ADDENDUM NO. 3

TO: PLANS AND SPECIFICATIONS FOR STATE OF MISSOURI

Site Development and Security
Scruggs Station Warehouse
Project No. O2433-08

Bid Opening Date: 1:30 PM, Thursday, March 25, 2025 (Not Changed)

Bidders are hereby informed that the construction Plans and/or Specifications are modified as follows:

SPECIFICATION CHANGES:
NONE

DRAWING CHANGES/CLARIFICATIONS:
NONE

GENERAL COMMENTS:

1. RESPONSE TO QUESTIONS:

   Q: Will there be a Geotechnical Report and how deep does the aggregate fill at the future building site need to be?

   A: Please find Geotechnical report attached to this addendum. The aggregate depth shall be the recommended depth in the Geotechnical Report in 6" lifts that meet compaction.

2. Please contact Paul Girouard, Contract Specialist, at 573-751-4797 or Paul.girouard@oa.mo.gov for questions about bidding procedures, MBE\WBE\SDVE Goals, and other submittal requirements.
3. The deadline for technical questions is March 18, 2025 at 12:00 PM.
4. Changes to, or clarification of, the bid documents are only made as issued in the addenda.
5. All correspondence with respect to this project must include the State of Missouri project number as indicated above.
6. Current Plan holders list available online at https://www.oafmdcplanroom.com/projects/2792/plans/o2433-08-site-development-and-security-scruggs-station-warehouse
7. Prospective Bidders contact American Document Solutions, 1400 Forum Blvd Suite 1C, Columbia MO 65201, 573-446-7768 to order official plans and specifications.
8. **All bids shall be submitted on the bid form without additional terms and conditions, modifications, or stipulations. Each space on the bid form shall be properly filled including a bid amount for each alternate. Failure to do so will result in rejection of the bid.**

9. **MBE/WBE/SDVE participation requirements can be found in DIVISION 00. The MBE/WBE/SDVE participation goals are 10%/10%/3%, respectively. Only certified firms as of the bid opening date can be used to satisfy the MBE/WBE/SDVE participation goals for this project. If a bidder is unable to meet a participation goal, a Good Faith Effort Determination Form must be completed. Failure to complete this process will result in rejection of the bid.**

ATTACHMENTS:

1. Geotech Report

March 20, 2025

END OF ADDENDUM NO. 1

GREDELL
ENGINEERING RESOURCES

CIVIL • GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • EARTH SCIENCES

September 26, 2024

Keith Brickey, PLS
Central Missouri Professional Services, Inc.
2500 E. McCarty Street
Jefferson City, MO 65101

RE: Subsurface Investigation, Analysis and Geotechnical Engineering Recommendations for Fleet Maintenance Building - State of Missouri Office of Administration, Jefferson City, Missouri

Dear Mr. Brickey:

GREDELL Engineering Resources, Inc. presents the attached report of "Subsurface Investigation, Analysis and Geotechnical Engineering Recommendations for Fleet Maintenance Building - State of Missouri Office of Administration, Jefferson City, Missouri.

This report was prepared to provide geotechnical recommendations and construction considerations to assist in the preparation of construction documents for the planned construction. The investigation was conducted using methods and procedures consistent with the professional standard of care and customary practice for geotechnical engineering investigations of this nature in Missouri.

GREDELL Engineering Resources, Inc. looks forward to continuing to work with you as this project moves ahead in design and construction. If you have any questions or require additional information, please contact me at (573) 659-9078.

Sincerely,

Bruce Dawson

Bruce Dawson, P.E.

Enclosure: Report Titled: ***Subsurface Investigation, Analysis and Geotechnical Engineering Recommendations for Fleet Maintenance Building - State of Missouri Office of Administration, Jefferson City, Missouri***

c: Thomas R. Gredell, P.E., GREDELL Engineering Resources, Inc.

1505 East High Street
Jefferson City, Missouri 65101-4826

Telephone (573) 659-9078
Fax (573) 659-9079

GREDELL
ENGINEERING RESOURCES

Subsurface Investigation, Analysis and Geotechnical Engineering Recommendations for Fleet Maintenance Building - State of Missouri Office of Administration Jefferson City, Missouri

Prepared for:

Keith Brickey, PLS
Central Missouri Professional Services, Inc.
2500 E. McCarty Street
Jefferson City, MO 65101

September 2024

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Subsurface Investigation, Analysis and Geotechnical Engineering Recommendations Fleet Maintenance Building - State of Missouri Office of Administration Jefferson City, Missouri

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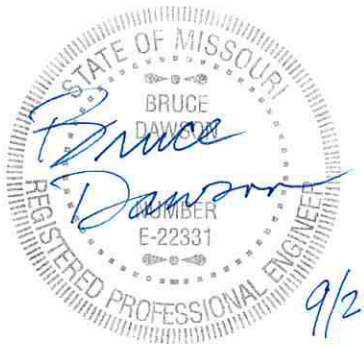

9/26/24

Subsurface Investigation, Analysis and Geotechnical Engineering Recommendations
State of Missouri Fleet Maintenance Building
Jefferson City, Missouri
September 2024

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APPENDICES

1.0 COMMISSION AND REPORT USE

Central Missouri Professional Services, Inc. (CMPS) retained GREDELL Engineering Resources, Inc. (GER) to perform a subsurface investigation and geotechnical engineering evaluation at the site of the planned new State of Missouri Fleet Maintenance Building. This subsequent engineering report has been prepared for the exclusive use of CMPS and their design team in the development of construction documents for the proposed facility. GER completed the investigation using methods and procedures consistent with the professional standard of care and customary practice for geotechnical engineering investigations of projects of this nature in Missouri.

The proposed project consists of site development and the construction of an approximately 30,000 square foot, slab-on-grade, pre-engineered metal building. CMPS provided project information including a topographic survey, a conceptual site plan, and a preliminary site grading plan. The proposed building is in the conceptual design stages and building dimensions and elevations are taken as approximate and preliminary in nature. Specific foundation loads were not available at the time of this investigation and the foundation performance analysis conducted for this report was performed using assumed loading conditions considered typical for structures of this type. Additional foundation performance analysis may be warranted upon determination of design loads.

The following report describes GER's geotechnical investigation and related design recommendations for the proposed construction. This report is based on the findings of our geotechnical investigation, our interpretation of subsurface conditions at the site, our experience with the geology of Cole County, and the currently identified project characteristics. We conducted this investigation to evaluate the impact of subsurface conditions on design and construction of the proposed project, and to develop geotechnical design parameters and recommendations for use by the responsible design professionals.

This investigation included but was not limited to evaluation of:

- The stratigraphy and engineering characteristics of subsurface materials.
- Groundwater levels and quantities.
- General excavation characteristics.
- The presence and potential effect of high plastic soils.
- Feasible foundation systems and their corresponding design parameters.
- Foundation settlement estimates.
- Seismic site classification.
- Subsurface drainage recommendations.
- Geotechnical related specification content, and
- Geotechnical construction considerations.

Findings and recommendations related to these topics are provided in this report. This report represents our professional opinion concerning these matters based on information and data available to us during this assignment.

2.0 PROJECT SCOPE OF SERVICES

The scope of our geotechnical investigation and evaluation was as follows:

1. Perform a site reconnaissance and conduct a subsurface investigation including both geotechnical borings and test pits at the proposed building site at 4720 Scruggs Station Road in Cole County, Missouri.
2. Develop recommendations for foundation systems to include foundation type, allowable foundation bearing capacity, minimum depth to bearing, foundation settlement estimates, and seismic site classification using assumed foundation loads.
3. Evaluate the excavation characteristics of the subsurface materials.
4. Assess the location of the groundwater or phreatic surface, if encountered, and evaluate its potential impact on geotechnical related design and construction.
5. Evaluate the potential impact of high plasticity soils, if any, on the proposed construction.
6. Evaluate the suitability of on-site materials for use as engineered fill and backfill.
7. Provide general recommendations for the design of surface and sub-surface drainage systems.
8. Describe the nature, location, and estimated quantities of identifiable potentially deleterious materials that may interfere with construction progress or structure performance.
9. Recommend appropriate geotechnical related specification content and describe applicable geotechnical construction considerations.

