Terracon GeoReport

Geotechnical Engineering Report

Lee's Summit Fire Station No. 3
Lee's Summit, Missouri
June 4, 2018
Terracon Project No. 02185145

Prepared for:
City of Lee's Summit, Missouri
Lee's Summit, Missouri

Prepared by:
Terracon Consultants, Inc.
Lenexa, Kansas

June 4, 2018

City of Lee's Summit, Missouri
220 SE Green Street
Lee's Summit, Missouri 64063

Attn: Ms. Dena Mezger, P.E.
(816) 969-1800

Re: Geotechnical Engineering Report
Lee's Summit Fire Station No. 3
NW Pryor Road and NW Shamrock Avenue
Lee's Summit, Missouri
Terracon Project No. 02185145

Dear Ms. Mezger:

We have completed a geotechnical exploration for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P02185145, dated May 15, 2018. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

STATE OF MISSOURI
KEVIN D. FRIEDRICHS
NUMBER PE-2013010325
6/4/18
PROFESSIONAL ENGINEER

Kevin D. Friedrichs, P.E.
Project Engineer
Missouri: PE 2013010325

Kole C. Berg

Kole C. Berg, P.E.
Senior Engineer
Missouri: PE 2002016417

REPORT TOPICS

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon GeoReport logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Geotechnical Engineering Report

Lee's Summit Fire Station No. 3
NW Pryor Road and NW Shamrock Avenue
Lee's Summit, Missouri

Terracon Project No. 02185145
June 4, 2018

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering evaluation performed for the proposed Lee's Summit Fire Station No. 3 to be located at NW Pryor Road and NW Shamrock Avenue in Lee's Summit, Missouri. Six exploratory borings were performed at the site to depths ranging from approximately 5 to 11 feet below existing site grades. This report describes the subsurface conditions encountered at the boring locations, presents the test data, and provides geotechnical recommendations for the following items:

- earthwork
- foundations
- floor slabs
- seismic site class
- pavements

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Project Location	The project is located at NW Pryor Road and NW Shamrock Avenue in Lee's Summit, Missouri.
Existing Improvements	The site is presently a grass surfaced vacant lot.
Existing Topography	The site generally slopes gradually down from north to south.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Proposed Structure	A new 16,050 square foot fire station is planned. The building will be a single-story steel-framed structure with CMU block walls and a grade-supported concrete floor slab.
Finished Floor Elevation (FFE)	The structure will have an FFE of 981.5 feet.
Maximum Loads	Anticipated structural loads for the new building were not provided. Based on our experience with similar structures, we have considered the following maximum loads: ■ Columns: 100 kips ■ Walls: 10 kips per linear foot ■ Slabs: 125 pounds per square foot
Grading/Slopes	Based on the provided grading plan, cuts of up to 2 feet and fills of up to 4 feet will be required to develop design grades. Final slope angles no steeper than 3H:1V (Horizontal: Vertical) are expected.
Below Grade Structures	No below grade structures or free standing retaining walls are planned.
Pavements	No information regarding anticipated vehicle types, axle loads, or traffic volumes was provided. Based on our experience with other fire station projects, we anticipate that concrete pavements will be used. We anticipate the pavements will be utilized primarily by fire trucks with occasional panel delivery trucks and trash collection trucks. Passenger vehicles will utilize the same pavements as the fire trucks.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced borings across the site, and variations are likely.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and at least minor cracking in the structure could still occur. The severity of cracking and other cosmetic damage caused by movement of the floor slabs will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request. The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Site preparation, excavation, subgrade preparation and placement of engineered fills should conform to recommendations presented in this section. The recommendations presented for design and construction of earth-supported elements including foundations, slabs, and pavements are contingent upon the recommendations outlined in this section being followed. We recommend earthwork on this project be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of subgrade preparation, engineered fill, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Vegetation, topsoil, and any loose, soft or otherwise unsuitable soils present within the proposed construction areas should be stripped. Based on information obtained at the boring locations, stripping depths on the order of 4 inches should be anticipated to remove the root zone materials. However, greater stripping depths may be required in areas not explored by the borings. Organic soils removed during site preparation should not be used as fill beneath the proposed new building and pavement areas.

The soils within the planned building area should be further undercut as necessary to accommodate placement of the recommended 24-inch thick LVC layer below floor slabs. The undercut areas should extend a minimum of 5 feet laterally outside the building wall lines. Undercutting to facilitate placement of the LVC layer would not be necessary in areas where more than 2 feet of fill will be placed to develop the floor slab subgrade level.

Following initial stripping and any necessary undercutting, the exposed soils should be proofrolled. A Terracon representative should observe the proofrolling. Proofrolling can be accomplished using a loaded tandem-axle dump truck with a gross weight of at least 20 tons, or similarly loaded equipment. Areas that display excessive deflection (pumping) or rutting during

proofroll operations should be improved by scarification/compaction or by removal and replacement with engineered fill.

Fill Material Types

All materials incorporated in engineered fill sections must be free of organic matter and debris. Fill materials should not be frozen and should not be placed on a frozen subgrade. A sample of each material type should be tested prior to being used on the site. Soil is commonly used as fill in this locale, but not all soils are suitable. Our professional opinions concerning suitability of fill materials are presented in the following table.

Suitability as Fill	Description	Unified Soil Classification	
		Group Symbol	Group Name
Suitable	Clean Gravel	GW	Well-graded gravel
		GP	Poorly graded gravel
	Gravel with fines	GM	Silty gravel
		GC	Clayey gravel
	Clean sand	SW	Well-graded sand
		SP	Poorly-graded sand
	Sand with fines	SM	Silty sand
		SC	Clayey sand
	Description	**Group Symbol**	**Group Name**
Marginally Suitable[1]	Silt	ML	Silt[2]
	Clay	CL	Lean clay[3]
	Clay	CH	Fat clay[4]
	Description	**Group Symbol**	**Group Name**
Unsuitable	Highly organic soils	MH	Elastic silt
		OL & OH	Organic clay & organic silt
		PT	Peat

1. Depends on location and intended use. Can be used if approved by geotechnical engineer.
2. Highly susceptible to frost action; unstable when wet. Should not be used directly below pavements and exterior slabs without prior approval of geotechnical engineer.
3. Can be expansive if dry or if liquid limit is 45 or greater. Requires approval of geotechnical engineer.
4. Expansive. Not recommended immediately below floors and other movement-sensitive features. Must be placed with strict moisture and density control to reduce swell potential.

