Architectural
Structural
Geotechnical

Employee Owned

Materials Testing
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Civil/Planning

PRELIMINARY SUBSURFACE SOIL INVESTIGATION

Parklands Village 2

Aurora, Colorado

PREPARED FOR:

Ventana Capital
9801 East Easter Avenue
Centennial, CO 80112

JOB NO. 186966

December 29, 2021

Respectfully Submitted,
RMG – Rocky Mountain Group

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Geotechnical Staff Engineer

Reviewed by,
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Geotechnical Project Manager

TABLE OF CONTENTS

GENERAL SITE AND PROJECT DESCRIPTION

Project Description

The site is located in the eastern portion of Aurora, Colorado east of the City of Denver and Toll Road E-470, approximately ½ mile south of East 1st Avenue. The approximate size of the site is 413 acres and bound to the west by East Harvest Road, to the West by South Powhaton Road, to the north by East Alameda Avenue, and to the south by East Mississippi Avenue.

RMG – Rocky Mountain Group was retained to explore the subsurface conditions at the site and develop preliminary geotechnical engineering recommendations for design and construction. Based on information provided by our client, it is our understanding the proposed construction is to consist subdividing the existing property and developing it with single- and multi-family residential structures. It has been assumed that excavations will not exceed 9 feet deep from the existing ground surface. If the proposed construction differs from the information provided or the assumptions made, RMG should be contacted immediately to review the differences and how they may impact construction and design of the proposed construction.

Existing Site Conditions

The site is primarily undeveloped land, however site is currently developed on the eastern side by two oil and gas wells located adjacent to South Powhaton Road and a single-family residence with a barn and ancillary structures on the western-central portion of the site. It is our understanding that the oil and gas wells are to remain. The existing vegetation consists of native grasses, cultivated vegetation, and weeds. The topography of the site consists of gentle hills with an overall slope that trends down to the south and west.

FIELD INVESTIGATION AND LABORATORY TESTING

Drilling

The subsurface conditions on the site were investigated by drilling twenty-one (21) test borings at the above-referenced site. The layout of the site and the approximate location of our explorations are provided in Figure 1.

The test borings were advanced with a power-driven, continuous-flight auger drill rig. Samples were obtained in general accordance with ASTM D-1586 utilizing a 2-inch OD split-barrel sampler or in general accordance with ASTM D-3550 utilizing a 2½-inch OD modified California sampler. An Explanation of Test Boring Logs is presented in Figure 2. The Test Boring Logs are presented in the Figures section at the end of this report.

Laboratory Testing

The moisture content for the recovered samples was obtained in the laboratory. Grain-size analysis, Atterberg Limits, and Denver Swell/Consolidation tests were performed on selected samples for purposes of classification and to develop pertinent engineering properties. A Summary of Laboratory Test Results are presented in the Figures section at the end of this report.

SUBSURFACE CONDITIONS

Subsurface Materials

The subsurface materials encountered in the test borings were classified using the Unified Soils Classification System (USCS) and the materials were grouped into the general categories of silty to clayey sand to sandy clay. Underlying the native soils alternating sandstone and claystone bedrock was encountered in the majority of the borings from a depth of approximately 2 feet to 24 ½ feet. Layers of highly organic Peat/Lignite was also encountered, interbedded in the claystone in three borings, B-11, 15, and 17, from approximately 22 to 28 feet below existing grade.

Additional descriptions and the interpreted distribution (approximate depths) of the subsurface materials are presented on the Test Boring Logs. The classifications shown on the logs are based upon the engineer's classification of the samples at the depths indicated. Stratification lines shown on the logs represent the approximate boundaries between material types and the actual transitions may be gradual and vary with location.

Groundwater

Groundwater was observed in three of the test borings, B-11, 17, and 22, from approximately 12 to 21 feet below existing grade at the time of field exploration. When these borings were checked 24 hours after drilling groundwater had risen in each boring by 1 ½ to 2 ½ feet above the original observed depth. Fluctuations in groundwater and subsurface moisture conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Development of the property and adjacent properties may also affect groundwater levels. Contractors should always be prepared to control groundwater during construction.

CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the test borings and on the project characteristics previously described. If conditions are different from those described in this report or the project characteristics change, RMG should be retained to review our recommendations and adjust them, if necessary.

Geotechnical Considerations

Loose surficial soils were encountered across the parcel in a majority of the Test Borings. The surficial soils are a mixture of nil- to moderately-expansive sandy soils and low- to highly-expansive clay soils and claystone bedrock. Potentially compressible and highly organic Peat/Lignite was encountered in several borings below 20 feet, if encountered at depths shallower than 20 feet during the foundation geotechnical exploration additional mitigation measures may be required. Groundwater was encountered during drilling and is not anticipated to influence foundation design and construction for excavations shallower than 9 feet.

Preliminary foundation design recommendations, based on the field investigation and laboratory testing, are presented below. It must be understood that these recommendations are preliminary in nature and a final, detailed, Geotechnical Investigation should be completed after mass overlot grading is complete to verify the preliminary recommendations and provide final foundation recommendations for each, individual lot in the subdivision.

Overexcavation and Replacement

We understand the client is interested in shallow foundation recommendations in lieu of deep foundation methods. These shallow foundation methods are likely to be conventional spread footings supporting reinforced grade beams, supported upon structural fill.

The on-site clay soils exhibit swell potential and are not considered suitable for direct support of shallow foundations. The recommended mitigations for clay soils are as follows:

> Conventional Spread Footing Foundations:
> This will require removal (overexcavation) and replacement with **moisture-conditioned structural fill** to a depth which results in at least 5 feet of compacted structural fill below foundation components and floor slabs. The zone of overexcavation shall extend at least 5 feet beyond the building foundation perimeter. The structural fill should be observed and tested during placement as indicated under the **Moisture-Conditioned Structural Fill** section of this report, to ensure proper compaction.
>
> Imported Non-Expansive Structural Fill:
> In lieu of on-site moisture-conditioned structural fill, **imported non-expansive, granular structural fill** may be used below foundation components and floor slabs. This will require removal (overexcavation) and replacement with at least 4 feet of compacted structural fill below foundation components and floor slabs. The zone of overexcavation shall extend at least 4 feet beyond the building foundation perimeter. The structural fill should be observed and tested during placement as indicated under the **Granular Structural Fill** section of this report, to ensure proper compaction.

It is important to note that these are just preliminary overexcavation recommendations. After completion of the final Geotechnical Investigation, the overexcavation depths are subject to change depending on the findings of the final report.

Preliminary Foundation Recommendations

Shallow foundations bearing atop one type of structural fill after removal, re-conditioning and compaction of the native soils are considered suitable for the proposed structures. It is anticipated that the deepest excavation cuts will be up to 9 feet below the final ground surface, not including overexcavation which may be required.

Foundations in general
Structures should not be supported atop significantly different types of soil. Selection of a foundation type shall consider the desired foundation performance characteristics, as well as the availability of structural fill soils. Once a foundation type has been selected, unsuitable soils shall be removed to the specified depths below foundation components and floor slabs and replaced with the corresponding structural fill type (either **moisture-conditioned structural fill** or **granular, non-expansive structural fill**, as specified in the **Overexcavation and Replacement** section of this report). Once selected, that structural fill type shall be used below the entire structure.

Note, even after the recommended overexcavation and replacement is completed, it is possible that some of the replacement soils will exhibit low-density or expansive characteristics. In all cases, contractors shall retain the responsibility for excavating to the appropriate line and grade, for the quality of their work, for adhering to plans and specifications, and for repairing defects regardless of when they are discovered.

Foundation walls supporting a grade difference should be designed to resist lateral pressures. For granular, non-expansive soils used as exterior backfill around foundations, an active equivalent fluid pressure (EFP) of 50 pcf may be used for design. For on-site low- to moderate-expansive soils used as exterior backfill around foundations, an active equivalent fluid pressure (EFP) of 65 pcf may be used for design. The lateral pressures presented herein apply to level, drained backfill conditions.

The foundation design should be prepared by a qualified Colorado Registered Professional Engineer using the recommendations presented in a detailed site specific Subsurface Soils Investigation. The bottoms of exterior grade beams should be at least 36 inches below finished grade for frost protection.

Shallow Spread-footing Foundations atop **structural fill**:
A shallow spread-footing foundation atop **moisture-conditioned structural fill** is suitable for the proposed structures. When the structural fill is selected, placed, and compacted as indicated herein, a maximum allowable bearing pressure of 2,500 psf and a minimum dead load of 800 psf may be used for design.

A shallow spread-footing foundation atop **imported granular, non-expansive structural fill** is suitable for the proposed structures. When the structural fill is selected, placed, and compacted as indicated herein, a maximum allowable bearing pressure of 2,000 psf with no minimum dead load may be used for design.

Foundation Drains

It is our assumption that below-ground (basement or crawlspace) areas are currently proposed. It should be anticipated that a subsurface perimeter drain will be recommended around portions of the structure which will have habitable or storage space located below the finished ground surface. This includes crawlspace areas if applicable. Depending on the conditions encountered during the detailed subsurface soil investigation and the conditions observed at the time of the open excavation observation, additional subsurface drainage systems may be recommended. If the structures are not going to have below-grade habitable or storage space a subsurface perimeter drain may not be necessary for the structures.

If an overexcavation is performed and granular, non-expansive backfill is used for the replacement soils, a subsurface drain may be recommended around the perimeter of the excavation. This drain is to be placed at the bottom of the overexcavated portion of the excavation prior to backfilling.

Floor Slabs

Backfill intended to support interior floor slabs should be installed in accordance with the corresponding structural fill section of this report. In general, even with careful overexcavation and replacement, vertical movement of one to three inches is considered possible for concrete slabs that are not integral with the foundation walls ("floating" garage or basement slabs) atop soils of low to moderate expansion potential which may be present in the structural fill. If movement and associated damage to floors and finish cannot be tolerated, a foundation with an integral (reinforced) slab and/or an isolated structural floor system should be considered.

Floor slabs should be separated from structural components to allow for vertical movement. Control and construction joints should be placed in accordance with the latest guidelines and standards published by the American Concrete Institute (ACI) and applicable local Building Code requirements.

Concrete

Type I/II cement is recommended for concrete in contact with the subsurface materials. Calcium chloride should be used with caution for soils with high sulfate contents. The concrete should not be placed on frozen ground. If placed during periods of cold temperatures, the concrete should be kept from freezing. This may require covering the concrete with insulated blankets and heating. Concrete work should be completed in accordance with the latest applicable guidelines and standards published by ACI.

EARTHWORK

Structural Fill - General

Areas to receive structural fill should have topsoil, organic material, or debris removed. The upper 6 inches of the exposed surface soils should be scarified and moisture conditioned to facilitate

compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698) or to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557) prior to placing structural fill.

- Materials used for granular structural fill should be approved by RMG prior to use. Structural fill should not be placed on frozen subgrade or allowed to freeze during moisture conditioning and placement.

- To verify the condition of the compacted soils, density tests should be performed during placement. The first density tests should be conducted when 24 inches of fill have been placed.

Granular Structural Fill

Structural fill placement for the upper 4 feet of the overexcavation is to consist entirely of granular, non-expansive material. Structural fill placement of granular, non-expansive soils should be placed in loose lifts not exceeding 8 to 12 inches, moisture conditioned to facilitate compaction (usually within 2 percent of the optimum moisture content) and compacted to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test, ASTM D-1557. The materials should be compacted by mechanical means.

Moisture-Conditioned Structural Fill

Moisture conditioned structural fill shall consist of a moisture-conditioned, on-site cohesive fill material. The fill material shall be moisture conditioned and replaced as follows:

- Fill shall be free of deleterious material and shall not contain rocks or cobbles greater than 6 inches in diameter.

- Fill materials shall be moisture-conditioned to a minimum of 1 percent to 4 percent above optimum moisture content (as determined by the Standard Proctor test, ASTM D-698), with an average of not less than 1 1/2 percent above optimum moisture content.

- The moisture-conditioned materials should be placed in maximum 6" compacted lifts. These materials should be compacted to a minimum of 95 percent of the maximum dry density as determined by the Standard Proctor test (ASTM D-698) or to a minimum of 92 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D-1557). Material not meeting the above requirements shall be reprocessed.

Proposed Grading, Cuts and Masses of Fill

Preliminary grading plans were not provided or reviewed by RMG at the time the report was issued. It is assumed (based on the test borings for this investigation) that the excavations will encounter sand and clay soils. The surficial soils can generally be used as site grading fill or structural fill. However, soils used for grading fill below buildings should consider the proposed overexcavation scheme and structural fill type selected for that building.

Prior to placement of overlot fill or removal and recompaction of the existing materials, topsoil, low-density native soil, fill and organic matter should be removed from the fill area. The subgrade should be scarified, moisture conditioned to within 2% of the optimum moisture content, and recompacted to the same degree as the overlying fill to be placed. The placement and compaction of fill should be periodically observed and tested by a representative of RMG during construction.

- ***Guideline Site Grading Specifications are included in the Appendix A.***

Surface Grading and Drainage

The ground surface should be sloped from the building with a minimum gradient of 10 percent for the first 10 feet. This is equivalent to 12 inches of fall across this 10-foot zone. If a 10-foot zone is not possible on the upslope side of the structure, then a well-defined swale should be created a minimum 5 feet from the foundation and sloped parallel with the wall with a minimum slope of 2 percent to intercept the surface water and transport it around and away from the structure. Roof drains should extend across backfill zones and landscaped areas to a region that is graded to direct flow away from the structure. Owners should maintain the surface grading and drainage recommended in this report to help prevent water from being directed toward and/or ponding near the foundations.

Landscaping should be selected to reduce irrigation requirements. Plants used close to foundation walls should be limited to those with low moisture requirements and irrigated grass should not be located within 5 feet of the foundation. To help control weed growth, geotextiles should be used below landscaped areas adjacent to foundations. Impervious plastic membranes are not recommended.

Irrigation devices should not be placed within 5 feet of the foundation. Irrigation should be limited to the amount sufficient to maintain vegetation. Application of more water will increase the likelihood of slab and foundation movements.