3.0 SITE DESCRIPTION

3.1 Site Location

The proposed site for the State of Missouri Fleet Maintenance Building is located near and within the westernmost boundary of the Jefferson City limits at 4720 Scruggs Station Road. The site is generally located in the southwest quarter of Section 17, Township 44 North, Range 12 West in Cole County, Missouri. (See Site Location Map, Appendix). The site is bounded to the north by Leandra Lane, Fairgrounds Road to the east and southeast, Scruggs Station Road to the southwest, and South Country Club Drive to the west.

3.2 Site Conditions

The western third of the twenty-eight-acre tract features an existing warehouse facility with loading docks and ancillary parking lots. Previous development of surrounding tracts has been predominantly for single family dwellings and industrial uses. The Fleet Maintenance Building is planned along the north side of an existing parking lot near the south edge of the tract. The site is generally forested except for the turf grass

areas adjacent to the existing building and parking lots. After the completion of this field investigation, contractors for the State of Missouri cleared much of the tract of hardwood trees and brush.

The site generally slopes to the north and east into a central drainage flowing off the property to the northeast. Ground surface conditions were dry at the time of the investigation, and the State of Missouri had cleared the areas planned for investigation using forestry mulching methods.

3.3 Project Description

The proposed project consists of site development and the construction of parking lots and an approximately 30,000 square foot pre-engineered metal building for use as a vehicle maintenance facility. The finished floor elevation is planned at about 805 feet. The proposed building is in the conceptual design stages and building dimensions and elevations are taken as approximate and preliminary in nature.

4.0 FIELD INVESTIGATION

The field investigation was conducted June 19 and 27, 2024 and included surface reconnaissance, staking proposed exploration locations, identifying and locating known underground utilities, and the completion of ten borings and nine test pit explorations. A total of twenty explorations were planned, but the planned location of FM20 was inaccessible due to steep site topography and was not completed. Exploration locations are shown on the Exploration Plan in the Appendix. The ground surface elevations shown on the exploration logs were estimated based on the topographic survey provided by CMPS and are considered accurate to within +/- 0.5 feet for the purposes of geotechnical modeling and analysis.

The geotechnical borings were completed June 19 and were advanced using a truck mounted CME 45C rotary drill rig equipped with 4-inch continuous flight augers. Termination criteria for the borings were: 1) minimum depth of twenty feet below existing ground surface for borings targeting the building footprint; 2) minimum depth of five feet below existing grade or planned finished grade in pavement areas, whichever is deeper; 3) auger refusal; 4) bedrock; or 5) Standard Penetration Test (ASTM D 1586) refusal, whichever occurred first.

Test pits were completed on June 27 and were advanced using a Caterpillar 308 excavator with a 24-inch bucket. Test pits were made in areas inaccessible to the truck mounted drill rig. Termination criteria for the test pits were: 1) minimum depth of five feet below existing ground surface for parking lot explorations; 2) machine reach limit for test pits targeting the building footprint; 3) practical machine refusal; or 4) bedrock, whichever occurred first.

The initially provided conceptual site plan used to lay out these explorations did not depict the south parking lot or the north wall bump-out shown in the later site grading plan. For this reason, no explorations were made for the south parking lot and explorations in the north wall bump-out were terminated at five feet.

Representative disturbed soil samples were obtained from auger cuttings and grab samples of select strata during drilling and excavation and from Standard Penetration Tests performed in accordance with ASTM D 1586, “Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils”.

Samples were preserved and transported in accordance with ASTM D 4220, “Standard Practices for Preserving and Transporting Soil Samples”.

5.0 LABORATORY INVESTIGATION

Following the field investigation, a laboratory investigation was conducted to quantify the probable range of engineering characteristics of the subsurface materials necessary in analyzing and predicting foundation and earthwork performance. The laboratory investigation included supplementary visual classification by the geotechnical engineer, water content tests, and Atterberg Limits determinations. Laboratory tests were conducted in coordination with Central Missouri Professional Services, Inc. of Jefferson City, Missouri in accordance with ASTM procedures. A Summary of Laboratory Test Results is provided in the Appendix.

6.0 GEOLOGY OF AREA

Jefferson City, Missouri lies near the northern edge of the Ozark uplift. The regional geology is characterized by dolomitic limestone bedrock of the Ordovician age Jefferson City Formation overlain by gravelly residual soils and Pleistocene loess on the upland surfaces and by Holocene and older alluvium in bottomland.

The Jefferson City formation consists of dolomite, limestone, argillaceous dolomite, siliceous limestone, sandstone, and shale. The lithologies may be thinly bedded with weathered seams of residual clay and are susceptible to groundwater movement. Large subsidence structures filled with younger, originally overlying lithologies are common in the region. Solution cavities may be present with dimensions that vary from a few inches to tens of feet. These solution features are often filled with younger, undifferentiated deposits of sand, gravel, or clay. While the bedrock topography in the Jefferson City area may generally mirror the surface topography, elevation changes in the bedrock surface typically occur in variable steps or bluffs rather than gradual slopes. Also, the bedrock surface may contain ridges or depressions due to karst activity or ancient erosional regimes that are not reflected by the surface topography.

7.0 SUBSURFACE CONDITIONS

7.1 General

GER visually classified the types of foundation materials encountered by the methods of ASTM D 2488, “Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)”. The soils and bedrock are described in detail by the Exploration Logs and Summary of Laboratory Test Results provided in the Appendix. The stratification lines represent approximate boundaries, and the transitions may be gradual.

7.2 Observed Stratigraphy

Surface materials across the site consisted of sod, woodland leaf litter, and concrete pavement. Piles of concrete pavement debris were noted in the vicinity of test pit FM13. The general subsurface profile consisted of variable thicknesses of clay fill and native clay soils overlying residual clays over limestone

bedrock. Fill materials generally consisted of firm clay soils with some areas displaying significant silt content. Native clay soils were generally firm with significant silt content. Residual soils above rock consisted of clay with some fine gravel content.

Groundwater was observed at a depth of 2.5 feet in boring FM7. Test pit FM17 encountered seepage near the surface due to its location near the central ditch flowline. Groundwater was not encountered in the remaining explorations.

Dolomitic limestone bedrock of the Ordovician age Jefferson City formation was encountered at depths ranging from about one to eight feet in these explorations. Explorations FM1, FM2, FM3, FM4 and FM5 along the north elevation of the proposed building encountered rock at elevations of 788.9, 786.8, 788.1, 791.3 and 795.5 feet, respectively, while borings FM6, FM7, FM8, FM9, and FM10 encountered rock at elevations of 793.6, 795, 794.6, 796.1, and 799.8 feet, respectively. The average depth to rock for explorations targeting the building footprint was about five feet. Bedrock was typically moderately hard to hard and was penetrated about one to two feet prior to auger refusal. The actual rock surface is expected to be somewhat irregular, and may contain weathered and fractured zones, boulder surfaces, rock ledges of varying heights, solution channels, or other lithologic and topographic variations.

8.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

The design recommendations that follow are based on the findings of our geotechnical investigation, our interpretation of subsurface conditions at the site, our experience with the geology of this region, and current project information furnished by CMPS. We recommend that GER be retained to review geotechnical related aspects of foundation plans, specifications, and design details at the design development phase. We also recommend that GER be retained as part of the geotechnical construction quality assurance team.

The project is in conceptual design and building dimensions and elevations are taken as approximate and preliminary in nature. Design foundation loads were not available at the time of this investigation and the foundation performance analysis conducted for this report was based on assumed loading considered typical for pre-engineered metal buildings.

8.1 Feasible Foundation Systems

General. Conventional shallow foundations are considered appropriate for the proposed building. Due to the proposed site grading and the shallow disturbance of soils caused by the previous forestation of the site and subsequent site clearing, site preparation will be critical to the suitable performance of any structures, pavements, or controlled fill. Specific site preparation recommendations are provided in later sections of this report. The current site plan indicates that the majority of the proposed building footprint will bear on new fill. The following foundation design alternatives are considered feasible for this project and should be evaluated by the design team based on cost and foundation performance considerations.

For the purposes of this investigation, foundation analyses were based on estimated service loads of 5 kips per linear foot (klf) for walls and 150 kips for columns. We have modeled anticipated foundation performance based on the above foundation loads and estimated allowable shallow foundation bearing

capacities for soil and shot rock fill. We have considered acceptable foundation performance to be total settlement of no more than 1.0-inch.