Low volume change (LVC) material placed below the building floor slabs can consist of well-graded crushed stone aggregate (e.g., MoDOT Type 5). Lean clay soils with a liquid limit less than 45 and plasticity index less than 23 could also be used as LVC material, but these soils

would be susceptible to softening and disturbance if they become wetted by surface water and precipitation. Soils that meet the LVC criteria were not encountered in the borings. Therefore, the use of imported LVC materials should be expected. If a granular leveling course (such as crushed stone aggregate) is used immediately below the floor slabs, this material can be considered part of the LVC zone.

Fill Compaction Requirements

Item		Description
Lift Thickness (maximum)		9 inches in loose thickness when large, self-propelled compaction equipment is used. 4 inches when small, hand-guided equipment (plate or "jumping jack" compactor) is used.
Minimum Compaction Requirements [1]		At least 95 percent of the material's maximum dry density [1]
Moisture Content of Clay Soil	LL<45	-2 to +2 percent of optimum moisture content value [1]
	LL>45	0 to 4 percent above the optimum moisture content value [1]
Moisture Content of Granular Material		Sufficient to achieve compaction without pumping when proofrolled

1. As determined by the standard Proctor test (ASTM D 698)

We recommend that engineered fill be tested for moisture content and compaction during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of clay fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Utility trenches are common sources of water infiltration and migration. All utility trenches that penetrate beneath the building should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the building. We recommend constructing an effective "trench plug" that extends at least 5 feet out from the face of the building exterior. The plug material should consist of clay compacted as recommended in **Earthwork**. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report.

Grading and Drainage

During construction, grades should be developed to direct surface water flow away from or around the site. Exposed subgrades should be sloped to provide positive drainage so that saturation of subgrades is avoided. Surface water should not be permitted to accumulate on the site. Final surrounding grades should promote rapid surface drainage away from the structures. Accumulation of water adjacent to the building could contribute to significant moisture increases in the subgrade soils and subsequent softening/settlement or expansion/heave.

After construction of the building and pavements has been completed, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the building should also be periodically inspected and adjusted as necessary, as part of the structure's maintenance program.

Earthwork Construction Considerations

Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proofrolling, placement and compaction of controlled compacted fills, backfilling of excavations into completed subgrades, and just prior to construction of foundations, slabs, and pavements.

Care should be taken to avoid disturbance of prepared subgrades. Unstable subgrade conditions can develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. If unstable subgrade conditions develop, stabilization measures will need to be employed. Construction traffic over the completed subgrade should be avoided to the extent practical. If the subgrade becomes frozen, desiccated, saturated, or disturbed, the affected materials should be removed or these materials should be scarified, moisture conditioned, and compacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, state, and federal safety regulations. The contractor should be aware that slope height, slope inclination, and excavation depth should in no instance exceed those specified by these safety regulations. Flatter slopes than those dictated by these regulations may be required depending upon the soil conditions encountered and other external factors. These regulations are strictly enforced and if they are not followed, the owner, contractor, and/or earthwork and utility subcontractor could be liable and subject to substantial penalties. Under no circumstances should the information provided in this report be interpreted to mean that Terracon is responsible for construction site safety or the contractor's activities. Construction site safety is the sole responsibility of the contractor who shall also be solely responsible for the means, methods, and sequencing of the construction operations.

SHALLOW FOUNDATIONS

Foundation Design Parameters

Based on the conditions encountered at the borings, the footings for the building are expected to bear on a combination of native soil and engineered fill.

Description	Value
Maximum net allowable bearing pressure [1]	2,500 psf
Minimum embedment below finished grade for frost protection [2]	3 feet
Minimum footing widths	Isolated footings: 30 inches Continuous footings: 16 inches
Estimated total settlement [3]	1 inch or less
Estimated differential settlement [3]	1/2 to 2/3 of the total settlement over a horizontal distance of 50 feet

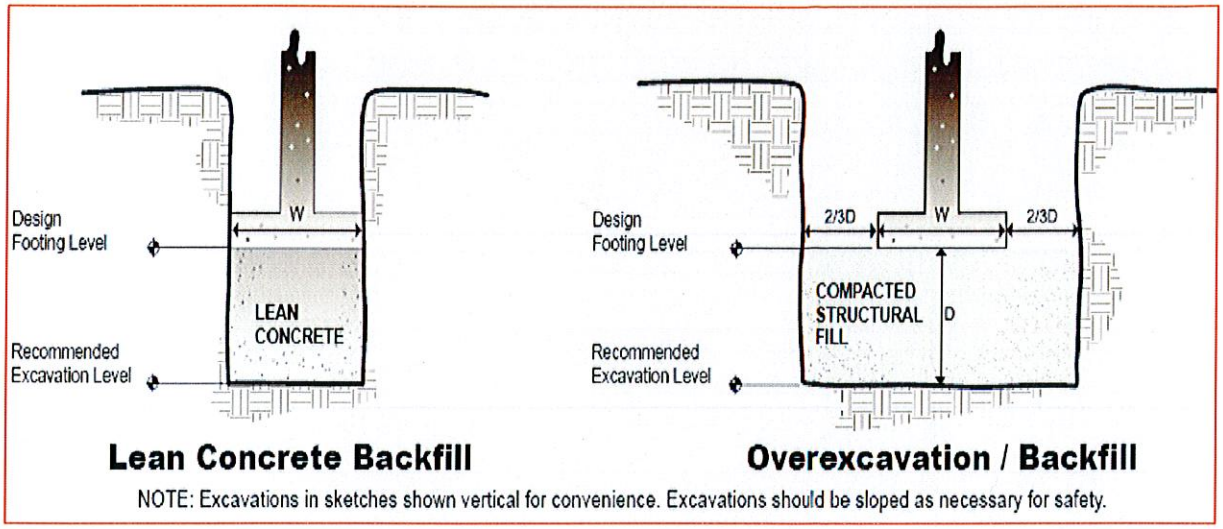
1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. This pressure assumes that any soft soils or other unsuitable materials, if encountered, will be undercut and replaced with engineered fill.
2. This embedment depth is recommended for perimeter footings and footings beneath unheated areas to provide frost protection and to reduce the effects of seasonal moisture variations in the foundation bearing soils. Interior footings in heated areas may be supported at shallower depths, provided they are not exposed to freezing conditions during construction.
3. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill below the footings, and the quality of the earthwork operations and footing construction.

Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose materials prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. If the soils at the bearing level become excessively dry, disturbed, saturated, or frozen, the affected soil should be removed prior to placing concrete. If the excavations must remain open overnight or for an extended period of time, placement of a lean concrete mud-mat over the bearing soils should be considered.

All footing bearing surfaces should be observed and tested by Terracon. If unsuitable conditions are encountered, footing excavations should be extended deeper to suitable bearing materials. Footings can bear directly on suitable soils at the lower level or on lean concrete backfill as shown in the following figure. The footings could also bear on properly compacted backfill extending down to suitable soils as shown in the following figure. Overexcavation for compacted engineered fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing elevation. The overexcavation should then

be backfilled up to the footing base elevation with well graded granular material (e.g., MoDOT Type 5 aggregate or an approved alternate gradation) placed and compacted as recommended in **Earthwork**.



SEISMIC CONSIDERATIONS

Code	Site Classification
2012 International Building Code (IBC)	C [1]

1. The 2012 International Building Code (IBC) seismic site class definitions are based on average properties of the subsurface profile to a depth of 100 feet. The exploratory borings terminated within limestone bedrock at a maximum depth of 11 feet. Our opinion of site classification is based on boring data and our knowledge of local geological and geotechnical conditions.

FLOOR SLABS

Floor Slab Design

Item	Description
Floor Slab Support	24 inches of low volume change (LVC) material
Modulus of Subgrade Reaction	100 pounds per square inch per inch of deflection (psi/in or pci) for point loading conditions
Granular Leveling Course Layer Thickness [1,2]	4 inches (minimum)

1. Well graded crushed stone (e.g., MoDOT Type 5 aggregate) or open-graded crushed stone (e.g. ASTM C33, Size No. 57 aggregate) can be used as the leveling course.
2. These granular materials may be considered part of the LVC zone.

Joints should be constructed in slabs at regular intervals as recommended by the American Concrete Institute (ACI) to help control the location of cracks. Joints or any cracks in the floor slab that develop should be sealed with a water-proof, non-extruding compressible compound.

Loads on footings that support structural walls and column loads are typically greater than floor slab loads. Consequently, footings should be expected to settle more than the adjacent floor slabs. The structural engineer should consider the potential for differential movement between foundations and grade-supported floor slabs.

Typically, some increase in the floor slab subgrade moisture content will occur because of gradual accumulation of capillary moisture, which would otherwise evaporate if the floor slab had not been constructed. The use of a vapor retarder should be considered beneath concrete slabs-on-grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Floor Slab Construction Considerations

If LVC materials consist of clay, the subgrade should be maintained in a relatively moist condition until the floor slab is constructed. If the subgrade becomes desiccated prior to construction of the floor slab, the affected material should be removed or the materials should be scarified, moistened, and compacted. Upon completion of grading operations in the building area, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slab.

On most project sites, the site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall etc. As a result, the floor slab subgrade soils may not be suitable for placement of the granular course and/or concrete at the time of building construction, and corrective action may be required.

Terracon should evaluate the condition of the floor slab subgrades immediately prior to placement of the granular leveling course and construction of the slabs. Particular attention should be paid to areas containing backfilled trenches and high traffic areas that were previously disturbed during construction. Where unsuitable conditions are located within the floor slab subgrade soils, the subgrade should be improved by removing and replacing the affected material with properly compacted fill.

PAVEMENTS

Pavement Subgrade Preparation

Pavement subgrades are expected to consist of on-site native clay soils. The pavement subgrades should be proofrolled as recommended in **Earthwork**. If soft or otherwise unsuitable areas are observed, additional over-excavation and replacement will be needed.

Grading and paving are commonly performed by separate contractors and there is often a time lapse between the end of grading operations and the commencement of paving. Subgrades prepared early in the construction process may become disturbed by construction traffic. Non-uniform subgrades often result in poor pavement performance and local failures relatively soon after pavements are constructed. Depending on the paving equipment used by the contractor, measures may be required to improve subgrade strength to greater depths for support of heavily loaded concrete trucks.

We recommend the moisture content and density of the subgrade be evaluated and the pavement subgrades be proofrolled (using a loaded tandem-axle dump truck with a minimum gross weight of 20 tons or similarly loaded rubber-tire equipment) within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be scarified, moisture conditioned, and compacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. The subgrade should be in its finished form at the time of the final review.

Opinions of Minimum Pavement Thickness

Pavement thickness depends upon many factors including but not limited to:

- applied wheel/axle loads and number of repetitions
- subgrade and pavement material characteristics
- climate conditions
- site and pavement drainage

Specific information regarding anticipated vehicle types, axle loads and traffic volumes was not provided. We considered a 20-year design period and the following traffic types to develop our minimum pavement thickness:

- Autos/Light Trucks: 100 vehicles per day
- Light Delivery and Trash Collection Vehicles: 10 vehicles per week
- Fire Trucks: 10 vehicles per day

Pavement Type	Parking and Drive Areas
Portland Cement Concrete (PCC)	7 inches PCC 4 inches open graded rock (ASTM C33 Size No. 57 aggregate or similar)

We recommend that subdrains be installed to collect and remove water from the subbase and reduce the potential for accumulation of water resulting in softening of the soil subgrade. The spacing between drains should be 50 feet or less. The drainable base should daylight to a reliable, frost-free outlet to allow for positive gravity drainage. Drainage of the pavement subgrade will be particularly important in areas where substantial quantities of water are anticipated, such as where vehicles will be washed.

