EXHIBIT B - SCOPE OF SERVICES

1) The parties agree that the Design-Builder's Scope of Services includes and is limited to the following:

1.1 Project Management:

(1) Design-Builder will host monthly project update meetings and will provide meeting minutes with updated Action Item log.
(2) Design-Builder will host a weekly on-site construction coordination meeting with Owner to document work completed the past week, planned work for the next week and key interfaces between Design-Builder and Owner.
(3) Design-Builder will provide a monthly invoice that includes the following:
    (a) AIA Payment application with approved schedule of values and based on percent complete.

1.2 Engineering Services:

(1) Advance the design to Issued for Construction (IFC) and produce a deliverable for the Owner's review. The IFC drawings will include feedback from Owner's previous review of the Pre-Final documents.
(2) Review and approve compliance submittals for equipment and materials to be incorporated into the Work. PDF versions of the final approved ("A" status) equipment submittals will be provided to Owner for Owner's information and records.
(3) Provide engineering submittal management associated with submittals throughout the construction period.
(4) Review third party test reports for equipment and materials to be incorporated into the project.
(5) Provide clarification and interpretation of the Issued for Construction design documents throughout the construction period. (Respond to Requests for Information [RFIs])
(6) Revise Issued for Construction design documents as needed to support any changes during construction.
(7) Prepare a PDF set of Conformed As-Constructed design documents incorporating any changes made to the Issued for Construction design documents during the construction process.

1.3 Procurement:

(1) Issuance and subsequent execution of supplier/vendor purchase orders.
(2) Receive, review, and process supplier/vendor payment applications, in accordance with the terms of the purchase orders.
(3) Perform supplier/vendor purchase order administration including the review and processing of RFIs, potential change order requests, change orders, etc.
(4) Manage equipment and material deliveries as needed to facilitate the project schedule.
(5) Review equipment and materials delivered to the site for compliance with the IFC documents and approved submittals prior to being implemented to the Work.

1.4 Construction Services:

(1) Coordinate site preconstruction conference.
(2) Conduct weekly construction coordination meetings with subcontractors and Owner personnel.

(3) Receive, review, and process subcontractor payment applications.
(4) Perform subcontract administration including the review and processing of RFIs, potential change order requests, change orders, etc.
(5) Manage Subcontractors to construct installation of the Work in accordance with the Contract Documents.
(6) Third party services, including surveying and materials testing.

1.5 Commissioning & Start-up:

(1) Design-Builder will lead all commissioning and start-up activities in coordination with the Owner, key equipment suppliers and subcontractors.

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EXHIBIT C – ASSUMPTIONS, CLARIFICATIONS & EXCLUSIONS

GENERAL / COMMERICAL

1. The Scope of Services, Contract Time and Contract Price are based on Exhibit K – Pre-Final Design Documents.
2. The Contract Price and Contract Times are based on the Contract being executed and Notice to Proceed issued before April 13, 2023.
3. The Contract Price and Contract Times are based on a standard 5-day week working 8 hours per day.
4. Taxes including sales, use, or special use on permanent equipment and materials are not included as a Tax Exemption Certificate has been provided by Owner to Design-Builder.
5. "Buy American" requirements are not included.
6. Labor rates for all craft labor are based upon Missouri Division of Labor Standards Wage and Hour Section, Annual Wage Order No. 29 for Greene County Missouri, dated March 10, 2022, Building Construction Rates, attached herein. Federal Davis-Bacon wage and fringe rates are not included.
7. COVID-19. The uncertainty and potential disruptions to the labor force and supply chain caused by the global outbreak and spread of COVID-19 ("coronavirus") may have an impact on this Project, the exact cost and duration of which Design-Builder can neither predict nor control. Government orders and restrictions may also delay or prevent performance as anticipated. Design-Builder will be granted with a period of relief in performance and appropriate cost relief where circumstances arise that are beyond Design-Builder's control, including COVID-19 related events. To the extent applicable, the doctrines of "commercial impracticability" or "frustration of purpose" under the Uniform Commercial Code may also excuse performance if delivery pursuant to our contract's terms has been made "impracticable" by the occurrence of a contingency, the non-occurrence of which both parties assumed when the contract was made. At this time, it is impossible to foresee or to predict the full impact of COVID-19 around the world and, therefore, have not included price or schedule contingency specifically for COVID-19.
8. The Contract Times are based on current lead times provided by the equipment and material suppliers. If these lead times are impacted by supply chain issues, the Design-Builder may request an increase in the Contract Times.
9. Owner's contingency or Owner's other costs are not included.
10. Performance & Payment Bonds are included.
11. Builder's Risk Insurance is included.
12. Spare parts are not included, unless called out in the Exhibit K – Pre-Final Design Documents.
13. Excludes charges for consumption fees for providing utility services (water, sewer). All consumption fees to be paid directly by Owner.
14. Owner will provide all water for construction and testing to Design-Builder at no cost.
15. Local Building Permit and right-of way fees have not been included as it was assumed these fees would be waived by the Owner.
16. All existing utilities are assumed to be as shown on the pre-final design drawings. If actual locations of existing utilities are different than shown on the pre-final design drawings, it will be considered a differing site condition.
17. The Design-Builder has not included any cost for easements. Easements will be procured by the Owner. The schedule is based on all easements being acquired before mobilization.
18. Design-Builder shall install 552 feet of gravity sewer as indicated in the contract drawings.

SITE CONSTRUCTION AND ACCESS :

1. Owner will provide adequate material staging, parking, and lay-down space for use during construction. This area is directly north of the existing McElhaney pump station and access drive. Design-Builder has included cost for installing stone for the laydown area, as well as restoring the disturbed area at Project Completion.
2. We have assumed excess spoils may be hauled to the City's site adjacent to the existing WWTP.
3. It is assumed that Design-Builder will not encounter any existing Hazards including, but not limited to, lead, asbestos, or contaminated soils. Mitigation/abatement of all existing hazardous substances is not included.
4. Seeding of disturbed areas is included. Landscape plantings or sodding are not included.
5. It is assumed groundwater will not be encountered in any excavations. Design-Builder has included pumping for precipitation water.
6. Design-Builder has included 3 months of by-pass pumping. By-pass pump sizing and pricing was based on a flow rate of 600 gallons per minute at 190' total dynamic head (130' static head).
7. Traffic control is based on MUTCD standards.
8. Design-Builder will keep the west bound lane of Farm Road 174 open during construction.
9. Design-Builder is connecting to an existing forcemain for bypass pumping during construction and is assuming that the forcemain is adequate for use for these purposes. No cost is included for repair to damage to the existing forcemain or any subsequent environmental impacts and cleanup.

DEMOLITION

1. Design-Builder has included demolition of the existing pump station, generator, and appurtenances.

PROCESS MECHANICAL & EQUIPMENT

1. Design-Builder has included cost of fuel for testing of the generator. First fill of the tank after startup, testing, and commissioning will be provided by the Owner.
2. Based on review of the bids received for the process equipment, Owner and Design-Builder have mutually agreed to using the following equipment manufacturers:
    a. Submersible Pumps – Environmental Process Systems (Sulzer)
    b. FRP Building - Shelter Works
3. Painting of ductile iron pipe is not included. The pumps will be factory painted.

ELECTRICAL, INSTRUMENTATION, & CONTROLS

1. Excludes work at the Wastewater Treatment Plant to receive a signal from the control panel at the new pump station constructed in this project. Work at the WWTP to receive this signal will be included in a future project at the WWTP.
2. Based on review of the bids received for the electrical equipment, Owner and Design-Builder have mutually agreed to use Cummins for the Generator and Automatic Transfer Switch.
3. Based on review of the bids received for the Instrumentation, Control Panel, and System Integration scope of work, Owner and Design Builder have mutually agreed to use R. E. Pedrotti Inc. to provide the lift station control panel, instrumentation, and system integration.
4. Excludes any new security devices or systems (cameras, card readers, etc.).

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EXHIBIT E – ANTICPATED LOST DAYS TO INCLEMENT / ADVERSE WEATHER

The chart below provides the days per month that the Design-Builder anticipates will be lost due to inclement / adverse weather. The days shown in this Exhibit B shall not accumulate month-to-month, but are to be used for determining only the anticipated adverse weather in a given month. Adverse Weather shall be as defined in Article 6 of the Agreement.

Anticipated Lost Days per Month	
Month	**Anticipated Lost Days**
January	2
February	2
March	1
April	2
May	3
June	3
July	2
August	2
September	2
October	2
November	1
December	1

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EXHIBIT G – ALLOWANCES

The parties have agreed to establish the following Allowance Items and Allowance Values. Allowance items are elements of work that are identified to potentially occur, but it cannot be determined if they will occur or the magnitude of the occurrence, so they are not included in the Design-Builder's current Scope of Work. The Allowance Value is the value which the parties have agreed to establish for an Allowance Item in accordance with Article 7.7 of the Agreement.

The Allowance Values are not included in the Phase 2 Contract Price. If Allowances are utilized, the Design-Builder shall be compensated for its costs and the Design-Builder's markup. Design-Builder and Owner shall agree to the compensation method prior to work being performed. It is noted that use of an Allowance may also require a schedule adjustment in certain situations.

1. Unforeseen Conditions, $50,000: This Allowance Item is established to fund differing site conditions that may be encountered through execution of the work. Examples of these items include, but are not limited to, the presence of unmarked utilities or existing utilities that were not previously identified in the Contract Documents, actual existing tie-in locations differ from what is shown on the Contract Documents, unforeseen underground obstructions that have not been previously identified (including rock), over-excavation of lean/fat clay, and additional work at tie-in locations due to poor quality of existing piping.

2. MODOT and Greene County Coordination, $30,000: This Allowance Item is established to fund additional cost that may arise due to coordination with MODOT and/or Greene County. MODOT will require the Owner to enter into an easement agreement for work within the Wilson Creek Boulevard/Highway ZZ right of way. The Design-Builder has excluded any cost that may arise due to changes MODOT makes to the alignment design. Cost for additional insurance specific to the MODOT easement agreement are not included.

3. Restoration Allowance, $55,000: This Allowance item is established to fund additional cost that may arise due to coordination and final restoration requests made by property owners along the alignment. The cost in this Amendment includes seeding of disturbed areas. Additional restoration work such as sodding and landscaping have not been included. If additional restoration work beyond the seeding that has been included in the Amendment pricing is required, it will be funded through this allowance item.

4. Additional Asphalt Repair, $30,000: This Allowance item is established to fund additional asphalt repairs above and beyond what is identified in the Contract Documents. Examples of items to be funded through this allowance include but are not limited to additional asphalt driveway demo and replacement,

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EXHIBIT H – PERMIT AND EASEMENT MATRIX

EXHIBIT H - PERMIT AND EASEMENT MATRICES

Republic, Missouri, Projects
CIP-7 Permit Matrix

Wetlands/Surface Water Permits									
Item #	**Permit/Clearance**	**Regulatory Agency**	**Description**	**Thresholds**	**Estimated Preparation Timeframe**	**Estimated Agency Review Time**	**Estimated Permit Application Fees**	**Notes**	**CIP-7**
1	Clean Water Act - Section 404 Permit (Wetlands)	**Missouri State Regulatory Office** 515 East High Street #202 Jefferson City, MO 65101 Tel: 573-634-2248 Fax : 573-634-7960 Regulatory.MissouriState@usace.army.mil **Little Rock District** ATTN: CESWL-RD 700 West Capitol Avenue Little Rock, AR 72201-3221 (501) 324-5295 ceswl-regulatory@usace.army.mil	If impacting over 0.1 acres of wetlands a Joint Application must be submitted to the Corps and MDNR. The Corps will determine if the project qualifies for a Nationwide Permit (NWP) or if an Individual Permit (IP and for wetland impacts over 0.50 acres) will be required. Corps has authorization to issue a Section 401 Water Quality Certification (WQC) with a NWP; however, if an IP is required then a separate WQC must be obtained from the MDNR. If a permit is required from the USACE then Section 106 for cultural resources and review of T&E species applies.	- Nationwide Permit required for impacts above 0.1 acres - Individual Permit required for impacts above 0.5 acres	The wetlands review, delineation, and report preparation could take 30 days to complete.	A NWP can take 60 to 90 days. An IP can take 90 to 120 days or more.	Typically no fees	**Based on the project route and the minimal, temporary impacts associated with this type of project, the USACE would authorize the project under a Nationwide Permit 58 for Utility Line Activities for Water and Other Substances. A Pre-Construction Notification would not be need to be submitted to the USACE because the Project would be cut into the pavement and would not permanently impact any streams or wetlands.**	Desktop Study only due to No Stream or Wetland Impacts
2	Clean Water Act - Section 401 Water Quality Certification	Missouri Department of Natural Resources (MDNR) Water Protection Program P.O. Box 176 Jefferson City, MO 65102 800-361-4827	The MDNR has authority to issue water quality certification (WQC) for projects that will impact wetlands or other waters of the US within the state of Missouri. MDNR has issued WQC for many of the NWPs if WQC conditions are followed. For all IPs and NWPs for which WQC has not been issued, an application must be submitted to the MDNR for an individual WQC. The application for WQC consists of submitted a copy of the Section 404 permit application to MDNR with a request for WQC.	Project impacting wetlands or waters of the United States.	60-90 days	45 days; occurs in parallel to the USACE review.	Typically no fees	**WQC will likely be issued along with the NWP 58 from the USACE. A separate WQC will likely not be required from MDNR.**	Desktop Study only due to No Stream or Wetland Impacts
3	Greene County, Missouri Floodplain Development Permit/Application	Tyler Goodwyn P.E. Greene County Stormwater Engineer Environmental Division 940 N Boonville Ave Room 315 Springfield, MO 65802 (417) 868-4147	Any construction located within a floodplain may require a floodplain permit from the City of Republic or Greene County. If development is within a regulatory floodway then a No Rise certification must be obtained from State and included with application.	Placement of any structures or fill within a floodplain.	60 Days	30-60 Days	$250	**Project crosses a 100-year floodplain. A floodplain development permit would likely be required.**	Permit Likely Required to Construct within Zone A Floodplain

Stormwater Permits									
Item #	**Permit/Clearance**	**Regulatory Agency**	**Description**	**Thresholds**	**Estimated Preparation Timeframe**	**Estimated Agency Review Time**	**Estimated Permit Application Fees**	**Notes**	**CIP-7**
4	NPDES Stormwater Permit and SWP2 Plan for Construction Activities and associated NOI	Missouri Department of Natural Resources (MDNR) Water Protection Program P.O. Box 176 Jefferson City, MO 65102 800-361-4827	A general stormwater permit is required for construction activities that disturb 1 or more acres of land. A stormwater pollution prevention plan (SWP2 Plan) is also required per the permit. Submittal information includes the NOI, location map, pertinent project information, application fee, and correspondence from Missouri Department of Conservation (MDC) and the State Historic Preservation Office (SHPO). The completed NOI must be submitted to MDC electronically prior to construction.	Disturbance of one acre or more of soil.	NOI: 2 days SWPPP: 10 days	60 Days	$515	**NOI must be submitted electronically.**	Required

Cultural Resources									
Item #	**Permit/Clearance**	**Regulatory Agency**	**Description**	**Thresholds**	**Estimated Preparation Timeframe**	**Estimated Agency Review Time**	**Estimated Permit Application Fees**	**Notes**	**CIP-7**
5	National Historic Preservation Act - Section 106 Cultural Resources Concurrence	Missouri State Historic Preservation Office (SHPO), P.O. Box 176; Jefferson City, Missouri 65102	If the project is considered a federal undertaking and Section 106 applies (Corps permit or federal funding), the following is typically required: background investigation; SHPO consultation; depending on SHPO consultation a phase II survey and report may be required; SHPO determination of proposed impacts; and curation of collected artifacts during survey. At minimum, the project must demonstrate consultation with SHPO to meet requirements for NPDES construction stormwater permit.	Project that is either: - Activities carried out by or on the behalf of a federal agency - Funded partially or entirely with federal assistance - Requires a federal permit, license, or approval	30 Days	45 Days	Typically there is no review fee; however, background research may involve on-line database fees.	**Cultural Resources field surveys would only be required if a USACE permit application is submitted.**	Desktop Study only due to No Potential USACE Permitting

Wildlife Permits									
Item #	**Permit/Clearance**	**Regulatory Agency**	**Description**	**Thresholds**	**Estimated Preparation Timeframe**	**Estimated Agency Review Time**	**Estimated Permit Application Fees**	**Notes**	**CIP-7**
6	Endangered Species Act -Threatened & Endangered Species Concurrence and Migratory Bird Treaty Act / Bald and Golden Eagle Protection Act Compliance	Fish and Wildlife Service (FWS) **Columbia, Missouri Ecological Services Field Office** 101 Park DeVille Drive, Suite A Columbia, MO 65203-0057 Phone: 573-234-2132	Coordination with the FWS will determine the level of effort needed for the project to proceed (e.g., habitat assessment, species surveys, avian impact studies, etc.).	Potential to impact threatened or endangered species.	14 Days	30 to 45 days for initial consultation; additional 30 to 45 days for report review and determination	Typically no fees	**1) Avoid Clearing trees from April 1 to November 15 to avoid impacts to protected bat species.** **2) Avoid clearing trees in from April 1 to July 15 to avoid impacts to nesting migratory birds.**	Desktop Study only due to No Potential USACE Permitting
7	State Protected Species	Missouri Department of Conservation (MDC) Environmental Review Coordinator Resource Science Division 2901 West Truman Blvd. Jefferson City, MO 65102 573-522-4115 ext. 3182	If the project will potentially impact protected species or their respective habitat, or if a Section 404 and/or State permit is required then the MDC should be contacted. A Missouri Natural Heritage Review can be completed online and will determine the level of effort needed for the project to proceed (e.g. habitat assessment, species surveys, lek surveys, avian impact studies, etc.).	Potential to impact threatened or endangered species.	14 Days	Initial Online Review is instantaneous; additional surveys would require 30 to 45 days for report review and determination	Typically no fees		Desktop Study only due to No Potential USACE Permitting

Additional Permits									
Item #	**Permit/Clearance**	**Regulatory Agency**	**Description**	**Thresholds**	**Estimated Preparation Timeframe**	**Estimated Agency Review Time**	**Estimated Permit Application Fees**	**Notes**	**CIP-7**
9	MoDOT Utility Crossing Permit	Ms. Teresa Nixon, Traffic Specialist (417) 766-3847 Missouri Department of Transportation Southwest District 3025 East Kearney St., Springfield, MO 65803	Permit will be required to install/construct across State Highway ZZ right-of-way.	Installation of facilities within MoDOT road right-of-way.	30 Days	45 Days	Exact fees TBD	**Only Required for crossing of Wilson's Creek Blvd/State Route ZZ.**	MoDOT Permit Required for Hwy ZZ Crossing
9	Greene County Utility Crossing Permit	Mr. Rick Artman Highway Department Administrator Highway Department Greene County Highway Department 2065 N Clifton Ave Springfield, MO 65803 (417) 831-3591	Permit will be required to install install/construct across county road right-of-way.	Installation of facilities within county road right-of-way.	30 Days	45 Days	$500 for a Road Bore and $1,000 for Open Cut - exact fees TBD	**Permit Likely Required for construction within a county public road right-of-way.**	County Permit Required for West Farm Road 174

Count	Address Number	Address Street	Owner	Type	Project
36	4660	S. Wilsons Creek Blvd.	GERDES, KARL ERIC TRUST	TCE	CIP #7
37	6310	W. Republic Rd.	REPUBLIC SCHOOL DIST R-III	ESMT_TCE	CIP #7

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EXHIBIT I – GEOTECHNICAL SOILS REPORT

Geotechnical Engineering Report

CIP 7: McElhaney Lift Station & Force Main
Republic, MO
April 8, 2022
Terracon Project No. B5215110

Prepared for:
Burns & McDonnell Engineering Co.
Kansas City, Missouri

Prepared by:
Terracon Consultants, Inc.
Springfield, Missouri

April 8, 2022

Burns & McDonnell Engineering Co.
9400 Ward Parkway
Kansas City, Missouri 64114

Attn: Ms. Allison White, P.E.
P: (314) 328 5431
E: alwhite@burnsmcd.com

Re: Geotechnical Engineering Report
CIP 7: McElhaney Lift Station & Force Main
Along W. Farm Road 174
Republic, MO
Terracon Project No. B5215110

Dear Ms. White:

We have completed a subsurface exploration and geotechnical engineering exploration for the referenced project. This study was performed in general accordance with Terracon Proposal No. P5215110, dated November 19, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations 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.