Conventional Shallow Foundations on Engineered Fill. GER considers conventional shallow foundations bearing on new engineered fill to be a feasible and practical alternative for the proposed building. Conventional shallow foundations bearing on controlled fill constructed of newly imported fine-grained soil or on-site fine-grained soil may be designed for a net allowable bearing capacity of 3,000 pounds per square foot (psf). Contingent upon site preparation being completed as recommended later in this report, GER recommends a minimum depth to bottom of foundation of 30-inches below lowest adjacent exterior grade for stability and frost protection.

Existing undocumented fill materials were observed in explorations FM7, FM8, and FM9 and may extend beyond these locations or be present in other parts of the site. Existing undocumented fill should be removed in its entirety where encountered. Undocumented fill should be replaced with new material placed as engineered fill or, subject to possible sorting and removal of objectional constituents (man-made debris, oversize material, organic soils, wood or woody debris, excessively wet material, and other deleterious material) or moisture conditioning, existing undocumented fill may be recompacted as engineered fill in accordance with the recommendations of this report and good earthwork construction practice.

Long term post construction settlement for foundations bearing on controlled soil fill or native soil is expected to be less than one inch. Further settlement analysis may be appropriate upon determination of design foundation loads and any concentrated slab loadings below vehicle lifts or other maintenance shop equipment.

Alternative Foundation System – Shallow Foundations on Shot Rock Fill. Shallow foundations constructed on controlled rock fill beginning at a maximum elevation of three feet below lowest design foundation bearing elevation may be designed for net allowable bearing capacities of 5,000 psf for isolated foundation elements and 4,000 psf for continuous foundation elements. Controlled rock fill placement should be extended a minimum of ten feet beyond the plan limits of the building footprint, at a maximum elevation of three feet below lowest design foundation bearing elevation. We recommend that clay subgrades receiving controlled rock fill be sloped at a minimum of 2-percent to minimize the potential for long-term ponding of infiltration on the clay subgrade.

Long term post construction settlement for foundations bearing on controlled shot rock fill placed and compacted in accordance with the recommendations of this report on subgrades prepared in accordance with the recommendations of this report, is estimated at less than one-half inch. Further settlement analysis may be appropriate upon determination of design foundation loads and any concentrated slab loadings below vehicle lifts or other maintenance shop equipment.

8.2 Seismic Site Classification

Seismic site classification was assessed based on the presumption that all new site fill beneath the building footprint will consist of controlled fine-grained soil fill as recommended herein. In accordance with Chapter 20 of ASCE Standard ASCE / SEI 7-10, Minimum Design Loads for Buildings and Other Structures, we consider that site subsurface conditions are consistent with a Seismic Site Classification of “D”.

8.3 Floor Slabs

Materials at floor slab subgrade are expected to consist of low to moderate plasticity clay fill or controlled shot rock fill. The conceptual site plan indicates fill will be required to reach floor slab subgrade elevation across the building footprint except for the southeast corner where existing grade is approximately equal to finished floor elevation.

If the building pad is constructed of engineered fill composed of local fine-grained soil, GER recommends constructing the upper 18-inches of the building pad with low volume change material (LVCM) similar to crushed limestone dense graded aggregate base locally known as “screenings”, “waste rock”, and “buckshot”. This material is typically produced with a top-size of about 5/16-inches. We anticipate that the designer will specify that the upper four to six inches of the building pad consist of drainage aggregate similar to Missouri Standard Specifications for Highway Construction (MSSHC) Section 1009 Grade 4 Aggregate for Drainage. The drainage aggregate thickness may be considered part of the recommended 18-inches of LVCM.

Floor slabs for heated spaces constructed on a minimum of 18-inches of LVCM over a controlled fill subgrade may be designed based on a modulus of subgrade reaction, k, of 200 pounds per cubic inch. A minimum slab thickness of four inches is recommended. Structural considerations may dictate a greater thickness.

If the building pad is constructed of engineered fill composed of shot rock, GER recommends constructing an approximately 4-inch thick levelling course of dense graded aggregate base to the bottom of the underslab drainage aggregate. Crushed limestone dense graded aggregate base similar to MSSHC Section 1007 Type 1 or Type 5 Aggregate for Base is recommended for this application.

8.4 Retaining Walls

Retaining Walls Integral to the Building. Retaining walls that abut or are integral to the building should be constructed as conventional reinforced concrete retaining walls, bearing on the same materials as the building. A net allowable bearing capacity of 2,500 pounds per square foot and a maximum toe pressure of 2,500 pounds per square foot are recommended for the design of retaining structures constructed on new controlled soil fill or native soils. A net allowable bearing capacity of 4,000 pounds per square foot and a maximum toe pressure of 4,000 pounds per square foot are recommended for retaining structures constructed on a minimum thickness of three feet of new shot rock fill.

Equivalent Fluid Pressure. Retaining walls that abut or are integral to the building are expected to be designed to resist rotation. Walls that are restrained from rotating and that are backfilled as recommended below should be designed for at-rest earth pressures using an equivalent fluid pressure of 60 pounds per cubic foot. Retaining walls that are designed to allow rotation and are backfilled as recommended below may be designed for the active state using an equivalent fluid pressure of 35 pounds per cubic foot (pcf).

Lateral Resistance. For wall and foundation systems subject to lateral forces bearing on approved soil fill, a friction coefficient of 0.4 is recommended to analyze sliding resistance. Sliding resistance analysis may also consider ultimate passive earth pressure resistance, Pu, of foundations bank formed in approved soil

fill, in pounds per square foot for a given depth, D, on the vertical face of the foundation element or key as follows:

$$Pu = 125 \times D + 2{,}500$$

For wall and foundation systems subject to lateral forces bearing on approved controlled rock fill or intact rock, a friction coefficient of 0.6 may be used to analyze sliding resistance. Sliding resistance analysis may also consider ultimate passive earth pressure resistance, Pu, of foundations bank formed in controlled rock fill, in pounds per square foot for a given depth, D, on the vertical face of the foundation element or key as follows:

$$Pu = 600 \times D$$

These equations yield an ultimate value and no safety factors are included. Furthermore, due to potential seasonal variations in soil parameters, passive pressure resistance should not be considered available at a depth of less than two feet below lowest adjacent finished grade. Available passive pressure resistance of conventionally formed foundations is dependent on compaction efforts during backfilling operations. Wall backfill placement and compaction recommendations are presented in the Construction Considerations section of this report.

Retaining Wall Drainage. We recommend that walls subject to unbalanced lateral earth pressures be designed and constructed with a free-draining aggregate backfill zone in the backfill space beginning at the base of the wall and extending out and up at a 30-degree angle off vertical. Although this geometry implies that some backfill above the heel of the footing may consist of fine-grained soil backfill, it is typically not practical or cost-effective to split the backfill materials in this manner. Typically, all the backfill material above the heel of the footing will consist of free-draining aggregate. Free-draining aggregate should be similar to MSSHC Section 1009 Grade 4 Aggregate for Drainage. The aggregate backfill zone should be wrapped with a non-woven geotextile filter fabric similar to Tencate Mirafi 160N. A perforated pipe should be installed at the base of the free-draining aggregate backfill zone and routed to daylight or accessible, down-gradient storm sewers. If the discharge is connected to a storm sewer, the storm sewer design should verify that storm sewers will not hydraulically surcharge wall backfill zones.

8.5 Pavements

The majority of the proposed north parking lot area requires new fill to reach pavement subgrade. Imported or on-site soil fill should be constructed in accordance with the engineered fill requirements of this report.

Flexible Pavements. An estimated Bearing Ratio (ASTM D 1883) of 5 is recommended for design of asphalt cement concrete (ACC) pavement bearing on fine-grained controlled fill at this site. If an aggregate base course is included in the flexible pavement design, GER recommends a gradation conforming to MSSHC Section 1007 Type 1 or Type 5. Other aggregate types may be acceptable, subject to the discretion of the Civil Engineer or review by GER.

Portland Cement Concrete Pavements. GER recommends a modulus of subgrade reaction, k, of 150 pounds per cubic inch for design of exterior Portland cement concrete (PCC) pavements constructed with a dense graded aggregate base with a minimum thickness of four inches. A project specific pavement design based on traffic characteristics should be used to determine the thickness of pavement sections and

aggregate base material, particularly in consideration of the potential for high traffic counts at the facility. Aggregate base course consisting of MSSHC Section 1007 Type 1 or 5 is recommended for concrete pavements. Other aggregate types may be acceptable, subject to the discretion of the Civil Engineer or review by GER.

9.0 CONSTRUCTION CONSIDERATIONS

The following subsections identify the recommendations for site preparation, foundation excavation and construction, groundwater and storm water management, engineered fill and backfill, and quality assurance testing.