Construction traffic on the pavements was not considered in developing our opinions of minimum pavement thickness. If the pavements will be subject to construction equipment/vehicles, the pavement sections should be revised to consider the additional loading.

The pavement section provided above considers that the subgrade soils will not experience significant increases in moisture content. Paved areas should be sloped to provide rapid drainage of surface water and to drain water away from the pavement edges. Pavements should be designed so water does not accumulate on or adjacent to the pavement, since this could saturate and soften the subgrade soils and subsequently accelerate pavement deterioration. Periodic and preventative maintenance of the pavements will be required. Cracks should be sealed, and areas exhibiting distress should be repaired promptly to help prevent further deterioration. Even with periodic and preventative maintenance, some movement and related cracking may still occur and repairs may be required.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between boring locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

The borings were located in the field by Terracon personnel using a hand-held GPS unit with a horizontal accuracy of ±20 feet. Ground surface elevations indicated on the boring logs were interpolated from a provided site topographic plan. Elevations are shown to the nearest 1 foot.

The borings were drilled with a track-mounted, rotary drill rig using solid-stem, continuous flight augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outside diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. The drill crew backfilled the borings with auger cuttings after completion of drilling/sampling and prior to leaving the site.

The drill crew prepared a field log of each boring to record data including visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The final boring logs included with this report represent the engineer's interpretation of the subsurface conditions at the borings based on field and laboratory data and observation of the samples.

Laboratory Testing

Representative soil samples were tested in the laboratory to measure their natural water content, dry unit weight, and Atterberg limits. A pocket penetrometer was used to estimate the consistency of selected cohesive samples. The test results are provided on the boring logs included in **Exploration Results**.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the laboratory testing described above. The soil descriptions presented on the boring logs are in accordance with the enclosed General Notes and Unified Soil Classification System (USCS). The estimated USCS group symbols for native soils are shown on the boring logs, and a brief description of the USCS is included in this report.

The bedrock materials encountered in the borings were described in accordance with the appended Description of Rock Properties on the basis of drilling characteristics and visual classification of disturbed auger cuttings. Petrographic analysis and rock core may indicate other rock types.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION

Lee's Summit Fire Station #3 ■ Lee's Summit, MO
June 4, 2018 ■ Terracon Project No. 02185145

Terracon GeoReport

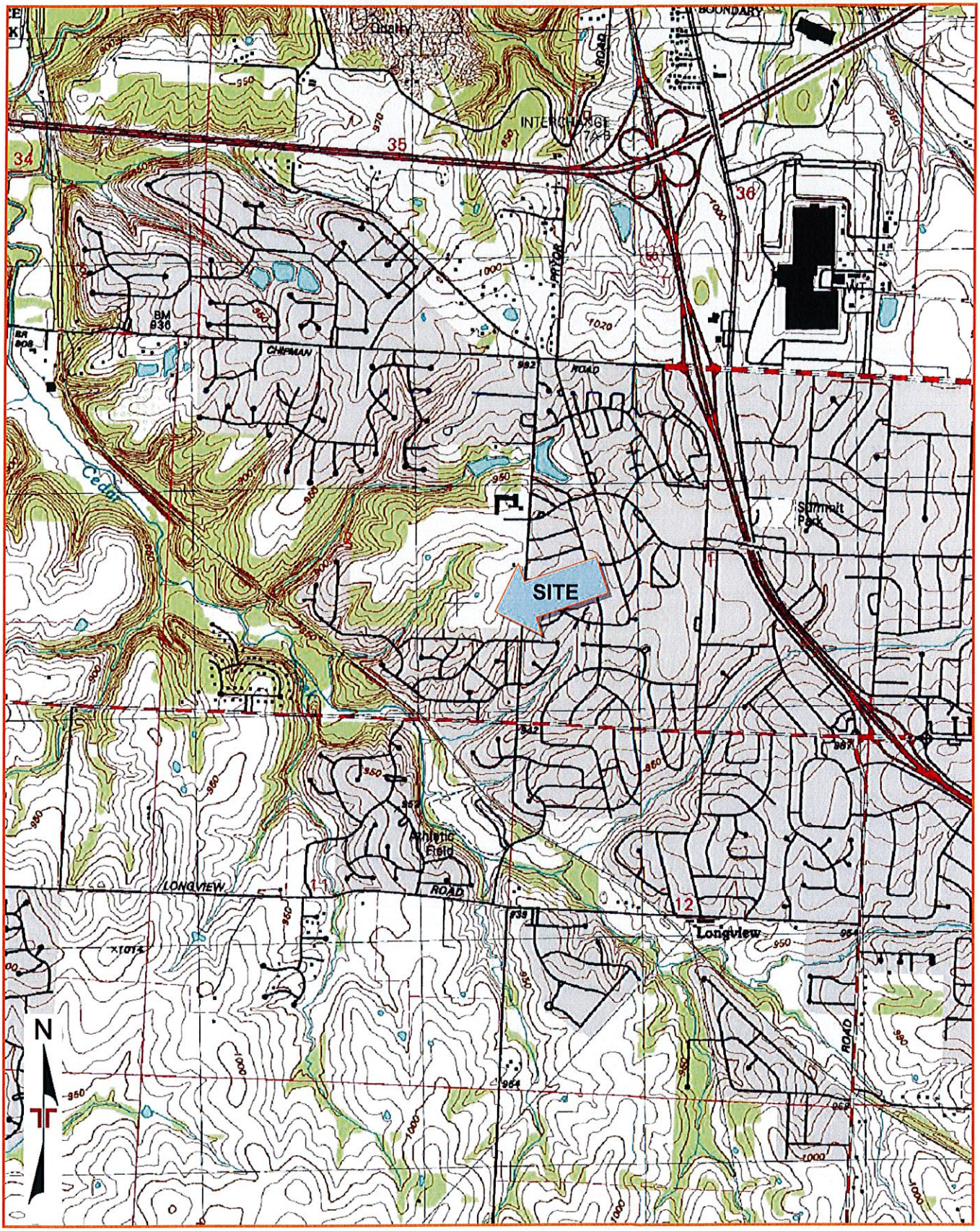


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: LEES SUMMIT, MO (1/1/1996).