Ripken B. Dodson, E.I.
Staff Geotechnical Engineer

Ty G. Alexander, P.E.
Office Manager/Principal
Missouri: PE-2009002087

REPORT TOPICS

Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

REPORT SUMMARY

A geotechnical exploration has been performed for the proposed Republic utility line upgrade located along Farm Road 174 in Republic, Missouri. Twenty-three (23) borings, designated 7-1 through 7-24 (7-17 was skipped intentionally), were performed to depths of approximately 7 to 45 feet below the existing ground surface. The following geotechnical considerations were identified:

- The recommendations and data in this report, regarding the foundations and lateral earth pressures for the lift station, align with the planned lift station extending to a depth of 20 feet below existing grade. The foundation bearing elevation is estimated based on a provided lift station foundation depth of 20 feet below existing grade. This indicates an elevation of approximately 1160 feet (±) for the base of the lift station. If the foundation bearing elevation is modified, Terracon should be notified to evaluate/provide any necessary modifications to our foundation recommendations.

- Existing undocumented fill was encountered at each of the boring locations, except 7-3 to depths ranging from approximately 2 to 8 feet.

- Some relatively high moisture content soils were encountered in the upper levels of some of the borings and may be exposed in excavations and cuts. These soils may become unstable when disturbed. During periods of dry weather, these soils may be stable upon initial exposure; however, these soils, if exposed, may become relatively soft and unstable under construction traffic. We recommend that the owner budget for the possibility that overexcavation and/or subgrade stabilization may be required and contractors be prepared to handle potentially unstable and/or soft conditions.

- Bedrock is present at approximately 22.5 feet below grade at Boring 7-1. Due to potential variation in bedrock elevation, it is possible bedrock may be encountered during foundation and utility line construction. Accordingly, we recommend the owner obtain unit rates for rock excavation which may be required for foundation construction and utility installation.

- Additionally, auger refusal was encountered at an approximate depth of 7 to 9 feet below existing grade in borings 7-2, 7-5, 7-12, and 7-21. Rock may be encountered at varying depths between borings as the site is located over a pinnacled bedrock unit. Pinnacles may extend into utility excavations. Accordingly, we recommend the owner obtain unit rates for rock excavation which may be required for shallow foundation construction and utility installation.

The professional opinions and recommendations presented in this report are based on evaluation of data developed by testing discrete samples obtained from widely-spaced borings. Site subsurface conditions have been inferred from available data, but actual subsurface conditions will only be revealed by excavation. So that variations in subsurface conditions which may affect the

design can be addressed as they are encountered, we recommend that Terracon be retained to observe excavations and perform tests during the site preparation, earthwork and foundation construction phases of the project.

This executive summary should not be separated from or used apart from this report. This report presents fully developed recommendations and opinions based on our understanding of the project at the time the report was prepared. The report limitations are described in the **General Comments** section of this report.

Geotechnical Engineering Report
CIP 7: McElhaney Lift Station & Force Main
Along W. Farm Road 174
Republic, MO
Terracon Project No. B5215110
April 8, 2022

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed CIP 7: McElhaney Lift Station & Force Main to be located at Along W. Farm Road 174 in Republic, MO. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil (and rock) conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Lateral earth pressures
- Excavation considerations

The geotechnical engineering services for this project included the advancement of twenty-three (23) test borings to depths ranging from approximately 8 to 43 feet below existing site grades.

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 and/or as separate pages in the **Exploration Results** section.

The **General Comments** section provides an understanding of the report limitations.

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
Parcel Information	The project is located at Along W. Farm Road 174 in Republic, MO. (See **Site Location**)
Existing Improvements	The planned alignment will be along W. Farm Road 174.

Item	Description
Current Ground Cover	Ground cover varies along the length of the planned alignment. Outside of roadways, the alignment is primarily grass covered with occasional residential driveways and wooded areas.
Existing Topography	Varies along length of planned alignment; based on boring surface elevations provided by Allgeier Martin and Associates, there is approximately 60 feet in elevation change across the explored area.
Geology	Based on the Geological Map of Missouri prepared by the Missouri Department of Natural Resources (MDNR), the subject site is located over the Burlington Limestone Bedrock Units. The Burlington Formation is composed primarily of limestone. Small amounts and layers of shale and chert are noted within this bedrock unit.
Geological Concerns	Solution features, including springs, caves, and sinkholes, are commonly present in the Burlington Series Bedrock Unit in this area. Based on the review of information available from Greene County GIS databases, the subject site does not contain any previously identified sinkhole formations, although sinkholes and springs are noted on the **Geologic Map** in the vicinity of the site. It is difficult to predict future sinkhole activity. Site grading and drainage may alter site conditions and could possibly cause sinkholes in areas that have no history of this activity.

We also collected photographs at the time of our field exploration program. Representative photos are provided in our **Photography Log**.

PROJECT DESCRIPTION

The table below presents a brief summary of our project understanding. This summary has been used as the basis of our analyses and recommendations. Any changes to this summary should be made known to Terracon immediately so revisions can be provided if necessary.

Item	Description
Information Provided	Information was provided by Ms. Allison White, P.E., with BMcD.
Project Description	The project consists of approximately 8,000 linear feet of force main sewer line primarily along W. Farm Road 174 to the planned McElhaney lift station.

GEOTECHNICAL CHARACTERIZATION

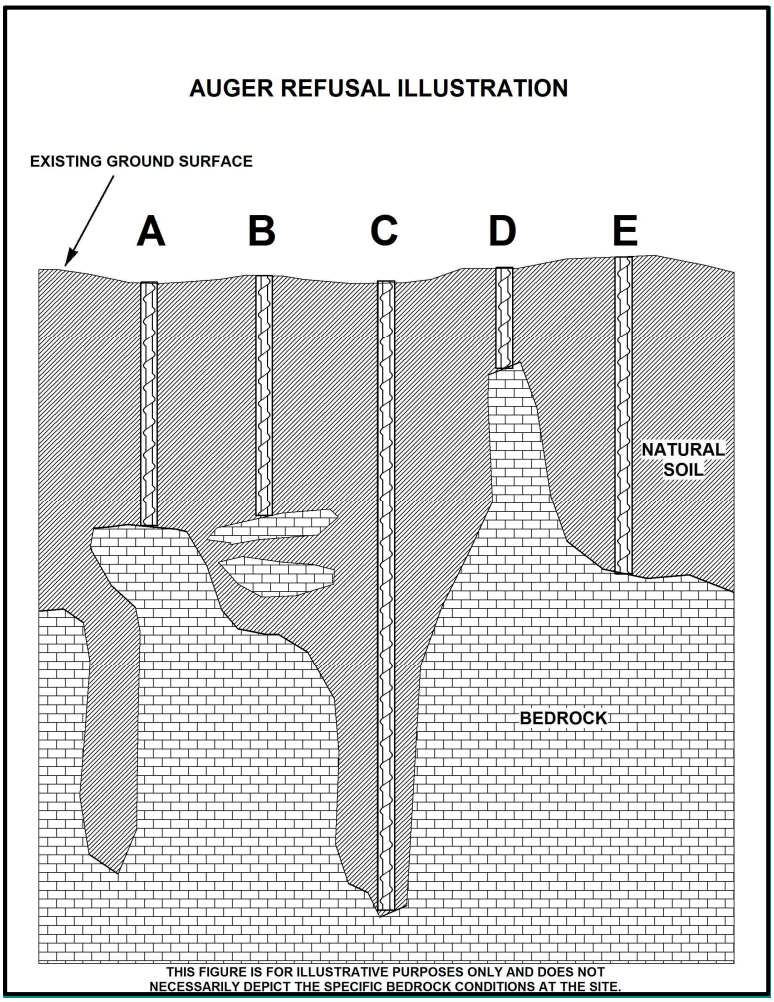
We have developed a general characterization of the subsurface conditions based upon the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration

point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Topsoil/Asphalt with Base**	Ground covering. Either topsoil or asphalt with aggregate base rock depending on boring.
2	**Fill-Lean Clay with Gravel**	Fill-Brown lean clay with gravel and varying amounts of sand.
3	**Lean Clay with Gravel**	Brown lean clay with gravel and varying amounts of sand.
4	**Fat Clay with Gravel**	Red fat clay with gravel and varying amounts of sand.
5	**Limestone Bedrock**	Gray limestone bedrock. Strong, slightly weathered, and slightly fractured.

Auger refusal is defined as the depth below the ground surface at which a boring can no longer be advanced with the soil drilling technique being used. Auger refusal is subjective and is based upon the type of drilling equipment used, the types of augers used, and the effort exerted by the driller. Auger refusal can occur on the upper surface of discontinuous bedrock (A), slabs of unweathered rock suspended in the residual soil matrix or "floaters" (B), in widened joints that may extend well below the surrounding bedrock surface (C), on rock "pinnacles" (D) rising above the surrounding bedrock surface, or on the upper surface of continuous bedrock (E). These possible auger refusal conditions are illustrated in the figure below. Linear interpolation of apparent bedrock elevations based upon the boring data is often used but can misrepresent actual rock removal quantities where anomalies exist, such as pinnacled rock, where rock could be shallower than that encountered in the borings. Additional borings, auger probes, test pits, or geophysical testing could be performed to obtain more specific bedrock information.



Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was not observed in the borings while drilling, or for the short duration the borings were left open prior to backfilling. However, this does not necessarily mean the borings terminated above groundwater. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole. Long-term observations in piezometers or observation wells, sealed from the influence of surface water, are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be different than the

levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

General

We recommend that the exposed subgrade be thoroughly evaluated after stripping of any topsoil and at the base of all cut areas, and prior to the start of any fill operations. We recommend that the geotechnical engineer be retained to evaluate the bearing material for the foundations and subgrade soils. Subsurface conditions, as identified by the field and laboratory testing programs, have been reviewed and evaluated with respect to the proposed project plans known to us at this time.

Possible Karst Development

Karst development in this area occurs from the dissolution of the native limestone bedrock material. Over time, groundwater can transport the surrounding soil into bedrock voids causing visible surface features such as circular depressions or areas of drainage. However, some sinkholes may not be readily visible from the surface because they are plugged or capped with a thin layer of rock. Maintaining and managing adequate storm water drainage is important within karst prone areas, as described in the **Grading and Drainage** section. The image below, provided by MDNR, depicts the development of sinkholes over time.

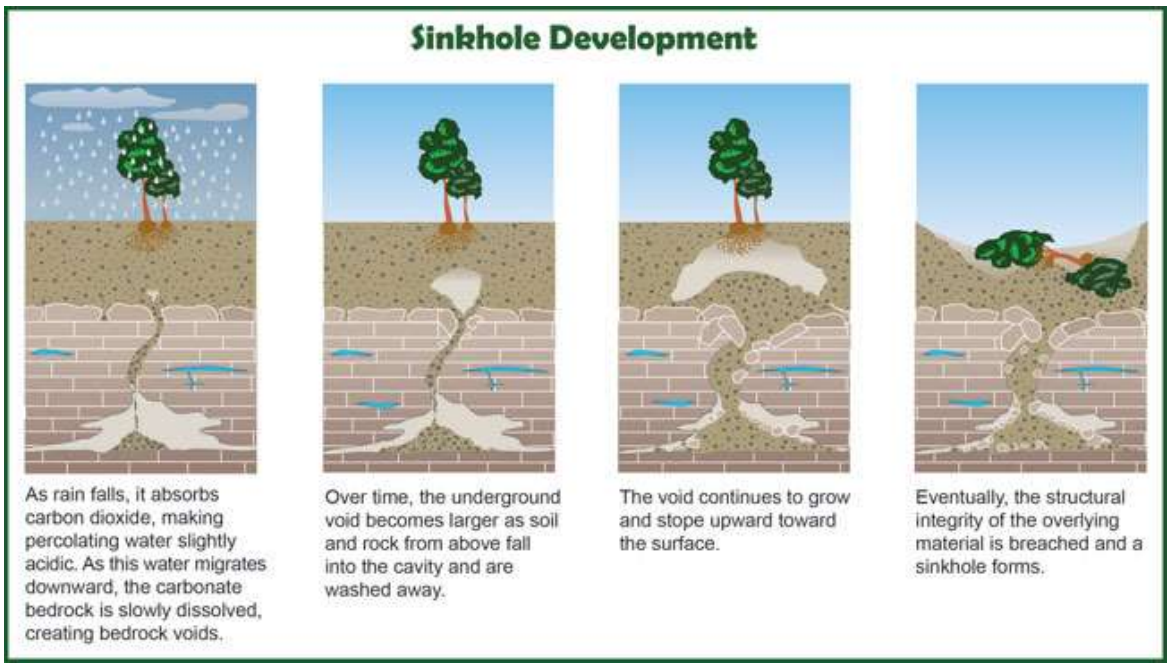


Image courtesy of MDNR

Additional testing of the subgrade including additional borings, bedrock profiling, and subsurface resistivity testing can aid in the detection of sinkholes and karst development. However, this additional testing can be costly and does not guarantee that existing or developing sinkholes will be identified.

Bedrock Considerations

Auger and/or sampler refusal on apparent intact bedrock was encountered in Borings 7-1, 7-2, 7-5, 7-12, and 7-21 at depths between about 7 and 23 feet below present grades. Prior to auger refusal, about ½ to 3 feet of weathered bedrock was encountered in Borings 7-1, 7-5, 7-12, and 7-21. The weathered rock was penetrated with the augers with some effort. Accordingly, site grading and excavations for the foundations and utilities may encounter bedrock. There is a possibility that the utility line could encounter shallow bedrock based on the auger refusal at select borings.

Weathered rock that is penetrated with drilling augers can typically be excavated with large excavation equipment fitted with rock teeth using concentrated effort or ripped with large bulldozers. Layers of intact rock may be present within the weathered zones, which could require breaking with pneumatic rock breakers or blasting. Excavations in weathered rock often result in larger excavations than in soils, which subsequently require more backfill.

The foundations could bear entirely on soil (native or engineered fill), entirely on intact bedrock, or partially on soil and partially on bedrock. If the foundations are either supported *entirely* on intact bedrock or *entirely* on soil, then the shallow foundations can bear directly on these materials. However, if the foundations will be supported partially on soil and partially on bedrock, then when rock is encountered in footing excavations, we recommend that the footings be overexcavated 1 foot below the design bearing level into the bedrock. The overexcavation should also extend laterally a sufficient distance to provide room for installation of a bond break with the sides of the footing excavation. The overexcavation into the bedrock should be backfilled with compacted, cohesive soil as described in section **Material Requirements**. Compactive effort should be in accordance with recommendations provided in section **Compaction Requirements**. The purpose of the overexcavation is to reduce differential settlement due to differing bearing materials.

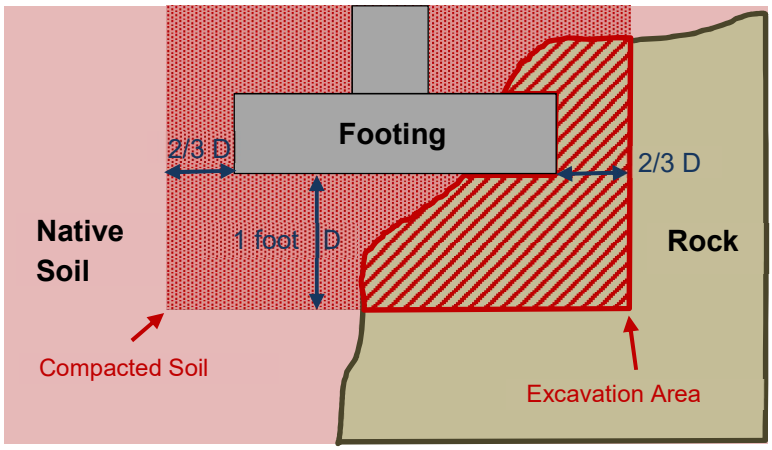


IMAGE NOT TO SCALE

Because of the variable bedrock depths, pinnacled bedrock, at this site, the client should anticipate encountering inconsistent bedrock elevations in areas not explored with soil borings. We recommend the owner obtain unit rates for rock excavation for shallow foundations.