The recommendations listed in this report are intended to address normal surface drainage conditions, assuming the presence of groundcover (established vegetation, paved surfaces, and/or structures) throughout the regions upslope from this structure. However, groundcover may not be present due to a variety of factors (ongoing construction/development, wildfires, etc.). During periods when groundcover is not present in the "upslope" regions, higher than normal surface drainage conditions may occur, resulting in perched water tables, excess runoff, flash floods, etc. In these cases, the surface drainage recommendations presented herein (even if properly maintained) may not mitigate all groundwater problems or moisture intrusion into the structure. We recommend that the site plan be prepared with consideration of increased runoff during periods when groundcover is not present on the upslope areas.

BURIED UTILITIES

Based upon the conditions encountered in the exploratory test borings, we anticipate that the soils encountered in the individual utility trench excavations will consist of silty to clayey sand

overlying claystone bedrock. It is anticipated that the sand will be encountered at loose to dense relative densities and claystone at very stiff to hard consistencies.

We believe the sandy soils will classify as Type C materials and the clay will classify as Type A materials as defined by OSHA in 29 CFR Part 1926. OSHA requires that temporary excavations made in Type A and C materials be laid back at ratios no steeper than ¾:1 (horizontal to vertical) and 1½:1 (horizontal to vertical), respectively, unless the excavation is shored and braced. Excavations deeper than 20 feet, or when water is present, should always be braced or the slope designed by a professional engineer.

Utility mains such as water and sanitary sewer lines are typically placed beneath paved roadways. The settlement of the utility trench backfill can have a detrimental effect on pavements and roadway surfaces. We recommend that utility trench backfill be placed in thin loose lifts, moisture conditioned as required and compacted to the recommendations outlined in the **Structural Fill - General** section of this report. The placement and compaction of utility trench backfill should be observed and tested by a representative of RMG – Rocky Mountain Group during construction. Use of "flowable fill," (i.e., a controlled low strength material (CLSM), or a similar material) should be considered in lieu of compacted soil backfill for areas with low tolerances for surface settlements in deep excavations and areas with difficult access.

It is a common local practice for underdrains to be placed at the bottom of sanitary sewer trenched within drive lanes. Underdrains placed in the sanitary sewer trenches in areas where groundwater is anticipated will likely be the "active" type, which uses a perforated drain pipe. In areas where groundwater is not anticipated, "passive" type underdrains may be used. The outfall for the sanitary sewer trench underdrain was not known at the time of this investigation because the development plan and grading plan were not available for our review.

PRELIMINARY PAVEMENT RECOMMENDATIONS

Development timelines and final pavement alignments had not been provided at the time of the report issue date. However, we anticipate that paving for public and private roads, driveways, and parking areas will be completed following overlot grading and installation of utilities. **When the street configurations and alignments are finalized additional test borings may be needed as required by the local governing authority.** Typically final geotechnical pavement borings are conducted after the street alignments are cut in, to-grade, and all subsurface utilities have been installed. Pavement recommendations by RMG are based off the general guidelines set forth by the latest edition of the MGPEC Pavement Design Standards.

Recommended pavement sections for the normally loaded paved areas and for heavy vehicle loading areas are presented below.

Estimated Hot-Mix Asphalt Pavement Section	
Traffic Level	**HMA over ABC (inches)**
Moderate Traffic / Some Trucks	4.0 / 8.0
Heavy Vehicles with Turning Motions	6.0 / 8.0

As an alternative to the HMA section above, Rigid Concrete Pavements are recommended in areas where heavy vehicle loading is expected. These areas include drop-off/pick-up areas, loading docks, trash pick-up areas, and other locations where heavy trucks will be making frequent turning and braking movements. Rigid pavements may be constructed directly on proof-rolled non-expansive granular subgrade, the top one foot of which has been compacted to a minimum of 95% of maximum dry density as determined by ASTM D1557.

Minimum Rigid Concrete Pavement Section	
Traffic Level	**Portland Cement Concrete (in.)**
Heavy Vehicles with Turning Motions	6.0 in.

Silty to clayey sand and silty to sandy clay, which classifies as A-6 and A-7 per the American Association of State Highway and Transportation Officials (AASHTO), were encountered at pavement depths in all of the borings. Mitigation measures to minimize destructive swell potential should be anticipated.

The subgrade clay soils in the area are expansive. To reduce the swell potential, it is recommended that the expansive clay soils below the pavement be moisture treated. Moisture treatment is the process of removing the soil, moisture conditioning the soil until the soil is between 1 and 4 percent over optimum, then recompacting the soil to a minimum of 95 percent of Standard Proctor density (AASHTO T 99). **The clay soils should be moisture treated to a depth of 4-feet below the bottom of the pavement section and extend curb-to-curb or to the back-of-walk if attached to the curb or monolithic.** Lifts should be a maximum of 8-inches prior to compacting. If the laboratory swell test results of the subgrade materials have over 2% swell during the final pavement design investigation, additional swell mitigation may be needed.

The exposed surface should then be proof rolled with a pneumatic-tired vehicle. Any soils which are noted to be pumping or deforming excessively under the moving wheel loads are considered to have a low support value. At least the top 8 inches of these areas should be stabilized chemically or stabilized mechanically. An alternative to subgrade stabilization is to remove and replace the material with properly compacted structural fill or road base material. Moisture/compaction tests and proof roll observations shall be performed by a representative of our office.

Pavements shall be sloped away from surrounding buildings to remove surface water. Periodic maintenance of the pavements should be performed to extend the life of the pavement.

CLOSING

This report has been prepared for the exclusive purpose of providing geotechnical engineering information and recommendations for development described in this report. RMG should be retained to review the final construction documents prior to construction to verify our findings, conclusions and recommendations have been appropriately implemented.

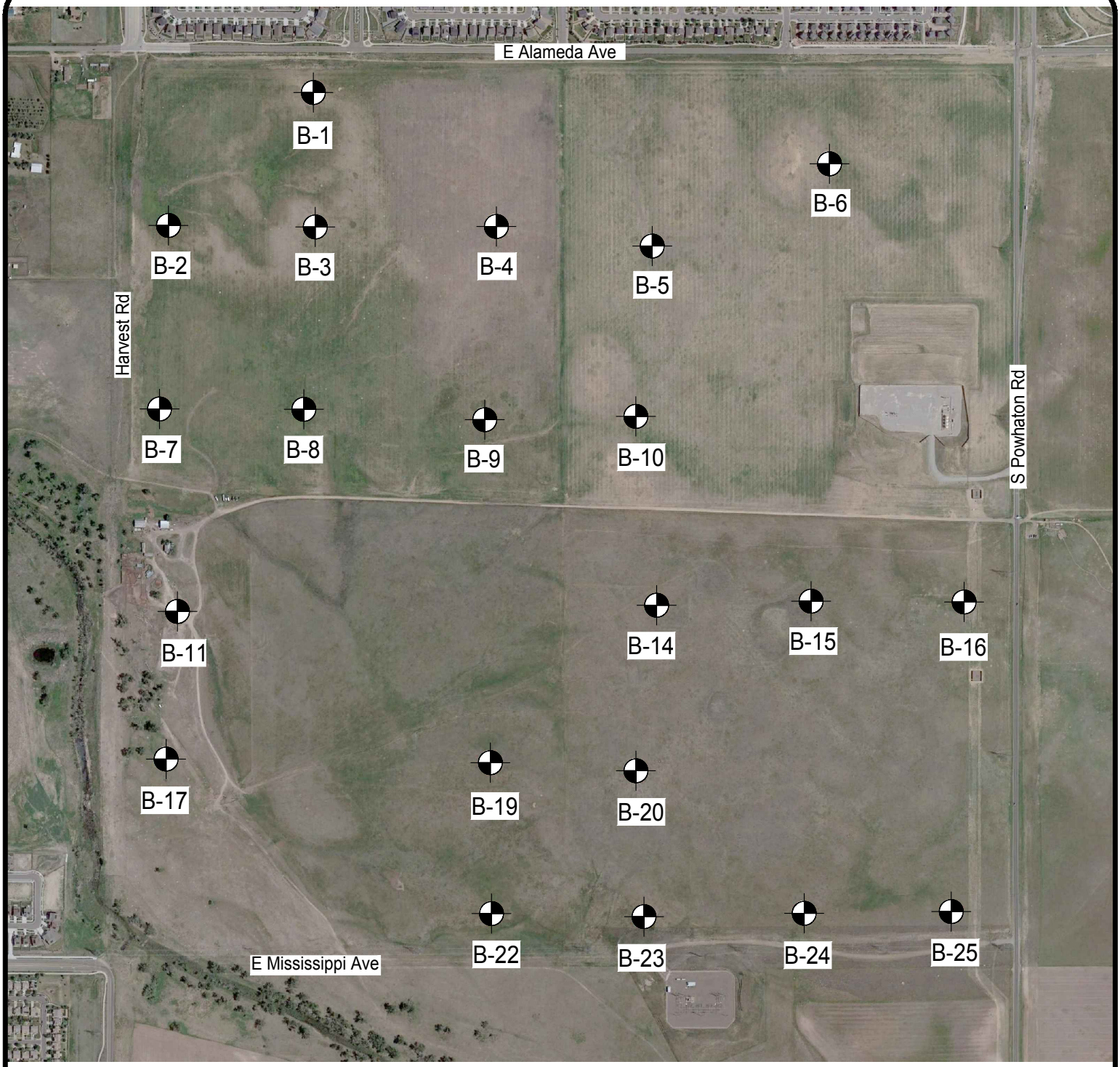
This report has been prepared for the exclusive use by **Ventana Capital** for application as an aid in the design and construction of the proposed development in accordance with generally accepted geotechnical engineering practices. The analyses and recommendations in this report are based in part upon data obtained from test borings, site observations and the information presented in referenced reports. The nature and extent of variations may not become evident until construction. If variations then become evident, RMG should be retained to review the recommendations presented in this report considering the varied condition, and either verify or modify them in writing.

Our professional services were performed using that degree of care and skill ordinarily exercised, under similar circumstances, by geotechnical engineers practicing in this or similar localities. RMG does not warrant the work of regulatory agencies or other third parties supplying information which may have been used during the preparation of this report. No warranty, express or implied is made by the preparation of this report. Third parties reviewing this report should draw their own conclusions regarding site conditions and specific construction techniques to be used on this project.

The scope of services for this project does not include, either specifically or by implication, environmental assessment of the site or identification of contaminated or hazardous materials or conditions. Development of recommendations for the mitigation of environmentally related conditions, including but not limited to biological or toxicological issues, are beyond the scope of this report. If the Client desires investigation into the potential for such contamination or conditions, other studies should be undertaken.

If we can be of further assistance in discussing the contents of this report or analysis of the proposed development, from a geotechnical engineering point-of-view, please feel free to contact us.

FIGURES



NORTH
NOT TO SCALE

DENOTES APPROXIMATE LOCATION OF TEST BORINGS

TEST BORING SITE MAP

HARVEST ROAD
AURORA, COLORADO

VENTANA CAPITAL

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Greeley / Evans, CO 80620
(970) 330-1071

JOB No. 186966

FIGURE 1

DATE: 12-20-2021

SOILS DESCRIPTION


CLAYSTONE


PEAT


SANDSTONE


SANDY CLAY


CLAYEY SAND


SILTY CLAY


SILTY SAND


USCS WELL-GRADED GRAVELLY SAND


TOPSOIL

UNLESS NOTED OTHERWISE, ALL LABORATORY
TESTS PRESENTED HEREIN WERE PERFORMED BY:
RMG - ROCKY MOUNTAIN GROUP
14 INVERNESS DR. EAST, SUITE E-136
ENGLEWOOD, COLORADO

SYMBOLS AND NOTES


XX — STANDARD PENETRATION TEST - MADE BY DRIVING A SPLIT-BARREL SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-1586. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


XX — UNDISTURBED CALIFORNIA SAMPLE - MADE BY DRIVING A RING-LINED SAMPLER INTO THE SOIL BY DROPPING A 140 LB. HAMMER 30", IN GENERAL ACCORDANCE WITH ASTM D-3550. NUMBER INDICATES NUMBER OF HAMMER BLOWS PER FOOT (UNLESS OTHERWISE INDICATED).


