ADDENDUM NUMBER 1

Project Number **89008230**

Project Title **NW 72nd Street Improvements**
Federal STP-3451(401)

ISSUE DATE: **12/19/2018**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **January 8, 2019**, are amended as follows:

Information to Bidders The following is provided to Bidders for information only:

1. The Design Professional has conducted a soil investigation and geotech report for design purposes only. The geotech report does not constitute the contractor's investigation of site conditions and was not included with the contract documents. The geotech report has been requested by bidders and is included with this addenda. The geotech report is deemed as not suitable for contractor's use, contractor is using it at their risk and the report is merely suggestive of the nature of the tested material, not representative of entire site conditions. Acknowledgement of this addenda shows acceptance of all risks associated with any use.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION

The Design Professional has conducted a soil investigation and geotech report for design purposes only. The geotech report does not constitute the contractor's investigation of site conditions and was not included with the contract documents. The geotech report has been requested by bidders and is included with this addenda. The geotech report is deemed as not suitable for contractor's use, contractor is using it at their risk and the report is merely suggestive of the nature of the tested material, not representative of entire site conditions. Acknowledgement of this addenda shows acceptance of all risks associated with any use.

NORTHWEST 72ND STREET FROM
NORTHWEST ROANRIDGE ROAD TO
NORTH OVERLAND DRIVE
KANSAS CITY, MISSOURI
TSI PROJECT NUMBER 20132012

WALTER P. MOORE
920 Main Street, Suite 10
Kansas City, Missouri 64105

TSi engineering,inc.

1322 Adams Street
Kansas City, Kansas 66103

June 3, 2013

TSi
engineering, inc.

1322 Adams Street
Kansas City, KS 66103
913.749.4010 (tel)
913.749.4011 (fax)
www.tsi-engineering.com

PROFESSIONAL SERVICE SINCE 1989

June 3, 2013

Mr. Dan Brown, P.E.
WALTER P. MOORE
920 Main Street, Suite 10
Kansas City, Missouri 64105

Re: **Report of Subsurface Exploration and**
Geotechnical Engineering Evaluation
NW 72nd Street from NW Roanridge Road to N Overland Drive
Kansas City, Missouri
TSi Project No. 20132012

Dear Mr. Brown:

TSi Engineering, Inc. (TSi) has completed the authorized subsurface exploration and geotechnical engineering evaluation for the referenced project and is pleased to submit this report of our findings to Walter P. Moore. The purpose of our work was to determine subsurface conditions at specific exploration locations and to gather data on which to prepare geotechnical recommendations for the design and construction of the proposed road improvements. This report describes the exploration procedures used, exhibits the data obtained, and presents our evaluations and recommendations relative to the geotechnical engineering aspects of the project.

We appreciate the opportunity to assist you with this project. If you have any questions, or if we may be of further service to you, please call us.

Respectfully submitted,
TSI ENGINEERING, INC.

STATE OF MISSOURI
KEVIN D. FRIEDRICHS
NUMBER PE-2013010325
6-3-13
PROFESSIONAL ENGINEER

Kevin Friedrichs, PE
Project Manager

Denise Hervey, PE MGS 6/3/13
Principal

Michael Schmitz, PE
Area Manager

CONTENTS

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION NORTHWEST 72ND STREET FROM NORTHWEST ROANRIDGE ROAD TO NORTH OVERLAND DRIVE KANSAS CITY, MISSOURI

1.0 SCOPE OF WORK

This report summarizes the results of a geotechnical study performed for the proposed widening of Northwest 72nd Street between Northwest Roanridge Road and North Overland Drive in northern Kansas City, Missouri. The study was performed in general accordance with discussions between TSi and Walter P. Moore. Based on TSi's understanding of the project, the following items have been identified for inclusion in this study report:

- Subsurface conditions at the boring locations;
- Laboratory test results;
- General excavation considerations;
- Influence of groundwater on the project;
- Preparation of fill subgrades;
- Recommendations for fill materials, placement, and compaction;
- Pavement subgrade preparation; and
- Selection of specific new pavement sections will be controlled by City standards. If poor subsurface conditions make standard pavement sections inappropriate, recommended alternatives will be presented.

2.0 SITE AND PROJECT DESCRIPTIONS

The following project understanding is based on discussions with Walter P. Moore and a site reconnaissance by an engineer from TSi. The general location of the project site is shown below. The Site and Boring Location Plan, Figure 1 in Appendix A, provides a more detailed plan of the project area.

This report covers the planned improvements to Northwest 72nd Street between Northwest Roanridge Road and North Overland Drive in northern Kansas City, Missouri. This is the east portion, approximately 2,500 feet, of a larger project which extends west of Interstate 29 an additional 1,500 feet. The exploration for the 1,500 feet of Northwest 72nd Street has already been completed and is detailed in TSi Report Number 20102051, dated December 3, 2010.

This portion of Northwest 72nd Street is currently a two-lane road with no shoulders, with drainage swales on both sides of the roadway. The existing two-lane road will be widened to a three-lane minor arterial road, and connected to already improved sections of Northwest 72nd Street. Final grading plans have not yet been developed, but preliminary plans call for no significant grade changes. No bridges, retaining walls, or significant drainage structures are planned as part of this project.

Most of the project area is bordered by existing residential developments. An exception to this is a former gas station that occupies the southeast corner of the intersection between Northwest 72nd Street and Northwest Roanridge Road.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

On April 19th, 2013, TSi conducted an exploration program at the project site consisting of five test borings (B-01 through B-05). Walter P. Moore selected the boring locations and provided TSi with a topographic map of the site. TSi located the borings in the field and the locations were adjusted as necessary to account for drill rig access and existing utilities. TSi left a labeled stake at each boring location so that the project surveyor could locate the borings. The approximate locations of the borings are indicated on the Site and Boring Location Plan in Appendix A.

The borings were drilled using a track-mounted CME-75 drill rig to advance flight auger drilling tools. The borings were all advanced to a depth of 15 feet or auger refusal. An engineer from TSi directed the exploration procedures in the field, maintained a field log of the conditions encountered in the borings, and collected and classified the samples recovered.

Split-spoon and Shelby tube samples were recovered from the borings. Split-spoon samples were recovered using a 2-inch outside-diameter, split-barrel sampler, driven by an automatic hammer, in accordance with ASTM D 1586. The split-spoon samples were placed in plastic bags for later testing in the laboratory. Three-inch Shelby tube samples were obtained in accordance with ASTM D 1587. The Shelby tube samples were preserved by sealing the entire sample in the tube.

A bulk sample of the auger cuttings was collected in boring B-03 from 1.0 to 5.5 feet below ground surface. A standard proctor and California Bearing Ratio (CBR) test were performed on the sample and the results are presented in Appendix C.

Test boring B-01 was drilled in close proximity to an existing gas station. At the request of Walter P. Moore the samples were screened with a Photoionization Detector (PID). The results are presented on Boring Log B-01 in Appendix B.

The results of the field tests and measurements were recorded on field logs by the engineer. The logs contain information concerning the exploration methods, samples attempted and recovered, indications of the presence of various subsurface materials, and the observation of groundwater, if present. The field logs contain the engineer's interpretations of the conditions between samples, based on the performance of the exploration equipment and the cuttings brought to the surface. The final logs included in this report were based on the field logs, modified as appropriate based on the results of laboratory testing of soil samples.

3.2 LABORATORY TESTING

A laboratory testing program was conducted by TSi to determine selected engineering properties of the obtained soil samples. The following laboratory tests were performed on the samples recovered from the borings:

- Visual descriptions by color and texture of each sample (ASTM 2488);
- Natural moisture content of selected samples (ASTM D 2216);
- Atterberg limits on selected cohesive samples (ASTM D 4318);
- Percent of soil finer than a No. 200 sieve (ASTM D 1140);
- Unit weight of selected undisturbed samples (ASTM D 2166);
- Unconfined compression tests on selected undisturbed cohesive samples (ASTM D 2166);
- Standard Proctor test of a select bulk sample (ASTM D 698); and
- California Bearing Ratio (CBR) test of a select bulk sample (ASTM D 1883).

The results of the laboratory tests are summarized on the boring logs, and the Proctor and CBR results can be found in Appendix C. The analysis and conclusions contained in this report are based on field and laboratory test results and on the interpretations of the subsurface conditions as reported on the logs. Only data pertinent to the objectives of this report have been included on the logs; therefore, these logs should not be used for other purposes.

4.0 SUBSURFACE CONDITIONS

Details of the subsurface conditions encountered at the boring locations are shown on the logs in Appendix B. The general subsurface conditions encountered and their pertinent engineering characteristics are described in the following paragraphs. Conditions represented by the borings should be considered applicable only at these locations on the dates shown; the reported conditions may be different at other locations or at other times.

4.1 REGIONAL GEOLOGY

The region is part of the central lowland physiographic province, dissected till plains region, loess hills subsection, and is covered with a stratum of wind-deposited loess soil. These lean clays and silts were deposited after the most recent period of glacial activity in the region and are thicker near the Missouri River. Some of the loess has been eroded by surface water. The loess is underlain by glacial till deposits that consist of fat clays mixed with variable quantities of sand and gravel. Glacial till soils in this area typically have seams and lenses of clean sand materials and/or gravel with occasional lenses of cobbles and boulders.

4.2 GENERALIZED SUBSURFACE PROFILE

All five borings were located on the south side of NW 72nd Street within 30 feet of the edge of pavement. Three to six inches of topsoil were found in all five borings. Fill was encountered in Borings B-01, B-04 and B-05 and ranged in depth between 1 and 2.5 feet. The fill is comprised of silty clay, sand, and gravel.

TSi encountered brown, reddish brown, and dark brown lean to fat clays (CL and CH, in accordance with the Unified Soil Classification System) with varying amounts of sand below the fill materials or topsoil. Exceptions to this are Boring B-02 where fine sand and highly weathered sandstone were encountered below lean clay to auger refusal at 8.5 feet, Boring B-03 where highly weathered sandstone was encountered below sandy lean clay at 15 feet, and Boring B-04 where weathered shale was encountered below fat clay at 13 feet until boring termination. Table 1 lists the depths of rock and auger refusal in each of the borings.

Standard penetration test (N) values in the native clays range from 5 to 17, with an average value of 11. The N values in the fill range from 4 to 8 with an average of 6. Atterberg limits tests on samples of the clay resulted in liquid limits (LL) of 32 to 51 and a plasticity index (PI) of 15 to 34. Dry unit weights of the clay range from 101 to 106 pounds per cubic foot (pcf) with an average of 103 pcf. Unconfined compressive strength tests on samples of the clay resulted in undrained shear strengths of 0.38 to 2.91 tons per square foot (tsf).

TABLE 1. BEDROCK DEPTH

Boring Location	Bedrock (ft.)	
	Top of Rock Depth	Auger Refusal Depth
B-01	NE	NE
B-02	8.5	8.5
B-03	15.0	NE
B-04	13.0	NE
B-05	13.5	NE

NE = Not Encountered

4.3 GROUNDWATER

Groundwater was observed during drilling in two of the five borings. Boring B-02 encountered water at 2.5 feet and Boring B-04 encountered water at 9.0 feet during drilling.