When the proposed grading plan is available and prior to foundation construction, additional borings or auger probes could be performed to obtain more specific bedrock information. Linear interpolation of apparent bedrock elevations based upon the boring data is often used but can misrepresent actual rock removal quantities where such anomalies exist.

Existing Undocumented Fill

Existing fill was encountered to depths of approximately 2 feet to 8 feet in all Borings except B-3. The fill could extend deeper in areas not explored. While the N-values obtained in the undocumented fill materials were generally equal to or higher than the existing native soils, no documentation or records regarding the placement of this fill were provided for our review. If records of the fill are available, Terracon should be supplied with these documents to better assess the suitability of the existing fill.

Due to the clayey gravels at the subject site, differentiating between native materials and man placed fill in soil boring samples is difficult and, in some cases, impossible without documentation. The designation of possible fill has been given to materials that are suspected of being fill but no definite indications of fill were noted in the sampling process. These materials should be carefully observed and inspected during excavations for indications of fill by a representative of Terracon. If indications of fill are found during the excavations, then the material should be treated as fill and the recommendations noted below should be considered.

Proposed utilities are anticipated to extend through the undocumented fill depths. However, fill depths may vary between borings. Areas of soft/unsuitable soils may be encountered beneath

proposed utilities. If these conditions are encountered during construction, additional recommendations may be required. Some overexcavation and replacement of unsuitable soils may be necessary to properly support the proposed sewer line. We recommend budgeting for this possibility.

Soft Subgrade Potential

The subgrade soils may become unstable when disturbed. During periods of dry weather, these soils may be stable upon initial exposure, however, these soils could become relatively soft and unstable under construction traffic. Further, depending upon site conditions during construction, overexcavation or stabilization of the subgrade and/or base of overexcavations may be needed to achieve a suitable working surface. Accordingly, we recommend that the owner budget for the possibility that overexcavation and/or subgrade stabilization may be required and contractors be prepared to handle potentially unstable and/or soft conditions.

EARTHWORK

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement.

Site Preparation

The subgrade should be observed, and we recommend that engineered fill be tested for moisture content and compaction throughout the construction phase. Areas which fail density testing should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by following the recommendations in the **Subgrade Stabilization** section. Excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

Fill Material Types

Materials used for fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
High Plasticity Material	CH (LL≥70 or PI≥40)	2 feet below foundations; and 1 foot below base of pavements
Moderate to High Plasticity Material [2]	CH or CL, with 70>LL≥45 or 40>PI≥25	2 feet below base of floor slabs and any other lightly-loaded structures, 1 foot below base of pavements
Granular Material [3]	GM, GC, SM, or SC	All locations and elevations

Low Plasticity Material [4]	CL (LL<45 & PI<25) or Granular Material [3]

1. Compacted structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to Terracon for evaluation. On-site soils generally appear suitable for use as fill, subject to the "acceptable location for placement" limitations described in this table.
2. Delineation of moderate to high plasticity clays should be performed in the field by a representative of the Geotechnical Engineer, and could require additional laboratory testing. If fat clay material contains greater than 35 percent granular material retained on a ¾-inch sieve, it may be used in the low volume change zone.
3. Crushed limestone aggregate, or granular material such as sand, gravel or crushed stone containing at least 15 percent low plasticity fines.
4. Low plasticity cohesive soil or granular soil having low plasticity fines. Material should be approved by the geotechnical engineer.

Fill Compaction Requirements

Fill should meet the following compaction requirements.

Item	Description
Fill Lift Thickness [1]	9 inches or less in loose thickness
Compaction Requirements [2]	At least 95 percent of the material's maximum standard Proctor dry density [3]
Water Content Range	Low plasticity cohesive: -2 percent to +2 percent of optimum [3] High plasticity cohesive: 0 to +4 percent of optimum [3] Granular: Workable moisture levels [4]

1. Reduced lift thicknesses of 4 to 6 inches are recommended in confined areas (e.g., utility trenches, foundation excavations, and foundation backfill) and when hand-operated compaction equipment is used.
2. 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. As stated within ASTM D 698, this procedure is intended for soils with 30 percent or less material larger than ¾ inch. Accordingly, we recommend full time proofroll observation be performed instead of moisture density testing for materials containing more than 30 percent aggregate retained on the ¾-inch sieve.
3. As determined by the standard Proctor test (ASTM D 698).
4. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

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 mitigation. All utility trenches that penetrate beneath structures should be effectively sealed to restrict water intrusion and flow through the trenches that could mitigate below the structure. We recommend constructing an effective “trench plug” that extends at least 5 feet out from the face of the structure exterior. The plug material should consist of clay compacted as recommended in the Earthwork section of this report. The clay fill should be placed to completely surround the utility line and be compacted in accordance with recommendations in this report. Alternatively, flowable fill could be used to construct the trench plug.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure’s maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade becomes excessively wet or dry, frozen, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to further 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, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for

construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The earthwork efforts should be observed and tested by a representative of the Geotechnical Engineer. Observation and testing should include documentation of removal of vegetation and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unacceptable conditions are encountered, the Geotechnical Engineer should be contacted to recommend mitigation options.

SHALLOW FOUNDATIONS

Provided the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for design of shallow foundations.

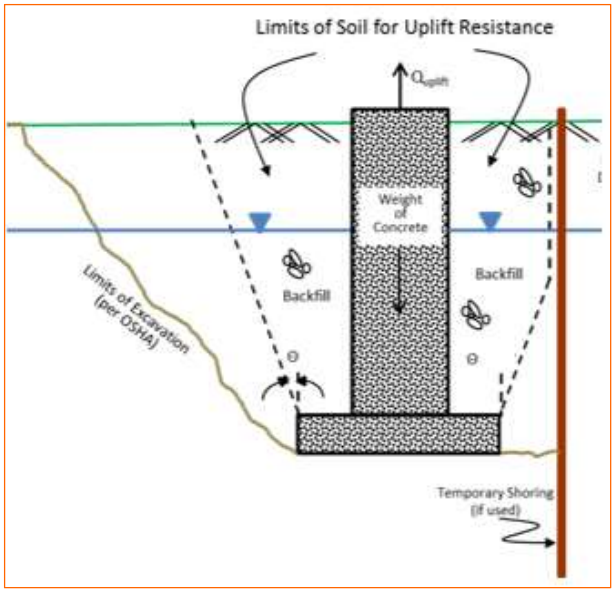
Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing pressure [1, 2, 3]	3,000 psf (foundation bearing on undisturbed native clay soils) 7,000 psf (foundation bearing on competent bedrock)
Minimum Foundation Dimensions	Columns: 30 inches Continuous: 18 inches
Ultimate Passive Resistance [4] **(equivalent fluid pressures)**	250 pcf (cohesive backfill) 350 pcf (granular backfill)
Ultimate Coefficient of Sliding Friction [5]	0.32 (native clay) 0.40 (granular material)
Minimum Embedment below Finished Grade	30 inches on soil N/A on bedrock
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch Less than about ½ inch on bedrock
Estimated Differential Settlement [2, 6]	About ¾ of total settlement

Item	Description
1.	The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. A factor of safety of 2.5 has been applied. Values assume that exterior grades are no steeper than 20 percent within 10 feet of the structure.
2.	Values provided are for the maximum loads noted in **Project Description**.
3.	Unsuitable or soft soils, including undocumented fill, should be overexcavated and replaced per the recommendations presented in **Earthwork**.
4.	Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face.
5.	Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. Should be neglected if passive pressure will be used to resist lateral loads.
6.	Differential settlements are as measured over a span of up to 50 feet.

Design Parameters - Uplift Loads

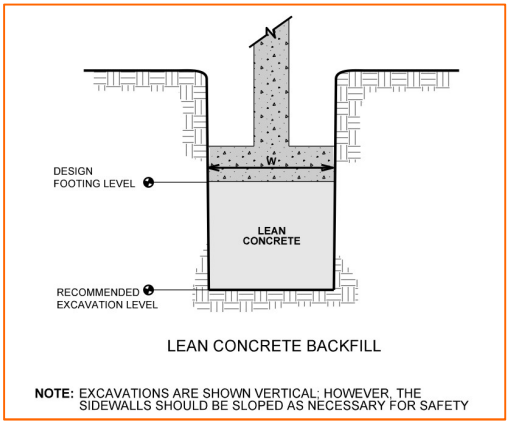
Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 100 pcf should be used for the backfill. This unit weight should be reduced to 40 pcf for portions of the backfill or natural soils below the groundwater elevation.



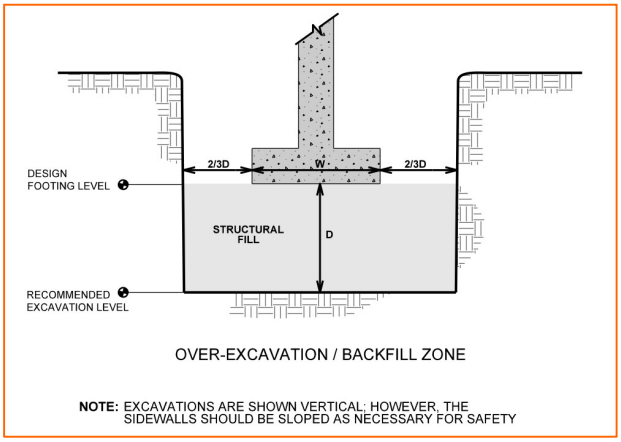
Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be observed and tested by a representative Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. Placement of a lean concrete mudmat over the bearing soils should be considered if the excavations must remain open for an extended period of time.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below. Care will need to be taken to maintain at least 12 inches of cohesive material between the bottom of the footing and/or lean concrete, and the top of rock for soil supported foundations.



Over-excavation for structural fill placement below footings should be conducted as shown below. The over-excavation should be backfilled up to the footing base elevation with suitable fill materials, as recommended in the **Earthwork** section.



SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. The Site Class is required to determine the Seismic Design Category for a structure. The Site Class is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the subsurface conditions encountered at the site and as described on the exploration logs and results, it is our professional opinion that the **Seismic Site Class is C**. Subsurface explorations at this site were extended to a maximum depth of 40 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. We could perform additional deeper borings or geophysical testing to confirm the conditions below the current boring depths. The table below summarizes the values gathered in an ACSE 7 Hazard Report.

Description	Value
2018 International Building Code Site Classification[1]	C
Site Latitude	37.1327 ° N
Site Longitude	-93.4189 ° W
Risk Category	IV
S_{DS} Spectral Acceleration for a Short Period[2]	0.21
S_{D1} Spectral Acceleration for a 1-Second Period[2]	0.11
F_a Site Coefficient	1.2

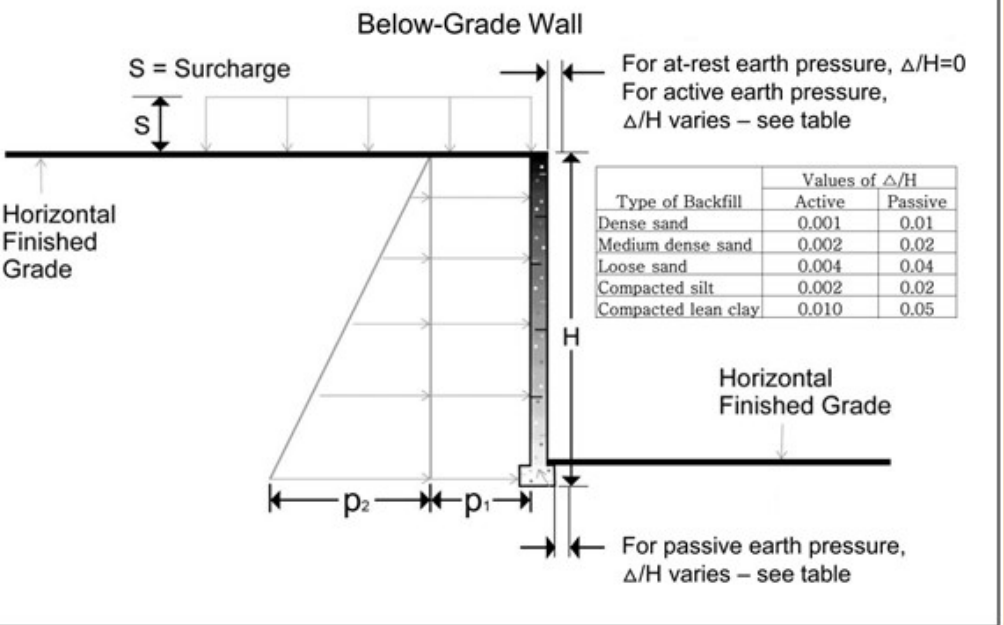
F_v Site Coefficient	1.68

1. Seismic site classification in general accordance with the 2018 International Building Code, which refers to ASCE 7-10.
2. These values were obtained using online seismic design maps and tools provided by the USGS (http://earthquake.usgs.gov/hazards/designmaps/) .

LATERAL EARTH PRESSURES

Design Parameters

Structures with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The “at-rest” condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Type of Backfill	Values of Δ/H	
	Active	Passive
Dense sand	0.001	0.01
Medium dense sand	0.002	0.02
Loose sand	0.004	0.04
Compacted silt	0.002	0.02
Compacted lean clay	0.010	0.05

Table from Movements Required to Reach Active or Passive Earth Pressure Conditions (Clough and Duncan, 1991)

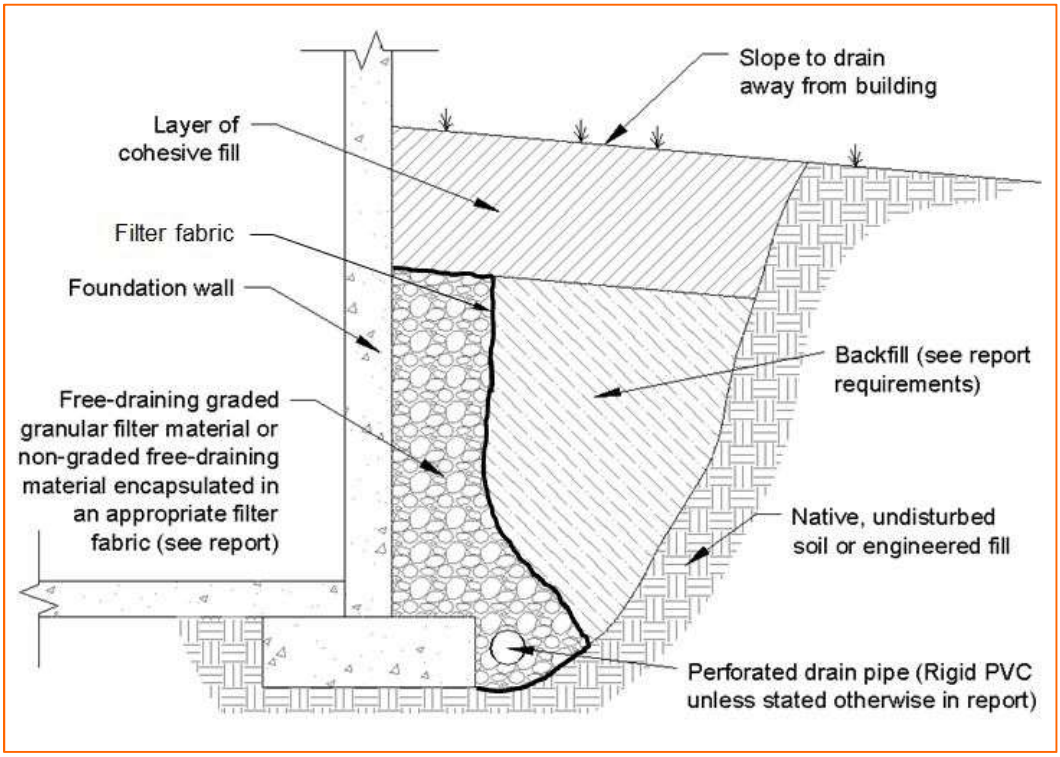
Lateral Earth Pressure Design Parameters				
Earth Pressure Condition [1]	Coefficient for Backfill Type [2]	Surcharge Pressure [3, 4, 5] p_1 (psf)	Effective Fluid Pressures (psf) [2, 4, 5]	
			Unsaturated [6]	Submerged [6]
Active (Ka)	Granular - 0.31 Fine Grained - 0.41	(0.31)S (0.41)S	(40)H (50)H	(80)H (85)H
At-Rest (Ko)	Granular - 0.47 Fine Grained - 0.58	0.47)S (0.58)S	(55)H (70)H	(90)H (95)H
Passive (Kp)	Granular - 3.25 Fine Grained - 2.46	--- ---	(390)H (295)H	(250)H (205)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance.
2. Uniform, horizontal backfill, compacted to at least 95% of the ASTM D 698 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



As an alternative to free-draining granular fill, a pre-fabricated drainage structure may be used. A pre-fabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion, and is fastened to the wall prior to placing backfill.

CHEMICAL SUITE SUMMARY

The table below lists the results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary								
Boring	**Sample Depth (feet)**	**Soil Description**	**Soluble Sulfate (mg/kg)**	**Soluble Chloride (mg/kg)**	**Electrical Resistivity (Ω-cm)**	**pH**	**Sulfides (mg/kg)**	**Total Salts (ppt)**
7-1	Cumulative (1'-20')	Predominantly Sandy/Gravelly Lean Clay	40	40	1,687	7.08	<.003	0.19

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 4.3.1 of ACI 318, Building Code Requirements for Structural Concrete and Commentary. Concrete should be designed in accordance with the provisions of ACI 318, Chapter 4.

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 may occur between exploration point 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 as the Geotechnical Engineer, where noted in this report, 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.