EXPLORATION PLAN

Lee's Summit Fire Station #3 ■ Lee's Summit, MO
June 4, 2018 ■ Terracon Project No. 02185145

Terracon GeoReport

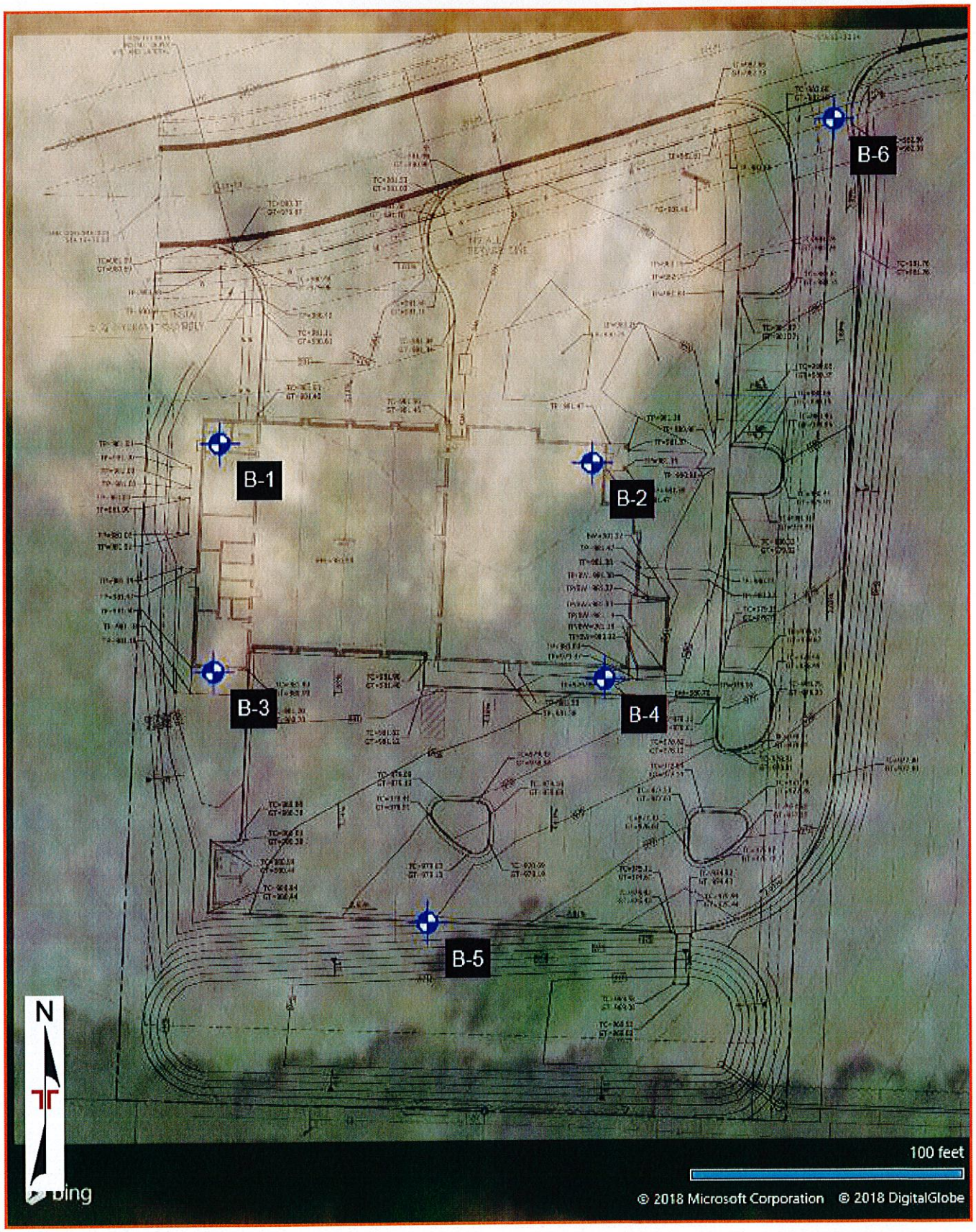


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: Lee's Summit Fire Station #3

CLIENT: City of Lee's Summit MO
Lee's Summit, MO

SITE: Shamrock Avenue and Pryor Road
Lee's Summit, MO

LOCATION See Exploration Plan

Latitude: 38.9163° Longitude: -94.4152°

Approximate Surface Elev: 979 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	HAND PENETROMETER (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
0.3	978.5+/-									
4" ROOT ZONE										
FAT CLAY (CH), with limestone fragments, brown to gray brown, stiff to very stiff										
					18	6-7-9 N=16		26		61-25-36
					17		3.0	23	105	
		5								
					18	5-7-7 N=14		35		
8.5	970.5+/-									
8.7 **LIMESTONE**, highly weathered	970.5+/-				1	50/1"		41		
Auger Refusal at 8.7 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock materials has been estimated based on observation of disturbed samples. Core samples and/or petrographic analysis may reveal other rock types.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 05-23-2018 | Boring Completed: 05-23-2018