The presence or absence of groundwater at a particular location does not necessarily mean that groundwater will be present or absent at that location at other times. Seasonal variations, the water level in the drainage ditches adjacent to the roadway, the water level in the adjacent creek, and other unknown considerations will cause fluctuations in water levels and the presence of water in the soils.

5.0 Engineering Assessments and Recommendations

5.1 Slope Stability

Final grading plans should limit cut and fill slopes to inclinations no steeper than 3 Horizontal to 1 Vertical (3H:1V). Slopes steeper than 3H:1V may be stable, but should be analyzed on a case-by-case basis, and will be harder to maintain. In general, grading should be designed to prevent surface water from collecting at the top of slopes and to avoid concentrated flow over the slopes, which will increase the potential for soil erosion.

5.2 Soft Subgrade Soils

The current project plans show new pavement areas over existing drainage swales adjacent to the roadways. The bottoms of these drainage swales will likely be soft, wet, and contain a greater thickness of organic soil than encountered in the surrounding borings. TSi recommends that the soft material in these areas be excavated until a subgrade is encountered that can pass the proofrolling recommendations described in Section 6.1 of this report. The soft material may extend for several feet below the bottom of the drainage swales.

5.3 Pavement Design

Based on the general character of the on-site subsurface conditions and assuming a properly prepared subgrade, a California Bearing Ratio (CBR) value of 3 is considered appropriate for use in designing the flexible pavement sections for cut and fill areas of the site. Rigid pavement design can be based on a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) for the subgrade. These values for rigid and flexible pavement design are based on the requirement that the pavement subgrade is prepared in accordance with the recommendations provided in this report.

TSi does not recommend placing a pavement section directly on the existing soils. Taking into consideration the moisture sensitivity and plasticity of the native soils, TSi recommends either importing acceptable fill material or stabilizing the subgrade with “Class C” fly ash to limit subgrade deterioration, especially during wet weather, and to provide for a more durable pavement. The stabilized pavement subgrade is less prone to potential damage from seasonal shrink and swell of the clay soils and less susceptible to subgrade failures during the life of the pavements. The stabilized section would function as a sub-base for the pavement section. The top 9 inches of pavement subgrade should be stabilized with “Class C" fly ash applied at a rate of 15% of the treated soil on a dry weight basis. The stabilized soils should be compacted as recommended in Section 6.5 of this report. Suggested specifications for the fly ash stabilization can be provided if desired.

6.0 Site Preparation and Excavation Considerations

6.1 Subgrade Preparation

Construction areas should be stripped of existing pavement, organic soil, and any deleterious materials prior to site excavation and grading. Tree stumps and root balls should also be removed. Care should be taken during stripping to prevent excessive disturbance of the underlying soil. After the removal of these materials, and where further excavation is not required, the exposed subgrade should be proofrolled. Proofrolling is accomplished by passing over the subgrade with proper equipment, such as a loaded tandem-axle dump truck or scraper, and observing the subgrade for pockets of excessively soft, wet, disturbed, or otherwise unsuitable soils. Any unacceptable materials thus found should be excavated and either recompacted or replaced with new structural fill.

Prior to placing fill in any area, the subgrade should be scarified to a depth of about 6 inches, the moisture content adjusted to near its optimum moisture content, and the subgrade recompacted in accordance with recommendations made in subsequent sections of this report. The recommended proofrolling and/or scarification and recompaction may be waived if, in the opinion of a geotechnical engineer, this procedure would be detrimental or unnecessary. Following satisfactory preparation of the subgrade, controlled fill material may be placed.

Where fill is being placed on slopes steeper than 5H:1V, the existing slopes should be benched as fill placement progresses. These benches should be vertically stepped no more than 2 feet. This procedure would key the fill into the original slopes and will facilitate compaction of the fill.

6.2 Excavations

The clayey soils can be excavated using conventional earth moving equipment and methods. The preliminary grading plans provided by Walter P. Moore do not indicate roadway excavations will be near the bedrock surface. Deeper utility excavations may encounter bedrock in some areas of the site. It is probable that the weathered upper portion of the sandstone and shale bedrock can be excavated using conventional equipment and methods, but deeper excavations into sandstone or shale, and any limestone excavation, will likely require a hydraulic breaker or other hard rock excavation method. Excavation of the bedrock in trenches will be difficult. The most suitable means to excavate the bedrock materials should be determined in the field.

Trenching, excavating, and bracing should be performed in accordance with OSHA (Occupational Safety and Health Administration) regulations and other applicable regulatory agencies. In accordance with the OSHA excavation standards, the existing clay soils at the site are considered Type B, which requires a side slope for excavations of not steeper than 1.0H:1.0V. The existing fill materials are considered Type C, which requires a side slope for excavations of not steeper than 1.5H:1V. However, worker safety and classification of the excavation soil is the responsibility of the contractor. Also according to OSHA requirements, any excavation extending to a depth of more than 20 feet must be designed by a registered professional engineer. An excavation retention system, such as soldier pile and lagging or sheet piling, may be used as an alternate to sloping back the sides of trench excavations.

6.3 Subgrade Protection

Construction areas should be properly drained in order to reduce or prevent surface runoff from collecting on the exposed subgrade. Any ponded water on the exposed subgrade should be removed immediately. Temporary storm-water swales and collection areas may be required to control surface water flow into low areas of the site.

To prevent unnecessary disturbance of the subgrade soils, heavy construction vehicles should be restricted from traveling through the finished subgrade. If areas of disturbed subgrade develop, they should be properly repaired in accordance with the recommendations in this report.

The lean clay loess soils that are present at the site are highly susceptible to disturbance from construction traffic, especially during rainy weather. Consideration should be given to leaving cut areas 1 to 2 feet higher than planned subgrade until immediately before paving operations are planned. The extra material that is left in place would protect the final subgrade from disturbance.

Immediately prior to construction of the pavement, it is recommended that the exposed subgrade be evaluated to determine whether moisture contents are within the recommended range and to identify areas disturbed by construction operations. Moisture conditioning of wet or dry areas is recommended prior to construction of the pavement section. Areas disturbed by construction traffic should be reworked.

6.4 Fill and Backfill Materials

According to the City of Kansas City, Missouri specifications, fill material for City streets should consist of a well-graded crushed granular material or clay with a liquid limit not exceeding 40, a plastic index not exceeding 25, and a maximum particle size of 3 inches. Most of the clay soils encountered in the borings are not acceptable fill materials according to these specifications. To meet the specifications, the unsuitable clay soils will have to be chemically treated (fly ash or lime). If an off-site borrow source is used for fill, the source will need to be selected and approved prior to its use. Soil with decayable material such as wood, trash, metal, or vegetation is not acceptable.

TSi recommends that the clay soils which do not meet the City's requirements be used in the deeper fill areas. TSi believes these materials can be used up to 2 feet below the bottom of the pavement section. The material within 2 feet of the bottom of the pavement section should consist of material which meets the City of Kansas City specifications or be fly ash treated on-site soils.

Some of the fill material may require the addition of moisture prior to compaction. This should be performed in a controlled manner using a tank truck with a spray bar, and the moistened soil should be thoroughly blended with a disk or pulverizer to produce a uniform moisture content. Repeated passages of the equipment may be required to achieve a uniform moisture content. If fill is placed during the winter season, fill materials should be carefully observed to see that no ice or frozen soils are placed as fill or remain in the base materials upon which fill is placed.

Some of the fill material may require moisture reduction prior to compaction. During warm weather, moisture reduction can generally be accomplished by disking, or otherwise aerating the soil. When air-drying is not possible, a moisture-reducing chemical additive, such as lime or Class C fly ash, may be used as a drying agent.

6.5 Fill and Backfill Placement

Cohesive fill should be compacted to a dry density of at least 95% of the standard Proctor maximum dry density (ASTM D 698) of the soil. Granular material, such as crushed limestone, placed for structure or pavement support, should be compacted to at least 100% of the standard Proctor maximum dry density. The moisture content of lean clay or granular fill at the time of compaction should be within ±3% of the optimum moisture content of the material as determined by the standard Proctor compaction test. The moisture content of fat clay fill materials should be from the optimum moisture content to 4% above optimum. Open-graded granular material used for drainage backfill should be compacted to at least 60% of the relative density of the material (ASTM D 4253 and D 4254). Fill should be placed in loose lifts not in excess of 8 inches thick, and compacted to the aforementioned criterion. However, it may be necessary to place fill in thinner lifts to achieve the recommended compaction when using small hand-operated equipment.

6.6 Groundwater Considerations

Groundwater was observed during drilling in two of the five borings. The presence or absence of groundwater at a particular location does not necessarily mean that groundwater will be present or absent at that location at other times. Seasonal variations and other unknown considerations will cause fluctuations in water levels and the presence of water in the soils. If groundwater is encountered in an excavation, it is anticipated that it could be handled by shallow swales and a sump and pump arrangement in most situations.

7.0 CONSTRUCTION OBSERVATION AND TESTING

It is recommended that TSi be retained during construction to perform testing and observation services for the following items:

- removal of soils with grass and roots, unsuitable fill, and any other deleterious material;
- proofrolling, recompaction, and preparation of the soil subgrade that will support new fill or structural elements;
- placement and compaction of fill, backfill, and sub-base materials; and
- placement and quality assurance testing of pavement material.

These quality assurance services should help to verify the design assumptions and maintain construction procedures in accordance with the project plans, specifications, and good engineering practice.

8.0 REPORT LIMITATIONS

This geotechnical report has been prepared for the exclusive use of **Walter P. Moore** for the specific application to the subject project. The information and recommendations contained in this report have been made in accordance with generally accepted geotechnical and foundation engineering practices; no other warranties are implied or expressed.

The assessments and recommendations submitted in this report are based in part upon the data obtained from the borings. The nature and extent of variations between the borings may not be evident at this time. If variations appear evident at a later date, it may be necessary to re-evaluate the recommendations of this report.