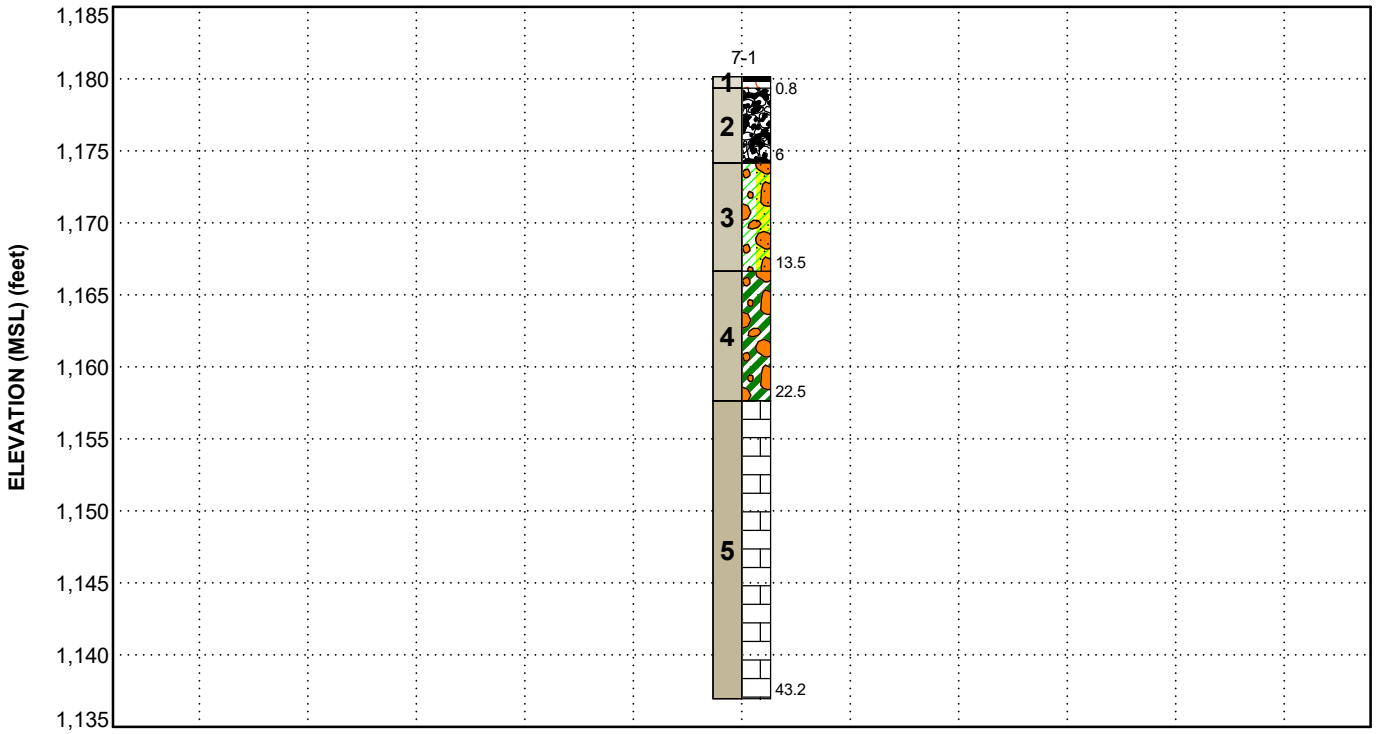
Site characteristics as provided are for design purposes and not to estimate excavation costs. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation costs. 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, cost estimating, 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.

FIGURES

Contents:

GEOMODEL

Republic, MO CIP 7- McElhaney Lift Station and Forcemain ■ Republic, MO
Terracon Project No. B5215110



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil/Asphalt with Base	Ground covering. Either topsoil or asphalt with agreggate base rock depedning on boring.
2	Fill-Lean Clay with Gravel	Fill-Brown lean clay with gravel and varying amounts of sand.
3	Lean Clay with Gravel	Brown lean clay with gravel and varying amounts of sand.
4	Fat Clay with Gravel	Red fat clay with gravel and varying amounts of sand.
5	Limestone Bedrock	Gray limestone bedrock. Strong, slightly weathered, and slightly fractured.

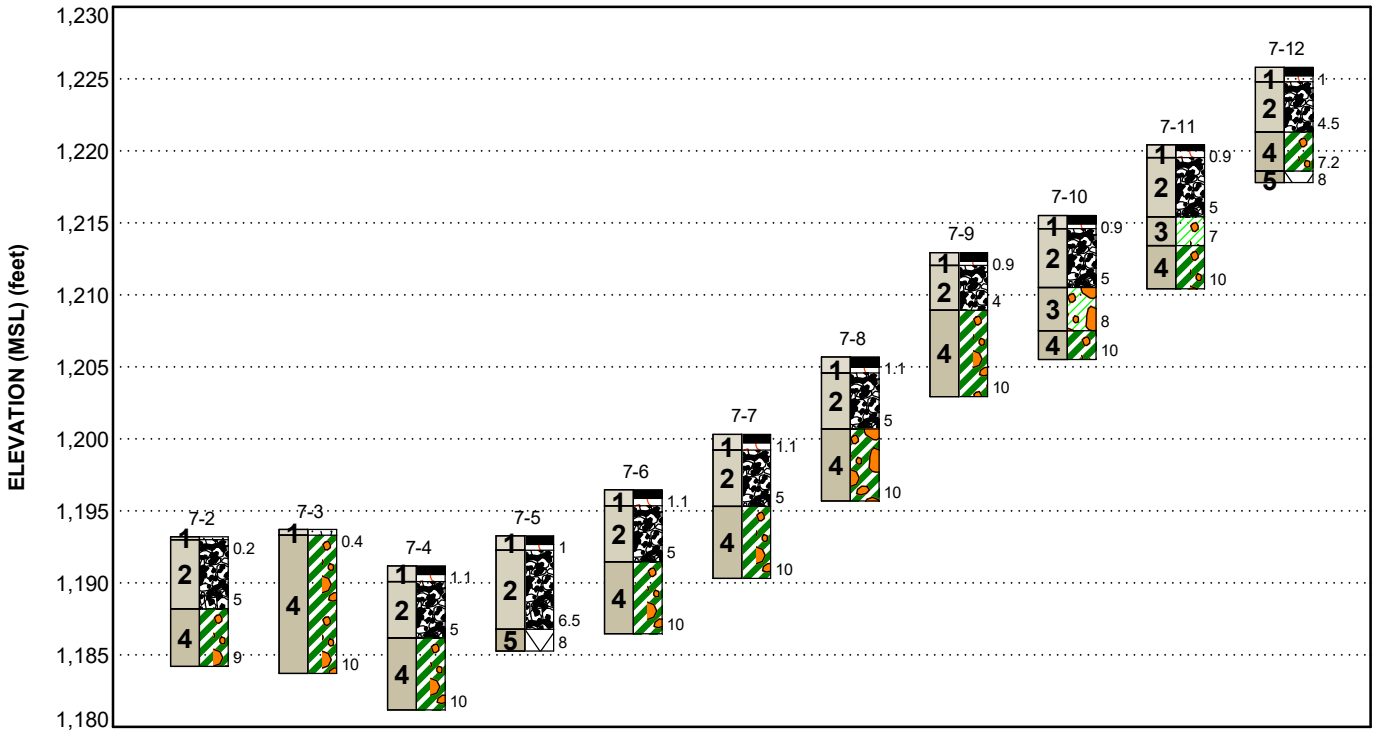
LEGEND

- Asphalt
- Aggregate Base Course
- Fill
- Gravelly Lean Clay with Sand
- Gravelly Fat Clay
- Limestone

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Republic, MO CIP 7- McElhaney Lift Station and Forcemain ■ Republic, MO
Terracon Project No. B5215110



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5	**Limestone Bedrock**	Gray limestone bedrock. Strong, slightly weathered, and slightly fractured.

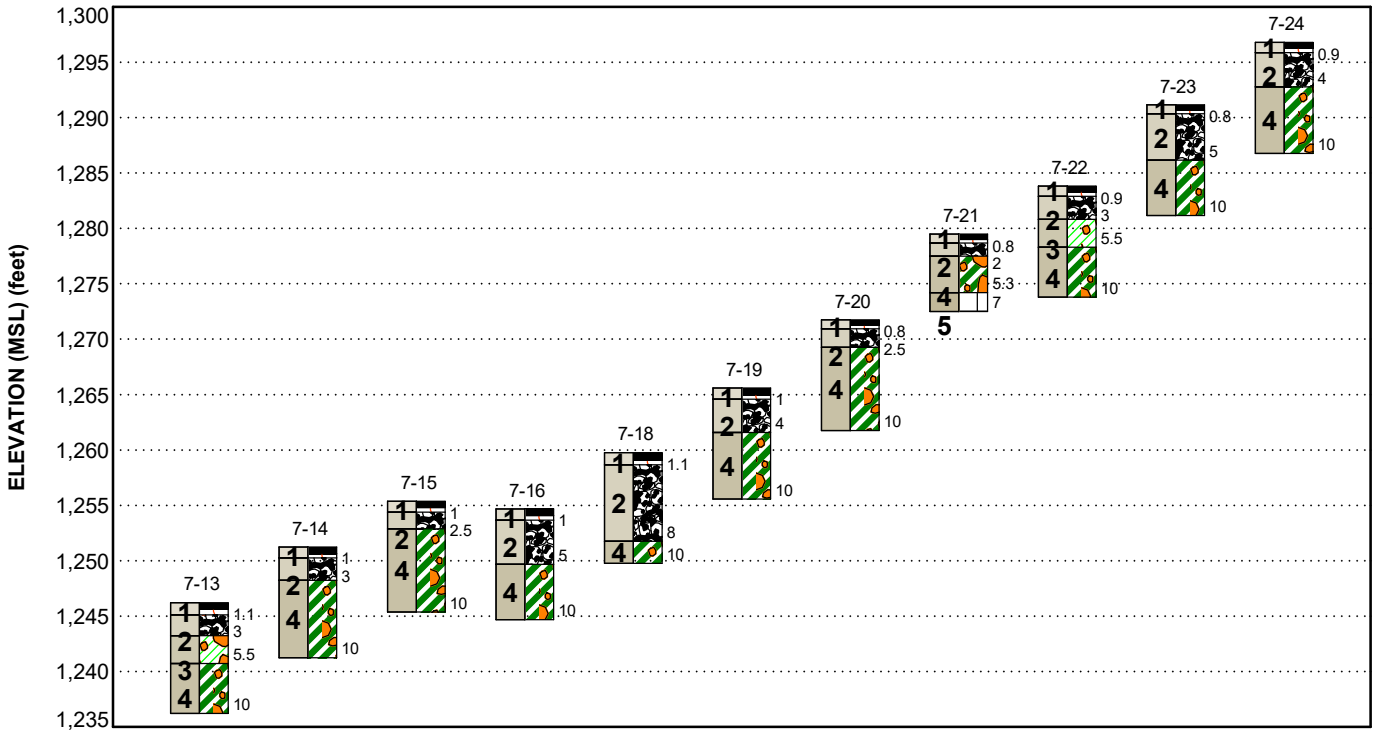
LEGEND

- Topsoil
- Asphalt
- Gravelly Fat Clay
- Fill
- Aggregate Base Course
- Gravelly Lean Clay
- Fat Clay with Gravel
- Weathered Rock
- Lean Clay with Gravel

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Republic, MO CIP 7- McElhaney Lift Station and Forcemain ■ Republic, MO
Terracon Project No. B5215110



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5	Limestone Bedrock	Gray limestone bedrock. Strong, slightly weathered, and slightly fractured.

LEGEND

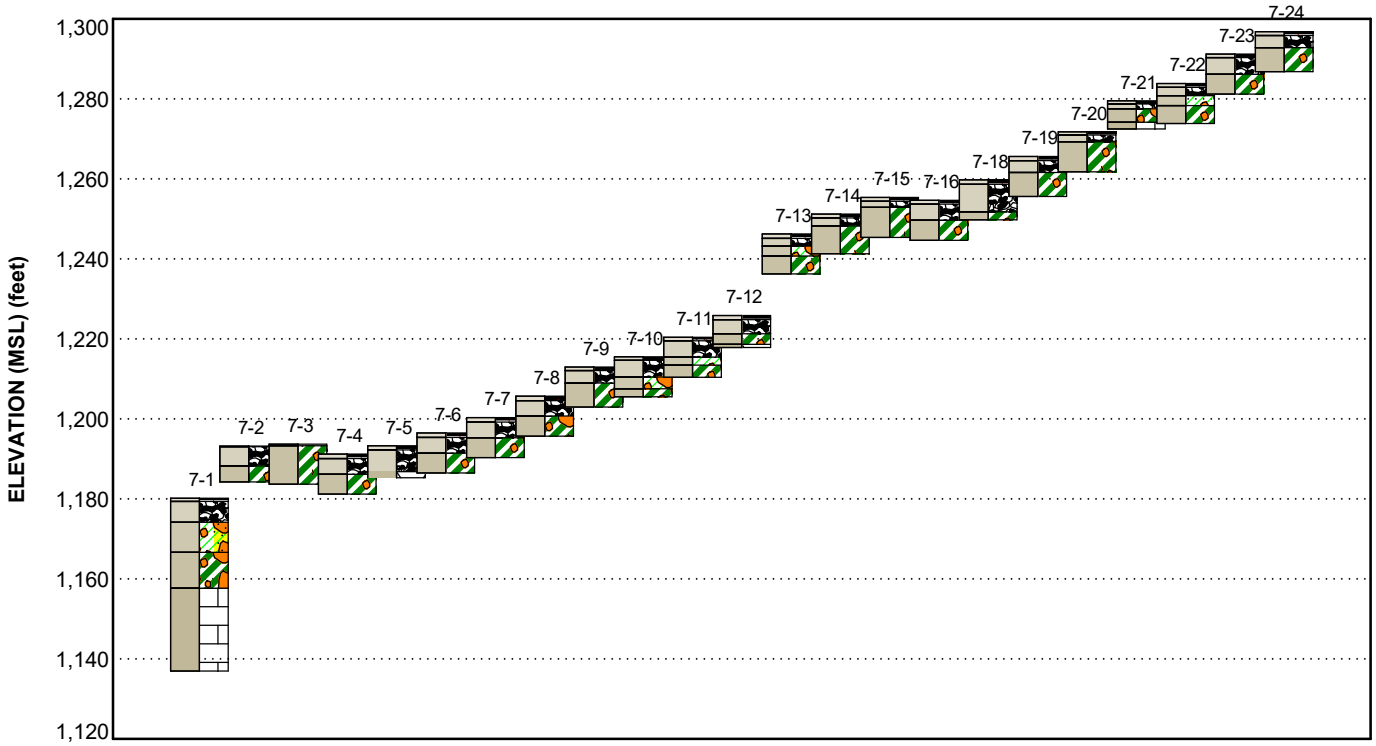
- Asphalt
- Aggregate Base Course
- Fill
- Gravelly Lean Clay
- Fat Clay with Gravel
- Gravelly Fat Clay
- Limestone
- Lean Clay with Gravel

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Republic, MO CIP 7- McElhaney Lift Station and Forcemain ■ Republic, MO
Terracon Project No. B5215110

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Topsoil/Asphalt with Base	Ground covering. Either topsoil or asphalt with agreggate base rock depedning on boring.
2	Fill-Lean Clay with Gravel	Fill-Brown lean clay with gravel and varying amounts of sand.
3	Lean Clay with Gravel	Brown lean clay with gravel and varying amounts of sand.
4	Fat Clay with Gravel	Red fat clay with gravel and varying amounts of sand.
5	Limestone Bedrock	Gray limestone bedrock. Strong, slightly weathered, and slightly fractured.

LEGEND

- Asphalt
- Aggregate Base Course
- Fill
- Gravelly Lean Clay with Sand
- Gravelly Fat Clay
- Limestone
- Topsoil
- Fat Clay with Gravel
- Weathered Rock
- Gravelly Lean Clay
- Lean Clay with Gravel

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet) [1]	Planned Location
22	10 or auger refusal[2]	Planned gravity alignment
1	50 or auger refusal[2,3]	Lift station location

1. Below ground surface
2. Borings 7-1, 7-2, 7-5, 7-12, and 7-21 encountered auger refusal on a possible cobble, boulder, or bedrock prior to their planned termination depth. All other borings extended to their planned depths.
3. Boring 1 (7-1) extended to a minimum depth of 40' with 20' of rock coring.

Boring Layout and Elevations: The boring layout was provided by Mr. Michael Canull, with Burnes and McDonnell. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±20 feet). Approximate elevations and coordinates were later obtained with a survey provided by Archer & Elgin.

Subsurface Exploration Procedures: The borings were advanced with an ATV-mounted rotary drill rig using continuous flight, solid-stem augers. Samples were obtained in the borings as noted in **Exploration Results**. The thin-walled tube sampling was performed with a thin-walled, seamless steel tube with a sharp cutting edge that was pushed hydraulically into the soil to obtain a relatively undisturbed sample. The split-barrel sampling procedure was performed using a standard 2-inch outer diameter, split-barrel sampling spoon that was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The automatic hammer used in our exploration has an hammer energy correction factor of 1.37. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration was 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 their respective test depths. Water levels were observed and recorded during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion. Pavements were patched with cold-mix asphalt and/or pre-mixed concrete.

Auger refusal materials were explored with rock coring procedures. An NQ2 rock core barrel was utilized to perform the rock cores at Boring 7-1. Water was used as a drilling fluid for cooling the rock bit and the spent water was discharged on site. Due to the use of water for rock coring, groundwater observations were not performed after the start of rock coring and through the completion of the boring.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the

materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

Classification of the soil samples was performed in general accordance with the Unified Soil Classification System (USCS) based on the material's texture and plasticity. The project engineer reviewed the field data and assigned laboratory tests to better understand the engineering properties of the various soil and rock strata.

- Water (Moisture) Content of Soil and Rock by Mass
- Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- Unconfined compressive strength of rock
- Pocket Penetrometer Results
- Chemical Analyses- pH, Sulfates, Chloride Ion, Electrical Resistivity

Boring log rock classification was determined using the Description of Rock Properties and locally accepted practices for engineering purposes. Petrographic analysis may reveal other rock types. Rock core samples typically provide an improved specimen for this classification.

Shelby tube samples were not taken at the lift station location due to the high gravel content. High gravel content can result in poor recovery or damage to the tube/equipment. Pocket penetrometer results give an indication of the shear strength of the soil.

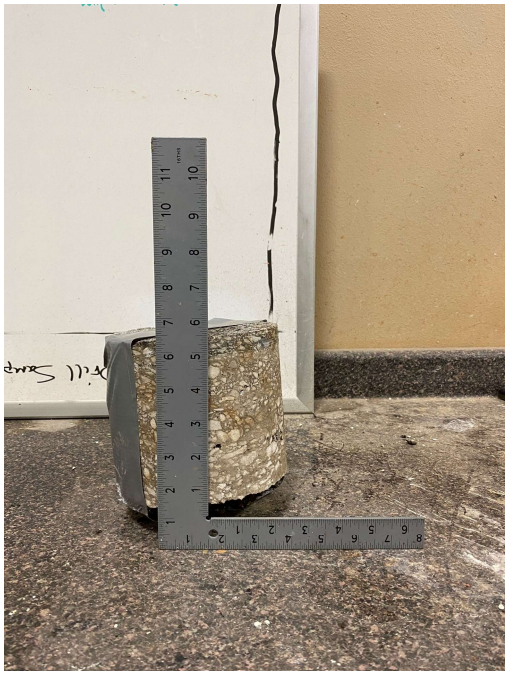
Rock Core Unconfined Compressive Strength

The following table is the results of rock core breaks and the corresponding values for unconfined compressive strength at Boring 7-1, the lift station boring.