FREE WATER TABLE


DEPTH AT WHICH BORING CAVED


BULK — DISTURBED BULK SAMPLE


AUG — AUGER "CUTTINGS"

4.5 — WATER CONTENT (%)

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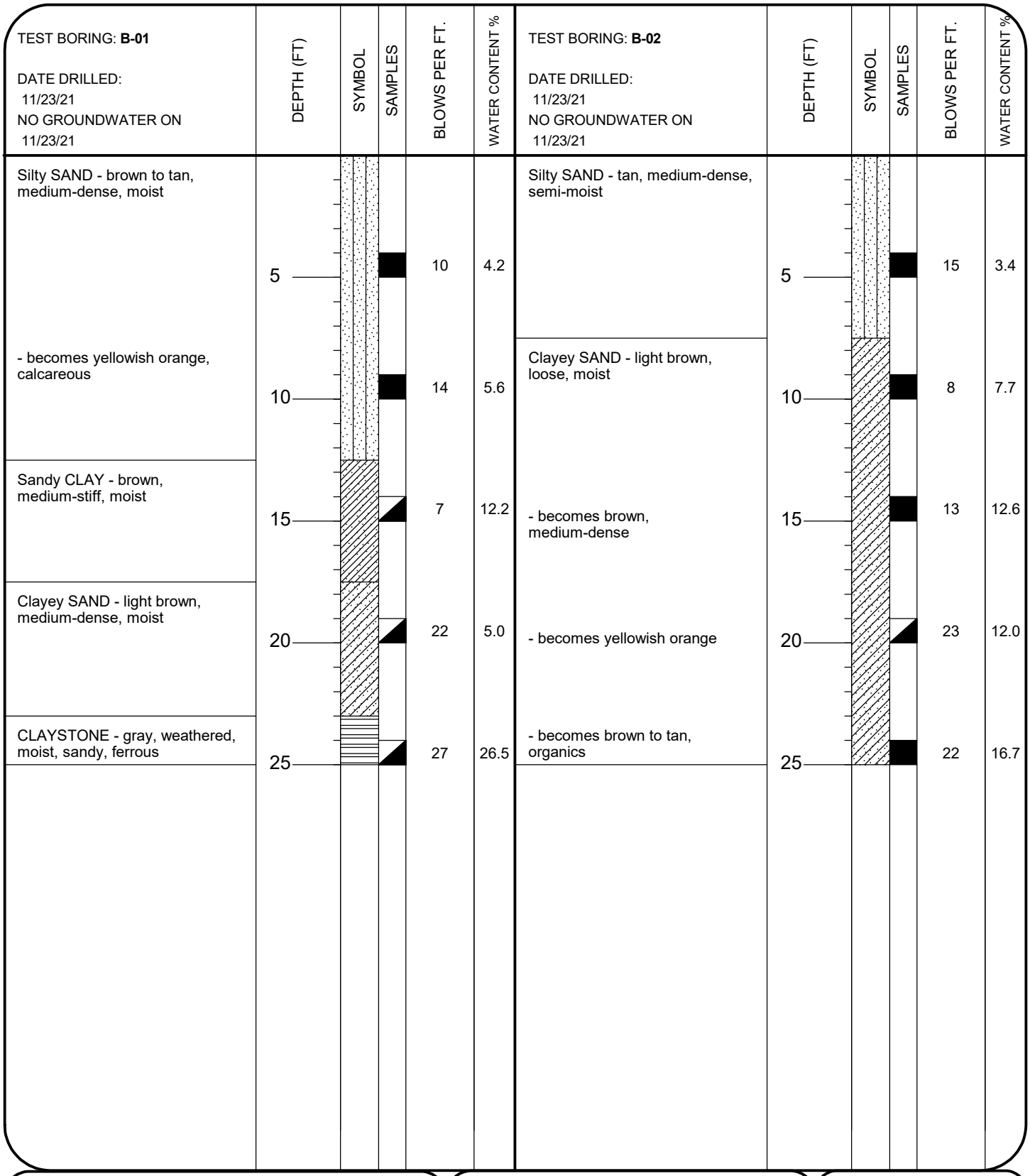
SOUTHERN COLORADO, DENVER METRO, NORTHERN COLORADO

EXPLANATION OF TEST BORING LOG

JOB No. 186966

FIGURE No. 2

DATE Dec/22/2021



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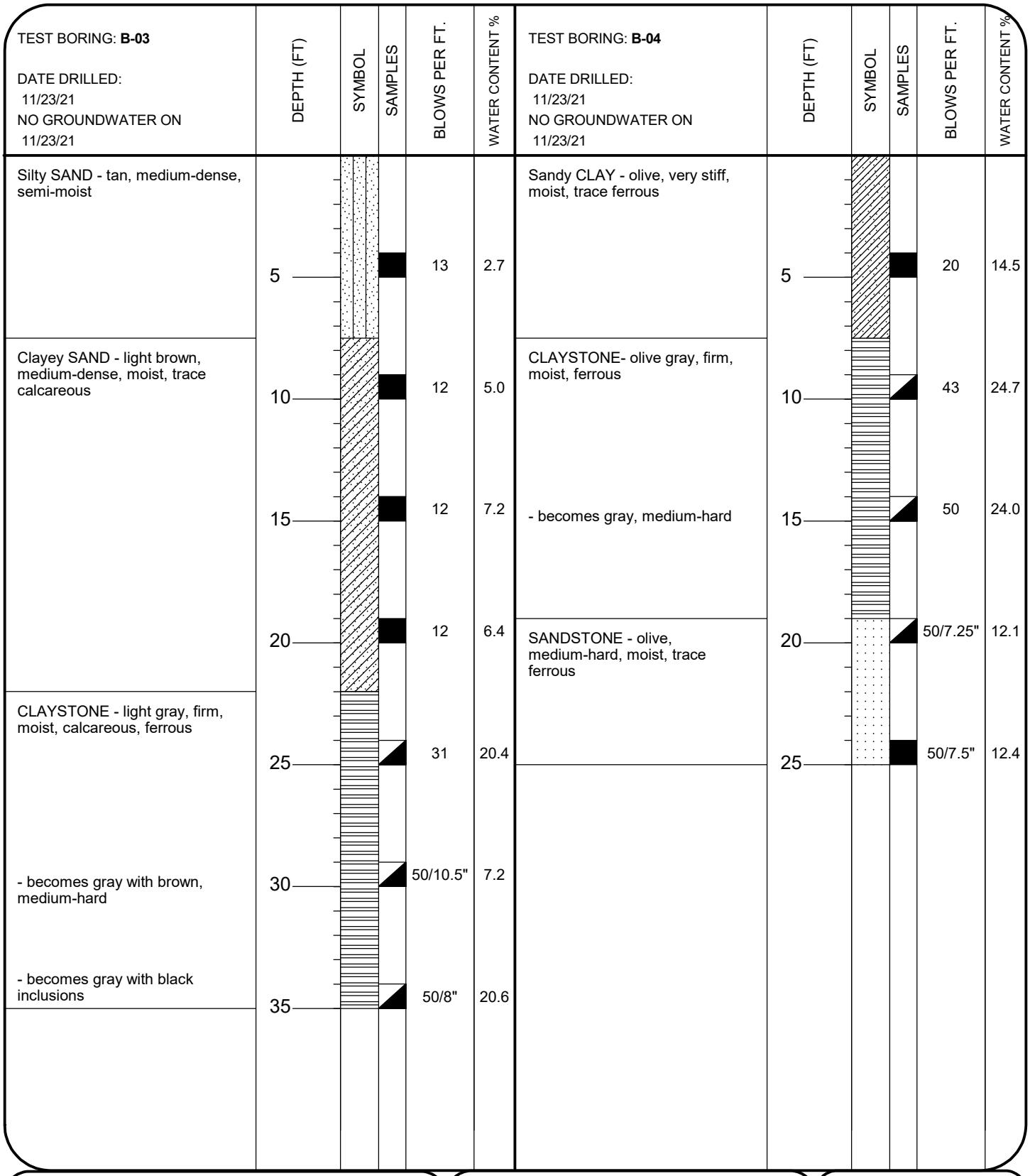
TEST BORING LOG

JOB No. 186966

FIGURE No. 3

DATE Dec/23/2021



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TEST BORING LOG

JOB No. 186966

FIGURE No. 4

DATE Dec/22/2021

TEST BORING: **B-05**

DATE DRILLED:
11/23/21
NO GROUNDWATER ON
11/23/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
Sandy CLAY - light brown, very stiff, moist, occasional gravel				
5			25	10.5
10			15	10.8
Silty SAND- brown to tan, medium-dense, moist				
15			22	9.4
SANDSTONE - brown, medium-hard, moist, gravelly				
20			50/9"	9.6
CLAYSTONE - gray, medium-hard, moist, ferrous				
25			50/11"	24.6

TEST BORING: **B-06**

DATE DRILLED:
11/23/21
NO GROUNDWATER ON
11/23/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
Sandy CLAY - light brown, very stiff, moist, occasional gravel				
5			23	6.5
10			19	9.7
- becomes brown, calcareous				
Silty SAND - tan, medium-dense, moist				
15			20	2.6
CLAYSTONE - gray, firm, moist, trace sand, very ferrous, with black inclusions				
20			26	23.3
25			50/11"	19.8
- becomes medium-hard				
30				19.4
- becomes light gray				
35			46	19.4

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TEST BORING LOG

JOB No. 186966

FIGURE No. 5

DATE Dec/22/2021

TEST BORING: **B-07** DATE DRILLED: 11/30/21 NO GROUNDWATER ON 11/30/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
Silty SAND - tan, medium-dense, moist	5			15	3.2
Clayey SAND - light brown, dense, moist, calcareous	10			38	8.0
Gravelly SAND - tan, medium-dense, moist	15			15	3.0
	20			19	2.9
	25			29	2.4

TEST BORING: **B-08** DATE DRILLED: 11/23/21 NO GROUNDWATER ON 11/23/21	DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
Silty SAND - tan, medium-dense, semi-moist to moist	5			16	3.8
	10			19	4.1
	15			16	2.7
	20			18	3.6
	25			12	10.6

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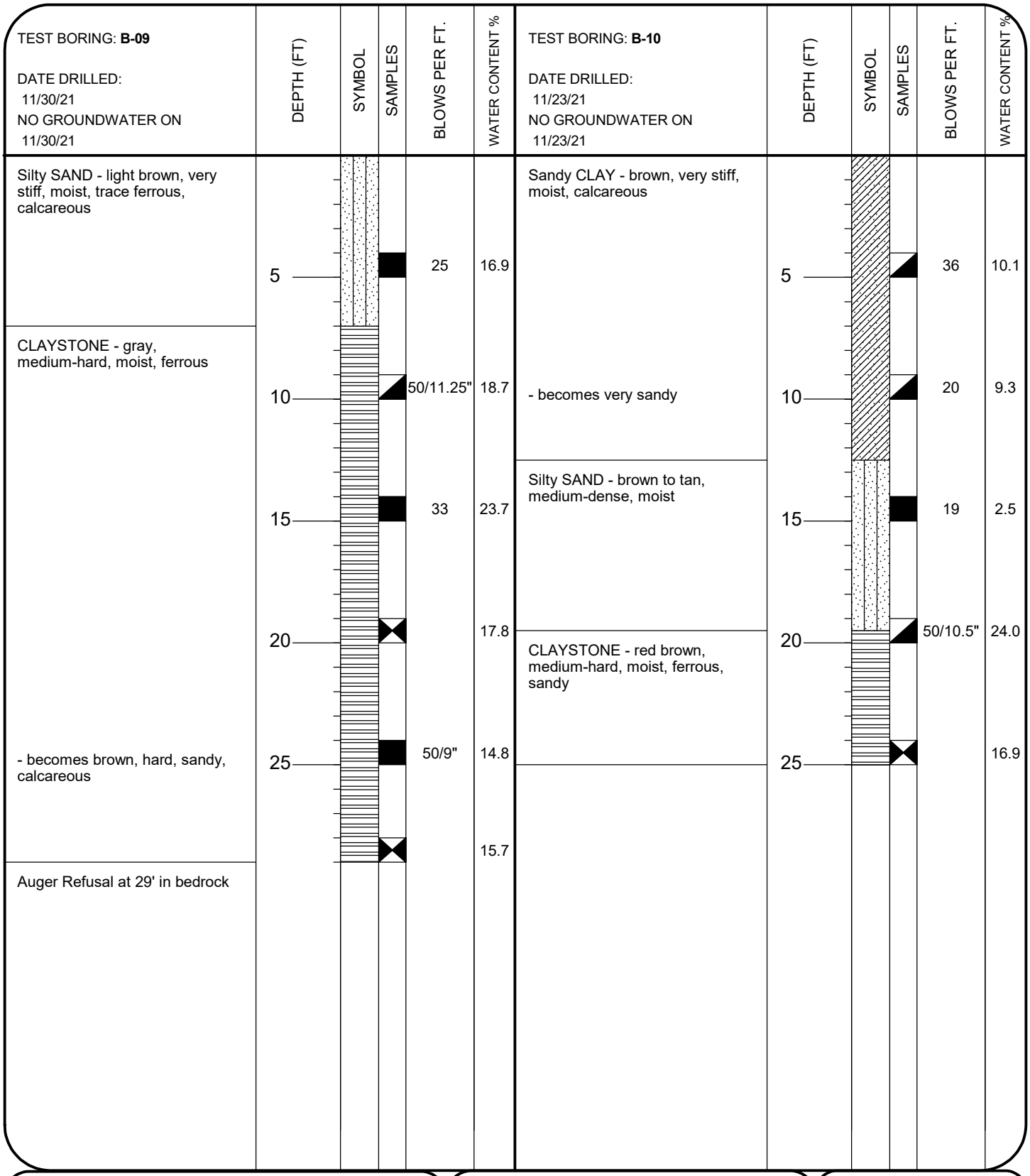
TEST BORING LOG

JOB No. 186966

FIGURE No. 6

DATE Dec/22/2021



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TEST BORING LOG

JOB No. 186966

FIGURE No. 7

DATE Dec/22/2021

TEST BORING: **B-11**

DATE DRILLED:
12/7/21
GROUNDWATER @ 10.0 '
12/8/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
Silty SAND - brown, medium-dense, moist				
5			11	3.5
10 ▽			10	5.6
Groundwater at 12.5' during drilling				
Clayey SAND - brown, medium-dense, very moist to wet				
15			18	16.7
CLAYSTONE - dark gray, firm, very moist to wet				
20			24	21.9
PEAT - black , very hard, very moist to wet				
25			50/4.5"	34.7
CLAYSTONE - light gray, very hard, very moist to wet				
30			50/5"	21.5
35				34.2

TEST BORING: **B-14**

DATE DRILLED:
11/30/21
NO GROUNDWATER ON
11/30/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
Clayey SAND - light brown, medium-dense, moist				
5			16	8.7
- trace gravel				
10			22	6.3
Gravelly SAND - light brown, medium-dense, moist				
15			14	4.3
20			30	3.4
Dry cave in at 24'				
25			34	17.6
CLAYSTONE - gray, medium-hard, moist, very ferrous				