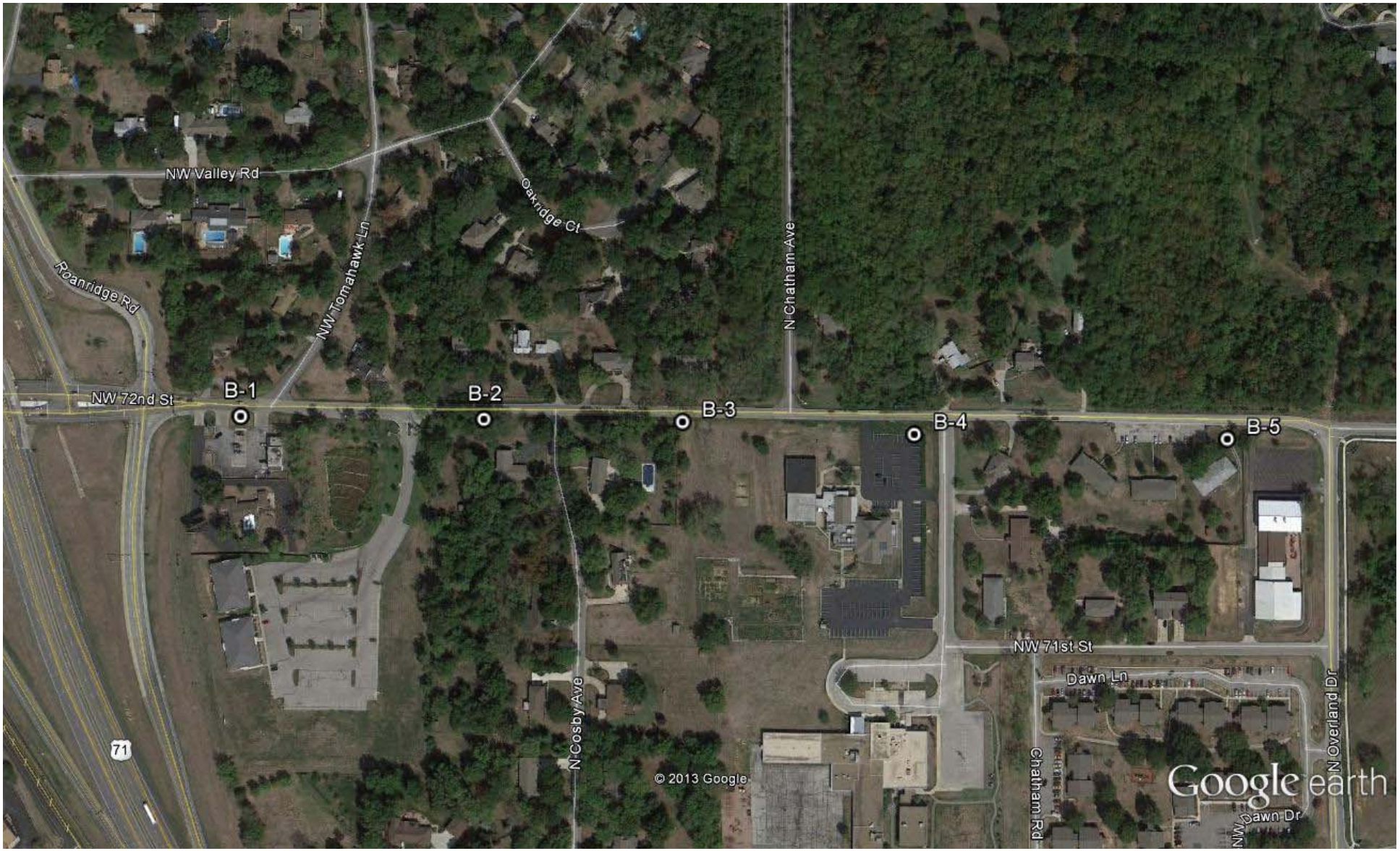
We emphasize that this report was prepared for design purposes only and may not be sufficient to prepare an accurate construction bid. Contractors reviewing this report should acknowledge that the information and recommendations contained herein are for design purposes.

If conditions at the site have changed due to natural causes or other operations, this report should be reviewed by TSi to determine the applicability of the analysis and recommendations considering the changed conditions. The report should also be reviewed by TSi if changes occur in the roadway location, traffic, elevations, grading and site development plans, or the project concepts.

TSi requests the opportunity to review the final plans and specifications for the project prior to construction to verify that the recommendations in this report are properly interpreted and incorporated in the design and construction documents. If TSi is not accorded the opportunity to make this recommended review, we can assume no responsibility for the misinterpretation of our recommendations.

APPENDIX A

Site and Boring Location Plan



Legend

◉ **Boring Location**

N
W E
S

Figure 1, Site and Boring Location Plan	Project No. 20132012
NW 72nd Street Kansas City, Missouri	
Not to Scale	Approved by: MES

APPENDIX B

Boring Logs
Boring Log Notes
Unified Soil Classification System

LOG OF BORING NO. B-01

Project Description: **NW 72nd Steet**
Kansas City, Missouri

TSi Engineering
1322 Adams Street
Kansas City, KS 66103
(913) 749-4010 (913) 749-4011 FAX

Surface El.:
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Dark brown, lean CLAY, with roots and organics										
		SS-1		Brown to dark brown, lean CLAY (CL) (FILL) (PID=0.4 ppm)	61		3 3 5				30			
				Light reddish brown, lean CLAY (CL)										
5		ST-2			100			3.00	1.45	102	24			
				- dark brown from 6.0 to 13.0 ft.										
		SS-3		(PID=13.2 ppm)	100		3 4 5				23	45	17	28
10														
				- reddish brown, with silt below 13.0 ft.										
		SS-4		(PID=1.6 ppm)	100		5 6 10				18			
15				Boring terminated at 15.0 ft.										
20														
25														

Completion Depth: 15.00
Date Boring Started: 4/19/13
Date Boring Completed: 4/19/13
Engineer/Geologist: KF
Project No.: 20132012

Remarks: Boring drilled with CME-75 using FA and auto SPT. Groundwater not encountered during drilling.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

KC LOG WITH LAB 20132012 72ND STREET.GPJ 6/3/13

LOG OF BORING NO. B-02

Project Description: **NW 72nd Steet**
Kansas City, Missouri

TSi Engineering
1322 Adams Street
Kansas City, KS 66103
(913) 749-4010 (913) 749-4011 FAX

Surface El.:

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Dark brown, lean CLAY, with roots and organics										
		SS-1		Reddish brown, lean CLAY (CL), with sand	89		4 5 7				17			
				▽ Reddish brown, lean clayey SAND (SC) trace gravel										
5		SS-2		Reddish brown, highly weathered SANDSTONE	100		2 4 14				30			
		SS-3		Auger refusal at 8.5 ft.			50/0							
10														
15														
20														
25														

Completion Depth: 8.50
Date Boring Started: 4/19/13
Date Boring Completed: 4/19/13
Engineer/Geologist: KF
Project No.: 20132012

Remarks: Boring drilled with CME-75 using FA and auto SPT. Groundwater encountered at 2.5 ft. during drilling.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

KC LOG WITH LAB 20132012 72ND STREET.GPJ 6/3/13

LOG OF BORING NO. B-03

Project Description: **NW 72nd Steet**
Kansas City, Missouri

TSi Engineering
1322 Adams Street
Kansas City, KS 66103
(913) 749-4010 (913) 749-4011 FAX

Surface El.:
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Dark brown, lean CLAY, with roots and organics										
		ST-1		Dark brown, lean CLAY (CL) - brown from 1.0 to 8.0 ft.	100			5.00	1.37	101	21	32	17	15
5		SS-2			100		4 5 5				28			
				- light reddish brown below 8.0 ft.										
10		SS-3			72		5 5 9				23	44	21	23
				- with fine sand below 11.0 ft.										
15		SS-4			100		2 4				18			
				Reddish brown, highly weathered SANDSTONE			48							
				Boring terminated at 15.5 ft.										
20														
25														

Completion Depth: 15.50
Date Boring Started: 4/19/13
Date Boring Completed: 4/19/13
Engineer/Geologist: KF
Project No.: 20132012

Remarks: Boring drilled with CME-75 using FA and auto SPT. Groundwater not encountered during drilling.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

KC LOG WITH LAB 20132012 72ND STREET.GPJ 6/3/13

LOG OF BORING NO. B-04

Project Description: **NW 72nd Steet**
Kansas City, Missouri

TSi Engineering
1322 Adams Street
Kansas City, KS 66103
(913) 749-4010 (913) 749-4011 FAX

Surface El.:

Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Dark brown, lean CLAY, with roots and organics										
				Dark brown, lean CLAY (CL) (FILL)										
		SS-1		Light reddish brown, fat CLAY (CH) - dark grayish brown from 2.0 to 6.0 ft.	100		2 2 3				24			
		SS-2			72		2 3 4				26	51	17	34
5				- reddish brown, with gravel below 6.0 ft.										
		ST-3		▽	50			5.00	0.38	102	20			
10														
		SS-4		Olive gray, weathered SHALE	100		5 7 10				21			
15				Boring terminated at 14.5 ft.										
20														
25														

Completion Depth:	14.50
Date Boring Started:	4/19/13
Date Boring Completed:	4/19/13
Engineer/Geologist:	KF
Project No.:	20132012

Remarks: Boring drilled with CME-75 using FA and auto SPT. Groundwater encountered at 9.0 ft. during drilling.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

KC LOG WITH LAB 20132012 72ND STREET.GPJ 6/3/13

LOG OF BORING NO. B-05

Project Description: **NW 72nd Steet**
Kansas City, Missouri

TSi Engineering
1322 Adams Street
Kansas City, KS 66103
(913) 749-4010 (913) 749-4011 FAX

Surface El.:
Location: **See Site and Boring Location Plan**

Depth, feet	Samples	Sample #	Graphic Log	MATERIAL DESCRIPTION	Recovery %	RQD	Penetration Blows Per 6 inches	Hand Penetrometer TSF	Undrained Shear Strength, TSF	Unit Dry Weight, lb/cu ft.	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
				Crushed limestone gravel (3")										
				Dark brown, lean CLAY (CL) (FILL)			2							
		SS-1		Light reddish brown, lean CLAY (CL)	100		2 2				22			
		ST-2			75			2.25	2.91	106	18	37	18	19
5				- trace sand and gravel below 7.0 ft.										
		SS-3			100		5 7 10				12			
10														
		SS-4		Boring terminated at 13.5 ft.			50/0"							
15														
20														
25														

Completion Depth: 13.50
Date Boring Started: 4/19/13
Date Boring Completed: 4/19/13
Engineer/Geologist: KF
Project No.: 20132012

Remarks: Boring drilled with CME-75 using FA and auto SPT. Groundwater not encountered during drilling.

The stratification lines represent approximate strata boundaries.
In situations, the transition may be gradual.

KC LOG WITH LAB 20132012 72ND STREET.GPJ 6/3/13

GENERAL NOTES

The number of borings is based on: topographic and geologic factors; the magnitude of structure loading; the size, shape, and value of the structure; consequences of failure; and other factors. The type and sequence of sampling are selected to reduce the possibility of undiscovered anomalies and maintain drilling efficiency. Attempts are made to detect and/or identify occurrences during drilling and sampling such as the presence of water, boulders, gas, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation in resistance to driving split-spoon samplers, unusual odors, etc. However, lack of notation regarding these occurrences does not preclude their presence.

Although attempts are made to obtain stabilized groundwater levels, the levels shown on the Logs of Boring may not have stabilized, particularly in more impermeable cohesive soils. Consequently, the indicated groundwater levels may not represent present or future levels. Groundwater levels may vary significantly over time due to the effects of precipitation, infiltration, or other factors not evident at the time indicated.

Unless otherwise noted, soil classifications indicated on the Logs of Boring are based on visual observations and are not the result of classification tests. Although visual classifications are performed by experienced technicians or engineers, classifications so made may not be conclusive.

Generally, variations in texture less than one foot in thickness are described as layers within a stratum, while thicker zones are logged as individual strata. However, minor anomalies and changes of questionable lateral extent may appear only in the verbal description. The lines indicating changes in strata on the Logs of Borings are approximate boundaries only, as the actual material change may be between samples or may be a gradual transition.