Sample Depth (feet) [1]	Height (in.)	Width (in.)	Weight (g)	Break (lb)	Qu (psi)
26.1	4.09	1.97	544.6	15670	5141
40.5	3.66	2.00	473.1	20730	6599

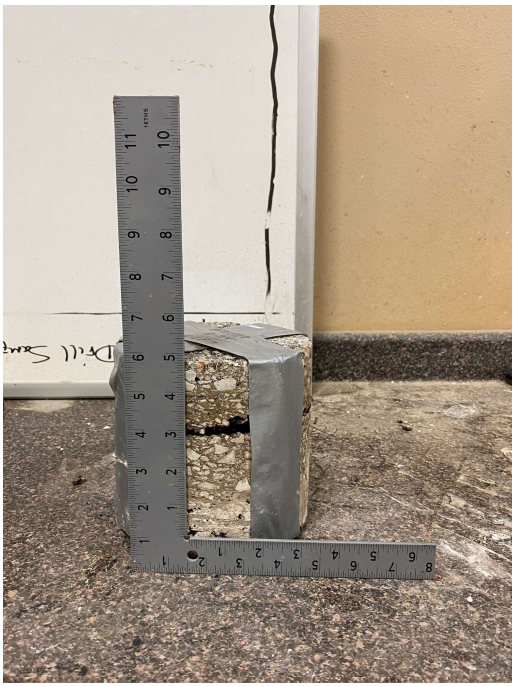
1. Below ground surface

PHOTOGRAPHY LOG

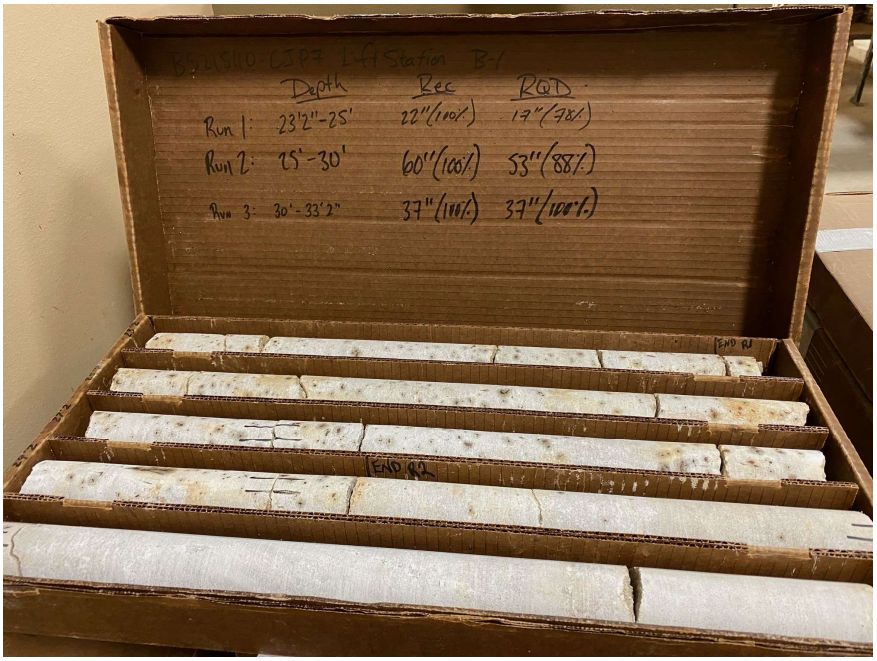


7-6 Asphalt Core

7-18 Asphalt Core



7-24 Asphalt Core



7-1 Rock Core: Run 1-3

7-1 Rock Core: Run 3-5

SITE LOCATION AND EXPLORATION PLANS

Contents:

SITE LOCATION

CIP 7: McElhaney Lift Station & Force Main ■ Republic, MO
April 8, 2022 ■ Terracon Project No. B5215110

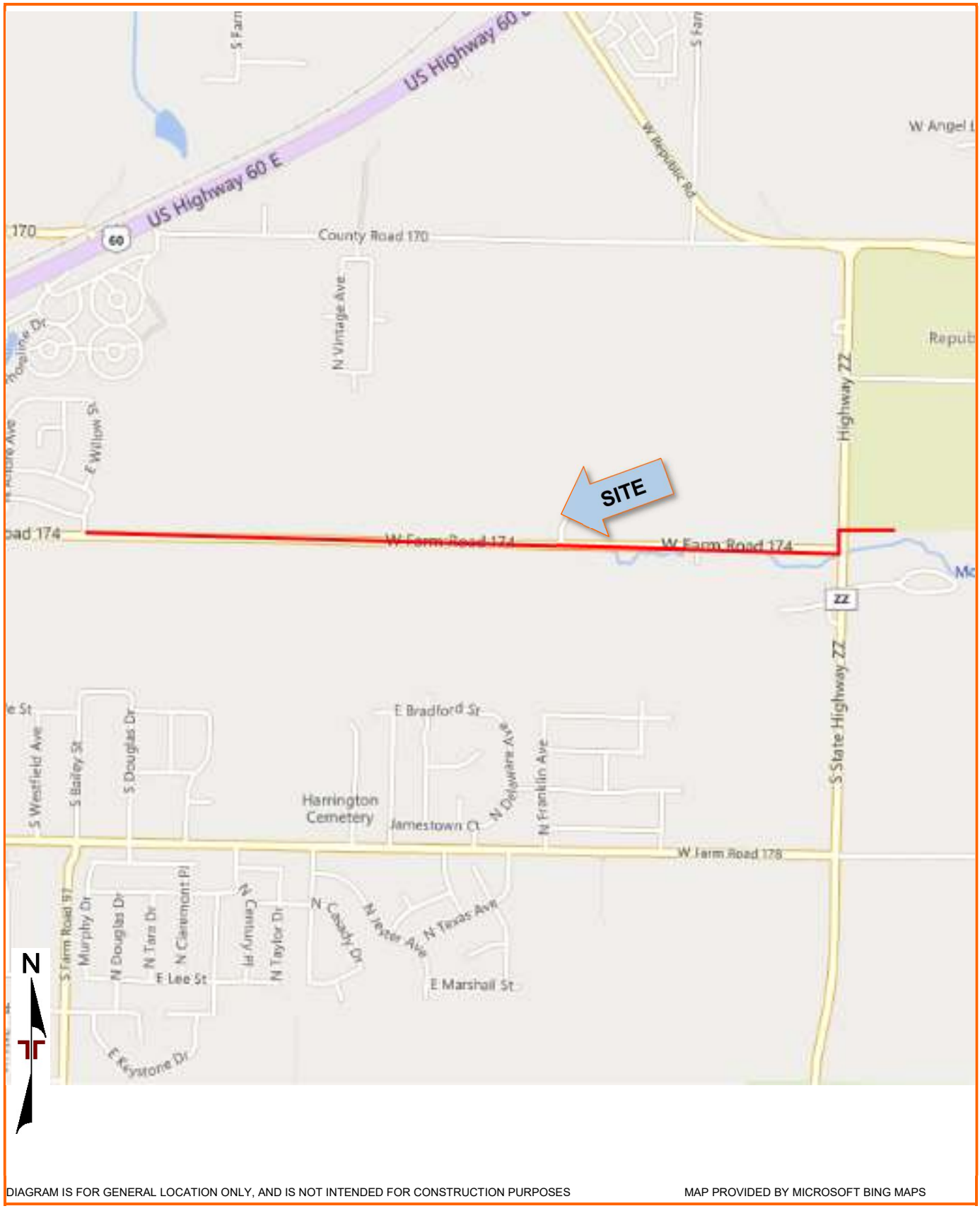


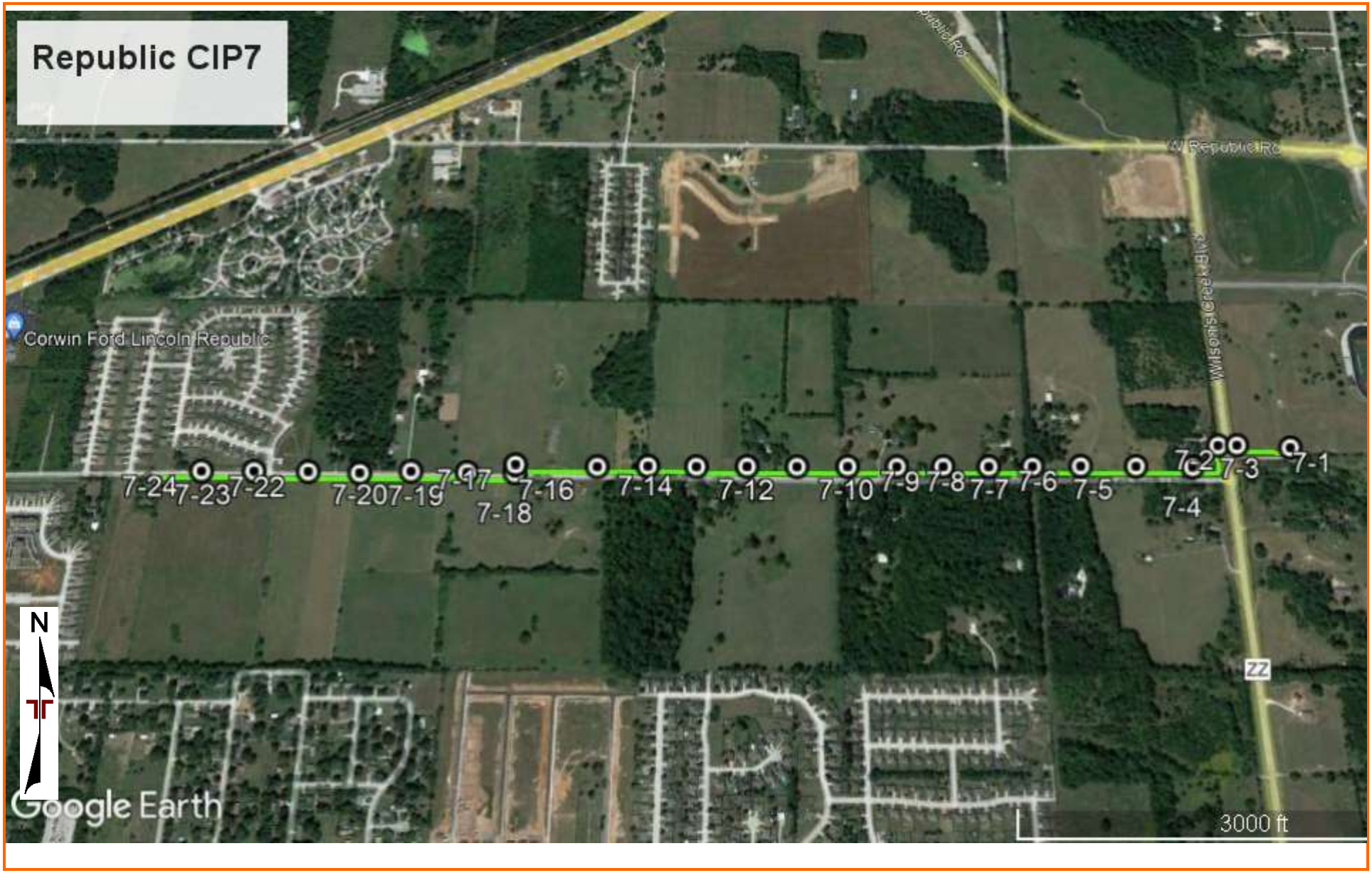
DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

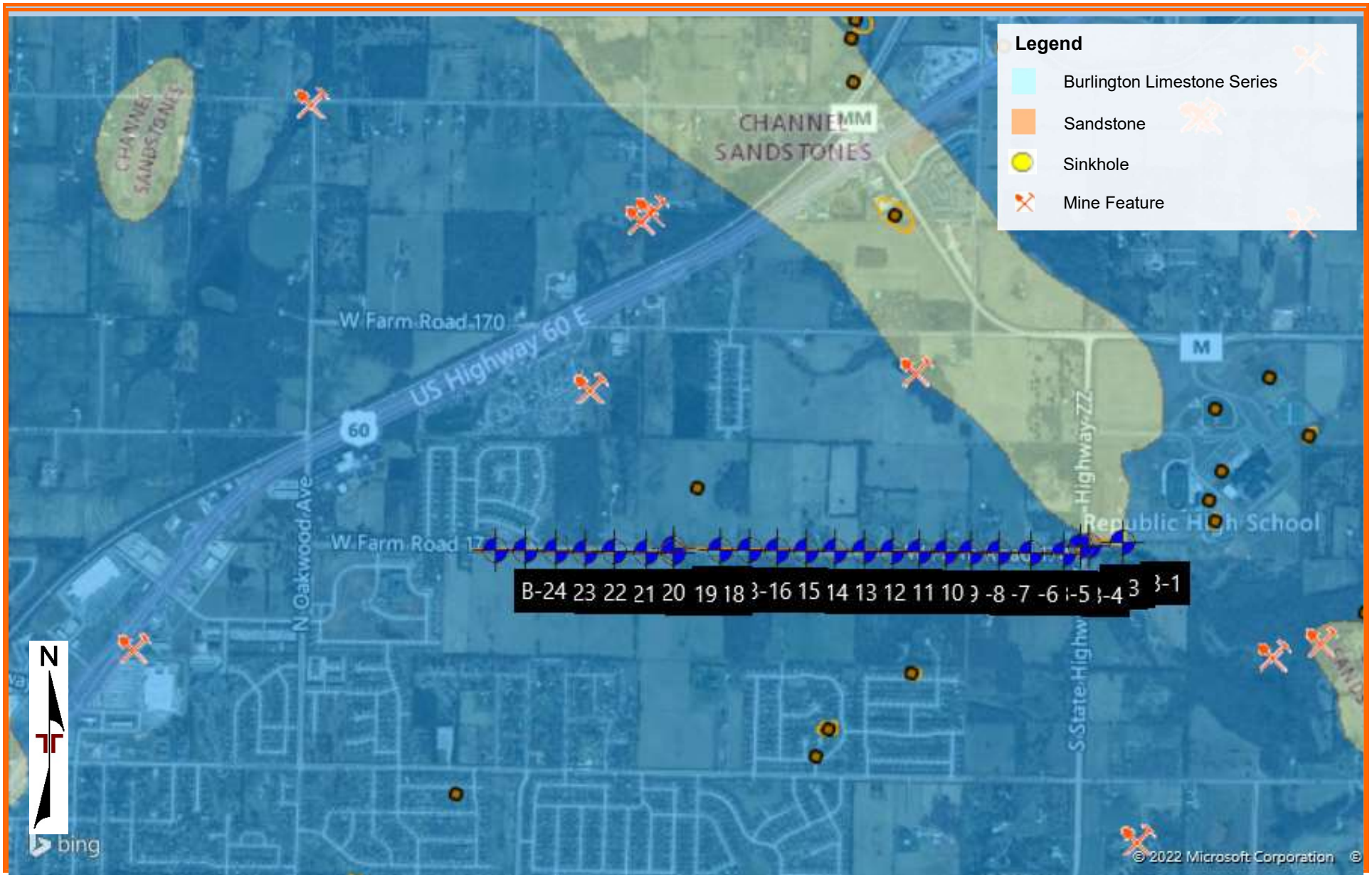
MAP PROVIDED BY MICROSOFT BING MAPS

BORING LOCATION PLAN

CIP 7: McElhaney Lift Station & Force Main ■ Republic, MO

April 8, 2022 ■ Terracon Project No. B5215110




Legend
Burlington Limestone Series
Sandstone
Sinkhole
Mine Feature
CHANNEL SANDSTONES
W Farm Road 170
US Highway 60 E
60
N Oakwood Ave
W Farm Road 17
Highway ZZ
M
Republic High School
B-24 23 22 21 20 19 18 3-16 15 14 13 12 11 10 9 -8 -7 -6 5 -4 3 -1
N
bing
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EXPLORATION RESULTS

Contents:

BORING LOG NO. 7-1

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1327° Longitude: -93.4189°

Surface Elev.: 1180.15 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.3	1180									
		ASPHALT (4")										
		0.8	1179.5									
		AGGREGATE BASE COURSE (6")										
2		**FILL - GRAVELLY LEAN CLAY WITH SAND (CL)**, brown and tan					14	5-5-6 N=11				
							10	8-10-5 N=15				
		6.0	1174	5								
3		**GRAVELLY LEAN CLAY WITH SAND (CL)**, brown, hard					10	10-10-11 N=21				
							6	15-10-11 N=21				
		13.5	1166.5	10								
4		**GRAVELLY FAT CLAY (CH)**, red, stiff to hard					14	21-30-42 N=72				
				15								
							11	3-8-7 N=15				
				20								
		22.5	1157.5									
5		**LIMESTONE**, with quartz veins, fine to medium-grained, slightly fractured, laminated bedding, slightly weathered, strong rock					22	22-17	85%			
				25								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A until 23.2', then rock core until 43.2'

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-07-2022 | Boring Completed: 02-07-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-1

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1327° Longitude: -93.4189°

Surface Elev.: 1180.15 (Ft.)

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
5					60	60-53	88%			
		30			60	60-56.5	94%			
		35			60	60-60	100%			
		40			38	38-38	100%			

LIMESTONE, with quartz veins, fine to medium-grained, slightly fractured, laminated bedding, slightly weathered, strong rock *(continued)*

43.2 1137

Boring Terminated at 43.2 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A until 23.2', then rock core until 43.2'

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-07-2022 Boring Completed: 02-07-2022

Drill Rig: #840 Driller: DH

Project No.: B5215110

BORING LOG NO. 7-2

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1327° Longitude: -93.4202°

Surface Elev.: 1193.21 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.2	1193									
		TOPSOIL (2")										
		FILL - LEAN CLAY WITH GRAVEL (CL), brown										
2						X	5	3-8-50 N=58		2.5 (HP)	15.2	
						X	8	5-6-5 N=11		4.0 (HP)	12.3	
		5.0	1188	5								
4		**FAT CLAY WITH GRAVEL (CH)**, red, stiff										
						X	11	6-6-7 N=13		3.0 (HP)	27.4	
		9.0	1184			X	0	41-50/2"		N/A	15.1	
		Refusal at 9 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:
Sampler refusal on possible cobble, boulder, or bedrock.