Drill Rig: RC | Driller: RC

Project No.: 02185145

BORING LOG NO. B-2

PROJECT: Lee's Summit Fire Station #3

CLIENT: City of Lee's Summit MO
Lee's Summit, MO

SITE: Shamrock Avenue and Pryor Road
Lee's Summit, MO

LOCATION See Exploration Plan

Latitude: 38.9163° Longitude: -94.4148°

Approximate Surface Elev: 981 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.3	980.5+/-	**4" ROOT ZONE**
		FAT CLAY (CH), with limestone fragments, brown to gray brown, medium stiff to stiff
10.0	971+/-	**LIMESTONE**, highly weathered
11.0	970+/-	*Auger Refusal at 11 Feet*

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	HAND PENETROMETER (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
			14	6-5-6 N=11		25		64-26-38
			15		3.0	25	100	
5			18	3-3-4 N=7		26		
			18	3-5-7 N=12		28		
10								

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock materials has been estimated based on observation of disturbed samples. Core samples and/or petrographic analysis may reveal other rock types.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 05-23-2018 | Boring Completed: 05-23-2018

Drill Rig: RC | Driller: RC

Project No.: 02185145

BORING LOG NO. B-3

PROJECT: Lee's Summit Fire Station #3

CLIENT: City of Lee's Summit MO
Lee's Summit, MO

SITE: Shamrock Avenue and Pryor Road
Lee's Summit, MO

LOCATION See Exploration Plan

Latitude: 38.9161° Longitude: -94.4152°

Approximate Surface Elev: 978 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	HAND PENETROMETER (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
0.3	977.5+/-									
4" ROOT ZONE										
FAT CLAY (CH), with limestone fragments, brown to gray brown, stiff										
					18	6-5-7 N=12		25		
					18		1.5	25	102	
		5								
					18	7-5-6 N=11		36		
8.0	970+/-									
8.5	969.5+/-				0	50/0"				
LIMESTONE, highly weathered										
Auger Refusal at 8.5 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock materials has been estimated based on observation of disturbed samples. Core samples and/or petrographic analysis may reveal other rock types.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 05-23-2018 | Boring Completed: 05-23-2018

Drill Rig: RC | Driller: RC

Project No.: 02185145

BORING LOG NO. B-4

PROJECT: Lee's Summit Fire Station #3

CLIENT: City of Lee's Summit MO
Lee's Summit, MO

SITE: Shamrock Avenue and Pryor Road
Lee's Summit, MO

LOCATION See Exploration Plan

Latitude: 38.9161° Longitude: -94.4147°

Approximate Surface Elev: 979 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	HAND PENETROMETER (tsf)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI
0.3 **4" ROOT ZONE**	978.5+/-								
FAT CLAY (CH), with limestone fragments, brown to gray brown, stiff									
				9	5-4-6 N=10		23		67-26-41
				20		4.0	25	101	
		5							
				18	10-7-8 N=15		40		
				14	6-16-50/1"		18		
9.5	969.5+/-								
10.0 **LIMESTONE**, highly weathered	969+/-	10							
Auger Refusal at 10 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock materials has been estimated based on observation of disturbed samples. Core samples and/or petrographic analysis may reveal other rock types.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 05-23-2018 | Boring Completed: 05-23-2018
Drill Rig: RC | Driller: RC
Project No.: 02185145

BORING LOG NO. B-5

PROJECT: Lee's Summit Fire Station #3

CLIENT: City of Lee's Summit MO
Lee's Summit, MO

SITE: Shamrock Avenue and Pryor Road
Lee's Summit, MO

LOCATION See Exploration Plan

Latitude: 38.9158° Longitude: -94.415°

Approximate Surface Elev: 978 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)
0.3 **4" ROOT ZONE**	977.5+/-					
FAT CLAY (CH), with limestone fragments, brown to gray brown, stiff						
				10	6-6-9 N=15	26
				18	5-5-7 N=12	25
5.0	973+/-	5				
Boring Terminated at 5 Feet						

GRAPHIC LOG | WATER LEVEL OBSERVATIONS | HAND PENETROMETER (tsf) | DRY UNIT WEIGHT (pcf) | ATTERBERG LIMITS LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock materials has been estimated based on observation of disturbed samples. Core samples and/or petrographic analysis may reveal other rock types.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 05-23-2018 | Boring Completed: 05-23-2018

Drill Rig: RC | Driller: RC

Project No.: 02185145

BORING LOG NO. B-6

PROJECT: Lee's Summit Fire Station #3

CLIENT: City of Lee's Summit MO
Lee's Summit, MO

SITE: Shamrock Avenue and Pryor Road
Lee's Summit, MO

LOCATION See Exploration Plan

Latitude: 38.9166° Longitude: -94.4144°

Approximate Surface Elev: 981 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)
0.3	980.5+/-					
4" ROOT ZONE						
FAT CLAY (CH), with limestone fragments, brown to gray brown, stiff						
				12	6-6-7 N=13	25
				17	6-6-9 N=15	24
5.0	976+/-	5				
Boring Terminated at 5 Feet						

HAND PENETROMETER (tsf)

ATTERBERG LIMITS

DRY UNIT WEIGHT (pcf)

LL-PL-PI

WATER LEVEL OBSERVATIONS

Stratification lines are approximate. In-situ, the transition may be gradual.
Classification of rock materials has been estimated based on observation of disturbed samples. Core samples and/or petrographic analysis may reveal other rock types.