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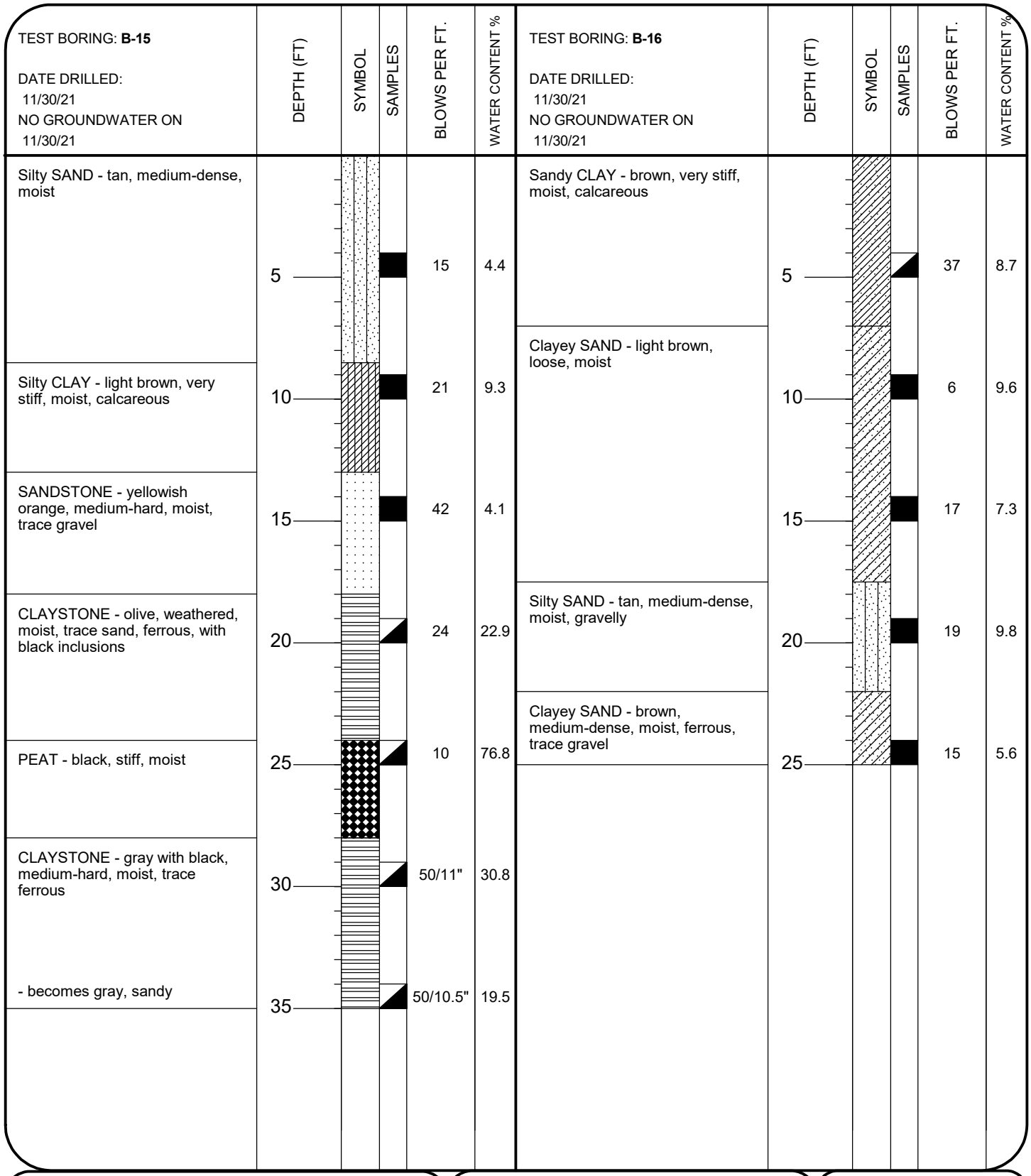
TEST BORING LOG

JOB No. 186966

FIGURE No. 8

DATE Dec/22/2021



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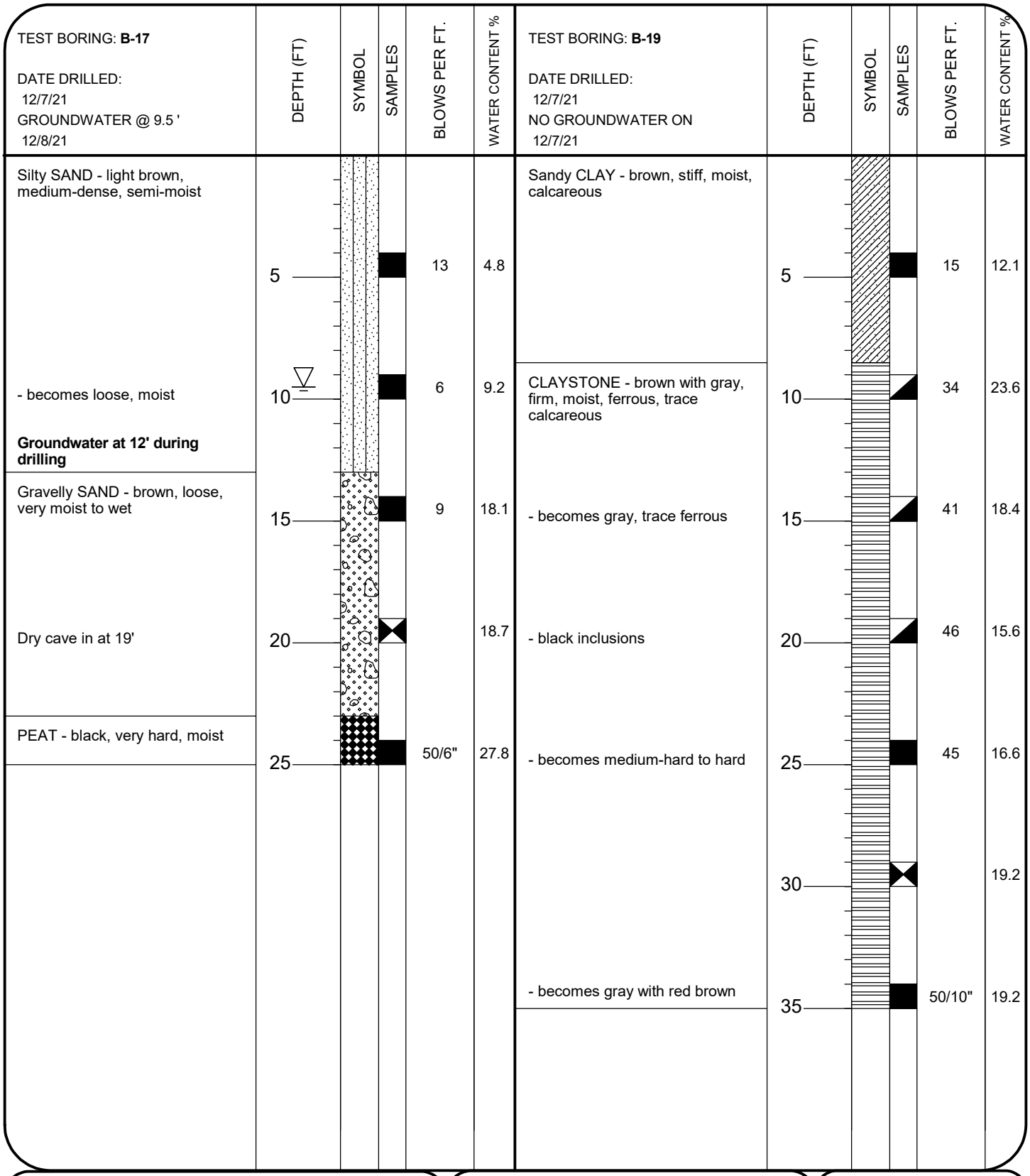
TEST BORING LOG

JOB No. 186966

FIGURE No. 9

DATE Dec/22/2021



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TEST BORING LOG

JOB No. 186966

FIGURE No. 10

DATE Dec/22/2021

TEST BORING: **B-20**

DATE DRILLED:
11/30/21
NO GROUNDWATER ON
11/30/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	Sandy CLAY - brown, very stiff, moist			
5			35	13.3
	Clayey SAND - brown, dense, moist, gravelly			
10			30	4.2
	CLAYSTONE- gray with brown, firm, moist, trace ferrous, calcareous			
15			35	17.8
	- becomes olive, ferrous, with black inclusions			
20			41	21.1
25				21.4

TEST BORING: **B-22**

DATE DRILLED:
12/7/21
GROUNDWATER @ 19.0 '
12/8/21

DEPTH (FT)	SYMBOL	SAMPLES	BLOWS PER FT.	WATER CONTENT %
	Sandy CLAY - brown, very stiff, moist, calcareous			
5			18	18.0
	- becomes light brown, stiff, silty			
10			15	14.2
	- becomes dark brown, trace calcareous			
15			16	19.0
20			10	25.0
	Groundwater at 21' during drilling			
	Clayey SAND - brown, medium-stiff, very moist to wet			
25			10	21.2

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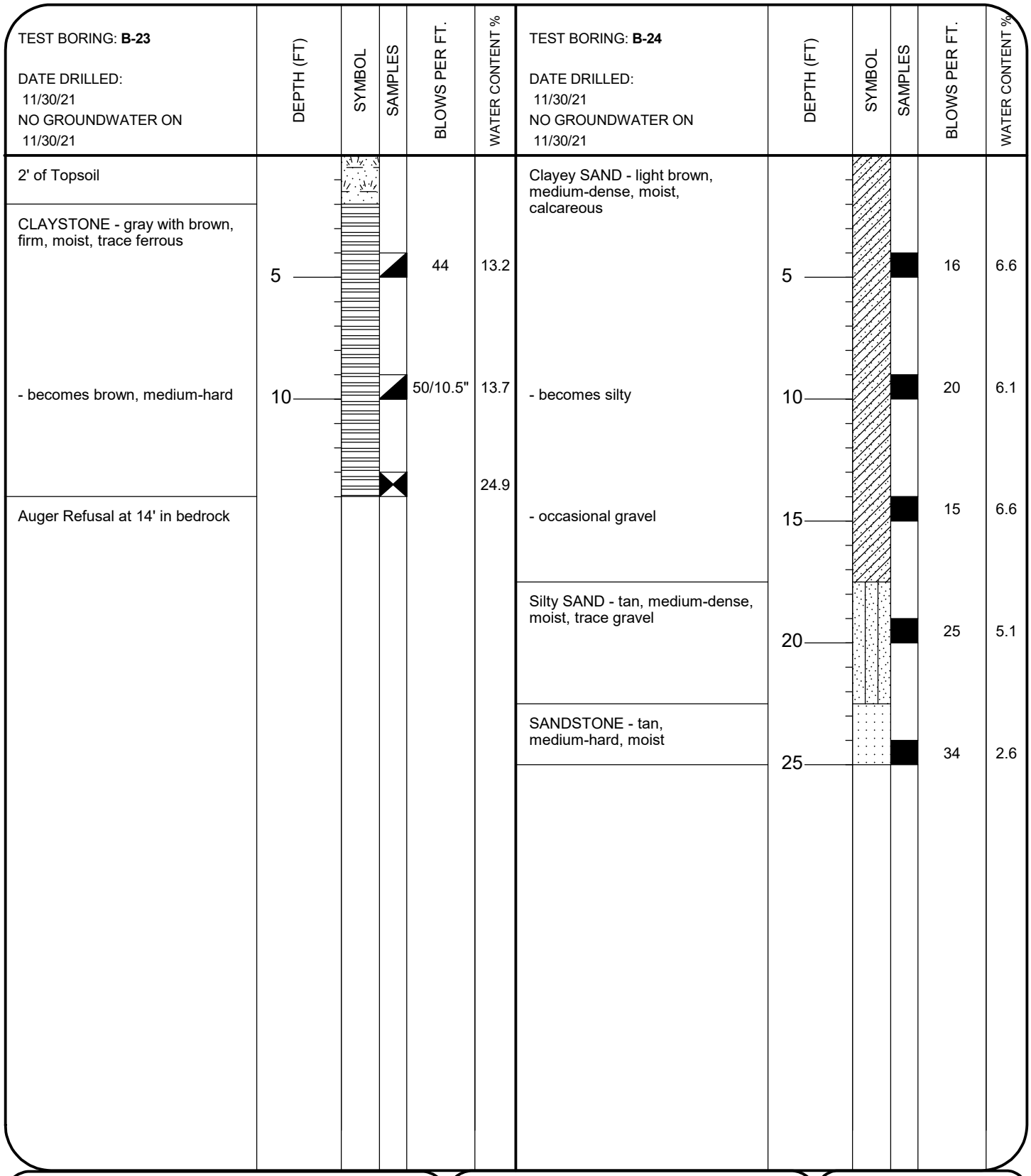
TEST BORING LOG

JOB No. 186966

FIGURE No. 11

DATE Dec/22/2021



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TEST BORING LOG

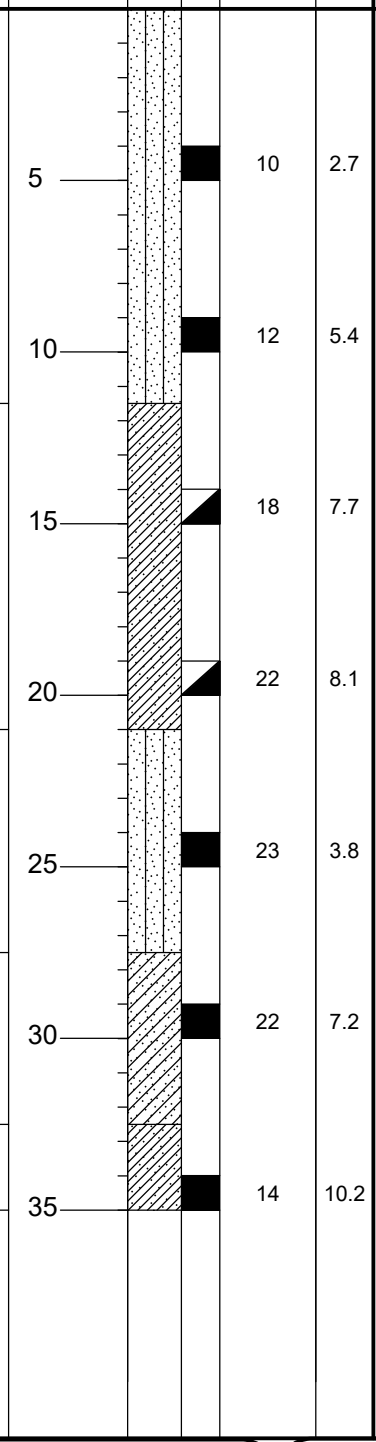
JOB No. 186966

FIGURE No. 12

DATE Dec/22/2021

TEST BORING: **B-25**

DATE DRILLED:
11/30/21
NO GROUNDWATER ON
11/30/21



DEPTH (FT)	SAMPLES	BLOWS PER FT.	WATER CONTENT %
5		10	2.7
10		12	5.4
15		18	7.7
20		22	8.1
25		23	3.8
30		22	7.2
35		14	10.2