Samples chosen for laboratory testing are selected in such a manner as to measure selected physical characteristics of each material encountered. However, as samples are recovered only intermittently and not all samples undergo a complete series of tests, the results of such tests may not conclusively represent the characteristics of all subsurface materials present.

NOTATION USED ON BORING LOGS

APPROXIMATE PROPORTIONS

TRACE	<15%
WITH	15-30%
MODIFIER	>30%

Clay or clayey may be used as major material or modifier, regardless of relative proportions, if the clay content is sufficient to dominate the soil properties.

PARTICLE SIZE

BOULDERS		>12 Inches
COBBLES		12 Inches – 3 Inches
GRAVEL		
	Coarse	3 Inches – ¾ Inch
	Fine	¾ Inch – No. 4 Sieve (4.750 mm)
SAND		
	Coarse	No. 4 – No. 10 Sieve (2.000 mm)
	Medium	No. 10 – No. 40 Sieve (0.420 mm)
	Fine	No. 40 – No. 200 Sieve (0.074 mm)
SILT		No. 200 Sieve - 0.002 mm
CLAY		< 0.002 mm

PENETRATION – BLOWS

Number of impacts of a 140-pound hammer falling a distance of 30 inches to cause a standard split-barrel sampler, 1 3/8 inches I.D., to penetrate a distance of 6 inches. The number of impacts for the first 6 inches of penetration is known as the seating drive. The sum of the impacts for the last 12 inches of penetration is the Standard Penetration Test Resistance or "N" value, blows per foot. For example, if blows = 6-8-9, "N" = 8+9 or 17.

OTHER NOTATIONS

Recovery % – length of recovered soil divided by length of sample attempted.

50/2"	Impacts of hammer to cause sampler to penetrate the indicated number of inches
WR	Sampler penetrated under the static loading of the weight of the drill rods
WH	Sampler penetrated under the static loading the weight of the hammer and drill rods
HSA	Hollow stem auger drilling method
FA	Flight auger drilling method
RW	Rotary wash drilling methods with drilling mud
AH	Automatic hammer used for Standard Penetration Test sample
SH	Safety hammer with rope and cathead used for Standard Penetration Test sample

GRAPHIC SYMBOLS

▽ Depth at which groundwater was encountered during drilling

▼ Depth at which groundwater was measured after drilling

⧗ Standard Penetration Test Sample, ASTM D1586

▮ 3-inch diameter Shelby Tube Sample, ASTM D1587

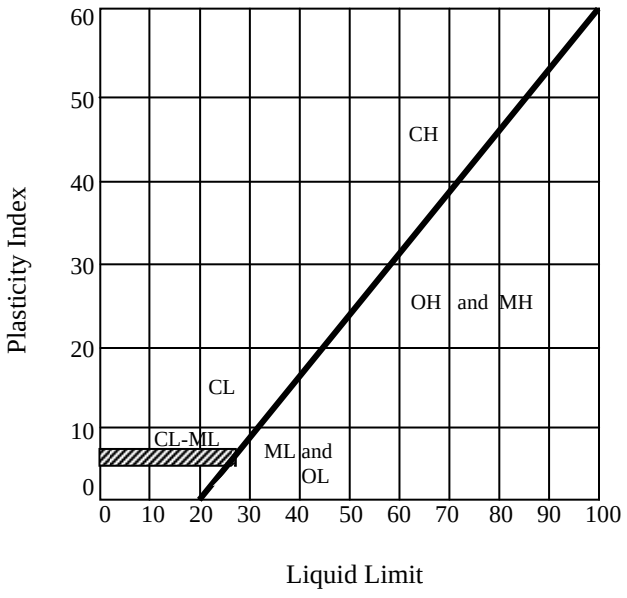
G Sample grabbed from auger

▮▮ NX Size rock core sample

TSi engineering,

UNIFIED SOIL CLASSIFICATION SYSTEM, (ASTM D-2487)

Major Divisions			*Group Symbols*		*Typical Names*	*Laboratory Classification Criteria*		
Coarse-grained soils (More than half of materials is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-Grained soils are classified as follows: Less than 5 per cent GW, GP, SW, SP More than 12 per cent GM, GC, SM, SC 5 to 12 per cent Borderline cases requiring dual symbols[b]	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			GP		Poorly graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW	
		Gravels with fines (Appreciable amount of fines)	GM[a]	d	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.1. less than 4	Above "A" line with P.1. between 4 and 7 are *borderline* cases requiring use of dual symbols
				u				
			GC		Clayey gravels, gravel-sand-clay mixtures		Atterberg limits below "A" line with P.1. greater than 7	
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	
			SP		Poorly graded sands, gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM[a]	d	Silty sands, sand-mix mixtures		Atterberg limits about "A" line or P.I. less than 4	Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols
				u				
			SC		Clayey sands, sand-clay mixtures		Atterberg limits about "A" line with P.I. greater than 7	
Fine-grained soils (More than half of materials is smaller than No. 200 sieve size)	Silts and clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	Plasticity Chart		
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays			
			OL		Organic silts and organic silty clays of low plasticity			
	Silts and clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts			
			CH		Inorganic clays of medium to high plasticity, organic silts			
			OH		Organic clays of medium to high plasticity, organic silts			
	Highly organic soils		Pt		Peat and other highly organic soils			



[a]Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when
L.L. is 26 or less and the P.1. is 6 or less; the suffix u used when L.L. is greater than 28.

[b]Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

APPENDIX C

Laboratory Test Results

TSI engineering, inc.

PROCTOR TEST

PROJECT NAME:	**72nd Street**
PROJECT No.:	20132012
SAMPLE NUMBER:	**A**
SAMPLE LOCATION:	**B-3 Bulk**
DEPTH:	**1 - 5.5**
VISUAL CLASS. (USCS):	**Brown silty lean clay**

TYPE OF COMPACTION	**Std.**	**D698**		
SIEVE ANALYSIS RESULTS	0.75	0.375	No. 4	**PROCEDURE**
% Retained(cummulative)				**A**

SOIL WEIGHT DATA					
Determination Number	1	2	3	4	5
Weight- Soil + Mold (wet),g	3730.6	3880.1	3964.2	3922.3	
Weight of Mold,g	1992.8	1992.8	1992.8	1992.8	
Weight Wet Soil,g	**1737.8**	**1887.3**	**1971.4**	**1929.5**	
Volume of Mold (ft^3)	**0.0333**	**0.0333**	**0.0333**	**0.0333**	
MOISTURE DATA					
Weight- Soil + Tare (wet),g	668.9	561.2	561.6	607.7	
Weight- Soil + Tare (dry),g	626.7	526.7	526.1	541.8	
Weight- Tare,g	284.7	283.9	313.4	197.3	
COMPUTED DATA					
Wet unit weight (pcf)	**115.1**	**124.9**	**130.5**	**127.7**	
Moisture content (%)	**12.3**	**14.2**	**16.7**	**19.1**	
Dry unit weight (pcf)	**102.4**	**109.4**	**111.8**	**107.2**	

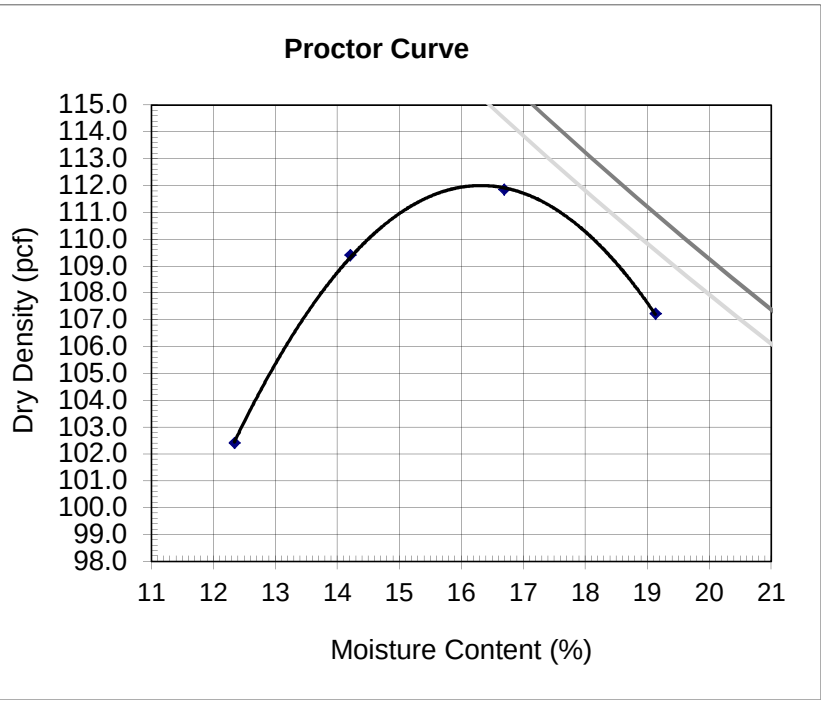
Maximum Dry Density (pcf)	**112.0**
Optimum Moisture Content (%)	**16.5**
Natural Moisture Content (%)*	

Liquid Limit	
Plastic Limit	
Plasticity Index	
CLASSIFICATION. (USCS)*	

*** with additive**

	Date
Tested by: BJ	4/25/2013
Calculated by: AWR	4/26/2013
Checked by: AWR	4/26/2013
Entered Into Excel by: AWR	4/26/2013

NOTE:



CALIFORNIA BEARING RATIO

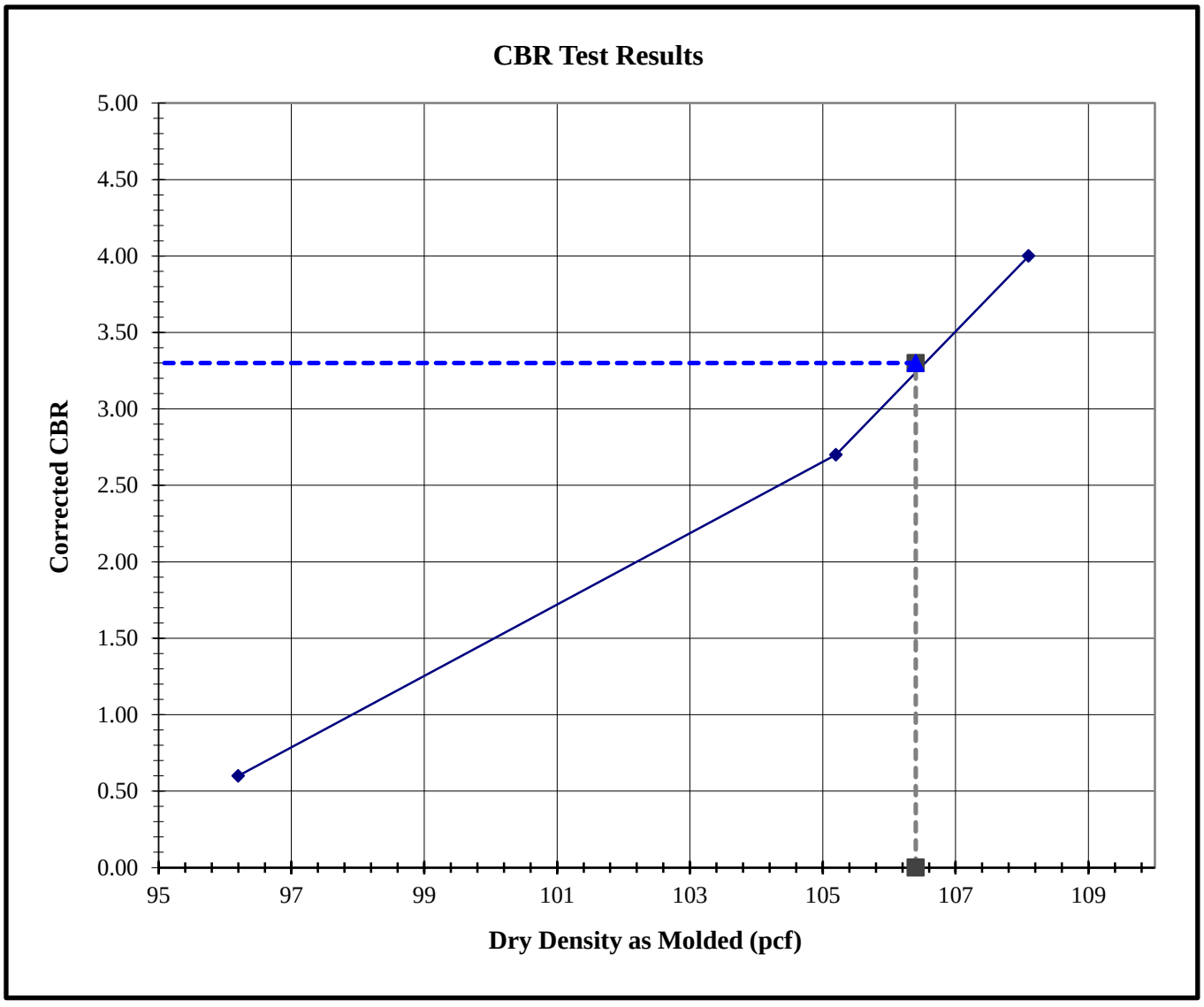
at Optimum Water Content

Project Name 72nd street
Project Number 20132012.02
Sample Number Bulk (1'-5.5')
Sample Location B-03
Soil Description Brown, Lean CLAY (CL)

Calc. by CAV
Checked by TEO

Maximum Dry Density	**112.0**
Optimum Moisture Content	**16.5**
Method of Compaction	**ASTM D 698**
Density at 95% Compaction	**106.4**

CBR at 95% Compaction 3.4



Limited Site Investigation

The Design Professional has conducted a soil investigation and geotech report for design purposes only. The geotech report does not constitute the contractor's investigation of site conditions and was not included with the contract documents. The geotech report has been requested by bidders and is included with this addenda. The geotech report is deemed as not suitable for contractor's use, contractor is using it at their risk and the report is merely suggestive of the nature of the tested material, not representative of entire site conditions. Acknowledgement of this addenda shows acceptance of all risks associated with any use.

NW 72nd Street Improvements
5905 NW 72nd Street
Kansas City, Missouri

January 4, 2018
Terracon Project No. 02177403

Prepared for:
Walter P. Moore
Kansas City, Missouri

Prepared by:
Terracon Consultants, Inc.
Lenexa, Kansas

January 4, 2018

Walter P. Moore
920 Main Street
Kansas City, Missouri

Attn: Mr. Daniel L. Brown, P.E.
(816) 701-2100
dlbrown@walterpmoore.com

Re: Limited Site Investigation
NW 72nd Street Improvements
5905 NW 72nd Street
Kansas City, Missouri 64151
Terracon Project No. 02177403

Dear Mr. Brown:

Terracon Consultants, Inc. (Terracon) is pleased to submit the enclosed Limited Site Investigation report for the above-referenced site. This assessment was performed in general accordance with Terracon's proposal (P02130638) dated July 12, 2013.

Terracon appreciates the opportunity to provide environmental services to Walter P. Moore. Should you have any questions or require additional information, please do not hesitate to contact our office.

Sincerely,
Terracon Consultants, Inc.

Prepared by:

Aaron L. Steigerwalt, P.E.
Project Environmental Engineer

Reviewed by:

Karen T. Rieken, P.E.
Senior Engineer

TABLE OF CONTENTS

LIMITED SITE INVESTIGATION
NW 72nd Street Improvements
5905 NW 72nd Street
Kansas City, Missouri 64151

Terracon Project No. 02177403
January 4, 2018

1.0 SITE DESCRIPTION

The site is located north of and adjacent to a gas station located along a roadway improvement project being designed for the City of Kansas City. The gas station is located at the southeast corner of the intersection of NW 72nd Street and the off-ramp for I-29 (a Sinclair station addressed at 5905 NW 72nd Street, Kansas City, Missouri).

Exhibit 1 provides a topographic map illustrating the general site location. Exhibit 2 provides a diagram illustrating the site, adjoining properties, and boring locations.

2.0 SCOPE OF SERVICES

Terracon's Limited Site Investigation (LSI) was undertaken in response to observed petroleum odors in soils that were discovered in 2013 during a geotechnical investigation conducted by TSI Engineering, Inc. The investigation area is part of a roadway improvement project.

The LSI was conducted to explore for the presence of petroleum indicator contaminants. The scope of services was not intended to identify every chemical possibly associated with the site. Similarly, the proposed scope was not intended to determine the extent or magnitude of any existing contamination.

2.1 Standard of Care

Terracon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time. Terracon makes no warranties, express or implied, regarding the findings, conclusions, or recommendations. Terracon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of the report. These LSI services were performed in accordance with the scope of work agreed with you, our client, as reflected in our proposal and were not restricted by ASTM E1903-11.

2.2 Additional Scope Limitations

Findings, conclusions, and recommendations resulting from these services are based upon information derived from the on-site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, nondetectable, or not present during these services. We cannot represent that the site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this LSI. Subsurface conditions may vary from those encountered at specific borings or wells or during other surveys, tests, assessments, investigations, or exploratory services. The data, interpretations, findings, and our recommendations are based solely upon data obtained at the time and within the scope of these services.

2.3 Reliance

This report has been prepared for the exclusive use of Walter P. Moore, and any authorization for use or reliance by any other party (except a governmental entity having jurisdiction over the site) is prohibited without the express written authorization of Walter P. Moore and Terracon. Any unauthorized distribution or reuse is at Walter P. Moore's sole risk. Notwithstanding the foregoing, reliance by authorized parties will be subject to the terms, conditions, and limitations stated in the proposal, LSI report, and Terracon's Agreement for Services. The limitation of liability defined in the terms and conditions is the aggregate limit of Terracon's liability to Walter P. Moore and all relying parties unless otherwise agreed in writing.

3.0 FIELD INVESTIGATION

Terracon conducted the fieldwork under a safety plan developed for this project. Work was performed using United States Environmental Protection Agency (USEPA) Level D work attire in accordance with Terracon's core safety rules and practices. Terracon contacted the State of Missouri's One-Call service to locate underground utilities (Ticket No. 173480630) prior to commencement of on-site activities.

3.1 Soil Borings

Drilling services were performed on December 21, 2017, by Dakota Technologies of Lee's Summit, Missouri. Soil borings were advanced using a truck-mounted Geoprobeâ equipped with a direct-push hydraulic system for advancing probes. Soil cores were retrieved by advancing stainless-steel macro-cores with acetate liners. The macro-cores were withdrawn to ground surface to document stratigraphy, perform field vapor screening, and collect analytical samples.

Mr. Aaron Steigerwalt, a Terracon environmental engineer and Ms. Jackie Zellmer, a Terracon environmental scientist, documented lithology and conducted drilling oversight for the four borings completed on site (Exhibit 2).

3.2 Geology/Hydrology

The soil lithology observed during boring advancement generally consisted of silty clay to approximately 5 feet below ground surface (bgs), the maximum depth of investigation. Saturated soil conditions were not observed during boring advancement. Lithologic descriptions are presented on the soil boring logs provided in Appendix B.

3.3 Field Screening

Soil cores were collected continuously from the macro-cores to observe and document soil lithology, color, moisture characteristics, and visual indicators of potential impact. Terracon field screened soil cores for organic vapors using a photoionization detector (PID). This device provides a direct reading in parts per million (ppm) isobutylene equivalents. Upon removal of the sampler from the borehole, Terracon placed a portion of each sample in a sealable plastic bag. After a stabilization period, Terracon screened the headspace above the soil using the PID equipped with a 10.6 electron-volt (eV) ultraviolet lamp source. Terracon calibrated the PID in accordance with the manufacturer's recommendations before the field activities. The boring logs include the field screening results for each soil boring and are included in Appendix B.

No odors or staining were observed and PID readings were less than 1 ppm for each boring.

3.4 Soil Sampling

Terracon collected soil samples from each boring from 1 to 3 feet as outlined in the proposal. Soil samples were collected and placed in laboratory prepared containers, labeled, placed on ice in a cooler, and secured with a custody seal. The samples and completed chain-of-custody forms were transported to the analytical laboratory for a standard seven business day turn-around time.

3.5 Boring Abandonment

Following completion of soil sampling activities, borings were abandoned in general accordance with applicable state regulations and guidelines. The borings were abandoned by backfilling with hydrated bentonite to approximately one foot below ground surface, followed by an appropriate surface cover.

3.6 Investigative Derived Waste

Investigative derived waste (IDW) generated from site activities included soil cuttings which were returned to the ground and in a manner to limit runoff. Personal protective equipment (PPE), disposal equipment, and general trash were disposed of as municipal solid waste.

4.0 LABORATORY ANALTYICAL METHODS

Samples were submitted to ESC Lab Sciences (ESC) in Mt. Juliet, Tennessee, a National Environmental Laboratory Accreditation Program (NELAP) accredited laboratory. Table 4-1 below indicates the sample analytical methods for the submitted samples.

Table 4-1 Sample Analysis

Boring Location	Analysis	Method	Media Sampled
B-1, B-2, B-3, B-4	MRBCA Volatiles and Oxygenates and TPH-GRO	8260B	Soil

Notes:
TPH GRO – Total Petroleum Hydrocarbon-Gasoline Range Organics
MRBCA Volatiles & Oxygenates – includes benzene, toluene, ethylbenzene, xylenes (BTEX), 1,2-dibromoethane (EDB), 1,2-dichloroethane (EDC), naphthalene, methyl-tertiary-butyl-ether (MTBE), tertiary-amyl methyl ether (TAME), tert-butyl alcohol (TBA), ethyl tert-butyl ether (ETBE), and di-isopropyl ether (DIPE).

5.0 ANALYTICAL RESULTS

Soil results were compared to the Missouri Risk-Based Corrective Action (MRBCA) Technical Guidance appendices (revised March 2010) for Default Target Levels (DTLs). The DTLs are the lowest risk-based contaminant concentrations calculated in MDNR Tier 1 risk assessments for soil types and pathways that allow unrestricted land and groundwater use.