9.1 Site Preparation

Existing Undocumented Fill Materials. Existing undocumented fill materials were observed at FM7, FM8, and FM9 and may extend beyond these locations or be present in other parts of the site. Existing undocumented fill should be removed in its entirety where encountered. Undocumented fill should be replaced with new material constructed as engineered fill or, subject to possible sorting and removal of objectional constituents (man-made debris, oversize material, organic soils, wood or woody debris, excessively wet material, and other deleterious material) or moisture conditioning, existing undocumented fill may be recompacted as engineered fill in accordance with the recommendations of this report and good earthwork construction practice.

Initial Site Preparation. Initial site preparation is expected to consist primarily of grubbing to remove remnant roots following recent tree clearing and cut-and-fill grading. Due to root disturbance and recent disturbance from tree clearing, GER recommends the following specific site preparation for areas that are planned for less than 1-foot of cut or for any fill placement beneath and within 10 horizontal feet of foundation elements, and for the upper 1-foot of subgrade soil and all subgrade areas to receive fill beneath pavements. These areas should be undercut to a minimum depth of 1-foot below existing grade, the resultant undercut subgrade moisture conditioned and compacted, and the excavated undercut material then moisture conditioned, replaced, and compacted as engineered fill in accordance with the engineered fill recommendations of this report. Floor slab and pavement subgrade in areas planned for less than 1-foot of cut should also be undercut to a minimum depth of 1-foot below finished dirt grade, and the undercut material moisture conditioned and replaced and compacted as an engineered fill. GER recommends that these areas be defined in the construction documents with appropriate specifications, plans, and details. GER should be retained to monitor site preparation to verify that actual subsurface conditions are consistent with the findings and recommendations of this investigation, and to determine if any areas require additional undercut and compaction. Following is a schematic outline of the process:

- Define and stake the relevant geometry: 1-foot cut line, 10-feet beyond foundation perimeters for foundations; 1-foot cut line for pavements.
- Excavate the defined areas to a minimum depth of 1-foot below existing grade in fill areas and 1-foot below finished dirt grade in cut areas. Windrow or stockpile the materials to expose the subgrade soils below the undercut.

- Moisture condition and compact the subgrade soils below the undercut in accordance with the Engineered Fill recommendations of this report.
- In areas to receive fill, replace and compact the undercut materials in two lifts, in accordance with the Engineered Fill recommendations of this report.
- Upon excavation to floor slab and pavement subgrade in cut areas, moisture condition and compact the subgrade soils in accordance with the Engineered Fill recommendations of this report.

9.2 Rock Excavation

Based on conditions observed at these explorations we do not expect that conventional shallow foundation excavations will encounter materials requiring rock excavation tools or methods. However, given the typical variability of the bedrock surface in Cole County, rock could be encountered at elevations higher than indicated by this exploration.

9.3 Subgrade Preparation

General. Subgrade preparation across the site will include controlled cut and fill of existing soils, removal or rework of existing fill materials, and placement of new controlled fill to reach subgrade elevation. Existing materials at subgrade elevation are expected to include native soils, and existing fill at the site.

Subgrade preparation may encounter lower strength silts and clays with a high degree of saturation during site preparation. The fine-grained soils at this site are susceptible to loss of shear strength and rutting due to precipitation, freeze-thaw, and construction traffic. Subgrade stabilization may be required and may consist of additional aeration, scarification, and re-compaction; placement of a slightly thicker initial lift of controlled fill under the supervision of the geotechnical engineer; installation of geosynthetic reinforcement; or installation of controlled rock fill.

Engineering Observation and Documentation of Site Preparation. GER should be retained during site preparation to monitor and document excavation, resultant subgrade materials and conditions, sorting of excavated materials, and controlled compaction of the replacement materials.

9.4 Foundation Construction

Foundation bearing surfaces should be excavated flat and level. Loose materials or materials disturbed by the excavation process should be removed from the bearing surface or compacted to densify and stabilize the bearing material. Foundation excavations that become inundated should be dewatered and re-evaluated prior to concrete placement. Foundation construction should be monitored by GER to verify that bearing surfaces have been prepared in a workmanlike manner consistent with the recommendations of this report and good construction practices.

9.5 Surface and Subsurface Drainage

Temporary Drainage Systems. The contractor should sequence and manage excavation and construction activities to provide positive surface drainage of active excavations and earthwork areas and to eliminate

or minimize inundation of subgrade materials. Subgrade areas or foundation bearing surfaces that become inundated should be dewatered and re-evaluated prior to proceeding with construction.

Permanent Surface Drainage Systems. Site grading design will be critical to maintaining positive drainage away from the building and its ancillary sidewalks and aprons. We recommend a minimum surface grade of 5 percent away from the building on landscape areas in the first 10 feet outside the building. We recommend a minimum surface grade of 2 percent away from the building on all paved surfaces in the first 20 feet away from the building.

Based on the expectation of positive surface drainage away from the structures, the general nature of the soils at foundation bearing elevation, and the absence of any observed groundwater, a perimeter foundation drainage system is not considered imperative where occupied spaces are above the surrounding site grade. We anticipate that the design will include a minimum four-inch-thick course of open graded drainage aggregate as a capillary break beneath floor slabs.

9.6 Potential Impact of High Plasticity Clays

Materials at floor slab subgrade may include moderate to high plasticity native clay or clay fill. If the building pad is constructed of engineered fill composed of local fine-grained soil, GER recommends constructing the upper 18-inches of the building pad of low volume change material (LVCM) similar to crushed limestone dense graded aggregate base locally known as “screenings”, “waste rock”, and “buckshot”. The LVCM should be placed and compacted in accordance with the Engineered Fill recommendations of this report. Due to the potential for significant variation in subgrade plasticity at this site, GER should observe all foundation, floor slab, and pavement subgrades to identify potential occurrences of very high plasticity clays that would require deeper undercut and replacement.

9.7 Engineered Fill

General. Based on the anticipated site grading, we anticipate controlled fill will be required to reach subgrade elevation for much of the north parking lot and the building footprint. We anticipate that the material excavated on site will include predominantly moderate plasticity native clay soil and lesser volumes of undocumented fill, high plasticity clay, and gravelly clay.

Materials. Material used as engineered fill or backfill should be free of significant organic matter, frozen material, significant construction debris, and corrodible or other deleterious material. If imported soils are proposed for use as fill or backfill, they should be reviewed and analyzed by the geotechnical engineer prior to use on site. Soil classified as MH, OH, OL, or PT (high plasticity soils and organic soils) by the Unified Soil Classification System (ASTM D 2487) should not be imported for use as engineered fill. Suitable imported materials for general site fill are those that classify as GW, GM, GC, SC, and CL in accordance with ASTM D 2487. CH materials may be used for general site fill but should not be placed within five feet vertically or ten feet horizontally of the buildings’ footprint, nor within three feet vertically from pavement finished grade.

Shot rock may be used as general site fill under the building and pavements in accordance with the following recommendations for maximum particle size, gradation, and lift thickness. Because the necessary

restrictions on top size and gradation would require special screening and handling, it is generally not practical to use shot rock for trench or wall backfill applications without additional processing.

Placement and Compaction. Fine-grained soils used as general site fill should be placed and compacted in uniform, horizontal lifts with a maximum loose thickness of nine inches. Loose lift thickness for on-site soils should be reduced to six inches for compaction with small compaction equipment such as walk-behind rollers or gas-powered tampers. Crushed aggregate products should be placed and compacted in uniform, horizontal lifts with a maximum loose thickness of six inches.

Engineered fill composed of fine grained soil should be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D 698 (Standard Proctor), at a moisture content ranging from two percent below optimum moisture to five percent above optimum moisture content as determined by ASTM D 698. Otherwise suitable fill materials that are outside this range of moisture contents may be wetted or dried, as appropriate, to bring them to an acceptable moisture content. Soils that become saturated due to weather or disturbed by construction activities may be used as fill or backfill subject to preceding materials recommendations, final design requirements, and compaction and moisture content requirements recommended in this report. Excessively wet soils may require spreading, aeration, disking, or other manipulation to reduce their moisture content.