Silty SAND - light brown, medium-dense, moist

Sandy CLAY - brown, stiff, moist

- becomes very stiff

Silty SAND - tan, medium-dense, moist, trace gravel

Clayey SAND - light brown, medium-dense, moist

Sandy CLAY - brown, stiff, moist

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TEST BORING LOG

JOB No. 186966

FIGURE No. 13

DATE Dec/22/2021

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
B-01	4.0	4.2								
B-01	9.0	5.6		NP	NP		21.4			SM
B-01	14.0	12.2								
B-01	19.0	5.0								
B-01	24.0	26.5	97.3						0.5	
B-02	4.0	3.4								
B-02	9.0	7.7								
B-02	14.0	12.6		27	11		44.2			SC
B-02	19.0	12.0	108.3						- 1.1	
B-02	24.0	16.7								
B-03	4.0	2.7								
B-03	9.0	5.0								
B-03	14.0	7.2								
B-03	19.0	6.4								
B-03	24.0	20.4					95.3			
B-03	29.0	7.2								
B-03	34.0	20.6	110.5						2.3	
B-04	4.0	14.5		50	29		79.7			CH
B-04	9.0	24.7								
B-04	14.0	24.0	100.3						0.7	
B-04	19.0	12.1								
B-04	24.0	12.4								
B-05	4.0	10.5								
B-05	9.0	10.8	117.4						- 0.3	
B-05	14.0	9.4								
B-05	19.0	9.6								
B-05	24.0	24.6					97.3			
B-06	4.0	6.5								
B-06	9.0	9.7								
B-06	14.0	2.6								
B-06	19.0	23.3								
B-06	24.0	19.8	108.8						2.5	
B-06	29.0	19.4								
B-06	34.0	19.4					93.0			

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 186966
FIGURE No. 14

DATE Dec/22/2021

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
B-07	4.0	3.2								
B-07	9.0	8.0		24	10		37.4			SC
B-07	14.0	3.0								
B-07	19.0	2.9								
B-07	24.0	2.4								
B-08	4.0	3.8								
B-08	9.0	4.1								
B-08	14.0	2.7								
B-08	19.0	3.6		NP	NP		11.1			SP-SM
B-08	24.0	10.6								
B-09	4.0	16.9		49	34		96.4			CL
B-09	9.0	18.7	108.6						2.5	
B-09	14.0	23.7								
B-09	19.0	17.8								
B-09	24.0	14.8								
B-09	28.0	15.7								
B-10	4.0	10.1	121.2						2.5	
B-10	9.0	9.3								
B-10	14.0	2.5		NP	NP		6.8			SP-SM
B-10	19.0	24.0								
B-10	24.0	16.9								
B-11	4.0	3.5								
B-11	9.0	5.6								
B-11	14.0	16.7		29	15		9.1			
B-11	19.0	21.9								
B-11	24.0	34.7								
B-11	29.0	21.5	97.9						3.4	
B-11	34.0	34.2								
B-14	4.0	8.7								
B-14	9.0	6.3	117.1						0.1	
B-14	14.0	4.3								
B-14	19.0	3.4								
B-14	24.0	17.6					78.1			
B-15	4.0	4.4								

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 186966
FIGURE No. 14

DATE Dec/22/2021

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
B-15	9.0	9.3								
B-15	14.0	4.1								
B-15	19.0	22.9					93.5			
B-15	24.0	76.8								
B-15	29.0	30.8	98.3						3.1	
B-15	34.0	19.5								
B-16	4.0	8.7	121.1						2.9	
B-16	9.0	9.6								
B-16	14.0	7.3		29	17		45.6			SC
B-16	19.0	9.8								
B-16	24.0	5.6								
B-17	4.0	4.8		NP	NP		19.8			SM
B-17	9.0	9.2								
B-17	14.0	18.1								
B-17	19.0	18.7								
B-17	24.0	27.8								
B-19	4.0	12.1								
B-19	9.0	23.6								
B-19	14.0	18.4					91.8			
B-19	19.0	15.6	117.1						6.1	
B-19	24.0	16.6								
B-19	29.0	19.2								
B-19	34.0	19.2								
B-20	4.0	13.3								
B-20	9.0	4.2								
B-20	14.0	17.8					75.0			
B-20	19.0	21.1	100.9						1.5	
B-20	24.0	21.4								
B-22	4.0	18.0								
B-22	9.0	14.2								
B-22	14.0	19.0	105.9						0.7	
B-22	19.0	25.0		71	52		87.4			CH
B-22	24.0	21.2								
B-23	4.0	13.2	99.8						4.8	

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SUMMARY OF LABORATORY TEST RESULTS

JOB No. 186966
FIGURE No. 14

DATE Dec/22/2021

Test Boring No.	Depth	Water Content (%)	Dry Density (pcf)	Liquid Limit	Plasticity Index	% Retained No.4 Sieve	% Passing No. 200 Sieve	Load at Saturation (psf)	% Swell/ Collapse	USCS Classification
B-23	9.0	13.7								
B-23	13.0	24.9					96.0			
B-24	4.0	6.6								
B-24	9.0	6.1								
B-24	14.0	6.6								
B-24	19.0	5.1								
B-24	24.0	2.6		20	7		14.9			SC-SM
B-25	4.0	2.7								
B-25	9.0	5.4								
B-25	14.0	7.7	127.2						0.7	
B-25	19.0	8.1								
B-25	24.0	3.8								
B-25	29.0	7.2		28	11		27.9			SC
B-25	34.0	10.2								

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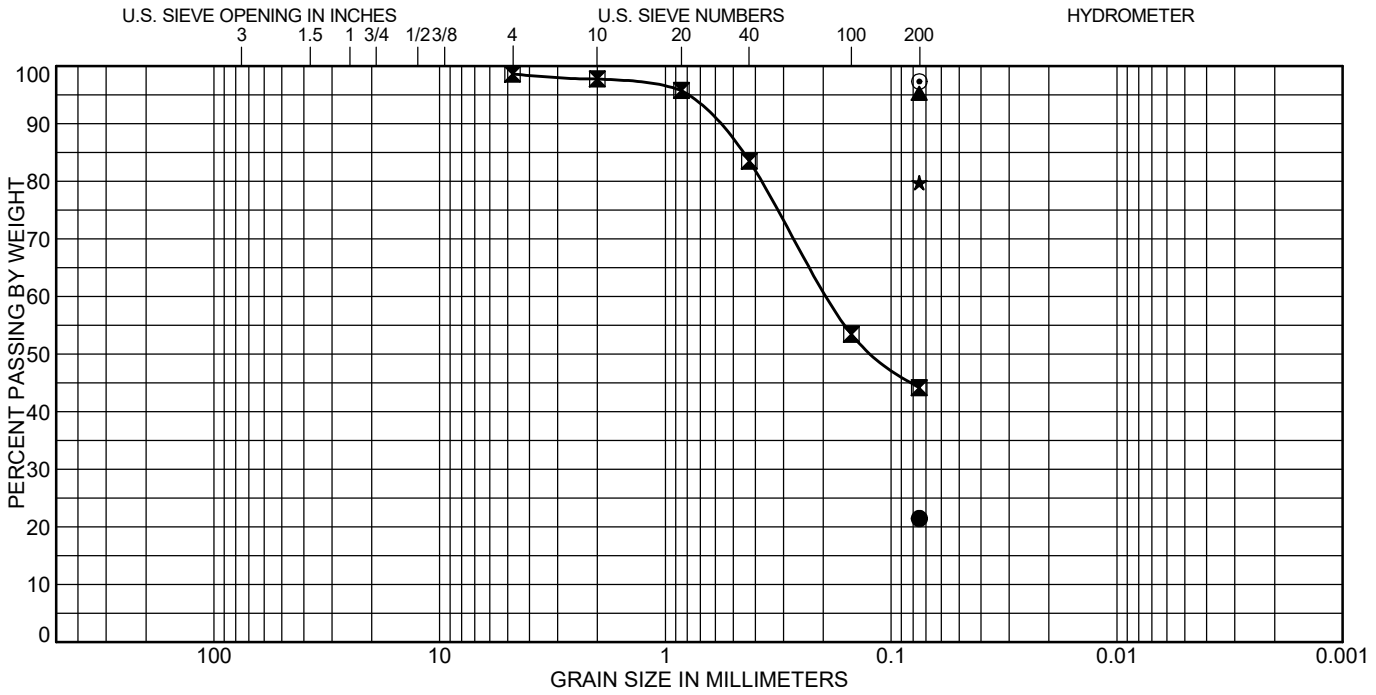
SUMMARY OF LABORATORY TEST RESULTS

JOB No. 186966
FIGURE No. 14

DATE Dec/22/2021



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**B-01**	**9.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**
⧓	**B-02**	**14.0**	**CLAYEY SAND(SC)**	**27**	**16**	**11**
▲	**B-03**	**24.0**				
★	**B-04**	**4.0**	**FAT CLAY with SAND(CH)**	**50**	**21**	**29**
⊙	**B-05**	**24.0**				

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**B-01**	**9.0**			**21.4**	
⧓	**B-02**	**14.0**		**54.5**	**44.2**	
▲	**B-03**	**24.0**			**95.3**	
★	**B-04**	**4.0**			**79.7**	
⊙	**B-05**	**24.0**			**97.3**	

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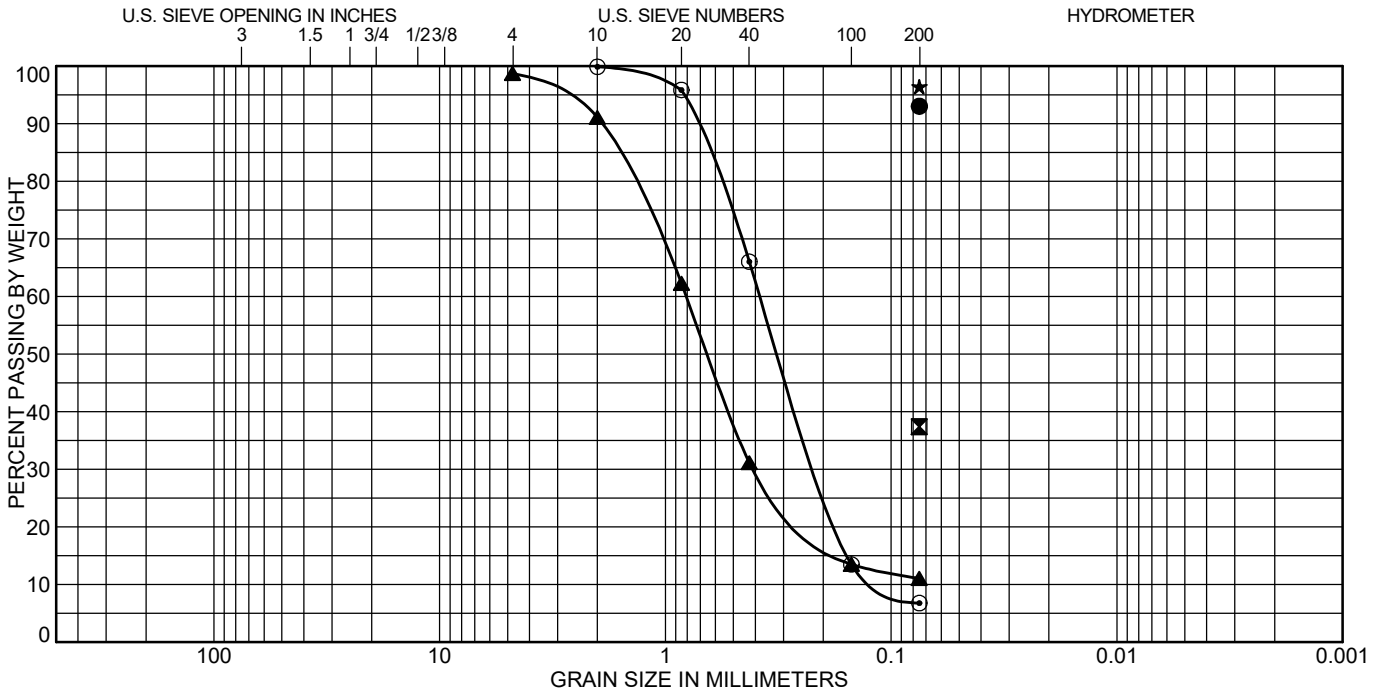
SOIL CLASSIFICATION DATA

JOB No. 186966

FIGURE No. 15

DATE Dec/22/2021



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**B-06**	**34.0**				
⧓	**B-07**	**9.0**	**CLAYEY SAND(SC)**	**24**	**14**	**10**
▲	**B-08**	**19.0**	**POORLY GRADED SAND with SILT(SP-SM)**	**NP**	**NP**	**NP**
★	**B-09**	**4.0**	**LEAN CLAY(CL)**	**49**	**15**	**34**
⊙	**B-10**	**14.0**	**POORLY GRADED SAND with SILT(SP-SM)**	**NP**	**NP**	**NP**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**B-06**	**34.0**			**93.0**	
⧓	**B-07**	**9.0**			**37.4**	
▲	**B-08**	**19.0**		**87.7**	**11.1**	
★	**B-09**	**4.0**			**96.4**	
⊙	**B-10**	**14.0**		**93.1**	**6.8**	