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-07-2022 | Boring Completed: 02-07-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-3

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1327° Longitude: -93.4205°

Surface Elev.: 1193.7 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.4	1193.5									
4		**TOPSOIL (5")**										
		FAT CLAY WITH GRAVEL (CH), red, soft to stiff										
						X	15	3-2-3 N=5		1.5 (HP)	21.8	
						X	9	4-4-6 N=10		1.5 (HP)	16.7	
				5								
						X	14	4-3-4 N=7		2.75 (HP)	37.9	
						X	5	6-7-6 N=13		1.5 (HP)	38.1	
		10.0	1183.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-07-2022 | Boring Completed: 02-07-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-4

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4214°

Surface Elev.: 1191.18 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6 **ASPHALT (7")**	1190.5									
		1.1 **AGGREGATE BASE COURSE (6")**	1190									
2		**FILL - GRAVELLY FAT CLAY (CL)**, brown				X	6	13-15-7 N=22		1.0 (HP)	7.7	
		5.0	1186									
4		**FAT CLAY WITH GRAVEL (CH)**, red, medium stiff to very stiff		5		X	13	7-9-12 N=21		1.0 (HP)	20.3	
						X	18	3-4-3 N=7		2.5 (HP)	52.2	
		10.0	1181	10		X	14	4-6-9 N=15		2.5 (HP)	53.7	
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-5

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4227°

Surface Elev.: 1193.27 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6 **ASPHALT (7")**	1192.5									
		1.0 **AGGREGATE BASE COURSE (5")**	1192.5									
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**					12	6-5-3 N=8		2.0 (HP)	21.9	
							11	4-6-5 N=11		1.0 (HP)	21.6	
		6.5	1187	5			5	4-50/4"		1.0 (HP)	18.0	
5		**LIMESTONE**, weathered										
		8.0	1185.5									
		Auger Refusal at 8 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:
Auger refusal on possible cobble, boulder, or bedrock.

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-6

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4240°

Surface Elev.: 1196.46 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6	1196									
		ASPHALT (7")										
		1.1	1195.5									
		AGGREGATE BASE COURSE (6")										
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown					13	3-2-3 N=5		2.25 (HP)	22.4	
							8	3-6-7 N=13		2.0 (HP)	31.3	
		5.0	1191.5	5								
4		**FAT CLAY WITH GRAVEL (CH)**, red, medium stiff										
							13	3-6-2 N=8		2.0 (HP)	53.7	
							14	3-3-4 N=7		2.0 (HP)	45.9	
		10.0	1186.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-7

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4250°

Surface Elev.: 1200.32 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6 **ASPHALT (7")**	1199.5									
		1.1 **AGGREGATE BASE COURSE (6")**	1199									
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown				X	6	6-5-4 N=9		3.0 (HP)	16.7	
						X	6	10-8-7 N=15		1.5 (HP)	13.7	
		5.0	1195.5	5								
4		**FAT CLAY WITH GRAVEL (CH)**, red, soft to stiff										
						X	17	3-4-5 N=9		1.5 (HP)	54.3	
						X	17	3-2-1 N=3		N/A	113.0	
		10.0	1190.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-8

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4260°

Surface Elev.: 1205.68 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.7 **ASPHALT (8")**	1205									
		1.1 **AGGREGATE BASE COURSE (5")**	1204.5									
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown					7	5-5-4 N=9		N/A	21.9	
							8	6-6-9 N=15		2.5 (HP)	26.4	
		5.0	1200.5	5								
4		**GRAVELLY FAT CLAY (CH)**, red, stiff to very stiff										
							6	7-10-5 N=15		.5 (HP)	25.3	
							18	4-4-5 N=9		3.0 (HP)	49.4	
		10.0	1195.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-9

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4274°

Surface Elev.: 1212.94 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6	1212.5									
		ASPHALT (7")										
		0.9	1212									
		AGGREGATE BASE COURSE (4")										
2		**FILL - LEAN CLAY (CL)**, brown					6	5-6-4 N=10		2.5 (HP)	23.5	
		4.0	1209									
4		**FAT CLAY WITH GRAVEL (CH)**, red brown, stiff to very stiff		5			9	5-6-8 N=14		3.0 (HP)	25.7	
							14	3-6-7 N=13		2.5 (HP)	33.9	
							9	8-14-9 N=23		1.5 (HP)	23.8	
		10.0	1203	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-10

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1324° Longitude: -93.4283°

Surface Elev.: 1215.51 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6	1215									
		0.9	1214.5									
		ASPHALT (7")										
		AGGREGATE BASE COURSE (4")										
2		**FILL - LEAN CLAY (CL)**, brown					11	3-3-3 N=6		1.0 (HP)	24.9	
							7	3-3-3 N=6		1.5 (HP)	25.3	
		5.0	1210.5	5								
3		**LEAN CLAY WITH GRAVEL (CL)**, brown, stiff										
							5	6-7-6 N=13		1.0 (HP)	26.1	
		8.0	1207.5									
4		**FAT CLAY WITH GRAVEL (CH)**, red brown, hard					4	7-24-18 N=42		N/A	23.2	
		10.0	1205.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-11

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1325° Longitude: -93.4296°

Surface Elev.: 1220.43 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.4	1220									
		0.9	1219.5									
		ASPHALT (5")										
		AGGREGATE BASE COURSE (6")										
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown					8	3-7-5 N=12		1.5 (HP)	19.2	
							12	4-5-6 N=11		2.5 (HP)	25.0	
		5.0	1215.5	5								
3		**LEAN CLAY WITH GRAVEL (CL)**, brown, very stiff										
							8	7-14-12 N=26		2.5 (HP)	21.7	
		7.0	1213.5									
4		**FAT CLAY WITH GRAVEL (CH)**, red, stiff										
							3	12-10-4 N=14		N/A	25.0	
		10.0	1210.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-12

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1325° Longitude: -93.4306°

Surface Elev.: 1225.81 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		0.6	1225									
1		**ASPHALT (7")**										
		1.0	1225									
		AGGREGATE BASE COURSE (5")										
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown					6	3-3-3 N=6		1.0 (HP)	17.2	
		4.5	1221.5									
4		**FAT CLAY WITH GRAVEL (CH)**, red, medium stiff		5			8	4-5-4 N=9		1.5 (HP)	23.2	
		7.2	1218.5									
5		8.0 **LIMESTONE**, weathered	1218				10	3-4-50/4"		1.5 (HP)	51.3	
		Auger Refusal at 8 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:
Auger refusal on possible cobble, boulder, or bedrock.

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-13

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1325° Longitude: -93.4320°

Surface Elev.: 1246.22 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6 **ASPHALT (7")**	1245.5									
		1.1 **AGGREGATE BASE COURSE (6")**	1245									
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown				X	11	3-7-16 N=23		2.0 (HP)	17.5	
		3.0	1243									
3		**GRAVELLY LEAN CLAY (CL)**, brown, hard		5		X	7	11-32-18 N=50		N/A	16.7	
		5.5	1240.5									
4		**FAT CLAY WITH GRAVEL (CH)**, red, stiff				X	9	12-6-4 N=10		3.0 (HP)	33.9	
						X	12	6-6-6 N=12		4.0 (HP)	34.3	
		10.0	1236	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-14

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1325° Longitude: -93.4332°

Surface Elev.: 1251.24 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6	1250.5									
		ASPHALT (7")										
		1.0	1250									
		AGGREGATE BASE COURSE (5")										
2		**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown					5	8-8-3 N=11		1.5 (HP)	21.2	
		3.0	1248									
4		**FAT CLAY WITH GRAVEL (CH)**, red, stiff		5			8	4-5-9 N=14		2.5 (HP)	45.5	
							17	4-4-5 N=9		3.0 (HP)	43.8	
				10			18	6-6-5 N=11		3.0 (HP)	49.8	
		10.0	1241									
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-08-2022 | Boring Completed: 02-08-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-15

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1325° Longitude: -93.4343°

Surface Elev.: 1255.38 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6 **ASPHALT (7")**	1255									
		1.0 **AGGREGATE BASE COURSE (5")**	1254.5									
2		**FILL - GRAVELLY LEAN CLAY (CL)**, brown				X	8	10-8-5 N=13		1.5 (HP)	25.3	
		2.5	1253									
4		**FAT CLAY WITH GRAVEL (CH)**, red, stiff to very stiff										
				5		X	10	4-11-15 N=26		3.5 (HP)	41.0	
						X	10	7-11-3 N=14		3.0 (HP)	43.3	
						X	8	6-14-6 N=20		2.0 (HP)	48.2	
		10.0	1245.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-16

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4356°

Surface Elev.: 1254.67 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		0.6	1254									
1		**ASPHALT (7")**										
		1.0	1253.5									
		AGGREGATE BASE COURSE (5")										
2		**FILL - GRAVELLY LEAN CLAY (CL)**, brown					7	5-11-7 N=18		N/A	18.8	
							12	9-8-4 N=12		1.5 (HP)	27.5	
		5.0	1249.5	5								
4		**FAT CLAY WITH GRAVEL (CH)**, red, medium stiff to very stiff										
							18	3-3-3 N=6		2.5 (HP)	55.9	
							10	7-12-7 N=19		1.0 (HP)	58.8	
		10.0	1244.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-18

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4374°

Surface Elev.: 1259.76 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
		0.7	1259									
1		**ASPHALT (8")**										
		1.1	1258.5									
		AGGREGATE BASE COURSE (5")										
		FILL - LEAN CLAY WITH GRAVEL (CL)				X	5	4-3-4 N=7		N/A	15.7	
2						X	16	1-0-1 N=1		.5 (HP)	24.2	
				5								
						X	8	4-3-3 N=6		2.0 (HP)	20.7	
		8.0	1252									
4		**FAT CLAY WITH GRAVEL (CH)**, red, very stiff				X	8	4-9-12 N=21		2.0 (HP)	19.5	
		10.0	1250	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-19

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4386°

Surface Elev.: 1265.58 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.6	1265									
		ASPHALT (7")										
		1.0	1264.5									
		AGGREGATE BASE COURSE (5")										
2		**FILL - GRAVELLY LEAN CLAY (CL)**, brown					15	6-9-6 N=15		1.5 (HP)	20.4	
		4.0	1261.5									
4		**FAT CLAY WITH GRAVEL (CH)**, red, stiff		5			10	6-9-6 N=15		2.0 (HP)	21.6	
							14	4-6-8 N=14		2.0 (HP)	45.5	
							17	7-8-6 N=14		2.0 (HP)	51.0	
		10.0	1255.5	10								
		Boring Terminated at 10 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-20

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4398°

Surface Elev.: 1271.75 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.5	1271.5									
		0.8	1271									
2			**ASPHALT (6")**									
			AGGREGATE BASE COURSE (4")									
			FILL - GRAVELLY LEAN CLAY (CL), brown				15	9-9-4 N=13		1.5 (HP)	18.5	
		2.5	1269.5									
4			**FAT CLAY WITH GRAVEL (CH)**, red, stiff to very stiff	5			15	6-7-7 N=14		3.5 (HP)	46.9	
							13	6-8-8 N=16		3.0 (HP)	49.8	
							10	7-8-9 N=17		4.0 (HP)	44.7	
		10.0	1262	10								
			Boring Terminated at 10 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-21

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4411°

Surface Elev.: 1279.49 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.5	1279									
		0.8	1278.5									
2			**ASPHALT (6")**									
			AGGREGATE BASE COURSE (4")									
		2.0	**FILL - LEAN CLAY (CL)**, brown, 1277.5				14	6-8-13 N=21		.5 (HP)	21.2	
4			**GRAVELLY FAT CLAY (CH)**, red, stiff									
							7	16-10-5 N=15		N/A	18.6	
		5.3	1274	5								
5			**LIMESTONE**, weathered, Bedrock per driller's notes				0	50/0"				
		7.0	1272.5									
			Auger Refusal at 7 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:
Auger refusal on possible cobble, boulder, or bedrock.

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-22

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4424°

Surface Elev.: 1283.81 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.5	1283.5									
		0.9	1283									
			ASPHALT (6")									
			AGGREGATE BASE COURSE (5")									
2			**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown				14	2-7-9 N=16		.5 (HP)	21.9	
		3.0	1281									
3			**LEAN CLAY WITH GRAVEL (CL)**, brown, very stiff	5			12	8-8-8 N=16		2.0 (HP)	24.6	
		5.5	1278.5									
4			**FAT CLAY WITH GRAVEL (CH)**, red, stiff to very stiff				11	4-9-7 N=16		1.5 (HP)	52.6	
							5	15-10-5 N=15		1.5 (HP)	44.9	
		10.0	1274	10								
			Boring Terminated at 10 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-23

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1326° Longitude: -93.4436°

Surface Elev.: 1291.16 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.5	1290.5									
		0.8	1290.5									
			ASPHALT (6")									
			AGGREGATE BASE COURSE (4")									
2			**FILL - LEAN CLAY WITH GRAVEL (CL)**, brown				14	4-5-12 N=17		4.0 (HP)	22.4	
							5	24-50/4"		1.5 (HP)	17.3	
		5.0	1286	5								
4			**FAT CLAY WITH GRAVEL (CH)**, red, stiff to very stiff				7	4-5-5 N=10		2.0 (HP)	38.5	
							10	8-9-8 N=17		2.5 (HP)	45.9	
		10.0	1281	10								
			Boring Terminated at 10 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

BORING LOG NO. 7-24

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

CLIENT: Burns & McDonnell Engineering Company Inc Kansas City, MO

SITE: Along W. Farm Road 174 Republic, MO

LOCATION See Exploration Plan

Latitude: 37.1327° Longitude: -93.4444°

Surface Elev.: 1296.78 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (Inches)	FIELD TEST RESULTS	RQD (%)	LABORATORY HP (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.5	1296.5									
		0.9	1296									
2			**ASPHALT (6")**									
			AGGREGATE BASE COURSE (5")									
			FILL - GRAVELLY LEAN CLAY (CL), brown				11	11-16-8 N=24		N/A	30.6	
		4.0	1293									
4			**FAT CLAY WITH GRAVEL (CH)**, red, very stiff to hard	5			12	21-20-11 N=31		N/A	20.2	
							15	5-8-11 N=19		2.5 (HP)	45.3	
							7	8-13-32 N=45		N/A	45.1	
		10.0	1287	10								
			Boring Terminated at 10 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
4" C.F.A

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

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 provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Terracon
4765 W Junction St
Springfield, MO

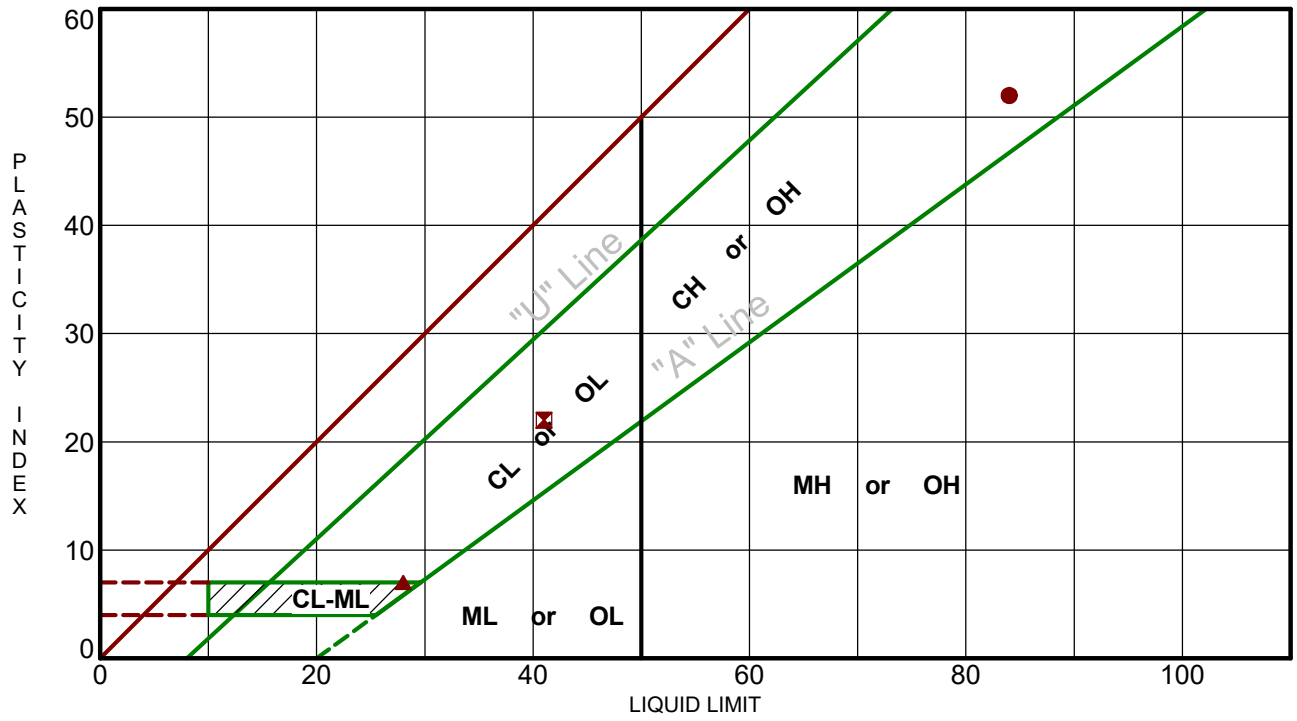
Boring Started: 02-09-2022 | Boring Completed: 02-09-2022

Drill Rig: #840 | Driller: DH

Project No.: B5215110

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth	LL	PL	PI	Fines	USCS	Description
●	B-3	6 - 7.5	84	32	52		CH	Fat Clay
⊠	B-12	3.5 - 5	41	19	22		CL	Lean Clay
▲	B-18	3.5 - 5	28	21	7		CL	Lean Clay

PROJECT: Republic, MO CIP 7- McElhaney Lift Station and Forcemain

SITE: Along W. Farm Road 174 Republic, MO

Terracon
4765 W Junction St
Springfield, MO

PROJECT NUMBER: B5215110

CLIENT: Burns & McDonnell Engineering Company Inc
Kansas City, MO

MMET, Inc • 316 N Airport Rd • Strafford, MO 65757
tel: 417-736-6016 • fax: 417-736-6018 • toll: 877-581-MMET
Email mmet@mmetinc.com Est. 1997

MMET LABORATORY

LABORATORY REPORT

Report Number: M260175
Lab Number: 220302
Report Date: 3/14/2022

Customer: Terracon
4765 W. Junction Street
Springfield, MO 65802
Phone 417-864-5100
Fax 417-864-0871
Cell 417-773-2500 Ripken.Dodson@terracon.com
Email Joshua.Elson@terracon.com Nic.Arens@terracon.com
Purchase Order No. David.Williams@terracon.com

Project Manager: Ripken Dodson, EI Staff Engineer
Project Name: B5215008 & B5215110
Project Location: Republic CIP3 & CIP7
Sample Matrix: Soil
Sampled By: Ripken Dodson, EI Staff Engineer
Sample ID: CIP 7:B-1 Depth: Cumulative
Date Sampled:
Date Received 2/10/2022 1700

Paramter	Method	Results	Units	Date of Analysis	Analyst
Sulfate	AASHTO T290-91	40	mg/Kg	3/11/2022	WAM
Sulfide	SM 4500-S D	< 0.003	mg/Kg	3/11/2022	WAM
Chloride	AASHTO T291	40	mg/Kg	3/14/2022	WAM
pH 1:1	EPA 9045C / AASHTO T289-91	7.08	SU	3/14/2022	WAM
Electrical Conductivity 1:2	SM 2510	366	µS	3/14/2022	WAM
TDS		184	ppm	3/14/2022	WAM
Salt		0.19	ppt	3/14/2022	WAM
Minimum Lab Soil Resistivity	AASHTO T288-91	1,687	Ω cm	3/13/2022	WAM

Report Approved by:

Wayne A. Middleton, Pres., Lab Dir.

