                              | 415.5         |
| 5                              | 415.6         |
| 6                              | 415.4         |
| 7                              | 415.5         |
| 8                              | 415.6         |
| 9                              | 415.5         |
| 10                             | 415.6         |
| 11                             | 415.6         |
| 12                             | 415.5         |
| <b>Total</b>                   | <b>4986.4</b> |

| Sieve Sizes (square openings)  |                   | Sample Portion<br>Mass, g |
|--------------------------------|-------------------|---------------------------|
| Passing Sieve                  | Retained On Sieve |                           |
| 1 1/2"                         | 1"                | 1264.4                    |
| 1"                             | 3/4"              | 1256.2                    |
| 3/4"                           | 1/2"              | 1238.7                    |
| 1/2"                           | 3/8"              | 1230                      |
| 3/8"                           | 1/4"              |                           |
| 1/4"                           | #4                |                           |
| #4                             | #8                |                           |
| Total Washed/Dried Sample Mass |                   | 4989.3                    |

Must meet limits in Table 1

**Table 2: Charge Selection**

| Grading | Number of Spheres | Mass of Charge, g |
|---------|-------------------|-------------------|
| A       | 12                | 5000±25           |
| B       | 11                | 4580±25           |
| C       | 8                 | 3330±20           |
| D       | 6                 | 2500±15           |

| Test Results                          |            |
|---------------------------------------|------------|
| Washed/Dried Wt Retained on #12 Sieve | 3040.2     |
| Percent Loss                          | <b>39%</b> |

**Table 1: Grading of Test Samples**

| Sieve Sizes (square openings) |                   | Mass of Indicated Sizes, g |         |         |         |
|-------------------------------|-------------------|----------------------------|---------|---------|---------|
| Passing Sieve                 | Retained On Sieve | Grading                    |         |         |         |
|                               |                   | A                          | B       | C       | D       |
| 1 1/2"                        | 1"                | 1250±25                    | -       | -       | -       |
| 1"                            | 3/4"              | 1250±25                    | -       | -       | -       |
| 3/4"                          | 1/2"              | 1250±25                    | 2500±10 | -       | -       |
| 1/2"                          | 3/8"              | 1250±25                    | 2500±10 | -       | -       |
| 3/8"                          | 1/4"              | -                          | -       | 2500±10 | -       |
| 1/4"                          | #4                | -                          | -       | 2500±10 | 5000±10 |
| #4                            | #8                | -                          | -       | -       | -       |
| Total                         |                   | 5000±10                    | 5000±10 | 5000±10 | 5000±10 |

# **Appendix B**

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Geotechnical Report Limitations and Guidelines for Use

# Geotechnical Report Limitations and Guidelines for Use

## AET Project No. 17-20132

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### REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by ASFE<sup>1</sup>, of which, we are a member firm.

### RISK MANAGEMENT INFORMATION

#### **Geotechnical Services are Performed for Specific Purposes, Persons, and Projects**

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. No one, not even you, should apply the report for any purpose or project except the one originally contemplated.

#### **Read the Full Report**

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

#### **A Geotechnical Engineering Report is Based on A Unique Set of Project-Specific Factors**

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typically factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, always inform your geotechnical engineer of project changes, even minor ones, and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

#### **Subsurface Conditions Can Change**

A geotechnical engineering report is based on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

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1 ASFE, 8811 Colesville Road/Suite G106, Silver Spring, MD 20910  
Telephone: 301/565-2733 : [www.asfe.org](http://www.asfe.org)

## **Geotechnical Report Limitations and Guidelines for Use**

### **AET Project No. 17-20132**

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#### **Most Geotechnical Findings Are Professional Opinions**

Site exploration identified subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

#### **A Report's Recommendations Are Not Final**

Do not over rely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

#### **A Geotechnical Engineering Report Is Subject to Misinterpretation**

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

#### **Do Not Redraw the Engineer's Logs**

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

#### **Give Contractors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In the letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need to prefer. A prebid conference can also be valuable. Be sure contractors have sufficient time to perform additional studies. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

#### **Read Responsibility Provisions Closely**

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their report. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

#### **Geoenvironmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated environmental problems have led to numerous project failures. If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. Do not rely on an environmental report prepared for someone else.