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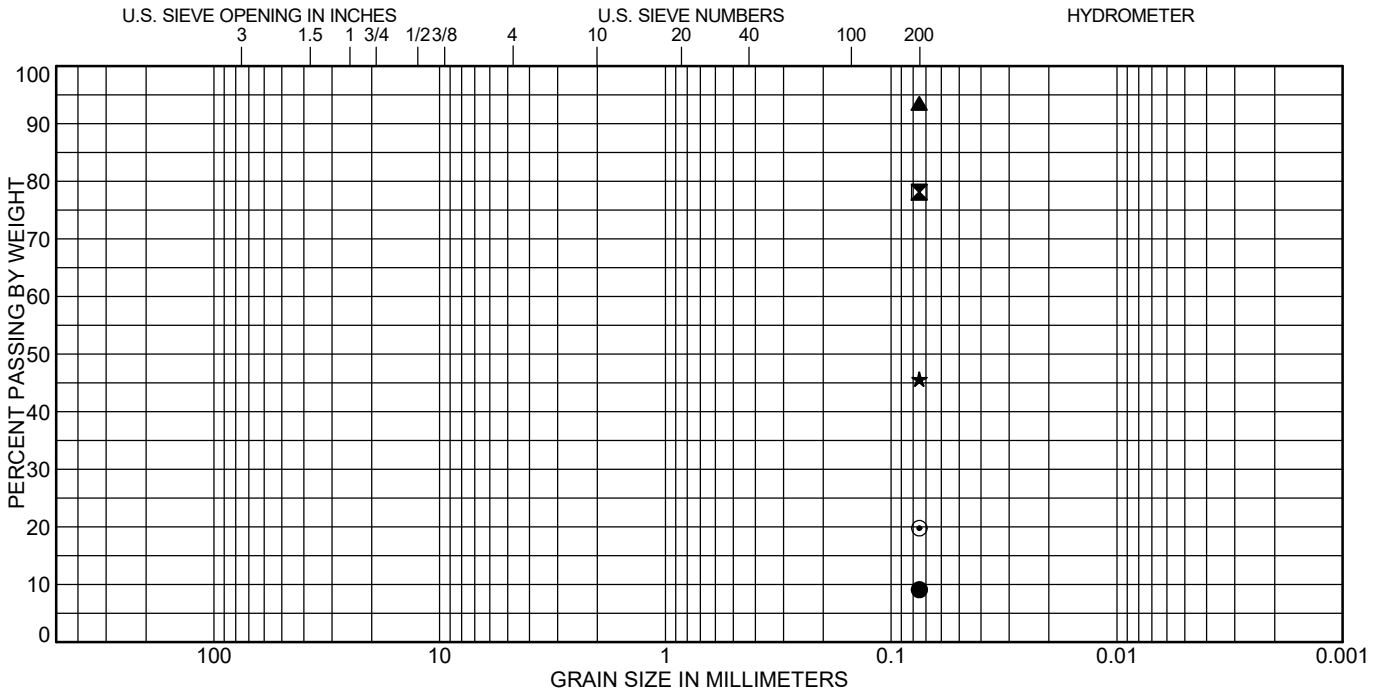
SOIL CLASSIFICATION DATA

JOB No. 186966

FIGURE No. 16

DATE Dec/22/2021



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**B-11**	**14.0**		**29**	**14**	**15**
⊠	**B-14**	**24.0**				
▲	**B-15**	**19.0**				
★	**B-16**	**14.0**	**CLAYEY SAND(SC)**	**29**	**12**	**17**
⊙	**B-17**	**4.0**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**B-11**	**14.0**			**9.1**	
⊠	**B-14**	**24.0**			**78.1**	
▲	**B-15**	**19.0**			**93.5**	
★	**B-16**	**14.0**			**45.6**	
⊙	**B-17**	**4.0**			**19.8**	

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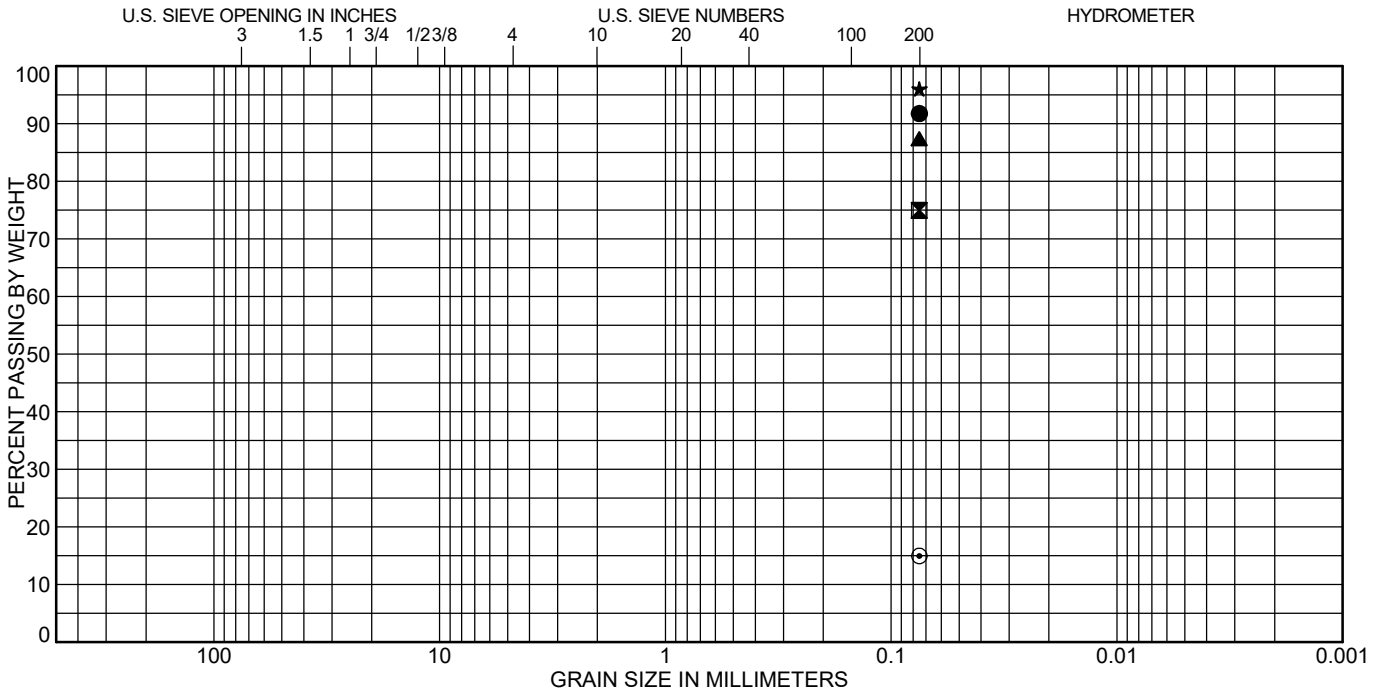
SOIL CLASSIFICATION DATA

JOB No. 186966

FIGURE No. 17

DATE Dec/22/2021



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**B-19**	**14.0**				
⧓	**B-20**	**14.0**				
▲	**B-22**	**19.0**	**FAT CLAY(CH)**	**71**	**19**	**52**
★	**B-23**	**13.0**				
⊙	**B-24**	**24.0**	**SILTY, CLAYEY SAND(SC-SM)**	**20**	**13**	**7**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**B-19**	**14.0**			**91.8**	
⧓	**B-20**	**14.0**			**75.0**	
▲	**B-22**	**19.0**			**87.4**	
★	**B-23**	**13.0**			**96.0**	
⊙	**B-24**	**24.0**			**14.9**	

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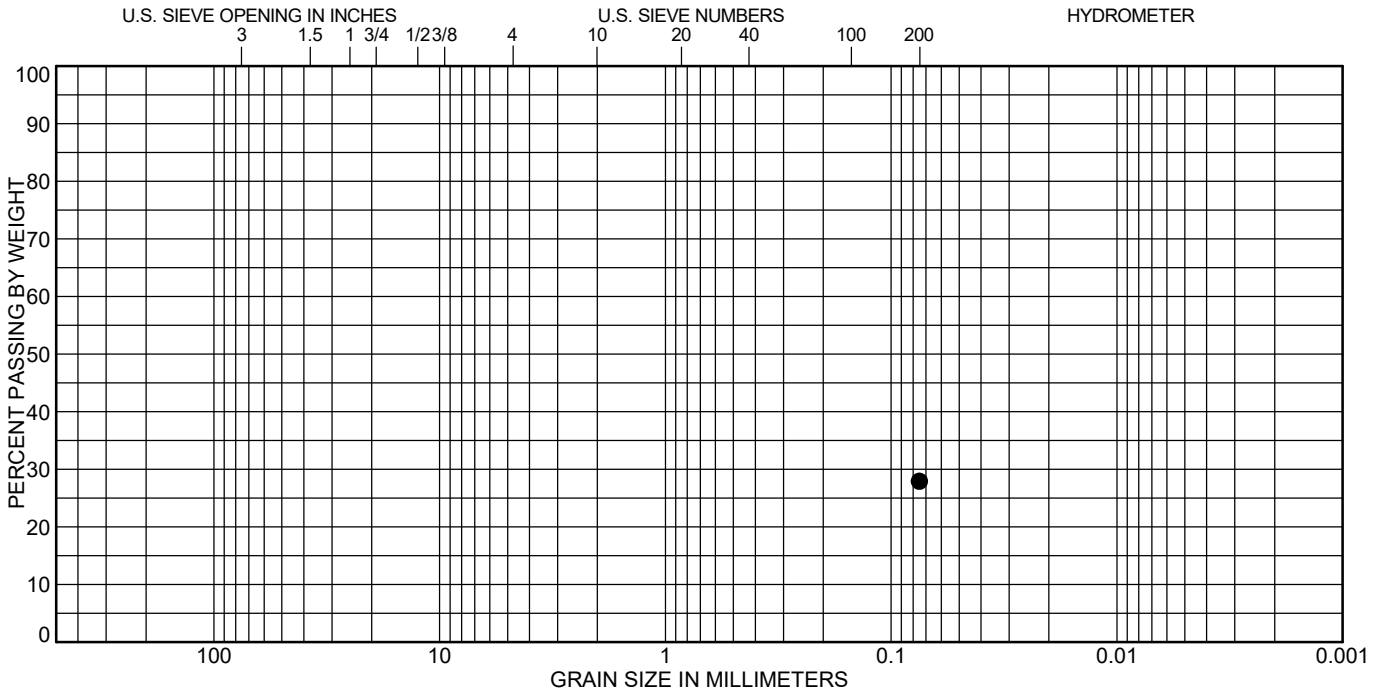
FIGURE No. 18

DATE Dec/22/2021



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Test Boring	Depth (ft)	Classification	LL	PL	PI
●	**B-25**	**29.0**	**CLAYEY SAND(SC)**	**28**	**17**	**11**

	Test Boring	Depth (ft)	%Gravel	%Sand	%Silt	%Clay
●	**B-25**	**29.0**			**27.9**	

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SOIL CLASSIFICATION DATA

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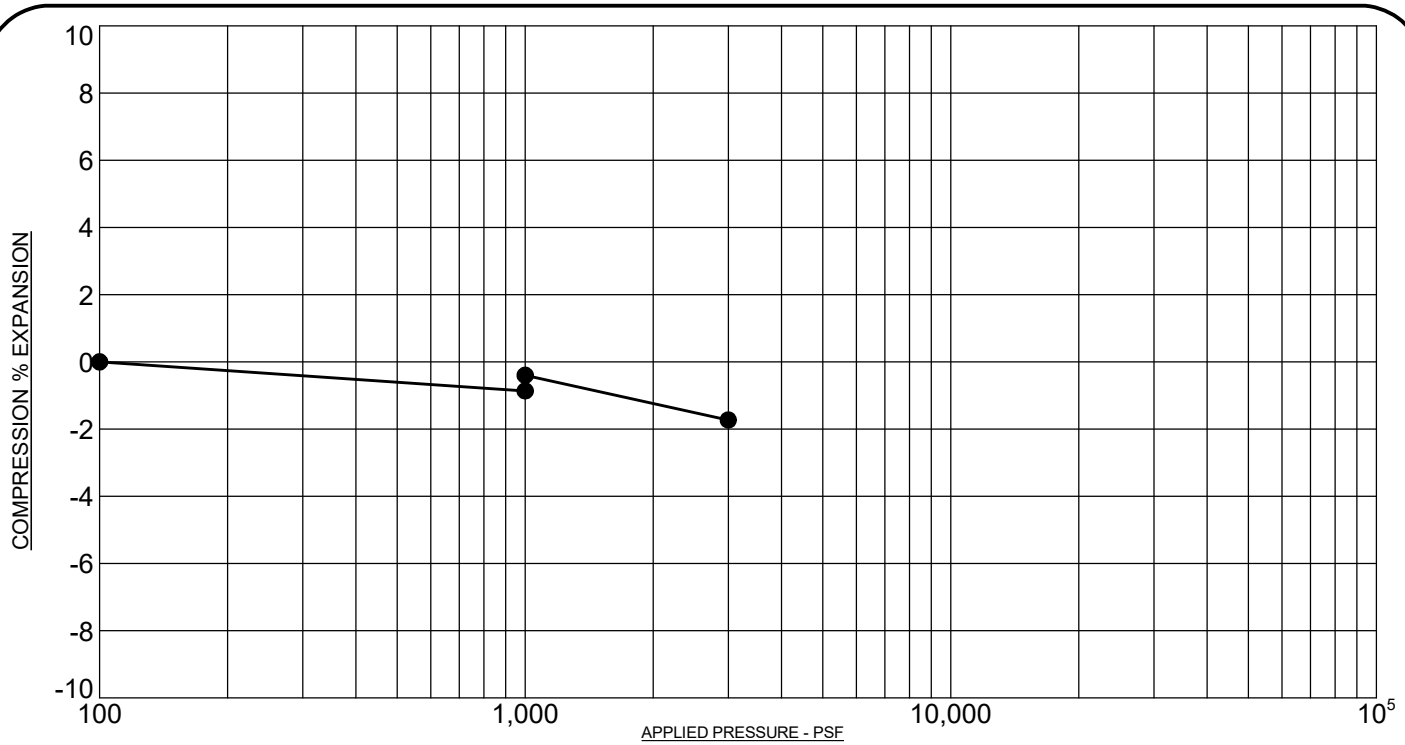
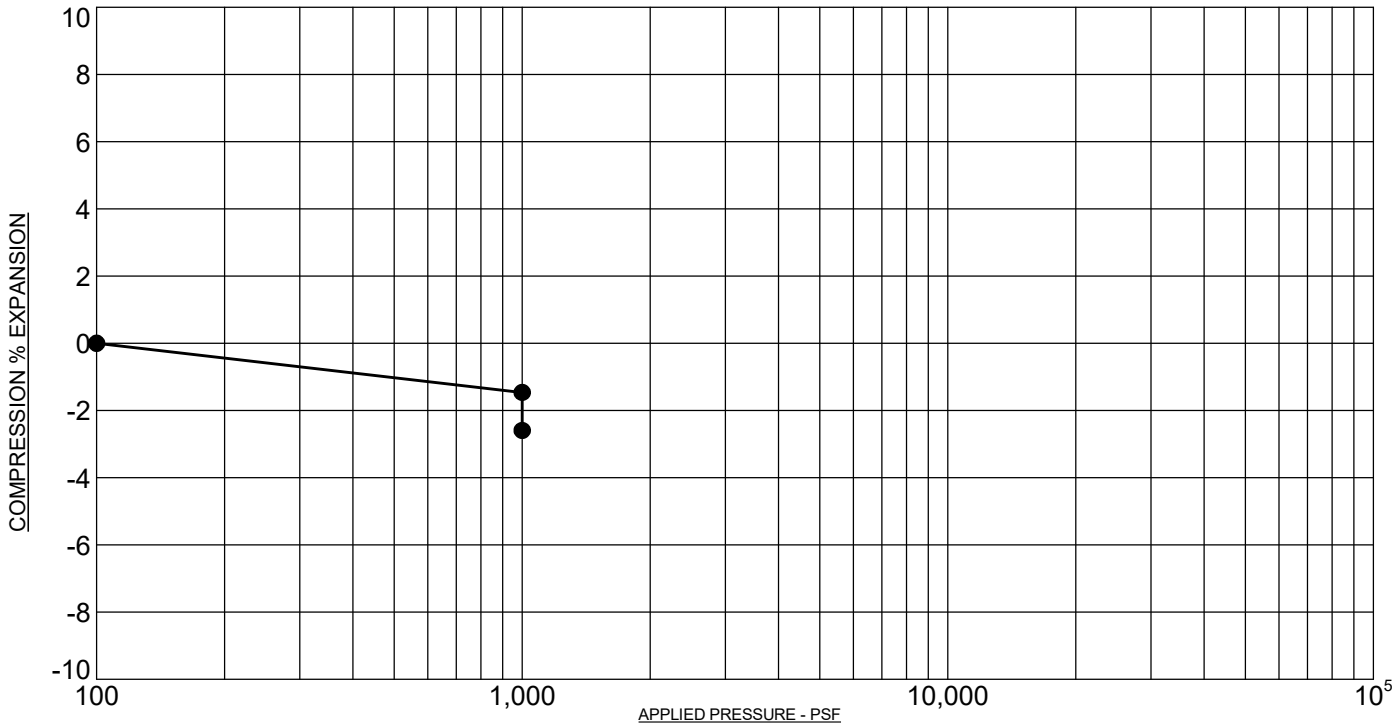
FIGURE No. 19