Dense graded aggregate base materials (GW) should be compacted to a minimum of 95 percent of maximum dry density as determined by ASTM D 698. Although moisture control is not necessary with these materials to control volume change characteristics, adequate moisture is essential to efficient compaction. These materials generally should be placed and compacted at moisture contents within two to three percentage points of their optimum moisture content. A smooth, steel-wheeled roller (static or vibratory) is expected to provide efficient compaction of dense graded aggregate base materials. In close quarters, where hand operated equipment is necessary, a large vibratory plate compactor or a "jumping jack" tamper is recommended. Loose lift thickness should be limited to about six inches.

Open graded or clean rock fill material with a thickness equal to or greater than three inches or in trench and wall backfill applications should be compacted to a minimum relative density of 70 percent, as determined in accordance with ASTM D 4253 and 4254.

Fractured rock, shot rock, crushed aggregate base, and gravelly clays with more than thirty percent by weight retained on a 3/4 inch sieve are not amenable to quality assurance testing based on comparison to laboratory standards such as ASTM D 698. Quality assurance of these fill materials is typically based on construction monitoring by a qualified geotechnical engineer or his representative. Lift thickness and compaction procedures will vary based on rock gradation and proposed applications.

Properly planned and executed blasting by experienced blasting contractors in the Jefferson City Dolomite can typically yield a relatively uniform shot rock that is well graded between about one and eight inches. Some particles will be produced between eight and twenty-four inches, and an erratic proportion will exceed twenty-four inches. The following table provides recommendations for maximum particle size, lift thickness, and compaction procedures based on structural application and depth below finished grade.

Table 1: Controlled Rock Fill Construction Recommendations			
Structural Application	**Maximum Particle Size**	**Maximum Lift Thickness**	**Minimum Compaction Process**
Building Elements, >3 ft. below finished grade	18"	18"	Construction traffic plus min. 4 complete coverage passes with a vibratory roller having a minimum centrifugal force of 40,000 lbs.
Building Elements, final 3 ft.	8"	12"	Construction traffic plus min. 4 complete coverage passes with a vibratory roller having a minimum centrifugal force of 40,000 lbs.
Pavements, >2 ft. below finished grade	24"	24"	Construction traffic plus min. 4 complete coverage passes with a vibratory roller having a minimum centrifugal force of 40,000 lbs.
Pavements, final 2 ft.	8"	12"	Construction traffic plus min. 4 complete coverage passes with a vibratory roller having a minimum centrifugal force of 40,000 lbs.

The above criteria may require further restriction if shot rock quality degrades. Thinner lifts are necessary as top size decreases or clay and shale content of the shot rock increases. For any of these applications, if shot rock material contains more than about 40 percent finer than two inches, or more than about 20 percent clay or shale, lift thickness must be reduced to a maximum of ten inches, and pieces larger than ten inches in any dimension must be removed from the fill. Shot rock with more than 20 percent clay or shale should not be placed within two feet of pavement subgrade elevation.

Controlled lift thickness will cause all particles larger than the lift thickness to be pushed out ahead of the placement equipment prior to compaction. These oversize pieces should be removed from the controlled rock fill, and may be placed in the outer shell or face of embankment slopes outside building and pavement limits, recovered for use as rip-rap if required, or crushed and screened to meet gradation requirements for other uses.

9.8 Quality Assurance Testing

We recommend that GER be retained to observe all foundation bearing surfaces immediately after excavation and immediately prior to concrete placement, and to observe subgrade conditions prior to engineered fill or aggregate base placement. We recommend that site excavation and controlled fill construction be carefully monitored to verify that actual field conditions are compatible with recommended design criteria. If actual field conditions vary from our interpretation of subsurface data, recommendations can then be provided to maintain or improve design and construction quality and function.

The construction quality assurance program should include sampling and classifying borrow materials in advance of controlled fill construction, and monitoring fill and backfill placement and compaction to assure that adequate compaction is achieved and proper methods are employed. In-place field density tests will be practical for on-site and similar fine-grained soils or crushed aggregate bases. Field density tests should be conducted in accordance with ASTM D 6938. We recommend that GER be retained to observe controlled rock fill construction using shot rock or similar coarse grained material.

10.0 WARRANTIES AND LIMITATIONS

This report has been prepared for the exclusive use of CMPS for the specific project discussed, in accordance with generally accepted geotechnical engineering practices common to projects of this nature in Missouri. No other warranties, expressed or implied, are made.

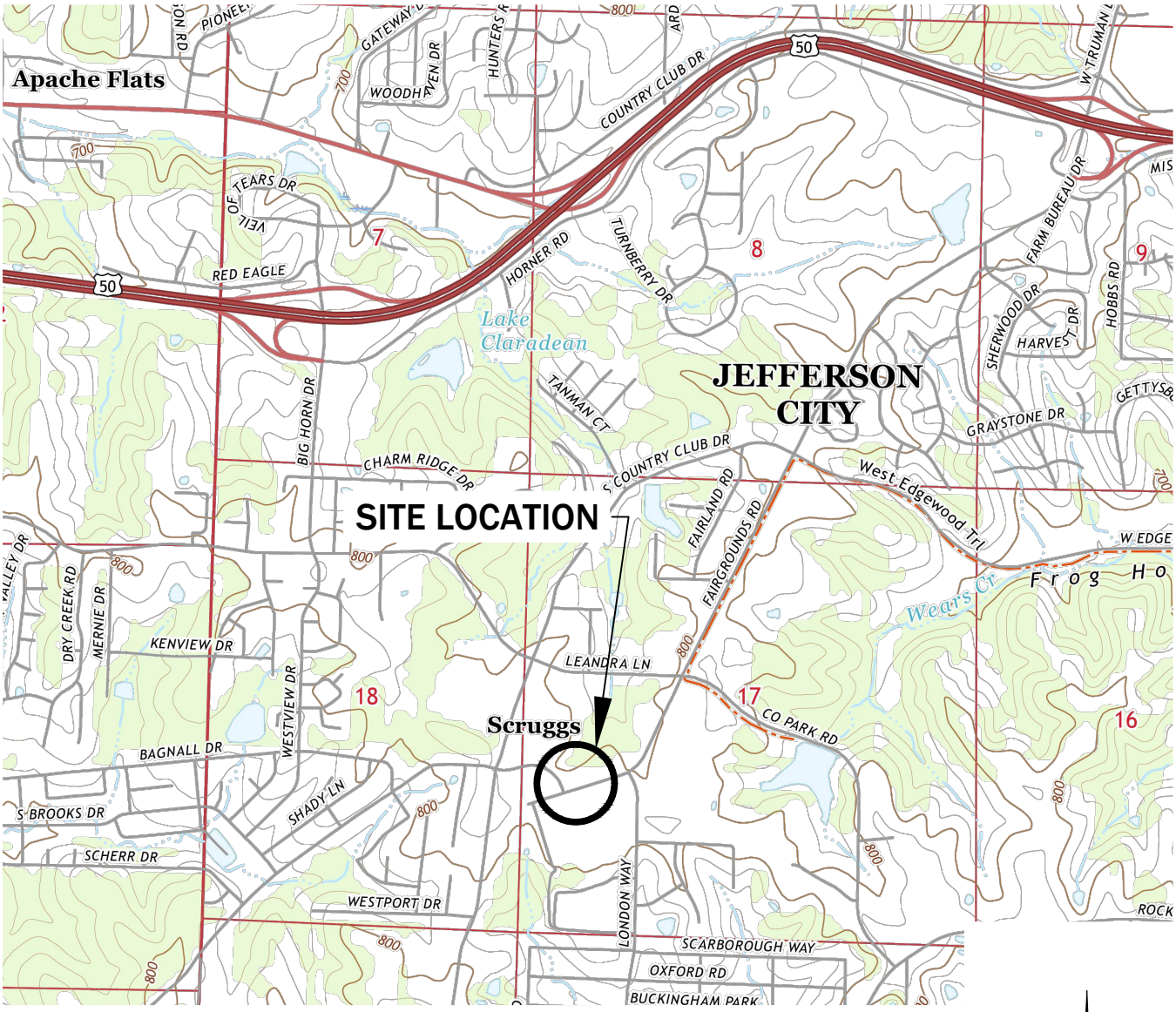
This investigation and report do not constitute a guarantee of subsurface conditions, groundwater conditions, excavation characteristics or construction conditions. We have interpreted subsurface conditions based on the findings of our field investigation, the geology of the area, other available subsurface information, and our experience with investigation and construction of similar projects. We recommend geotechnical engineering review of foundation and other geotechnical related designs and specifications at the design development phase and construction documents phase, as well as geotechnical monitoring of the construction.