Hammer Type: Automatic

Advancement Method:
Continuous Flight Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from a topographic site plan.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
13910 W 96th Ter
Lenexa, KS

Boring Started: 05-23-2018 | Boring Completed: 05-23-2018

Drill Rig: RC | Driller: RC

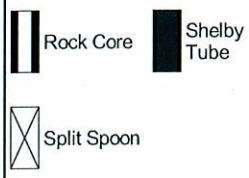
Project No.: 02185145

SUPPORTING INFORMATION

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

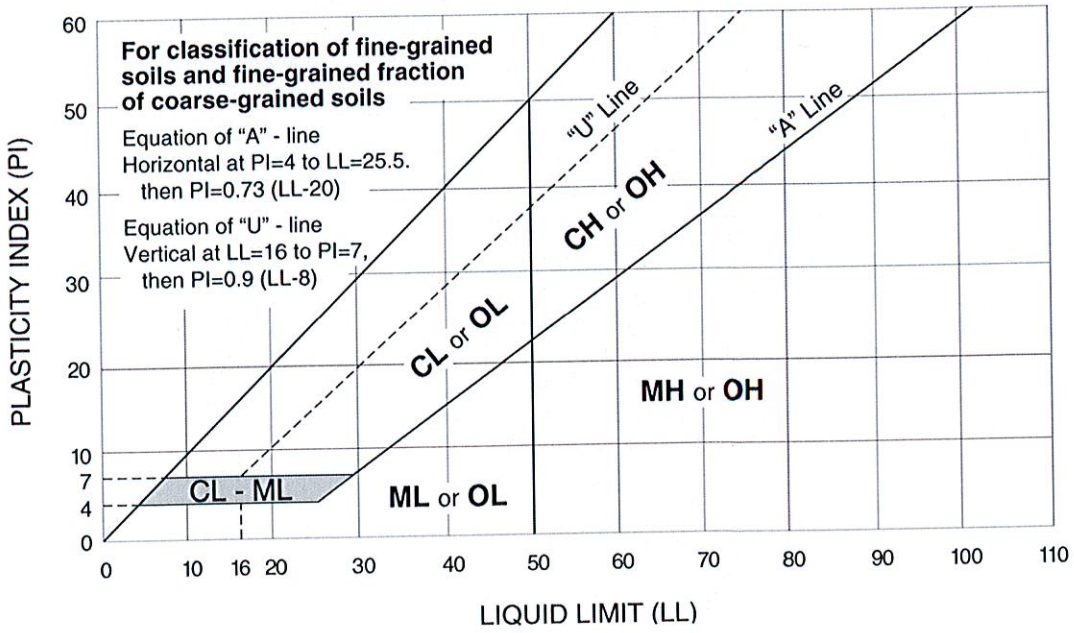
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, PSI (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft (50 – 300 mm)
Moderate	8 in – 2 ft (200 – 600 mm)	**Medium**	1 ft – 3 ft (300 – 900 mm)
Wide	2 ft – 6 ft (600 mm – 2.0 m)	**Thick**	3 ft – 10 ft (900 mm – 3 m)
Very Wide	6 ft – 20 ft (2.0 – 6 m)	**Massive**	> 10 ft (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0 degree angle.

ROCK QUALITY DESIGNATION (RQD*)	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

*The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

Terracon

Williams
Spurgeon
Kuhl &
Freshnock
Architects, Inc.

Architecture · Interior Design · Illustration · Planning

October 2, 2018

Joe Frogge, Plans Examiner
Lee's Summit Development Services
220 SE Green Street
Lee's Summit, MO 64063

Re: ***Permit Number: PRCOM20182387***
Commercial Building Permit
For Lee's Summit Fire Station #3
WSKF Architects, Inc., Applicant

Dear Mr. Frogge:

In regards to the Building Permit comments of September 18, 2018 regarding the above mentioned permit application, please find listed below each comment requiring correction or comment, followed by our response.

FIRE PLAN REVIEW
Reviewed By: Joe Dir

1. 2012 IFC 907.1.1- Construction documents. Construction documents for fire alarm systems shall be submitted for review and approval prior to system installation. Construction documents shall include, but not be limited to, all of the following: 1. A floor plan which indicates the use of all rooms. 2. Locations of alarm-initiating and notification appliances. 3. Alarm control and trouble signaling equipment. 4. Annunciation. 5. Power connection. 6. Battery calculations. 7. Conductor type and sizes. 8. Voltage drop calculations. 9. Manufacturers, model numbers and listing information for equipment, devices and materials. 10. Details of ceiling height and construction. 11. The interface of fire safety control functions.

   Action required: (Information purposes)
   Have the fire alarm system contractor provide shop drawings of the fire alarm system to be installed.

   Applicant's Response:
   WSKF Architects would like to request deferral on this item as it won't be submitted until after the project is underway.

2. 2012 IFC 901.2- Construction documents. The fire code official shall have the authority to require construction documents and calculations for all fire protection systems and to require permits be issued for the installation, rehabilitation or modification of any fire protection system. Construction documents for fire protection systems shall be submitted for review and approval prior to system installation.

   Action required: (Information purposes)

Have the fire sprinkler system contractor provide shop drawings of the fire sprinkler system to be installed.

Applicant's Response:
WSKF Architects would like to request deferral on this item as it won't be submitted until after the project is underway.

3. 2012 IFC 901.5- Installation acceptance testing. Fire detection and alarm systems, fire-extinguishing systems, fire hydrant systems, fire standpipe systems, fire pump systems, private fire service mains and all other fire protection systems and appurtenances there to shall be subject to acceptance tests as contained in the installation standards and as approved by the fire conde official. The fire code official shall be notified before any required acceptance testing. The fire code official shall be notified 48 hours before any required acceptance test.

   Action required: (Information purposes)
   Field tests and acceptance testing of the fire sprinkler, fire alarm, CO monitoring and kitchen hood systems will be required prior to the final occupancy inspection. Contact the Fire Department to schedule testing.

   Applicant's Response:
   Acknowledged.

4. Access controlled doors

   Action required: (Verified at inspection/testing)
   Access controlled doors shall drop off upon fire alarm activation.

   Applicant's Response:
   Acknowledged.

BUILDING PLAN REVIEW
Reviewed By: Joe Frogge

1. The building permit for this project cannot be issued until the Codes Administration Department has received the approved Final Development Plan from the Planning and Development Department.

   Action required: Comment is for informational purposes.
   8/13/18 – Acknowledged in response letter. FDP is in "approved" status but is not yet completely processed.

   Applicant's Response:
   Acknowledged; the project is listed under Applicant Number: PL2018022.

2. A License Tax application completed by the contractor must be submitted to the City of Lee's Summit, Codes Administration Department, and any applicable License Tax paid prior to issuing a building permit.