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-01 @ 24 FT**
NATURAL DRY UNIT WEIGHT: **97.3 PCF**
NATURAL MOISTURE CONTENT: **26.5%**
PERCENT SWELL/COMPRESSION: **0.5**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Clayey Sand**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-02 @ 19 FT**
NATURAL DRY UNIT WEIGHT: **108.3 PCF**
NATURAL MOISTURE CONTENT: **12.0%**
PERCENT SWELL/COMPRESSION: **- 1.1**

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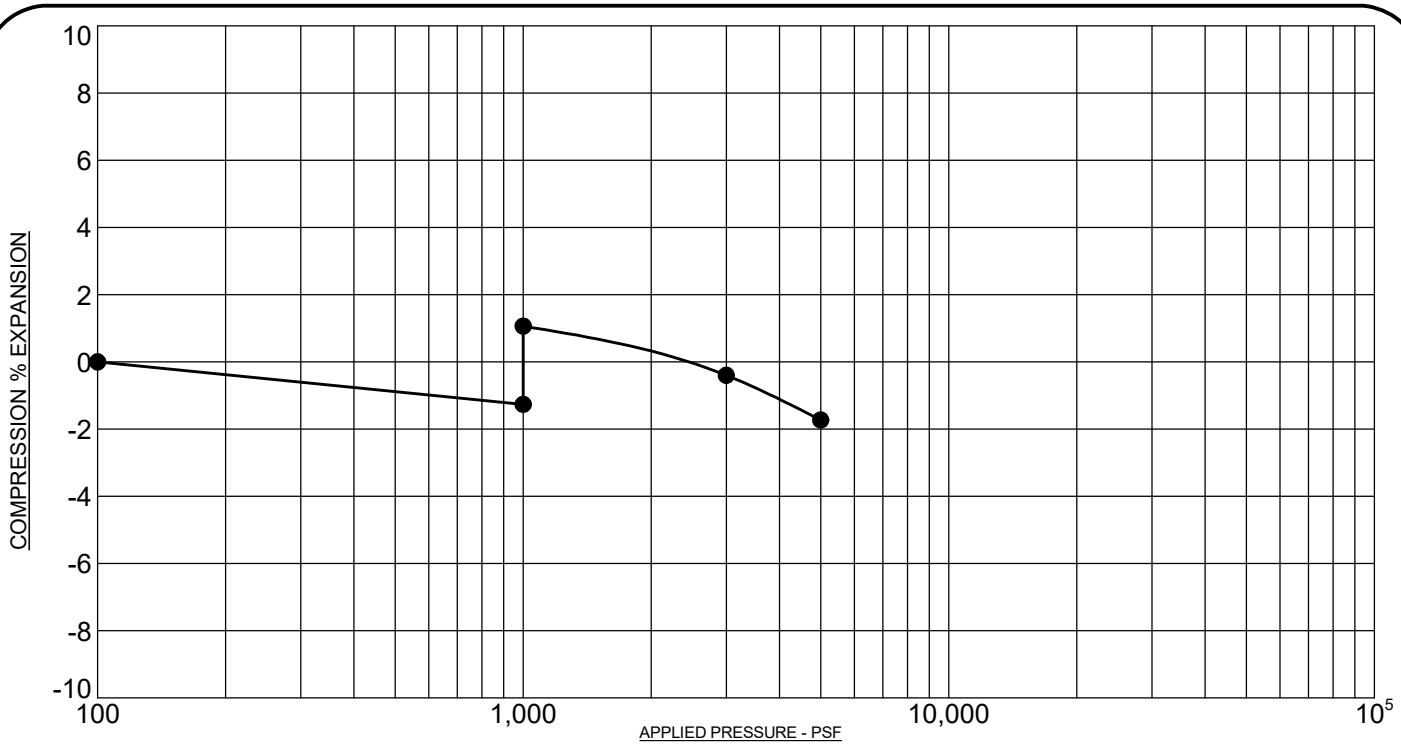
JOB No. 186966

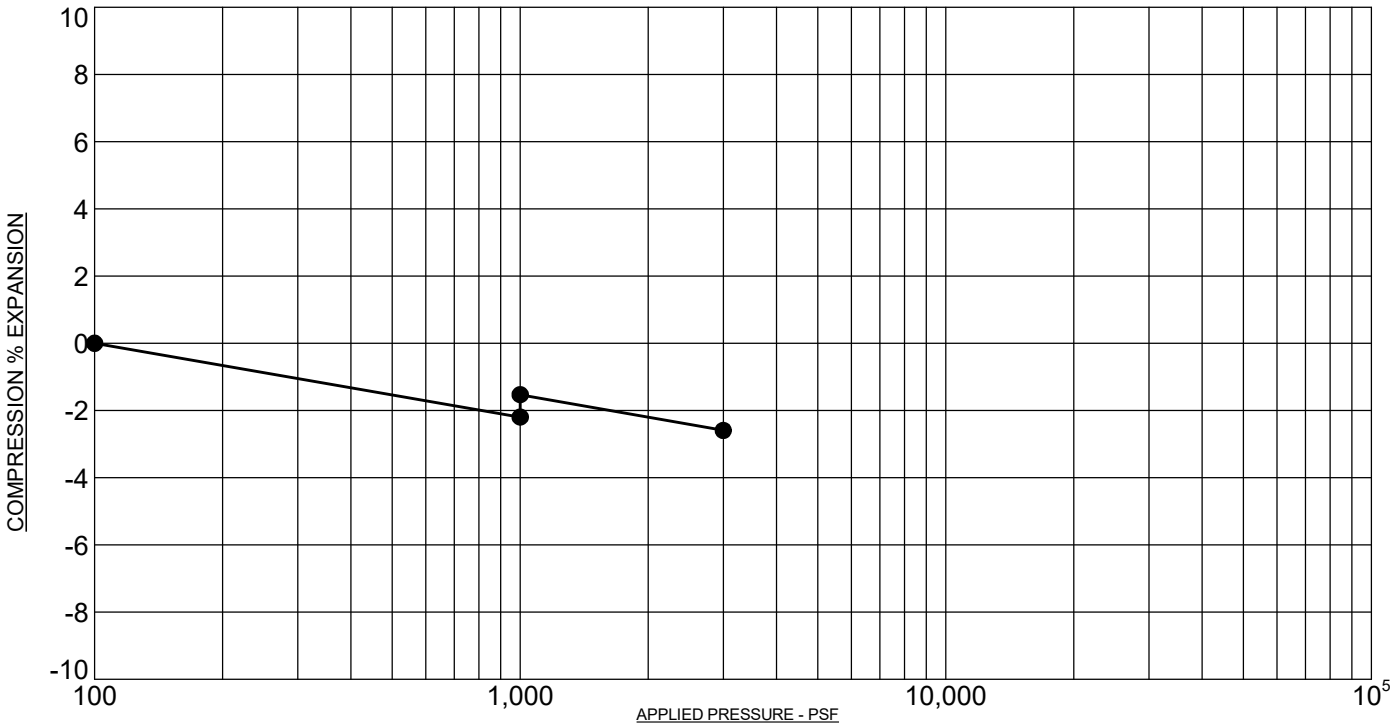
FIGURE No. 20

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-03 @ 34 FT**
NATURAL DRY UNIT WEIGHT: **110.5 PCF**
NATURAL MOISTURE CONTENT: **20.6%**
PERCENT SWELL/COMPRESSION: **2.3**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-04 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **100.3 PCF**
NATURAL MOISTURE CONTENT: **24.0%**
PERCENT SWELL/COMPRESSION: **0.7**

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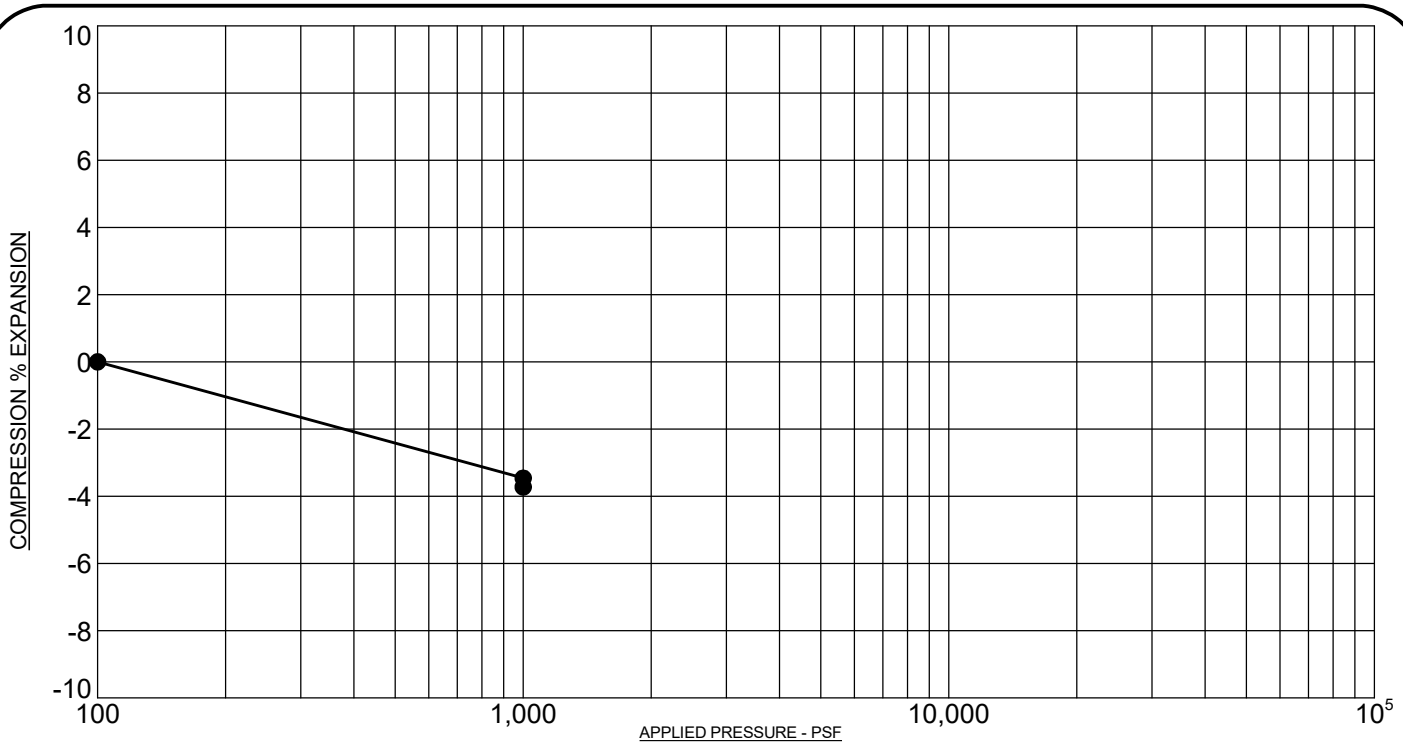
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 186966