Recommendations contained in this report are based on subsurface conditions and proposed designs provided as of this date. The above study and recommendations are applicable only for the conditions and locations described and specifically for the proposed State of Missouri Fleet Maintenance Building at this site. The project is in conceptual design and building dimensions and elevations were taken as approximate and preliminary in nature. Design foundation loads were not available at the time of this investigation and the foundation performance analysis conducted for this report was performed using estimated foundation loads considered typical of pre-engineered metal buildings. Additional foundation performance analysis may be warranted upon determination of design loads. Significant changes in plans or soil conditions should be brought to our attention. GER will be available at any stage of design development and construction to assist in the interpretation and application of these recommendations.

Estimated excavation thickness, volumes or quantities discussed in this report were developed as general, order-of-magnitude estimates suitable for preliminary planning and cannot be considered precise estimates for bid quantities or construction planning. Use of the data contained herein by others may require interpretation or analysis that was not contemplated by our investigation and analysis. The uses of this data and any interpretations or conclusions developed by others are the sole responsibility of those firms or individuals.

Factors affecting design and construction often become apparent during detailed design or actual construction that was not anticipated in the pre-design or early design phases. GER is available during design and construction to assist in evaluating these factors and their impact on these geotechnical recommendations.

Appendix



USGS LOHMAN QUADRANGLE
MISSOURI, 7.5 MINUTE SERIES
SW ¼ S17 T44N R12W

N

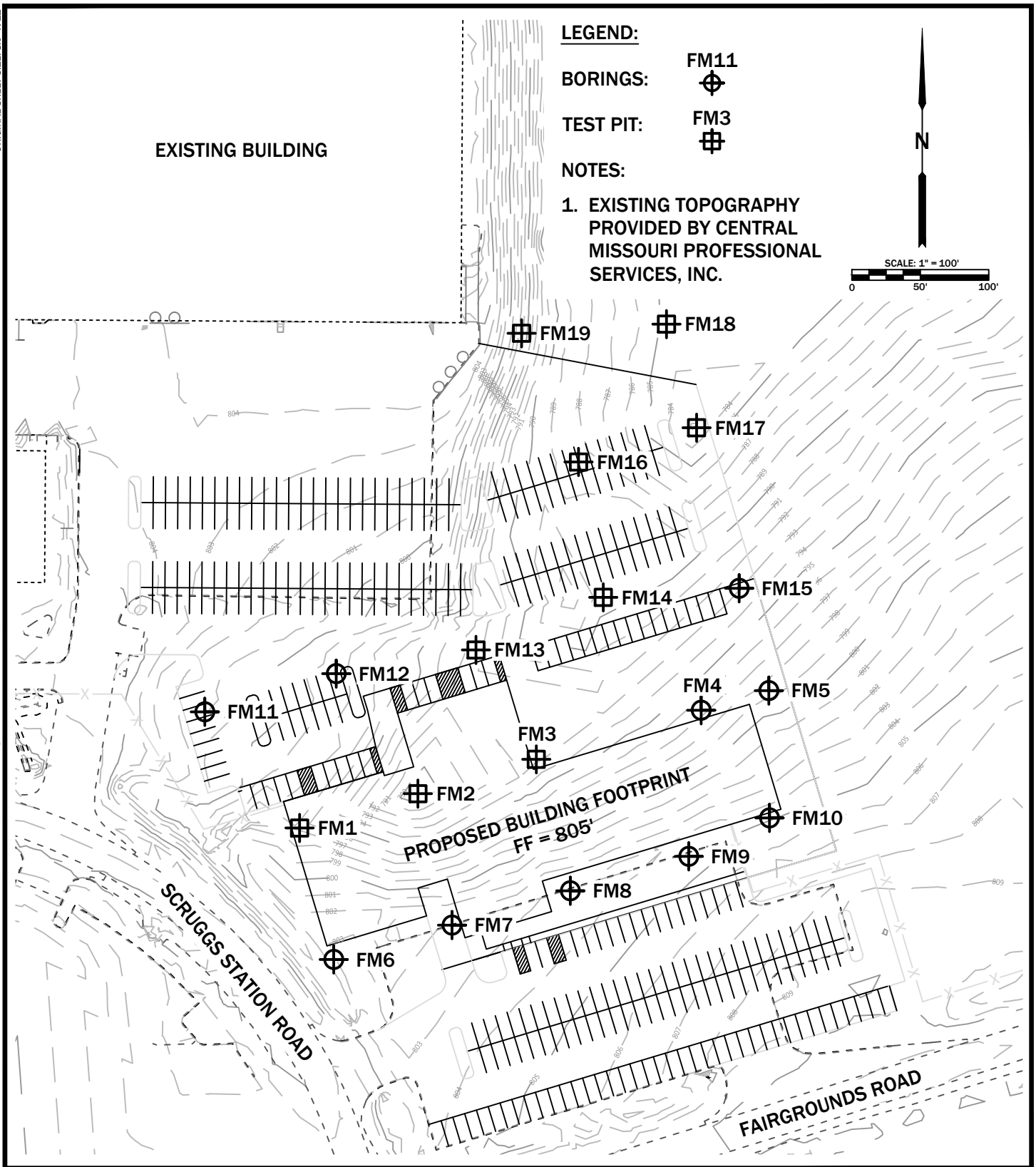
SCALE: 1" = 2000'
0 1000' 2000'

CENTRAL MISSOURI
PROFESSIONAL SERVICES, INC.
STATE OF MISSOURI FLEET
MAINTENANCE BUILDING

SITE LOCATION MAP

GREDELL ENGINEERING RESOURCES
CIVIL • GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • EARTH SCIENCES
1505 East High Street
Jefferson City, Missouri
Telephone: (573) 659-9078
Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

DATE	SCALE	PROJECT NAME	REVISION
08/24	1" = 2000'	FLEET MAINT BLDG	N/A
DRAWN	APPROVED	FILE NAME	SHEET #
BM	WE	BASE-SITE-01	1 OF 2



CENTRAL MISSOURI PROFESSIONAL SERVICES, INC. STATE OF MISSOURI FLEET MAINTENANCE BUILDING

EXPLORATION PLAN

GREDELL ENGINEERING RESOURCES
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Jefferson City, Missouri
Telephone: (573) 659-9078
Facsimile: (573) 659-9079
MO CORP. ENGINEERING LICENSE NO. E-2001001669-D

DATE	SCALE	PROJECT NAME	REVISION
08/24	1" = 100'	FLEET MAINT BLDG	N/A
DRAWN	**APPROVED**	**FILE NAME**	**SHEET #**
BM	WE	BASE-SITE-02	2 OF 2

GREDELL ENGINEERING RESOURCES

CIVIL • GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • EARTH SCIENCES

Central Missouri Professional Services
State of Missouri Fleet Maintenance Building
Summary of Laboratory Test Results

Test Pit Or Boring	Sample	Depth (ft)	Water Content	USCS	Atterberg Limits		
					LL	PL	PI
FM1	S1	1.5-2.5	22	CL	30	21	9
FM1	S2	4.5-5.5	21				
FM2	S1	1.0-2.0	23	CL	37	19	18
FM3	S1	2.0-3.0	17	ML	31	25	6
FM6	SS1	2.0-3.5	18				
FM7	S3	6.5-7.0	29				
FM8	SS1	4.0-5.5	24	CL	31	19	12
FM8	SS2	6.0-5.5	24	CL	40	21	19
FM9	SS1	3.0-4.5	23	CL	37	19	18
FM9	SS2	5.0-6.5	16				
FM10	SS1	2.0-3.5	13				
FM11	SS1	1.0-2.5	22	CL	33	18	15
FM12	SS1	1.0-2.5	25				
FM12	SS2	3.5-5.0	19	CH	52	20	32
FM13	S1	1.0-2.0	27	CL	42	19	23
FM13	S2	3.0-4.0	25				
FM14	S1	1.5-2.5	22				
FM14	S2	3.0-4.0	12				
FM15	SS1	1.0-2.5	22	CL	37	19	18
FM16	S1	1.0-2.0	24				
FM16	S2	2.5-3.5	17	CL	38	18	20
FM18	S1	1.0-2.0	16	CL	36	22	14
FM18	S2	3.0-4.0	22				
FM19	S1	2.0-3.0	26				
FM19	S2	3.5-4.5	23				

Prepared by:
GREDELL Engineering Resources, Inc.