5.1 Soil Sample Results

Laboratory analyses were performed for soil samples collected from borings B-1, B-2, B-3, and B-4. Soil sample analytical detections are summarized in Table 1 (Appendix C). A copy of the laboratory analytical report and chain-of-custody is provided as Appendix D.

MRBCA Volatiles and Oxygenates
Volatiles and oxygenates were not detected above laboratory reporting limits in samples collected from borings B-1, B-2, B-3, and B-4.

TPH

TPH-GRO was not detected above laboratory reporting limits in samples collected from borings B-1, B-2, B-3, and B-4.

6.0 CONCLUSIONS

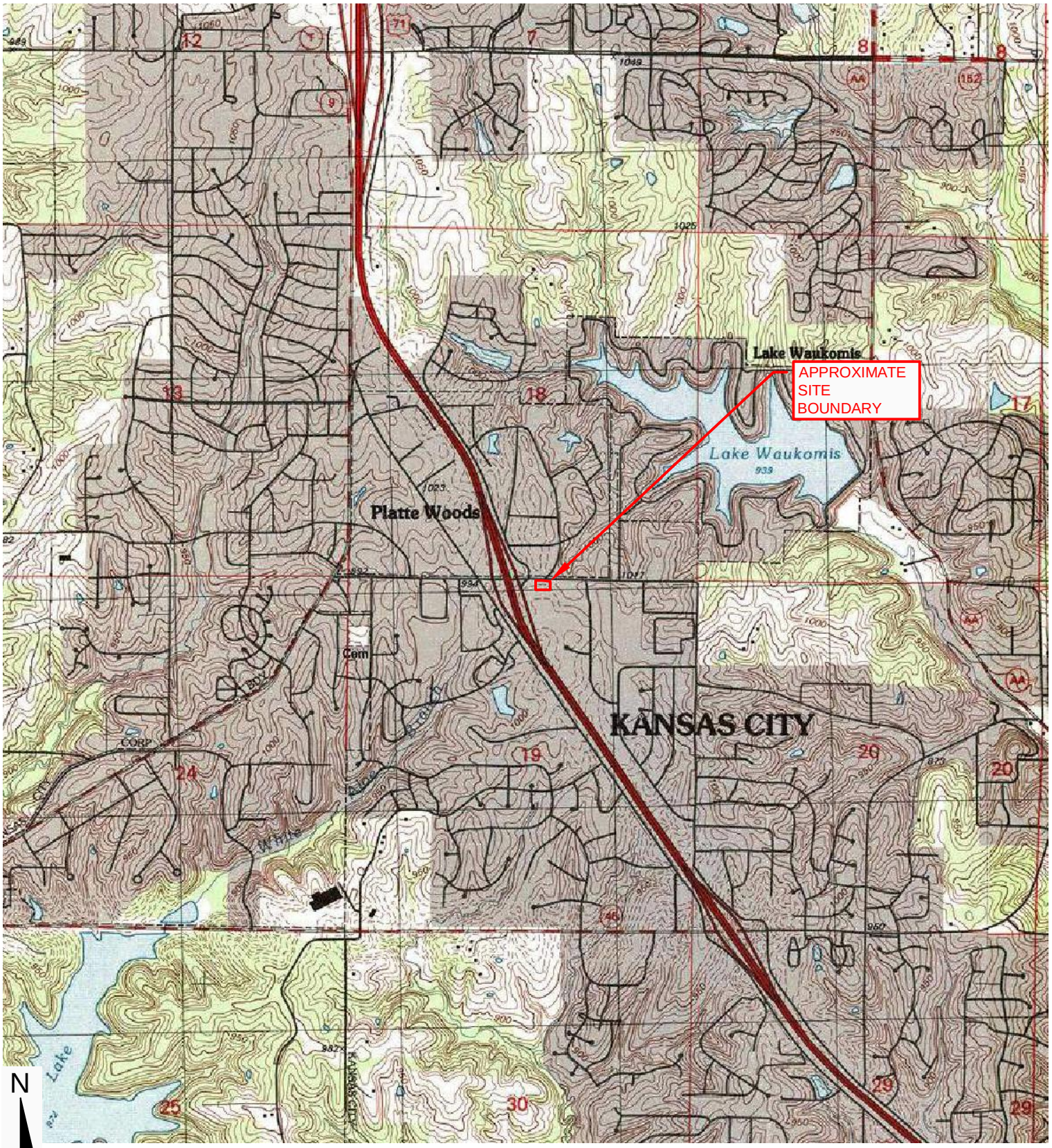
Based on the scope of services described in this report and subject to the limitations described herein, Terracon concludes the following.

- Four soil borings were advanced at the site to depths of 5 feet for the collection of one soil sample per boring from 1 to 3 feet.
- Groundwater was not observed in the soil borings during drilling.
- TPH-GRO and Volatiles and Oxygenates were not detected above laboratory reporting limits in the four soil samples.

7.0 RECOMMENDATIONS

Based on the scope of services described in this report, subject to the limitations described herein, and the analytical results, no additional investigation is recommended at this time.

APPENDIX A – EXHIBITS



U.S.G.S. 7.5 MINUTE SERIES TOPOGRAPHIC MAP

STATE OF MISSOURI QUADRANGLES
PARKVILLE 1996

0 1000' 2,000' 4,000'

DIAGRAM IS INTENDED FOR GENERAL USE ONLY, AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.

Project Mngr:	ALS
Approved By:	ALS
Checked By:	ALS
Drawn By:	DBM

Project No.	02177403
Scale:	1" = 2000'
Date:	1/4/17
File No.	02177403E1.dwg

Terracon
Consulting Engineers and Scientists
13910 W. 96TH TERRACE LENEXA, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

TOPOGRAPHIC MAP

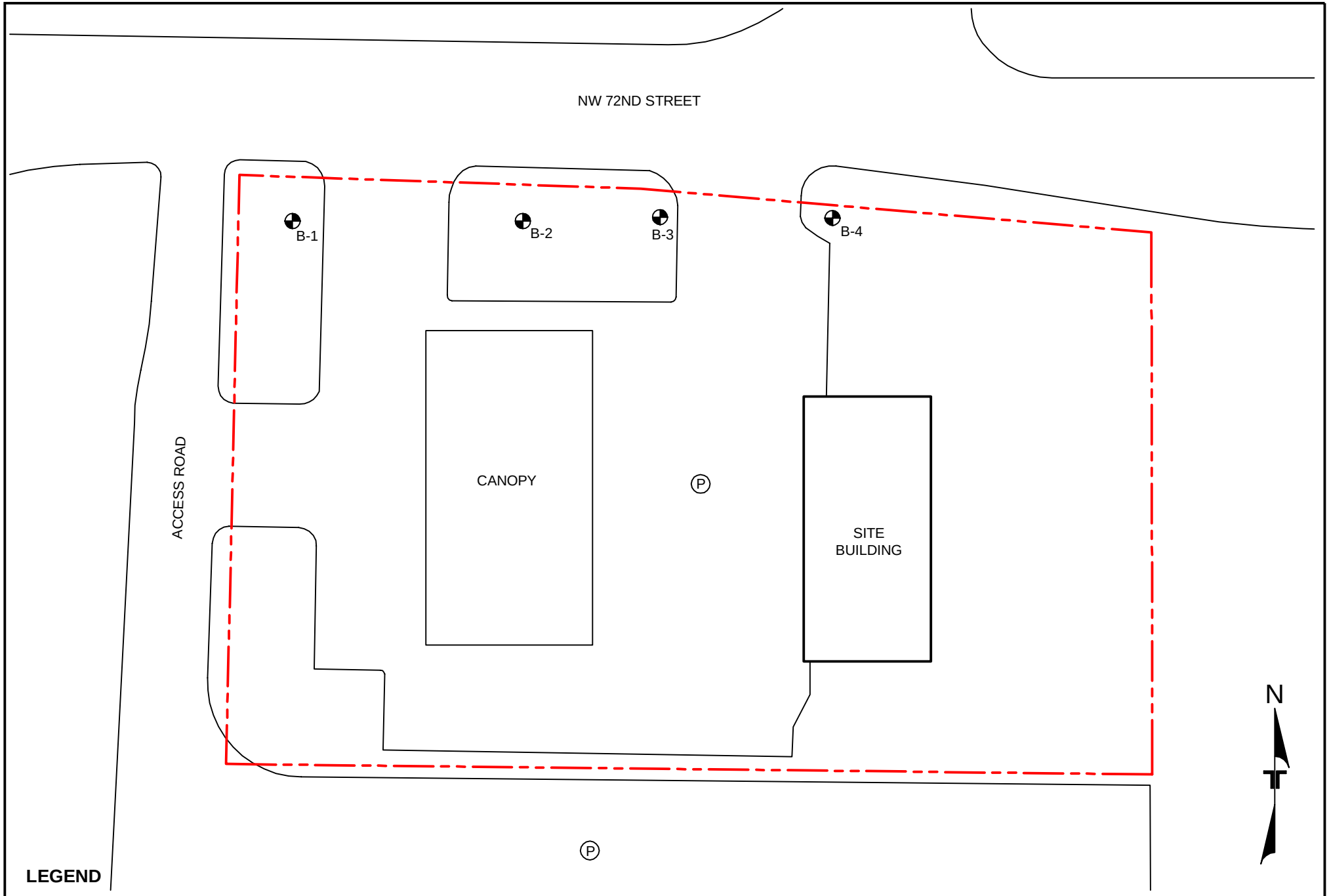
NW 72ND STREET IMPROVEMENTS

SEC OF NW 72ND STREET AND I-29

KANSAS CITY, MISSOURI

EXHIBIT

1



LEGEND

- APPROXIMATE SITE BOUNDARY
- (P) PARKING AREA
- BORING LOCATION

DIAGRAM IS INTENDED FOR GENERAL USE ONLY, AND IS NOT FOR CONSTRUCTION PURPOSES. LOCATIONS ARE APPROXIMATE.