SUPPORTING INFORMATION

Contents:

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

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 [$Cc<1$ or $Cc>3.0$] [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 [$Cc<1$ or $Cc>3.0$] [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"		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.

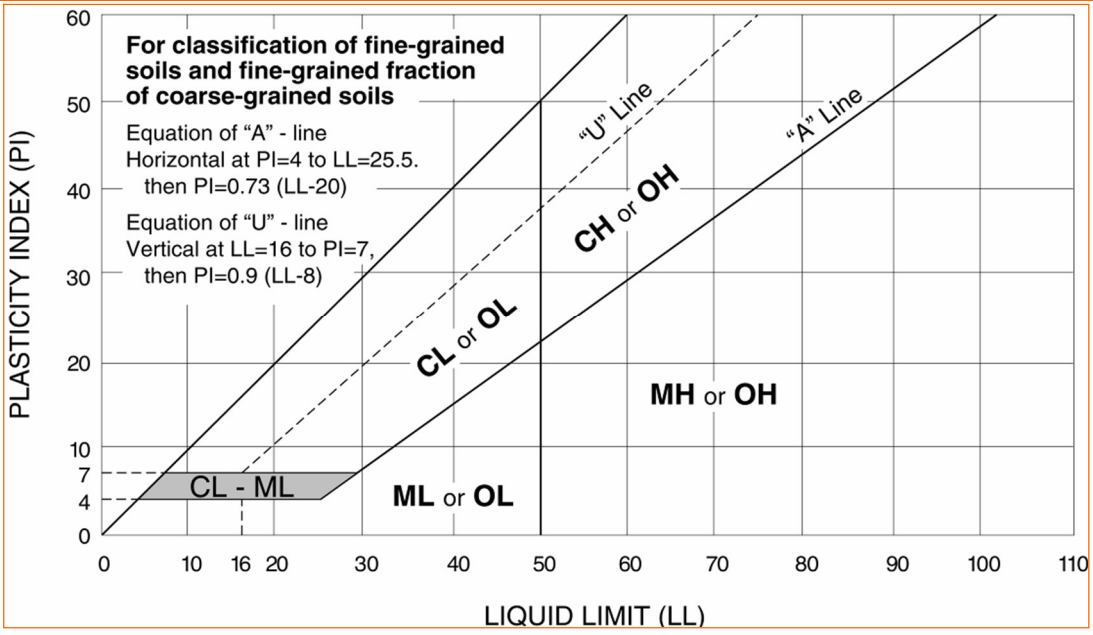
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[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.



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) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. 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

DESCRIPTION OF ROCK PROPERTIES

WEATHERING	
Fresh	Rock fresh, crystals bright, few joints may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, joints stained, some joints may show thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some show clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately severe	All rock except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" no discernible or discernible only in small, scattered locations. Quartz may be present as dikes or stringers.

HARDNESS (for engineering description of rock – not to be confused with Moh's scale for minerals)	
Very hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of hammer required to detach hand specimen.
Moderately hard	Can be scratched with knife or pick. Gouges or grooves to ¼ in. deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 in. deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1-in. maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces 1-in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

Joint, Bedding, and Foliation Spacing in Rock [1]

Spacing	Joints	Bedding/Foliation
Less than 2 in.	Very close	Very thin
2 in. – 1 ft.	Close	Thin
1 ft. – 3 ft.	Moderately close	Medium
3 ft. – 10 ft.	Wide	Thick
More than 10 ft.	Very wide	Very thick

1. Spacing refers to the distance normal to the planes, of the described feature, which are parallel to each other or nearly so.

Rock Quality Designator (RQD) [1]

RQD, as a percentage	Diagnostic description
Exceeding 90	Excellent
90 – 75	Good
75 – 50	Fair
50 – 25	Poor
Less than 25	Very poor

1. RQD (given as a percentage) = length of core in pieces 4 inches and longer / length of run

Joint Openness Descriptors

Openness	Descriptor
No Visible Separation	Tight
Less than 1/32 in.	Slightly Open
1/32 to 1/8 in.	Moderately Open
1/8 to 3/8 in.	Open
3/8 in. to 0.1 ft.	Moderately Wide
Greater than 0.1 ft.	Wide

References: American Society of Civil Engineers. Manuals and Reports on Engineering Practice - No. 56. Subsurface Investigation for Design and Construction of Foundations of Buildings. New York: American Society of Civil Engineers, 1976. U.S. Department of the Interior, Bureau of Reclamation, Engineering Geology Field Manual.

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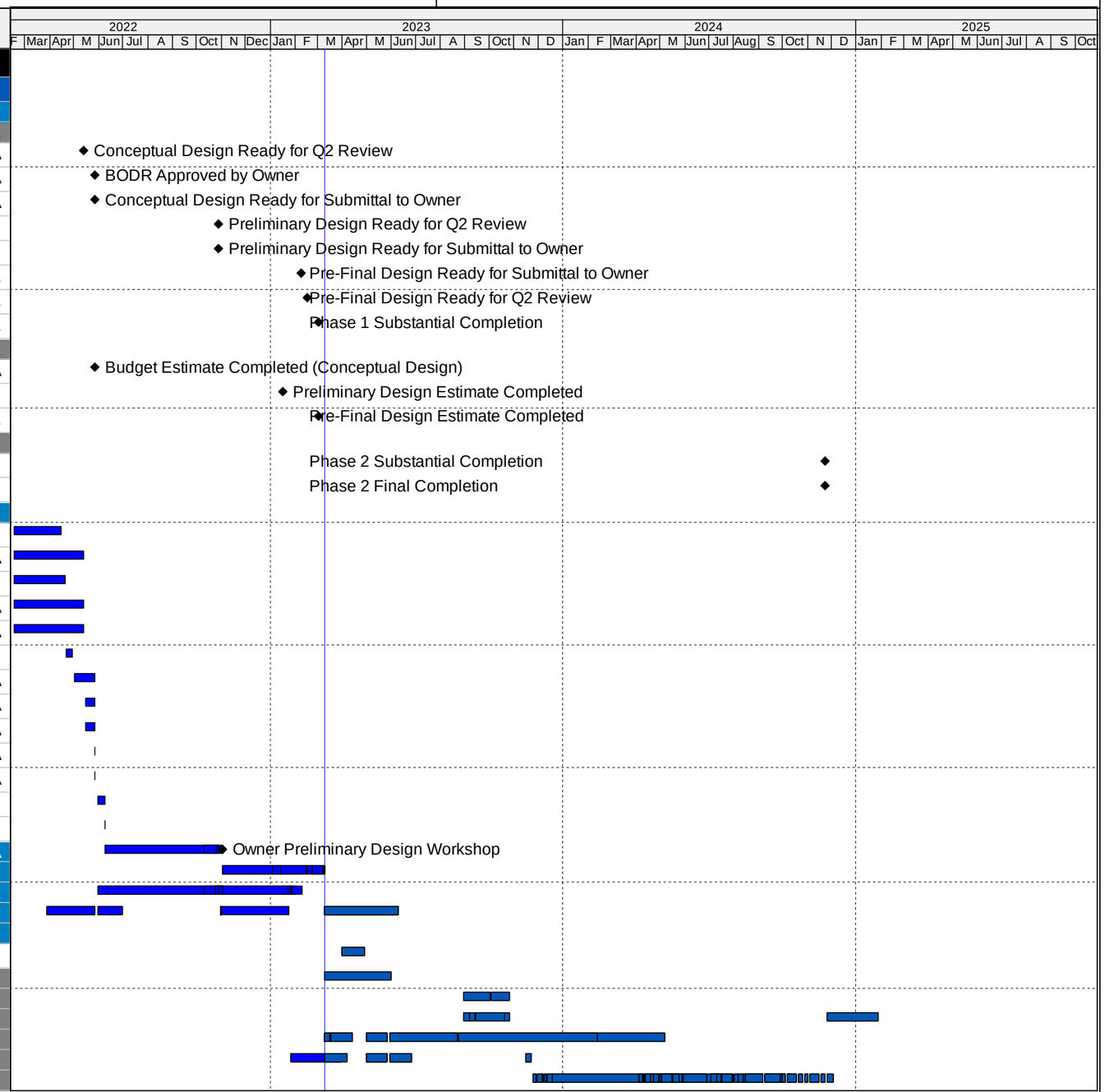
EXHIBIT J – PROJECT SCHEDULE

Republic, MO WWTP - CIP7

Activity ID	Activity Name	Remaining Duration	Start	Finish
Republic, MO WWTP - CIP7		479	16-Feb-22 A	28-Jan-25
CIP7 Schedule		479	16-Feb-22 A	28-Jan-25
Major Milestones		0	13-May-22 A	22-Nov-24
Engineering		0	13-May-22 A	01-Mar-23 A
CIP7-MS-30-1	Conceptual Design Ready for Q2 Review	0		13-May-22 A
CIP7-MS-1170	BODR Approved by Owner	0		27-May-22 A
CIP7-MS-30-2	Conceptual Design Ready for Submittal to Owner	0		27-May-22 A
CIP7-MS-60-1	Preliminary Design Ready for Q2 Review	0		28-Oct-22 A
CIP7-MS-60-2	Preliminary Design Ready for Submittal to Owner	0		28-Oct-22 A
CIP7-MS-90-2	Pre-Final Design Ready for Submittal to Owner	0		08-Feb-23 A
CIP7-MS-90-1	Pre-Final Design Ready for Q2 Review	0		15-Feb-23 A
CIP7-MS-100	Phase 1 Substantial Completion	0		01-Mar-23 A
Estimating		0	27-May-22 A	01-Mar-23 A
CIP7-MS-30-EST	Budget Estimate Completed (Conceptual Design)	0		27-May-22 A
CIP7-MS-60-EST	Preliminary Design Estimate Completed	0		16-Jan-23 A
CIP7-MS-90-EST	Pre-Final Design Estimate Completed	0		01-Mar-23 A
Construction		0	22-Nov-24	22-Nov-24
CIP7-MS-100-CN	Phase 2 Substantial Completion	0		22-Nov-24
CIP7-MS-101-CN	Phase 2 Final Completion	0		22-Nov-24
BODR & Conceptual Design		0	16-Feb-22 A	08-Jun-22 A
CIP7-BODR-1240	Site Investigation and Data Review	0	16-Feb-22 A	15-Apr-22 A
CIP7-BODR-1280	Conceptual Design	0	16-Feb-22 A	13-May-22 A
CIP7-BODR-1110	Prepare BODR	0	16-Feb-22 A	20-Apr-22 A
CIP7-BODR-1130	Prepare and Submit Drawing List	0	16-Feb-22 A	13-May-22 A
CIP7-BODR-1140	Prepare and Submit Specification List	0	16-Feb-22 A	13-May-22 A
CIP7-BODR-1120	BODR Q3/Q4 Review and Incorporate Comments	0	21-Apr-22 A	29-Apr-22 A
CIP7-BODR-1010	BODR Review & Approval by Owner	0	02-May-22 A	27-May-22 A
CIP7-BODR-1030	Budget Estimate (Conceptual Design)	0	16-May-22 A	27-May-22 A
CIP7-BODR-1330	Conceptual Design Q2 Review and Incorporate Cor	0	16-May-22 A	27-May-22 A
CIP7-BODR-1007	Site Plan Finalized	0	27-May-22 A	27-May-22 A
CIP7-BODR-1260	Primary Power Feed Finalized	0	27-May-22 A	27-May-22 A
CIP7-BODR-1650	Conceptual Design Documents Review and Approv	0	31-May-22 A	08-Jun-22 A
CIP7-BODR-1020	Owner Conceptual Design Workshop	0	08-Jun-22 A	08-Jun-22 A
Preliminary Design		0	09-Jun-22 A	02-Nov-22 A
Pre-Final Design		0	02-Nov-22 A	10-Mar-23
CDB Tasks		0	31-May-22 A	09-Feb-23 A
Environmental Permitting		65	28-Mar-22 A	09-Jun-23
Phase 2		479	27-Jan-23 A	28-Jan-25
CIP7-PH2-1100	Execute DB Phase 2 Contract	21	31-Mar-23	28-Apr-23
IFC Design		58	10-Mar-23	31-May-23
NPDES Stormwater Permit		41	30-Aug-23	26-Oct-23
Permitting (TBD)		358	30-Aug-23	28-Jan-25
Procurement		296	10-Mar-23	07-May-24
Subcontracts		181	27-Jan-23 A	22-Nov-23
Construction		260	24-Nov-23	02-Dec-24



Report Date: 10-Mar-23

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EXHIBIT K – PRE-FINAL DESIGN DOCUMENTS

The Pre-final Design Documents consist of the Work Description and Pre-Final Design Drawings.

Work Description

This Work Description identifies major definable components of the Project as they can be defined at the time that the Agreement was prepared. In addition to the major components called out herein, the Work Description outlines the general requirements for each design element. The intent of this document is to establish the scope and criteria of products, materials, and equipment to be furnished and install under the Agreement. The Design-Builder will develop the final design documents and construct the Work in accordance with the criteria identified herein.

010000 GENERAL CONDITIONS

1. All supervision, administrative costs, and temporary facilities necessary to construct the work.
2. Owner to provide sales tax exemption certificate for the project. Sales tax will be exempt for all permanent materials incorporated into the project.
3. There are no applicable local building permits for the project.
4. Any chemicals required for startup, testing or operation of the facility will be provided by Owner.
5. Builders risk insurance will be provided by Design-Builder.
6. Design and construction administration are included for the duration of the schedule.
7. Design will be completed pursuant to the codes listed below:
    a. International Building Code (IBC), 2018 Edition
    b. International Energy Conservation Code (IECC), 2018 Edition
        i. Climate Zone: 4A
    c. International Mechanical Code (IMC), 2018 Edition
    d. International Plumbing Code (IPC), 2018 Edition
    e. International Fuel Gas Code (IFGC), 2018 Edition
    f. National Electric Code (NEC), 2017 Edition
8. Civil testing lab services will be performed by a 3rd party and paid for by the Design-Builder, including civil testing for soil, concrete, and/or asphalt testing. This testing includes:
    a. Concrete air and slump testing
    b. Concrete compressive cylinder testing
    c. Soils proctors
    d. Soils and aggregate compressive testing
9. Testing Provided by the applicable trade subcontractor include:
    a. Hydrostatic pipe testing
    b. Cable Megger Testing
    c. Grounding System Testing
10. Performance, payment and statutory bonds are included for the entire contract amount.
11. O&M's supplied by equipment suppliers shall be turned over to the Owner, paper (3 sets) and electronic PDF form.
12. Work shall be completed in accordance with all applicable Federal and State rules, regulations, and requirements as well as the applicable City standards.
13. All work and materials in accordance with AWWA where required.
14. This project is subject to current prevailing wages as of the date of the contract execution.
15. No costs are included for any special inspections required by the current IBC.
16. In the event that there are discrepancies between the Technical Memoranda and this document, this document shall govern.
17. Short Circuit, Coordination, and Arc Flash Studies are not included.

010100 SPECIAL SITE CONDITIONS

1. No hazardous or special waste are known of at this time or anticipated to be encountered in the course of this project.
2. No provisions for groundwater are included. Normal surface water will be handled by small, localized pumps and are assumed to be discharged to the stormwater system.

010150 OWNER FURNISHED ITEMS

1. Operation and maintenance of existing facilities during construction.
2. Land acquisition easements or Right-of-Way as required.
3. Cost of offsite utility upgrades if required.
4. Emergency backup generator, including fuel, until permanent generator is commissioned.
5. Permanent water, sewer, and gas connection fees will be paid by the Owner.

013300 SUBMITTALS

1. Design Builder will provide shop drawings for major process and electrical equipment to the Owner for review and comment. Owner will provide comments within 10 business days.
2. Design-Builder will provide Conformed to Construction Drawings.

015000 CONSTRUCTION EQUIPMENT

1. All construction equipment necessary to complete the work is included.

015100 TEMPORARY UTILITIES AND FACILITIES

1. Design-Builder will provide temporary sanitary facilities to support the construction staff.
2. Design-Builder has excluded cost for electricity consumed during construction. Owner will pay Utility directly for power used during construction.
3. Design-Builder has excluded cost for water consumption during construction. Water will be provided to Design-Builder at no cost. Design-Builder will be responsible for conveyance of water from the Owner's source to the Work as required, including providing and installing temporary piping and/or hoses.