August 2024

GREDELL
ENGINEERING RESOURCES

CIVIL • GEOTECHNICAL • ENVIRONMENTAL • GEOLOGY • EARTH SCIENCES

EXPLORATION LOG LEGEND AND NOMENCLATURE

Depth is in feet below ground surface. **Elevation** is in feet mean sea level, site datum, or as otherwise noted.

Sample Type

SS Split-spoon sample, disturbed, obtained by driving a 2-inch-O.D. split-spoon sampler (ASTM D 1586).

NX Diamond core bit, nominal 2-inch-diameter rock sample (ASTM D 2113).

ST Thin-walled (Shelby) tube sample, relatively undisturbed, obtained by pushing a 3-inch diameter tube (ASTM D 1587).

S Disturbed sample, obtained from cuttings.

CS Continuous sample, disturbed, obtained by pushing a split-barrel tube, Giddings tube, or similar.

Recovery is expressed as a ratio of the length recovered to the total length pushed, driven, cored.

Blows Numbers indicate blows per 6 inches of split-spoon sampler penetration when driven with a 140-pound hammer falling freely 30 inches. The number of total blows obtained for the second and third 6-inch increments is the N value (Standard Penetration Test or SPT) in blows per foot (ASTM D 1586).

For analysis, the N value is used when obtained by a cathead and rope system. When obtained by an automatic hammer, the N value may be increased by a factor of 1.3.

WH Weight of Hammer

Description indicates soil constituents and other classification characteristics using the visual-manual procedure (ASTM D 2488) and may include the laboratory determined Unified Soil Classification System (ASTM D 2487). Color is further defined by the Munsell notation using the Munsell Soil Color Book. Secondary soil constituents (expressed as a percentage) are described as follows:

Trace	0 to 5
Few	5 to 10
Little	15 to 25
Some	30 to 45

Stratigraphic Breaks may be observed or interpreted, and are indicated by a dashed line. Transition between described materials may be gradual.

Laboratory Test Results

- Natural moisture content (ASTM D 2216) in percent.
- Dry density in pounds per cubic foot (pcf).
- Hand penetrometer value of apparently intact cohesive sample in tons per square foot (tsf).
- Unconfined compressive strength (ASTM D 2166) in tons per square foot (tsf).
- Liquid and Plastic Limits (ASTM D 4318) in percent.

RQD (Rock Quality Designation) is the ratio between the total length of core segments 4 inches or more in length and the total length of core drilled. RQD (expressed as a percentage) indicates in-situ rock quality as follows:

Excellent	91 to 100
Good	76 to 90
Fair	51 to 75
Poor	26 to 50
Very Poor	0 to 25

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GREDELL Engineering Resources, Inc.

TEST PIT LOG FM1

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 796.9 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	796.9				SOD.		
0.4	796.5				CLAY: Dark brown, dry to moist, firm, friable.		
1.5	795.4					S1	21.5
4.0	792.9				- trace limestone gravel, angular.		
4.5	792.4					S2	20.8
8.0	788.9				LIMESTONE: Buff, dry to moist, hard, weathered.	S3	
9.0	787.9				- hard to very hard.		
9.8	787.1				Test pit terminated at 9.8 feet in Limestone due to machine refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 9.8 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM2

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 789.1 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	789.1				SOD.		
0.3	788.8				CLAY: Dark brown, moist to wet, soft to firm.		
1.0	788.1					S1	22.8
2.3	786.8				LIMESTONE: Buff, dry to moist, hard, weathered.		
2.5	786.6				- hard to very hard.	S2	
3.3	785.8				Test pit terminated at 3.3 feet in Limestone due to machine refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 3.3 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM3

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 792.6 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	792.6				SOD.		
0.4	792.2				CLAY: Dark brown, dry, firm, friable.		
2.0	790.6				- firm to hard.	S1	16.9
4.5	788.1				LIMESTONE: Buff, dry to moist, hard, weathered.	S2	
5.0	787.6				- not weathered, hard to very hard.		
5.3	787.3				Test pit terminated at 5.3 feet in Limestone due to machine refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 5.3 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM13

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 792.9 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	792.9				SOD.		
0.4	792.5				CLAY: Dark brown, moist to wet, firm to hard, orange and gray mottled		
1.0	791.9					S1	27.3
3.0	789.9				- firm to hard.	S2	25.3
3.8	789.1						
4.5	788.4				- trace fine gravel, orange, gray, black mottled.		
5.0	787.9				Test pit terminated at 5.0 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 5.0 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM14

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 789.4 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	789.4				SOD.		
0.4	789				CLAY: Light brown, moist to wet, firm, friable.		
1.5	787.9					S1	21.7
3.0	786.4				- some angular rock fragments, dry, firm.	S2	12.0
6.0	783.4				Test pit terminated at 6.0 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 6.0 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

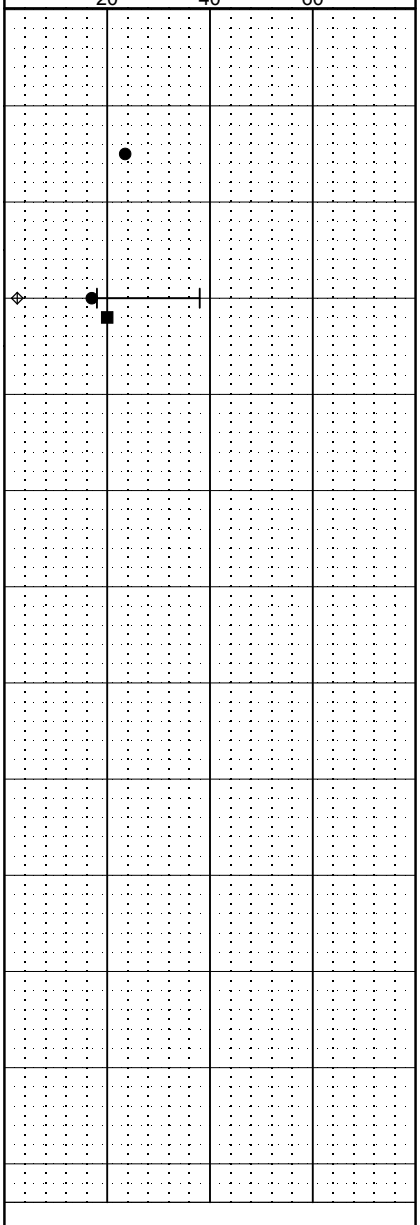
TEST PIT LOG FM16

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 788.8 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	788.8				SOD.		
0.4	788.4				CLAY: Dark brown, moist to wet, firm.		
1.0	787.8					S1	23.5
2.0	786.8				- orange mottling.		
2.5	786.3					S2	17.0
3.2	785.6						
3.5	785.3				- orange-gray mottling.		
5.0	783.8				Test pit terminated at 5.0 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60



OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 5.0 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM17

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 782.9 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	782.9				CLAY: Dark brown, wet, soft, some fine limestone gravel.		
0.5	782.4	▽			- standing water in pit.		
3.0	779.9				LIMESTONE: Buff, wet, hard.		
3.7	779.2				Test pit terminated at 3.7 feet in Limestone due to machine refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION 0.5 FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 3.7 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM18

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 784.9 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	784.9				SOD.		
0.4	784.5				CLAY: Light brown, dry to moist, soft, friable.		
1.0	783.9				- red mottled, firm.	S1	15.6
3.0	781.9				- grayish-reddish brown, firm to hard.	S2	22.1
5.0	779.9				Test pit terminated at 5.0 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 5.0 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

TEST PIT LOG FM19

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 795.7 ft DATUM: Site Topo
DATE EXCAVATED: 6-27-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY UNIT WEIGHT (PCF) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES.	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	795.7				SOD.		
0.3	795.4				FILL: Clay; Tan, moist to wet, firm to hard, trace gravel.		
2.0	793.7					S1	25.5
3.5	792.2				CLAY: Light brown, dry to moist, firm to hard.	S2	23.4
4.5	791.2				- trace fine gravel.		
5.5	790.2				Test pit terminated at 5.5 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

OPERATOR: Lane
EQUIPMENT: CAT 308
BUCKET SIZE: 24"
LOGGED BY: TC
BACKFILLED WITH: Spoil

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING EXCAVATION - FEET
AT - FEET AFTER - HOURS
COMPLETION DEPTH 5.5 FEET
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

KEY TO SYMBOLS

State of MO Fleet Maintenance Building

Symbol	Description
	**Grass**
	**Clay**
	**Limestone**
	**Fill: As described**

Misc. Symbols

■	**Penetrometer**
⌖	**Torvane**
⏚	**Water table during drilling/excavation**

Soil Samplers

	**Bulk/Grab sample**

Notes:

NE Not Encountered
NA Not Applicable
CFA Continuous Flight Augers
HSA Hollow Stem Augers

GREDELL Engineering Resources, Inc.