   Action required: Comment is for informational purposes.
   8/13/18 – Acknowledged in response letter.

   Applicant's Response:
   Acknowledged; the General Contractor will provide this information prior to picking up the building permit.

3. 2012 IBC 1704.2 Special inspections. Where application is made for construction as described in this section, the owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more approved agencies to perform inspections during construction on the types of work listed under Section 1705. These inspections are in addition to the inspections identified in Lee's Summit Code of Ordinances Chapter 7. (see code section for exceptions)

   Action required: Provide statement of special inspections / letter of responsibility from company contracted to perform special inspections.
   8/13/18 – Acknowledged in response letter.

   Applicant's Response:
   Acknowledged.

4. Copies of the engineered truss package were not provided at the time of permit application.

   Action required: Provide roof truss packages or request deferral.
   8/13/18 – Acknowledged in response letter.

   Applicant's Response:
   Acknowledged.

5. 2012 IBC 1803.1 General. Geotechnical investigations shall be conducted in accordance with Section 1803.2 and reported in accordance with Section 1803.6. Where required by the building official or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a registered design professional.

   Action required: Provide soils report to justify design assumption of soil bearing capacity greater than 2,000psf.
   8/13/18 – Response letter refers to an attached report that was not found in the submittal.

   Applicant's Response:
   The geotechnical report was inadvertently left out of the last resubmittal and has been attached to this response letter for the city's review.

6. Water meter information not provided.

   Action required: Provide water meter size and location.
   8/13/18 – Unable to locate information on drawings.

   Applicant's Response:
   See sheet C5.0 Utility Plan for updated water meter specifications. 2" tap and 2" meter are specified for the 3" domestic water line.

7. Sand/oil separator information not provided.

   Action required: Provide sand/oil separator specifications.
   8/13/18 – Unable to find information on drawings.

   Applicant's Response:
   See sheet C5.0 Utility Plan, and C8.0 Site Details for oil/sand separator specifications and details. A Striem OS-100 oil separator has been specified.

8. 2012 IPC 708.3.2 Building sewers. Building sewers shall be provided with cleanouts located not more than 100 feet apart measured from the upstream entrance of the cleanout. For building sewers 8 inches and larger, manholes shall be provided and located not more than 200 feet from the junction of the building drain and building sewer, at each change in direction and at intervals of not more than 400 feet apart. Manholes and manhole covers shall be of an approved type.

   Action required: Additional cleanouts required at waste piping. Required at exit from building at every 100'.
   8/13/18 – Acknowledged in response letter. To be field verified.

   Applicant's Response:
   Acknowledged.

10. 2012 IBC 1210.3.2 – Urinal partitions. Each urinal utilized by the public or employees shall occupy a separate area with walls or partitions to provide privacy. The walls or partitions shall begin at a height not more than 12 inches form and extend not less than 60 inches above the finished floor surface. The walls or partitions shall extend from the wall surface at each side of the urinal not less than 18 inches or to a point not less than 6 inches beyond the outermost front lip of the urinal measured from the finished backwall surface, whichever is greater. (See code section for possible exceptions.)

    Action required: Provide partitions at urinals. Modify designs at, but not limited to, Toilet rooms #156 & #122.
    8/13/18 – Room 122 approved as-is. Provide locking hardware at door into #156 in order to qualify as single user restroom.

    Applicant's Response:
    The following door hardware is provided for Door 156 at Toilet 4 (156). This change was made as part of Addendum Two, dated August 2, 2018 and has been included in the contractor's pricing.

Set: 27.0
Doors: 156

3	Hinge (heavy weight)	T4A3786 4-1/2" x 4-1/2"	US26D	MK 087100
1	Privacy Set	8265 LNMI	US26D	SA 087100
1	Door Closer	281 O	EN	SA 087100
1	Kick Plate	K1050 10" x 2" LDW 4BE CSK	US32D	RO 087100
1	Wall Stop	400	US26D	RO 087100
1	Threshold	171A		PE 087100
1	Gasketing	S88D		PE 087100
1	Sweep	18061CNB TKSP8		PE 087100

15. 2012 IBC 1209.2 – Attic spaces. An opening not less than 20 inches by 30 inches shall be provided to any attic area having a clear height of over 30 inches. Clear headroom of not less than 30 inches shall be provided in the attic space at or above the access opening.

    Action required: Provide access to attic areas.
    8/13/18 – Response letter references access panels that we are unable to locate on plans.

Applicant's Response:
Attic access is being provided in five locations: BC Shower-110, Mechanical-112, Technology-120, Apparatus Bays-148, and Fitness-157. The size of the openings will be updated to show a 20" x 30" opening in lieu of the 24" x 24" that we were showing. See the attached plan, A5.01, for revisions.

LICENSED CONTRACTORS
Reviewed By: Joe Frogge

1. Lee's Summit Code of Ordinance, Section 7-130.10 – Business License. It shall be unlawful for any person to engage in the construction contracting business without first obtaining a business license as required under the applicable provisions of Chapter 28 of the Lee's Summit Code of Ordinances.

   Action required: Either a Class A or Class B license is required. Provide the name of the licensed general contractor.
   8/13/18 – Acknowledged in response letter.

   Applicant's Response:
   Acknowledged.

2. Lee's Summit Code of Ordinance, Section 7-130.4 – Business License. (excerpt)
   No person, other than a licensed contractor or employees of a licensed contractor, shall engage in electrical, plumbing or mechanical business, construction, installation or maintenance unless duly licensed in accordance with this section.

   Action required: MEP subcontractors are required to be listed on permit. Provide company names of licensed MEP contractors.
   8/13/18 – Acknowledged in response letter.

   Applicant's Response:
   Acknowledged.

With these responses and enclosures, we trust that all necessary and appropriate information has been provided.

Respectfully,
Williams Spurgeon Kuhl & Freshnock Architects, Inc.

Rick Kuhl, RA MBA LEED AP

Enc. Revised Documents
Cc: file