Project Mngr:	ALS
Approved By:	ALS
Checked By:	ALS
Drawn By:	DBM

Project No.	02177403
Scale:	NOT TO SCALE
Date:	1/4/17
File No.	02177403E2.dwg

Terracon
Consulting Engineers and Scientists
13910 W. 96TH TERRACE LENEXA, KS 66215
PH. (913) 492-7777 FAX. (913) 492-7443

BORING LOCATION DIAGRAM

NW 72ND STREET IMPROVEMENTS
SEC OF NW 72ND STREET AND I-29
KANSAS CITY, MISSOURI

EXHIBIT 2

APPENDIX B – SOIL BORING LOGS

BORING LOG NO. B-1

PROJECT: NW 72nd Street Improvements

CLIENT: Walter P. Moore
Kansas City, Missouri

SITE: SEC of NW 72nd Street and I-29
Kansas City, Missouri

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	OVA/PID (ppm)	SAMPLE INTERVAL
		SILTY CLAY (CL-ML), with organics, dark brown, no odor, dry, medium stiff						
	1.0	**SILTY CLAY (CL-ML)**, tan-brown, no odor, dry, medium stiff, mottled, with reddish brown iron staining				100	0	B-1 (1-3)
		increased mottling						
	5.0	***Boring Terminated at 5 Feet***	5					

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Advancement Method:
Direct Push

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 12-21-2017 | Boring Completed: 12-21-2017

Drill Rig: Geoprobe | Driller: A. Sense

Project No.: 02177403 | Exhibit: B-1

BORING LOG NO. B-2

PROJECT: NW 72nd Street Improvements

CLIENT: Walter P. Moore
Kansas City, Missouri

SITE: SEC of NW 72nd Street and I-29
Kansas City, Missouri

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	OVA/PID (ppm)	SAMPLE INTERVAL
		SILT (ML), with organics, dark brown, no odor, dry, stiff						
	1.0							
		SILTY CLAY (CL-ML), tan-brown, no odor, dry, stiff, with mottling and iron nodules, grades to reddish brown				100	0	B-2 (1-3)
		soft, with trace iron nodules						
	5.0							
		Boring Terminated at 5 Feet	5					

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Advancement Method:
Direct Push

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 12-21-2017 | Boring Completed: 12-21-2017

Drill Rig: Geoprobe | Driller: A. Sense

Project No.: 02177403 | Exhibit: B-2

BORING LOG NO. B-3

PROJECT: NW 72nd Street Improvements

CLIENT: Walter P. Moore
Kansas City, Missouri

SITE: SEC of NW 72nd Street and I-29
Kansas City, Missouri

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	OVA/PID (ppm)	SAMPLE INTERVAL
		FILL - SILTY CLAY (CL-ML), with organics, dark brown, no odor, dry, stiff						
	1.0	**SILTY CLAY (CL-ML)**, tan-brown, no odor, dry, soft, with increased iron nodules				100	0.3	B-3 (1-3)
		with iron staining						
	5.0	***Boring Terminated at 5 Feet***	5					

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Advancement Method:
Direct Push

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 12-21-2017 | Boring Completed: 12-21-2017

Drill Rig: Geoprobe | Driller: A. Sense

Project No.: 02177403 | Exhibit: B-3

BORING LOG NO. B-4

PROJECT: NW 72nd Street Improvements

CLIENT: Walter P. Moore
Kansas City, Missouri

SITE: SEC of NW 72nd Street and I-29
Kansas City, Missouri

LOCATION See Exhibit A-2

GRAPHIC LOG	DEPTH	MATERIAL DESCRIPTION	DEPTH (ft)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (%)	OVA/PID (ppm)	SAMPLE INTERVAL
		SILT (ML), with organics and gravel, dark brown, no odor, dry, stiff						
	1.0							
		SILTY CLAY (CL-ML), with mottling and iron nodules, tan-brown, no odor, dry, soft				87	0.1	B-4 (1-3)
		increased iron nodules						
	5.0		5					
		Boring Terminated at 5 Feet						

The stratification lines represent the approximate transition between differing soil types and/or rock types; in-situ these transitions may be gradual or may occur at different depths than shown.

Advancement Method:
Direct Push

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 12-21-2017 | Boring Completed: 12-21-2017

Drill Rig: Geoprobe | Driller: A. Sense

Project No.: 02177403 | Exhibit: B-4

APPENDIX C – ANALYTICAL DATA TABLES

Table 1
Summary of Soil Analytical Data
NW 72nd Street Improvements
Kansas City, Missouri
Terracon Project No. 02177403

		Sample ID	**B-1**	**B-2**	**B-3**	**B-4**	**MRBCA Default Target Levels (DTLs)**
		Collection Depth Below Ground Surface (feet)	1-3	1-3	1-3	1-3	
		Collection Date	12/21/2017	12/21/2017	12/21/2017	12/21/2017	
Analyte	**Method**	**Units**					
Volatile Organic Compounds (VOCs) and Oxygenates							
VOCs and Oxygenates	8260B	mg/kg	ND	ND	ND	ND	**---**
Total Petroleum Hydrocarbons (TPHs)							
Gasoline Range Organics (GRO)	8260B	mg/kg	ND	ND	ND	ND	**385**

Source

Laboratory analysis performed by ESC Lab Sciences, 2017.
MDNR Missouri Risk-Based Corrective Action (MRBCA) Technical Guidance (revised March 2010).

Notes

Soil concentrations in milligrams per kilogram (mg/kg).
ND = Not detected above the listed laboratory analytical reporting limit. See individual lab reports for chemical specific reporting limits.
--- = No established MDNR screening value or not applicable (reported concentrations did not exceed DTLs).
Bold = Detection reported above the laboratory reporting limit.

APPENDIX D – ANALYTICAL LABORATORY REPORT

ANALYTICAL REPORT

December 29, 2017

Terracon - Lenexa, KS

Sample Delivery Group:	L959438
Samples Received:	12/22/2017
Project Number:	02177403
Description:	KCMODOT

Report To: Aaron Steigerwalt
13910 West 96th Terrace
Lenexa, KS 66215

Entire Report Reviewed By:

Jeff Carr
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

TABLE OF CONTENTS

B-1 L959438-01 Solid

Collected by: Jackie Zellmer
Collected date/time: 12/21/17 10:30
Received date/time: 12/22/17 11:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1057737	1	12/28/17 14:01	12/28/17 14:15	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1057137	1	12/21/17 10:30	12/26/17 19:30	ACG

B-2 L959438-02 Solid

Collected by: Jackie Zellmer
Collected date/time: 12/21/17 10:45
Received date/time: 12/22/17 11:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1057738	1	12/28/17 13:29	12/28/17 13:42	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1057137	1	12/21/17 10:45	12/26/17 19:51	ACG

B-3 L959438-03 Solid

Collected by: Jackie Zellmer
Collected date/time: 12/21/17 11:00
Received date/time: 12/22/17 11:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1057738	1	12/28/17 13:29	12/28/17 13:42	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1057137	1	12/21/17 11:00	12/26/17 20:12	ACG

B-4 L959438-04 Solid

Collected by: Jackie Zellmer
Collected date/time: 12/21/17 11:25
Received date/time: 12/22/17 11:45

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Total Solids by Method 2540 G-2011	WG1057738	1	12/28/17 13:29	12/28/17 13:42	KDW
Volatile Organic Compounds (GC/MS) by Method 8260B	WG1057137	1	12/21/17 11:25	12/26/17 20:33	ACG

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jeff Carr
Technical Service Representative

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	79.4		1	12/28/2017 14:15	WG1057737

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
TPH (GC/MS) Low Fraction	ND		0.630	1	12/26/2017 19:30	WG1057137
tert-Amyl Methyl Ether	ND		0.00126	1	12/26/2017 19:30	WG1057137
Benzene	ND		0.00126	1	12/26/2017 19:30	WG1057137
tert-Butyl alcohol	ND		0.00630	1	12/26/2017 19:30	WG1057137
1,2-Dichloroethane	ND		0.00126	1	12/26/2017 19:30	WG1057137
1,2-Dibromoethane	ND		0.00126	1	12/26/2017 19:30	WG1057137
Di-isopropyl ether	ND		0.00126	1	12/26/2017 19:30	WG1057137
Ethylbenzene	ND		0.00126	1	12/26/2017 19:30	WG1057137
Ethyl tert-butyl ether	ND		0.00126	1	12/26/2017 19:30	WG1057137
Methyl tert-butyl ether	ND		0.00126	1	12/26/2017 19:30	WG1057137
Naphthalene	ND		0.00630	1	12/26/2017 19:30	WG1057137
Toluene	ND		0.00630	1	12/26/2017 19:30	WG1057137
Xylenes, Total	ND		0.00378	1	12/26/2017 19:30	WG1057137
(S) Toluene-d8	*99.1*		*80.0-120*		*12/26/2017 19:30*	WG1057137
(S) a,a,a-Trifluorotoluene	*103*		*80.0-120*		*12/26/2017 19:30*	WG1057137
(S) 4-Bromofluorobenzene	*95.0*		*64.0-132*		*12/26/2017 19:30*	WG1057137

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	77.6		1	12/28/2017 13:42	WG1057738

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
TPH (GC/MS) Low Fraction	ND		0.644	1	12/26/2017 19:51	WG1057137
tert-Amyl Methyl Ether	ND		0.00129	1	12/26/2017 19:51	WG1057137
Benzene	ND		0.00129	1	12/26/2017 19:51	WG1057137
tert-Butyl alcohol	ND		0.00644	1	12/26/2017 19:51	WG1057137
1,2-Dichloroethane	ND		0.00129	1	12/26/2017 19:51	WG1057137
1,2-Dibromoethane	ND		0.00129	1	12/26/2017 19:51	WG1057137
Di-isopropyl ether	ND		0.00129	1	12/26/2017 19:51	WG1057137
Ethylbenzene	ND		0.00129	1	12/26/2017 19:51	WG1057137
Ethyl tert-butyl ether	ND		0.00129	1	12/26/2017 19:51	WG1057137
Methyl tert-butyl ether	ND		0.00129	1	12/26/2017 19:51	WG1057137
Naphthalene	ND		0.00644	1	12/26/2017 19:51	WG1057137
Toluene	ND		0.00644	1	12/26/2017 19:51	WG1057137
Xylenes, Total	ND		0.00387	1	12/26/2017 19:51	WG1057137
(S) Toluene-d8	*98.4*		*80.0-120*		*12/26/2017 19:51*	WG1057137
(S) a,a,a-Trifluorotoluene	*102*		*80.0-120*		*12/26/2017 19:51*	WG1057137
(S) 4-Bromofluorobenzene	*95.2*		*64.0-132*		*12/26/2017 19:51*	WG1057137

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	78.6		1	12/28/2017 13:42	WG1057738

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
TPH (GC/MS) Low Fraction	ND		0.636	1	12/26/2017 20:12	WG1057137
tert-Amyl Methyl Ether	ND		0.00127	1	12/26/2017 20:12	WG1057137
Benzene	ND		0.00127	1	12/26/2017 20:12	WG1057137
tert-Butyl alcohol	ND		0.00636	1	12/26/2017 20:12	WG1057137
1,2-Dichloroethane	ND		0.00127	1	12/26/2017 20:12	WG1057137
1,2-Dibromoethane	ND		0.00127	1	12/26/2017 20:12	WG1057137
Di-isopropyl ether	ND		0.00127	1	12/26/2017 20:12	WG1057137
Ethylbenzene	ND		0.00127	1	12/26/2017 20:12	WG1057137
Ethyl tert-butyl ether	ND		0.00127	1	12/26/2017 20:12	WG1057137
Methyl tert-butyl ether	ND		0.00127	1	12/26/2017 20:12	WG1057137
Naphthalene	ND		0.00636	1	12/26/2017 20:12	WG1057137
Toluene	ND		0.00636	1	12/26/2017 20:12	WG1057137
Xylenes, Total	ND		0.00382	1	12/26/2017 20:12	WG1057137
(S) Toluene-d8	*102*		*80.0-120*		*12/26/2017 20:12*	WG1057137
(S) a,a,a-Trifluorotoluene	*102*		*80.0-120*		*12/26/2017 20:12*	WG1057137
(S) 4-Bromofluorobenzene	*95.6*		*64.0-132*		*12/26/2017 20:12*	WG1057137