BORING LOG FM4

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 795.1 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	795.1				SOD.		
0.4	794.7				CLAY: Light reddish brown, dry to moist, firm.		
2.0	793.1					SS1 30/0" REC=50%	
2.2	792.9				LIMESTONE: Buff, dry to moist, hard, weathered.		
3.5	791.6				- hard to very hard.		
3.8	791.3				Boring terminated at 3.8 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 3.8 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

BORING LOG FM5

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 798.5 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION
0.0	798.5				SOD.
0.4	798.1				CLAY: Brown, dry to moist, firm.
1.2	797.3				LIMESTONE: Buff, dry to moist, hard, weathered.
2.0	796.5				- hard to very hard.
3.0	795.5				Boring terminated at 3.0 feet in Limestone due to auger refusal.

SAMPLE ID
DRY DENSITY (pcf)
BLOWS PER 6 INCHES
RQD= ROCK QUALITY DES.
REC= RECOVERY

MOISTURE CONTENT
PERCENT BY WEIGHT

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3

STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)

● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)

PL ├──────────┤ LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 3.0 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

GREDELL Engineering Resources, Inc.

BORING LOG FM6

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 802.9 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	802.9	SOD.		
0.4	802.5	CLAY: Brown, moist to wet, firm to hard.		
2.0	800.9	- firm to hard, trace gravel, angular, 1" top size.	SS1 5-6-9 REC=67%	18.3
5.0	797.9	- firm.	SS2 3-3-5 REC=89%	32.3
8.0	794.9	LIMESTONE: Buff, dry to moist, moderately hard to hard, weathered.		
8.5	794.4	- hard.		
9.0	793.9	- hard to very hard.		
9.3	793.6	Boring terminated at 9.3 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 9.3 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

BORING LOG FM7

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 802.8 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	802.8				CONCRETE.		
0.5	802.3				AGGREGATE BASE.		
0.7	802.1				FILL: Gravelly Clay; Tan, moist to wet, hard.		
2.5	800.3	▽			- wet.		
3.0	799.8					SS1 2-4-5 REC=0%	
4.5	798.3				FILL: Clay; Tan, wet, firm, trace gravel.		
5.0	797.8				- some fine gravel.	SS2 3-3-2 REC=17%	
6.5	796.3					S3 REC=100%	29.1
7.0	795.8				LIMESTONE: Buff, wet, hard.		
7.3	795.5				- hard to very hard.		
7.8	795				Boring terminated at 7.8 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: 2.5 FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 7.8 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

BORING LOG FM8

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 803.6 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	803.6	CONCRETE.		
0.5	803.1	AGGREGATE BASE.		
0.7	802.9	FILL: Gravelly Clay; Brown, dry to moist, firm, 1" top size.		
3.0	800.6	- moist to wet.		
4.0	799.6		SS1 3-2-3 REC=67%	24.1
5.5	798.1	CLAY: Dark brown, moist to wet, hard.		
6.0	797.6	- reddish-brown.	SS2 3-6-18 REC=89%	23.5
6.9	796.7			
7.5	796.1	LIMESTONE: Buff, dry to moist, hard.		
8.5	795.1	- hard to very hard.		
9.0	794.6	Boring terminated at 9.0 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 9.0 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

GREDELL Engineering Resources, Inc.

BORING LOG FM9

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 804.3 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	804.3	CONCRETE.		
0.5	803.8	AGGREGATE BASE.		
0.8	803.5	FILL: Gravelly Clay; Tan, dry to moist, firm, with limestone gravel, angular, 1/2" top size.		
1.5	802.8	CLAY: Dark brown, moist to wet, firm.		
3.0	801.3	- light reddish brown, firm to hard.	SS1 3-5-7 REC=89%	22.7
5.0	799.3	- trace limestone gravel, angular.	SS2 8-6-14 REC=33%	15.6
7.5	796.8	LIMESTONE: Buff, dry to moist, hard, weathered.		
8.0	796.3	- hard to very hard.		
8.2	796.1	Boring terminated at 8.2 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 8.2 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

BORING LOG FM10

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 805.1 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	805.1				SOD.		
0.4	804.7				CLAY: Dark brown, moist to wet, hard.		
2.0	803.1					SS1 3-10-11 REC=28%	12.6
4.0	801.1				LIMESTONE: Buff, dry to moist, hard.		
4.5	800.6				- hard to very hard.		
5.3	799.8				Boring terminated at 5.3 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 5.3 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

GREDELL Engineering Resources, Inc.

BORING LOG FM11

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 801.0 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	801				SOD.		
0.4	800.6				CLAY: Light brown, moist to wet, firm.		
1.0	800				- gray and orange mottled, firm to hard.	SS1 3-6-6 REC=67%	22.2
3.5	797.5				- firm to hard.	SS2 7-9-3 REC=28%	
5.0	796				Boring terminated at 5.0 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 5.0 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

Figure Sheet 1 of 1

GREDELL Engineering Resources, Inc.

BORING LOG FM12

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 798.4 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	798.4				SOD.		
0.4	798				CLAY: Dark brown, moist to wet, firm.		
1.0	797.4				- firm.	SS1 2-3-4 REC=44%	25.0
3.0	795.4				- light brown, hard, orange mottled.		
3.5	794.9					SS2 4-8-11 REC=67%	
4.5	793.9						19.4
5.0	793.4				Boring terminated at 5.0 feet in Clay.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 5.0 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

GREDELL Engineering Resources, Inc.

BORING LOG FM15

State of MO Fleet Maintenance Building
Jefferson City, Missouri
CLIENT: **Central MO Professional Services, Inc.**

LOCATION: Jefferson City, MO
ELEVATION: 791.5 ft DATUM: Site Topo
DATE DRILLED: 6-19-24

DEPTH (FEET)	ELEVATION	WATER TABLE	GRAPHIC LOG	SAMPLE TYPE	MATERIAL DESCRIPTION	SAMPLE ID / DRY DENSITY (pcf) / BLOWS PER 6 INCHES / RQD= ROCK QUALITY DES. / REC= RECOVERY	MOISTURE CONTENT PERCENT BY WEIGHT
0.0	791.5				SOD.		
0.4	791.1				CLAY: Dark brown, dry to moist, firm.		
1.0	790.5				- orange mottled, moist to wet, hard to very hard.	SS1 5-5-19 REC=28%	21.5
3.0	788.5				LIMESTONE: Buff, dry to moist, hard.		
3.5	788				- hard to very hard.		
4.0	787.5				Boring terminated at 4.0 feet in Limestone due to auger refusal.		

SHEAR STRENGTH, tsf
△ QU/2 ■ PP □ SV ⊕ TV
1 2 3
STANDARD PENETRATION TEST
▲ N-VALUE (BLOWS PER LAST FOOT)
● MOISTURE CONTENT, %
○ % FINES (PASSING #200 SIEVE)
PL LL
20 40 60

DRILLING COMPANY: Twehous Excavating Co.
DRILLING METHOD: 4" Rotary CFA
DRILL RIG: CME 45C
SPT HAMMER: Auto
LOGGED BY: Tristanna C.

STRATIFICATION LINES ARE APPROXIMATE SOIL BOUNDARIES ONLY; ACTUAL CHANGES MAY BE GRADUAL OR MAY OCCUR BETWEEN SAMPLES.

WATER LEVELS: DURING DRILLING: - FEET
AFTER DRILLING: - FEET
COMPLETION DEPTH: 4.0 FEET
BACKFILLED WITH: Cuttings
CHECKED BY: WE REVIEWED BY: BD

Date Printed: 8/15/2024

KEY TO SYMBOLS

State of MO Fleet Maintenance Building

Symbol Description

Strata symbols

 **Sod**

 **Clay**

 **Limestone**

 **Concrete**

 **Aggregate Base**

 **FILL: As described**

Misc. Symbols

■ **Penetrometer**

⊕ **Torvane**

 **Water table during drilling**

Soil Samplers

 **Standard penetration test**

 **Bulk/Grab sample**