015200 FIELD OFFICES AND SHEDS

1. Design-Builder will supply field offices and sheds as required.

015700 TEMPORARY BARRIERS AND CONTROLS

1. Design-Builder will provide all barriers and controls necessary to complete the work.
2. Design-Builder will provide dust and erosion control BMPs and maintenance as required.
3. Design-Builder will provide any temporary access roads and construction staging as required.

031000 FORMWORK

1. Exterior Form
    a. Fill any repairable honeycomb; patch all tie holes.
    b. All wall surfaces will have a formed finish.
    c. Joints to be noticeable, but not protruding. Grind all form fins over ½".
    d. Chamfer all exposed edges.

032000 REINFORCING

1. Deformed Bars: ASTM A615, Grade 60.
2. Welded Wire Fabric: ASTM A1064.
3. No epoxy coated reinforcement except at driveway dowels.

033000 CONCRETE

1. ASTM C 150 Type I/II or ASTM C595 Type IL (MS) with Type F fly ash.
    a. Fly ash shall be omitted if Type F is not available.
    b. If ASTM C595 Portland Lime Cement (PLC) is used, Type IL (HS) is also acceptable.
    c. Silica fume may be substituted up to 10% replacement of Portland Cement (PC) or Portland Lime Cement (PLC)

1. 1” nominal maximum aggregate, air entrained.
2. 28-Day Compressive Strength:
    a. Mud slabs (seal slabs): 2,000 psi
    b. Fill and encasement – 3,000 psi
    c. Site pavements, curbs, gutters, sidewalks: 4,000 psi
    d. Structural concrete: 4,500 psi
3. All concrete supplied for the project will meet the latest applicable code.
4. Foundations
    a. All foundations will be supported on minimum of 24” of engineered structural fill or 12” of engineered structural fill if supported on bedrock.

034120 PRECAST CONCRETE

1. 28-Day Compressive Strength: As determined by precast manufacturer design.

050519 CONCRETE ANCHORS

1. For wet or submerged service: AISI Type 304 or 316 stainless steel adhesive anchors where indicated.
2. Other exterior applications: AISI type 304 stainless steel wedge or adhesive anchors.
3. Low corrosion potential: galvanized wedge or adhesive anchors

051200 METALS

1. Wet Well Trench:
    a. Grating: 1” AISI Type 316 stainless steel type 19-W-4
    b. Embedded angles:
        - AISI Type 316 stainless steel
        - Welding shall conform to AWS D1.6
    c. Headed studs: AISI Type 316 stainless steel

07 16 00 DAMPPROOFING

1. Apply to exterior of concrete walls at the following locations:
    a. Lift Station Valve Vault
    b. Lift Station Meter Vault
2. Product: Coal Tar-Epoxy Dampproofing:
    a. Tnemec Tneme-Tar Hi Build Series 46H-413; 16-20 mils DFT.
        - Or Engineer Approved Equal
3. Bituminous Dampproofing:
    a. General: Provide products recommended by manufacturer for designated application and suitable for service intended.

b. Cold-Applied, Coal Tar-Epoxy Dampproofing: Roll or spray applied heavy-duty water-resistant epoxy coating made with pitch for protection of concrete from severe chemical fumes and corrosive vapors. Coating shall be suitable for buried or immersion conditions.

083483 ACCESS HATCHES

1. Wet well and vault hatches shall be of aluminum construction.

260000 ELECTRICAL

1. All work to be completed per National Electric Code (2020).
2. All electrical equipment shall be UL listed.
3. All equipment to be new and unused.
4. Includes trenching, excavation and backfill per design documents for electrical conduits.
    a. Concrete encasement (minimum 4,000 psi) under all main drives. Flowable fill used for backfill material for all other areas.
    b. All conduits installed below grade shall be installed 30-inches or more to be under frost depth.
5. Includes install of vendor supplied control panels and equipment. Design-Builder to furnish and install all conduit/conductors as needed for a complete functional system.
6. General Material Uses and Types:
    a. Power conductors shall be type XHHW copper, single stranded conductor, for all 480Vac loads.
    b. Lighting and 120Vac branch circuits shall be type THHN/THWN stranded copper.
    c. Control wiring shall be single conductor XHHW stranded, conductor size per contract drawings.
    d. Instrument wiring shall be TC #18TSP.
    e. Underground conduit shall be SCHED 40 PVC, conduit elbows and risers shall be PVC coated RGS. All conduit installed below grade shall be as indicated on contract drawings. Where encased, conduits shall have a minimum of 3-inches of concrete around all conduits, backfill with fill dirt and seed accordingly.
    f. Underground service conduit installation shall be per Liberty Utility design standards.
    g. All above grade conduit shall be Rigid Aluminum.
    h. All exterior strut and mounting hardware shall be 304 stainless steel. All interior strut and mounting hardware shall be aluminum.
    i. All concrete anchors, washers and nuts shall be 304 stainless steel.
    j. Connections to equipment may be LTFMC (aluminum core), for lengths not to exceed max. 36”.
    k. Provide all conduit seal fittings as required.
    l. All pilot lights shall be push-to-test.
    m. Provide weatherproof while-in-use covers for all exterior receptacles. Provide weatherproof covers for all exterior light switches.
7. Exterior Pull Boxes/Junction Boxes/Wireway:
    a. All exterior boxes shall be NEMA 4X Stainless Steel.
    b. Size as Required.
8. Grounding location and size shown on Contract Drawings.
    a. All ground rods shall be ¾” x 10’-0” copper clad.
    b. All grounding conductor shall be Tinned Copper.
    c. Grounding conductor encased in Concrete shall be Bare Copper.
    d. Connections shall be exothermic weld or irreversible splice for cable to cable, cable to ground rod, cable to equipment.

9. Supply, Installation, startup, and connections for the following.
    a. One (1) 400kW generator
        i. Spare parts shall include:
            1. Two complete sets of oil, air and fuel filters.
            2. One quart of touch-up paint.
            3. Two spare sets of fuses of each type and rating.
    b. One (1) 600A automatic transfer switch with integral surge protector
    c. One (1) 600A power panel
    d. Three (3) 160 HP VFDs with integral bypass
    e. One (1) lighting panel

312050 SITE EXCAVATION / BACKFILL

1. Site to be stripped and stockpiled as required; all materials to be utilized or wasted on site.
2. Stockpile top 6” of topsoil from site excavation.
3. Excavation shall be as necessary to construct structures in accordance with the drawings.
4. Over excavation of lean clay to fat clay and fat clay material is excluded. If over-excavation is required, payment for over-excavation will be through owner allowance.
5. Fill will be native, onsite material except as indicated at select structures.
6. Excess spoils will be wasted on site or at City provided dump site.
7. Fill will be native, onsite material if lean clay and clayey sand is available. If lean clay is not available onsite, MODOT type 1 or Type 5 aggregate shall be used for fill material below slab.
8. Lean clay and clayey sand shall be at Optimum Moisture Content to 4 percent above Optimum Moisture Content. Granular shall be workable moisture content and shall not pump when proof-rolled.
9. Imported fill materials compacted to at least 95 percent of Standard Proctor with material listed above, maximum 9-inch lifts when using heavy self-propelled compaction equipment or maximum 6-inch lifts when using hand guided or light self-propelled equipment.
10. In situ soil or compacted material to 95 percent of Standard Proctor under structures or roadways, maximum 9-inch lifts when using heavy self-propelled compaction equipment or maximum 6-inch lifts when using hand guided or light self-propelled equipment.
11. Site grading and backfilling of Structures to 90 percent of Standard Proctor.
12. Backfill around structure walls will be completed with on-site soils to extent possible
13. 4” aggregate bedding below and 12” above pipe – ¾ -inch open graded materials.

321123 CRUSHED AGGREGATE BASE COURSE

1. For new City of Republic Streets asphalt pavement base, 6-inches of MODOT type 5 aggregate base.
2. For new Greene County Streets asphalt pavement base, 4-inches of MODOT type 5 aggregate base
3. For new asphalt driveway base, 6-inches of MODOT type 5 aggregate base.
4. For new asphalt sidewalk detail, 6-inches of MODOT type 5 aggregate base.
5. For new concrete curb and gutter, 6-inches of MODOT type 1 aggregate base.
6. For new concrete driveways base, 4-inches of MODOT type 4 aggregate base.
7. For new gravel driveway bases, 8-inches of MODOT type 5 aggregate base
8. For structural fill below structures where required, MODOT Type 5.

321214 PRIME COAT

1. MC-30 Cutback Bitumen per ASTM D2027

321215 TACK COAT

1. SS-1 Asphalt Emulsions per ASTM D977

32 12 17 HOT MIX ASPHALT

1. Mix design conforms to Section 401 of Missouri Standard Specifications for Highway Construction, Latest Edition for Composition of the Mix
2. For new City of Republic Streets asphalt pavement, 6-inches of mix BB, overlaid by 2-inches of BP-1 or BP-2
3. For new Greene County Streets asphalt pavement base, 5-inches of mix BB, overlaid by 2-inches of BP-1 or BP-2
4. For new asphalt driveway base, variable depth of mix BB to match existing depth, overlaid by 2-inches of BP-1 or BP-2
5. For new asphalt sidewalk detail, , 5-inches of mix BB

321600 CONCRETE WALKS CURBS AND GUTTERS

1. New concrete sidewalks, 4-inches thick, 4-foot control joints.
2. New concrete aprons, 5-minimum inches thick Pavement Concrete or Class B-1 concrete in accordance with Section 501 of Missouri Standard Specifications for Highway Construction, Latest Edition, 10-foot each way control joints.

323113 CHAINLINK FENCES AND GATES

1. Fence and gates to conform to federal specifications RR-F-191
2. All materials are galvanized in conformance with FS RR-F-191J/GEN
3. Fence fabric height of 6-foot, with barbed wire
4. Gate widths as indicated.

329200 SEEDING

1. Return stripped topsoil and fine grade site and seed any disturbed areas.
2. Seed will be standard contractor mix consisting of Alta Fescue, Rye Grass, Kentucky Blue Grass, and Creeping Red Fescue.

330524 UTILITY CASINGS

1. Sizes as indicated, steel casing with fusion boded epoxy and abrasion resistant overcoat

331100 PRESSURE PIPE

1. Ductile iron pipe shall conform to AWWA C115, C150 and C151
2. Buried ductile iron pipe shall be mechanical and push-on type, cement lined.
3. Interior ductile iron pipe shall be flanged and drilled ANSI B16.1 Class 125.
4. Pipe supports for piping located above ground shall be stainless steel.
5. Buried sanitary sewer forcemain shall be PVC C-905 DR-25 with ductile fittings.

331216 UTILITY VALVES AND ACCESSORIES

1. Eccentric plug valves
    a. Design
        i. Style: Flanged, ANSI B16.1, Class 125
        ii. Port areas shall be at least 80% of full pipe area

b. Materials of Construction
    i. Body: ASTM A126 Class B Cast iron
    ii. Plug: ASTM A126 Class B Cast iron or ASTM A536 ductile iron. Resilient plug or body seats shall be Buna N or approved equivalent compound suitable for wastewater use.
    iii. Seat ring: corrosion resistant stainless steel, nickel, or Monel.
    iv. Exposed fastening hardware: zinc plated or stainless steel.
c. Actuators
    1. 2-inch nut actuator for use with tee handle valve key
    2. Handwheels shall be located in positions indicated on drawings

2. Standard Swing Check Valves
    a. Design
        i. Conform to AWWA C508
        ii. Style: Flanged, ANSI B16.1, Class 125
    b. Materials of Construction
        i. Body and cover: Cast iron
        ii. Rubber faced discs or disc rings: Buna N for use in wastewater application
3. Air Valves
    a. Design
        i. Conform to AWWA C512
        ii. Style: Heavy duty combination air release style
    b. Materials of Construction
        i. Body and cover: ASTM A126 Class B Cast iron or ASTM A536 ductile iron
        ii. Float: Stainless steel
        iii. Internal parts: Stainless steel
    c. Operation
        i. Release air when filling line
        ii. Release accumulated air while pipeline is full and operating under pressure
    d. Connection
        i. Tapped bosses or flanged outlets
        ii. Connecting fittings and pipe shall be bronze, brass, or copper rated for 150 psi service
        iii. Isolation valves shall be provided and shall be bronze gate valves

333113 GRAVITY PIPE

1. Buried sanitary sewer pipe shall be minimum SDR 26 PVC with PVC fittings.

333222 SUBMERSIBLE PUMPS

1. Three (3) submersible pumps capable of pumping raw wastewater sewage with up to 3-inch diameter spherical solids. Includes pump casings, shafts, bearings, seals, piping assemblies, guide rails, anchor bolts, motors, controls, power cable and accessories required for proper installation, operation, and maintenance.
    a. Design
        i. Operation: 2 duty/1 standby
        ii. Duty point: 3,500 gpm at 170 feet of Total Dynamic Head
        iii. Maximum motor HP: 140 hp
        iv. Motor: Variable Frequency Drive
        v. Pump discharge connection to receive discharge connection without bolts
    b. Materials of Construction
        i. Motor housing, pump casing, and major components shall be cast iron conforming to ASTM A48
        ii. Impeller: Hard iron or equivalent design

c. Pump model
    i. Sulzer Model XFP

333900 UTILITY STRUCTURES

1. All structures shall be pre-cast in accordance with 034120.
2. Air Release Valve vaults to have interior epoxy coating
3. Coal-tar waterproofing on all exterior wall from base slab to grade

400000 INSTRUMENTATION AND CONTROLS

1. Field Equipment, including:
    a. 14” Magnetic Flow Meter, including accessories.
    b. 4 Float Level Switches, including accessories.
    c. 1 Analog level transmitter
    d. 1 Pressure gauge.
2. Lift Station Control panel
    a. Float based control with PLC (CompactLogix) primary mode and relay backup.
    b. Panel to include:
        i. • 120VAC TVSS
        ii. • UPS outlet and cord set
        iii. • Mount and wire pump protection module for each pump (supplied by pump manufacturer)
        iv. Cellular Router
        v. UPS, and required power supplies.
        vi. Intrinsically safe relays, pilot lights, pump pilot controls, and other panel components as required.
3. Other Services
    a. SCADA System Programming and Screen Development
    b. Telemetry Startup, testing, and tie in with WWTP
    c. Instrumentation and control system startup, calibration and testing.
    d. On-site training.
    e. Approval of submittals and O&M Documentation.
4. Spare parts
    a. Fuses: Provide two of each type used
    b. Two spare LED indicating lamps for each type and color used.

BURNS McDONNELL

Pre-final Design Drawings

The Pre-final Design Drawing package includes the drawings listed below. All drawings are Revision C dated January 11, 2023.

CONTRACT DRAWINGS

GENERAL DRAWINGS

DRAWING NO	DRAWING TITLE
G001	COVER
G002	INDEX
G003	GENERAL NOTES

CIVIL DRAWINGS

DRAWING NO	DRAWING TITLE
C001	FORCEMAIN PLAN & PROFILE SHEET 1
C002	FORCEMAIN PLAN & PROFILE SHEET 2
C003	FORCEMAIN PLAN & PROFILE SHEET 3
C004	FORCEMAIN PLAN & PROFILE SHEET 4
C005	FORCEMAIN PLAN & PROFILE SHEET 5
C006	FORCEMAIN PLAN & PROFILE SHEET 6
C007	FORCEMAIN PLAN & PROFILE SHEET 7
C008	FORCEMAIN PLAN & PROFILE SHEET 8
C009	FORCEMAIN PLAN & PROFILE SHEET 9
C010	FORCEMAIN PLAN & PROFILE SHEET 10
C011	MCELHANEY LIFT STATION DEMO PLAN
C012	MCELHANEY LIFT STATION SITE PLAN
C013	CIVIL DETAILS 1
C014	CIVIL DETAILS 2

ARCHITECTURAL DRAWINGS

DRAWING NO	DRAWING TITLE
A001	ARCHITECTURAL LEGEND & ABBREVIATIONS
A002	ARCHITECTURAL GENERAL NOTES
A003	ELECTRICAL BUILDING FLOOR PLAN
A004	ELECTRICAL BUILDING ELEVATIONS
A005	ELECTRICAL BUILDING SECTION
A006	ELECTRICAL BUILDING ROOF PLAN, SCHEDULES AND DETAILS

STRUCTURAL DRAWINGS

DRAWING NO	DRAWING TITLE
S001	LEGEND, ABBREVIATIONS, AND GENERAL NOTES
S002	STRUCTURAL STANDARD DETAILS SHEET 1

S003	STRUCTURAL STANDARD DETAILS SHEET 2
S004	STRUCTURAL STANDARD DETAILS SHEET 3
S005	ELECTRICAL BUILDING FOUNDATION PLAN AND SECTION
S006	WET WELL PLANS
S007	WET WELL SECTIONS
S008	VALVE VAULT PLANS AND SECTIONS

MECHANICAL DRAWINGS

DRAWING NO	**DRAWING TITLE**
M001	GENERAL NOTES, ABBREVIATIONS, & LEGEND
M002	MECHANICAL SCHEDULES, DETAILS & SEQUENCE OF OPERATIONS
M003	ELECTRICAL ROOM HVAC PLAN

PROCESS DRAWINGS

DRAWING NO	**DRAWING TITLE**
DI001	P&ID LEGEND, ABBREVIATIONS, & GENERAL NOTES SHEET 1
DI002	P&ID LEGEND, ABBREVIATIONS, & GENERAL NOTES SHEET 2
DI003	P&ID LEGEND, ABBREVIATIONS, & GENERAL NOTES SHEET 3
DI004	LIFT STATION P&ID
D001	PROCESS LEGEND, ABBREVIATIONS, AND GENERAL NOTES
D002	PROCESS STANDARD DETAILS
D003	LIFT STATION PLAN & SECTION

ELECTRICAL DRAWINGS

DRAWING NO	**DRAWING TITLE**
E001	ELECTRICAL LEGEND
E002	MCELHANEY LIFT STATION ELECTRICAL DEMO PLAN
E003	MCELHANEY LIFT STATION ELECTRICAL SITE PLAN
E004	ELECTRICAL POWER AND CONTROL SINGLE LINE DIAGRAMS
E005	CONTROL SCHEMATICS SHEET 1 OF 2
E006	CONTROL SCHEMATICS SHEET 2 OF 2
E007	WIRING DIAGRAMS
E008	ELECTRICAL ROOM LAYOUT
E009	ELECTRICAL DETAILS AND SECTIONS