Total Solids by Method 2540 G-2011

Analyte	Result	Qualifier	Dilution	Analysis	Batch
	%			date / time	
Total Solids	80.4		1	12/28/2017 13:42	WG1057738

Volatile Organic Compounds (GC/MS) by Method 8260B

Analyte	Result (dry)	Qualifier	RDL (dry)	Dilution	Analysis	Batch
	mg/kg		mg/kg		date / time	
TPH (GC/MS) Low Fraction	ND		0.622	1	12/26/2017 20:33	WG1057137
tert-Amyl Methyl Ether	ND		0.00124	1	12/26/2017 20:33	WG1057137
Benzene	ND		0.00124	1	12/26/2017 20:33	WG1057137
tert-Butyl alcohol	ND		0.00622	1	12/26/2017 20:33	WG1057137
1,2-Dichloroethane	ND		0.00124	1	12/26/2017 20:33	WG1057137
1,2-Dibromoethane	ND		0.00124	1	12/26/2017 20:33	WG1057137
Di-isopropyl ether	ND		0.00124	1	12/26/2017 20:33	WG1057137
Ethylbenzene	ND		0.00124	1	12/26/2017 20:33	WG1057137
Ethyl tert-butyl ether	ND		0.00124	1	12/26/2017 20:33	WG1057137
Methyl tert-butyl ether	ND		0.00124	1	12/26/2017 20:33	WG1057137
Naphthalene	ND		0.00622	1	12/26/2017 20:33	WG1057137
Toluene	ND		0.00622	1	12/26/2017 20:33	WG1057137
Xylenes, Total	ND		0.00373	1	12/26/2017 20:33	WG1057137
(S) Toluene-d8	*102*		*80.0-120*		*12/26/2017 20:33*	WG1057137
(S) a,a,a-Trifluorotoluene	*101*		*80.0-120*		*12/26/2017 20:33*	WG1057137
(S) 4-Bromofluorobenzene	*93.1*		*64.0-132*		*12/26/2017 20:33*	WG1057137

Method Blank (MB)

(MB) R3276489-1 12/28/17 14:15

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.001			

L959334-01 Original Sample (OS) • Duplicate (DUP)

(OS) L959334-01 12/28/17 14:15 • (DUP) R3276489-3 12/28/17 14:15

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	68.8	67.9	1	1		5

Laboratory Control Sample (LCS)

(LCS) R3276489-2 12/28/17 14:15

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.1	100	85-115	

Method Blank (MB)

(MB) R3276486-1 12/28/17 13:42

Analyte	MB Result %	MB Qualifier	MB MDL %	MB RDL %
Total Solids	0.001			

L959438-04 Original Sample (OS) • Duplicate (DUP)

(OS) L959438-04 12/28/17 13:42 • (DUP) R3276486-3 12/28/17 13:42

Analyte	Original Result %	DUP Result %	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Total Solids	80.4	80.9	1	1		5

Laboratory Control Sample (LCS)

(LCS) R3276486-2 12/28/17 13:42

Analyte	Spike Amount %	LCS Result %	LCS Rec. %	Rec. Limits %	LCS Qualifier
Total Solids	50.0	50.0	100	85-115	

Method Blank (MB)

(MB) R3275919-4 12/26/17 14:44

Analyte	MB Result mg/kg	MB Qualifier	MB MDL mg/kg	MB RDL mg/kg
TPH (GC/MS) Low Fraction	U		0.183	0.500
Benzene	U		0.000270	0.00100
1,2-Dibromoethane	U		0.000343	0.00100
1,2-Dichloroethane	U		0.000265	0.00100
Di-isopropyl ether	U		0.000248	0.00100
Ethylbenzene	U		0.000297	0.00100
Methyl tert-butyl ether	U		0.000212	0.00100
Naphthalene	U		0.00100	0.00500
Toluene	U		0.000434	0.00500
Xylenes, Total	U		0.000698	0.00300
tert-Amyl Methyl Ether	U		0.000270	0.00100
Ethyl tert-butyl ether	U		0.000400	0.00100
tert-Butyl alcohol	U		0.00200	0.00500
(S) Toluene-d8	*105*			*80.0-120*
(S) a,a,a-Trifluorotoluene	*105*			*80.0-120*
(S) 4-Bromofluorobenzene	*96.5*			*64.0-132*

Laboratory Control Sample (LCS)

(LCS) R3275919-1 12/26/17 12:38

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0250	0.0253	101	71.0-124	
1,2-Dibromoethane	0.0250	0.0295	118	78.0-122	
1,2-Dichloroethane	0.0250	0.0261	104	69.0-128	
Di-isopropyl ether	0.0250	0.0312	125	62.0-133	
Ethylbenzene	0.0250	0.0281	112	77.0-120	
Methyl tert-butyl ether	0.0250	0.0274	110	66.0-125	
Naphthalene	0.0250	0.0292	117	64.0-125	
Toluene	0.0250	0.0252	101	77.0-120	
Xylenes, Total	0.0750	0.0830	111	77.0-120	
(S) Toluene-d8			*101*	*80.0-120*	
(S) a,a,a-Trifluorotoluene			*103*	*80.0-120*	
(S) 4-Bromofluorobenzene			*96.7*	*64.0-132*	

Laboratory Control Sample (LCS)

(LCS) R3275919-2 12/26/17 13:21

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
TPH (GC/MS) Low Fraction	5.00	6.43	129	59.0-157	
(S) Toluene-d8			*107*	*80.0-120*	
(S) a,a,a-Trifluorotoluene			*102*	*80.0-120*	
(S) 4-Bromofluorobenzene			*103*	*64.0-132*	

Laboratory Control Sample (LCS)

(LCS) R3275919-3 12/26/17 14:03

Analyte	Spike Amount mg/kg	LCS Result mg/kg	LCS Rec. %	Rec. Limits %	LCS Qualifier
tert-Butyl alcohol	0.0500	0.0325	64.9	50.0-150	
(S) Toluene-d8			*102*	*80.0-120*	
(S) a,a,a-Trifluorotoluene			*104*	*80.0-120*	
(S) 4-Bromofluorobenzene			*93.6*	*64.0-132*	

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

(dry)	Results are reported based on the dry weight of the sample. [this will only be present on a dry report basis for soils].
MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
RDL (dry)	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state “ND” (Not Detected) or “BDL” (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ACCREDITATIONS & LOCATIONS

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
***** Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Connecticut	PH-0197	North Carolina [1]	DW21704
Florida	E87487	North Carolina [2]	41
Georgia	NELAP	North Dakota	R-140
Georgia [1]	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky [1]	90010	South Dakota	n/a
Kentucky [2]	16	Tennessee [1 4]	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

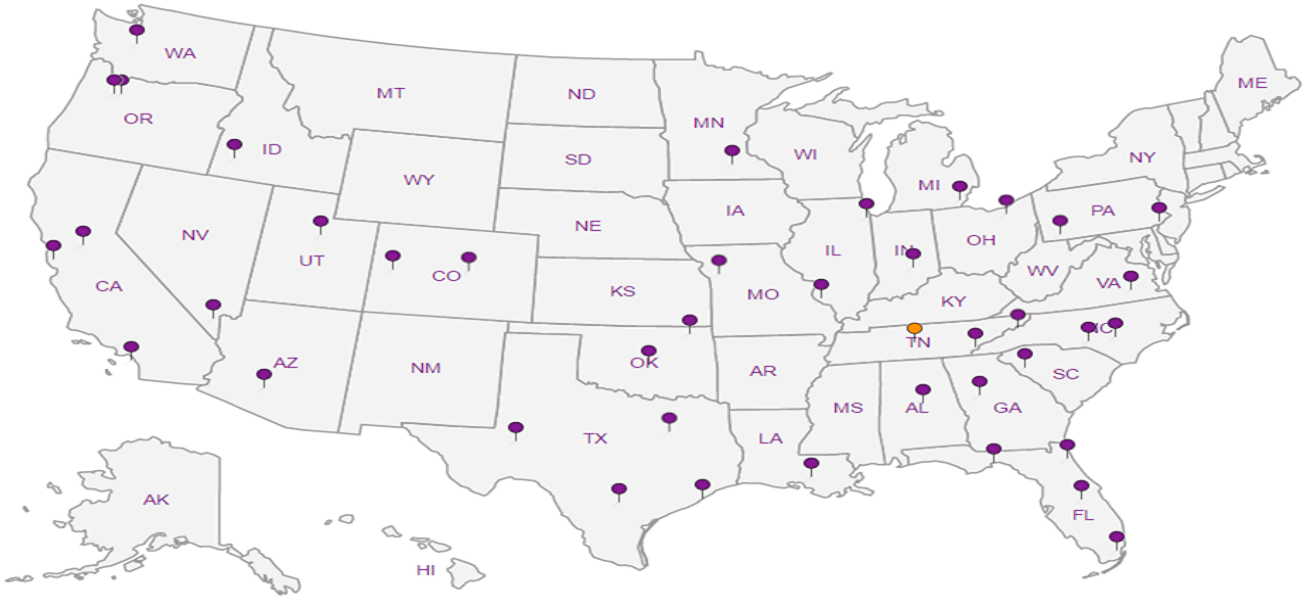
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Terracon-Lenexa, KS
13910 W 96th Terrace
Lenexa, KS 66215

Billing Information:

Report to: **Aaron Steigerwalt**

Email To: **aaron.steigerwalt@terracon.com**

Project Description: **KCMODOT**

City/State Collected: KC, MO

Phone: **913-998-7431**
Fax: **913-492-7433**

Client Project # 02177403

Lab Project #

Collected by (print): Jackie Zellmer

Site/Facility ID #

P.O. #

Collected by (signature):

Immediately Packed on Ice N ___ Y X

Rush? (Lab MUST Be Notified)
___ Same Day X Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #

Date Results Needed: Dec. 29th

Pres Chk

Analysis / Container / Preservative

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	BTEXN, MtBE, Oxy, GRO 8260B
B-1	grab	SS	1-3	12/21/17	1030	4	X
B-2	↓	↓	1-3	↓	1045	4	X
B-3			1-3		1100	4	X
B-4			1-3		1125	4	X

Chain of Custody Page 1 of 1

ESC LABORATORIES

YOUR LAB OF CHOICE

12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# L954438

Table E006

Acctnum: TERRLKS

Template:

Prelogin:

TSR:

PB:

Shipped Via:

Remarks	Sample # (lab only)
	-01
	02
	03
	04

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other

Remarks:

pH ___ Temp ___

Flow ___ Other ___

Samples returned via:
__ UPS __ FedEx __ Courier SWA

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP Y N
COC Signed/Accurate: Y N
Bottles arrive intact: Y N
Correct bottles used: Y N
Sufficient volume sent: Y N
If Applicable
VOA Zero Headspace: Y N
Preservation Correct/Checked: Y N

Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
	12/21/17	12:30	Brandi K. Hoyatt
Relinquished by : (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by : (Signature)	Date:	Time:	Received for lab by: (Signature)
			830

Trip Blank Received: Yes / No
HCL / MeoH
TBR

Temp: 0.0 °C Bottles Received: 16

Date: 12/22/17 Time: 1145

If preservation required by Login: Date/Time

Hold:

Condition: NCF / OK