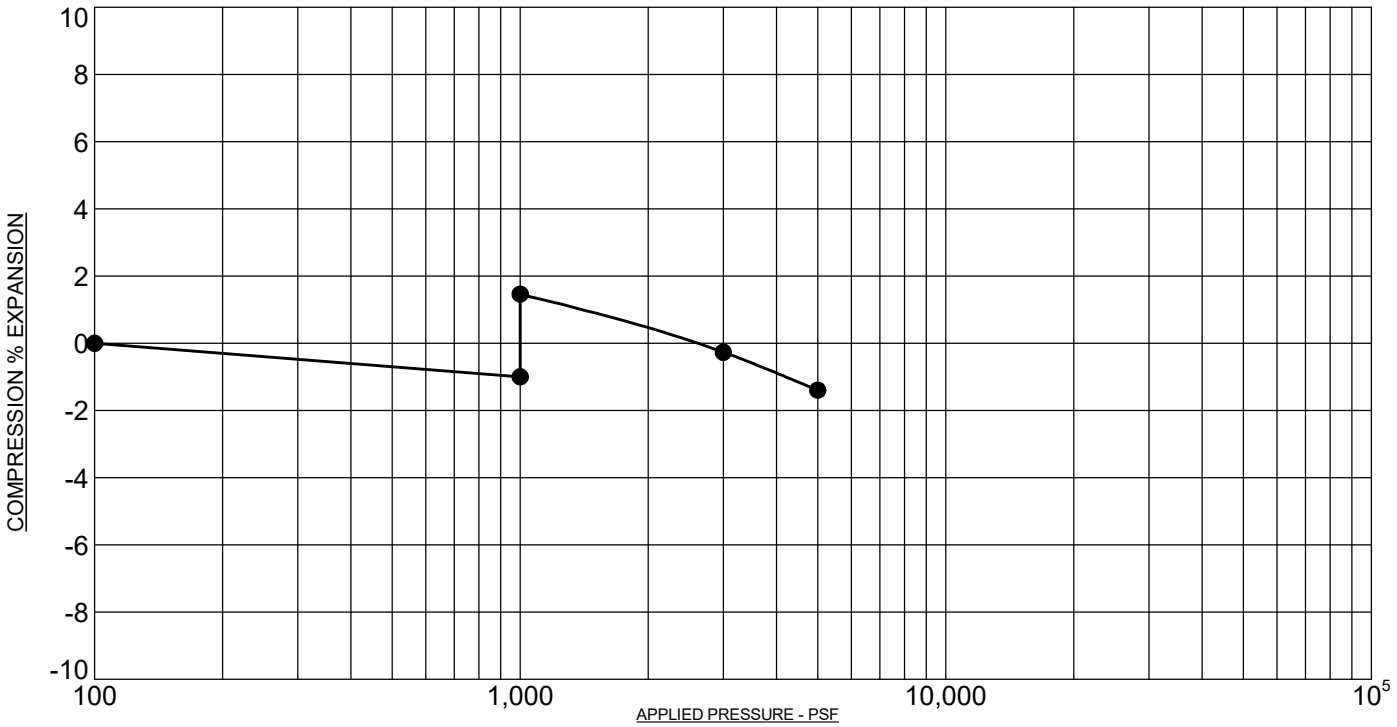
FIGURE No. 21

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Sandy Clay**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-05 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **117.4 PCF**
NATURAL MOISTURE CONTENT: **10.8%**
PERCENT SWELL/COMPRESSION: **- 0.3**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-06 @ 24 FT**
NATURAL DRY UNIT WEIGHT: **108.8 PCF**
NATURAL MOISTURE CONTENT: **19.8%**
PERCENT SWELL/COMPRESSION: **2.5**

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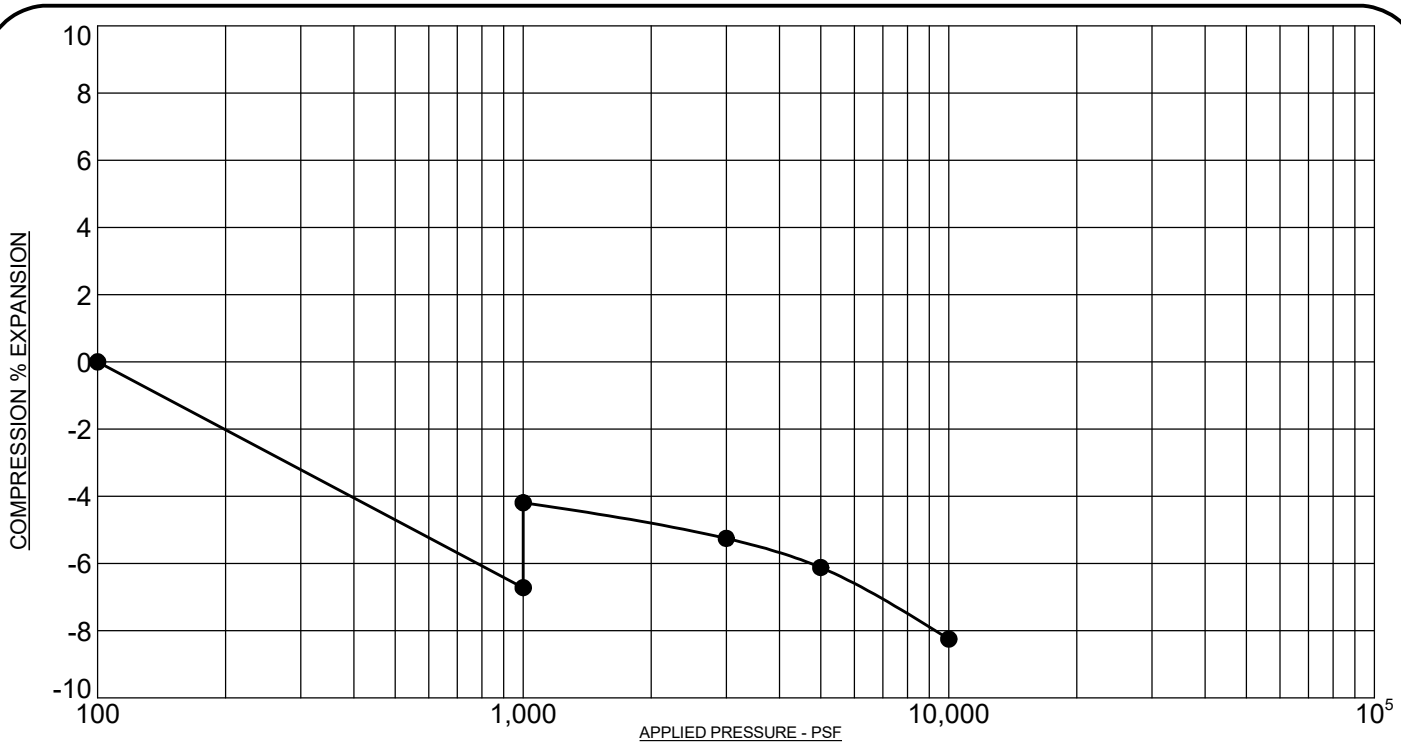
JOB No. 186966

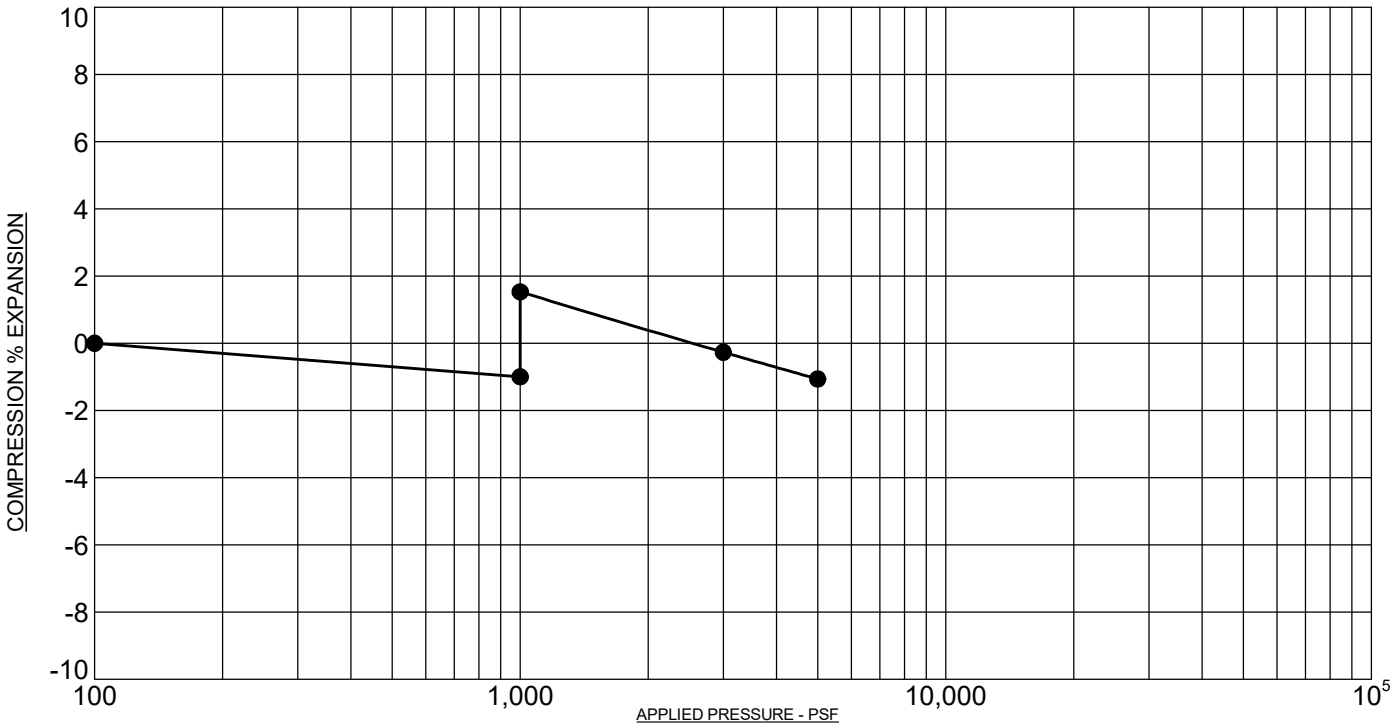
FIGURE No. 22

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-09 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **108.6 PCF**
NATURAL MOISTURE CONTENT: **18.7%**
PERCENT SWELL/COMPRESSION: **2.5**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Sandy Clay**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-10 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **121.2 PCF**
NATURAL MOISTURE CONTENT: **10.1%**
PERCENT SWELL/COMPRESSION: **2.5**

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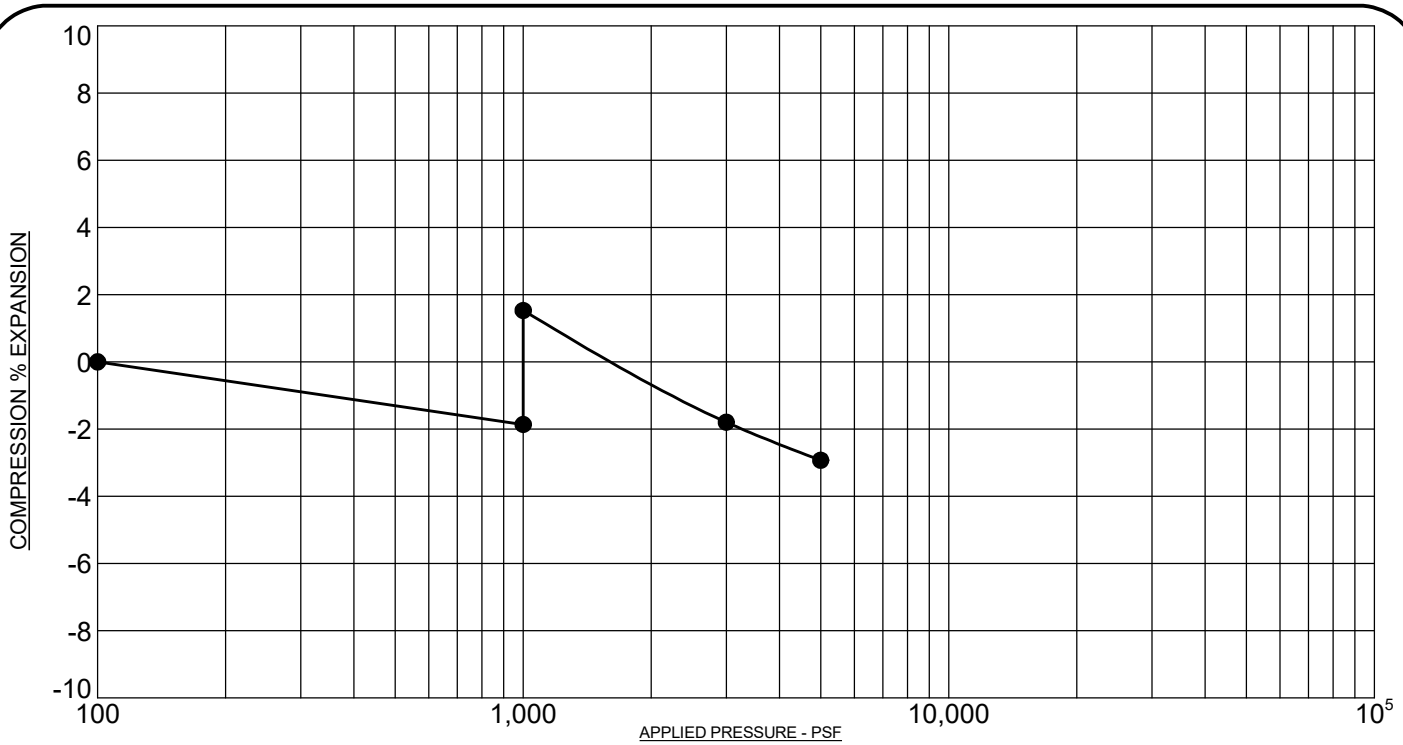
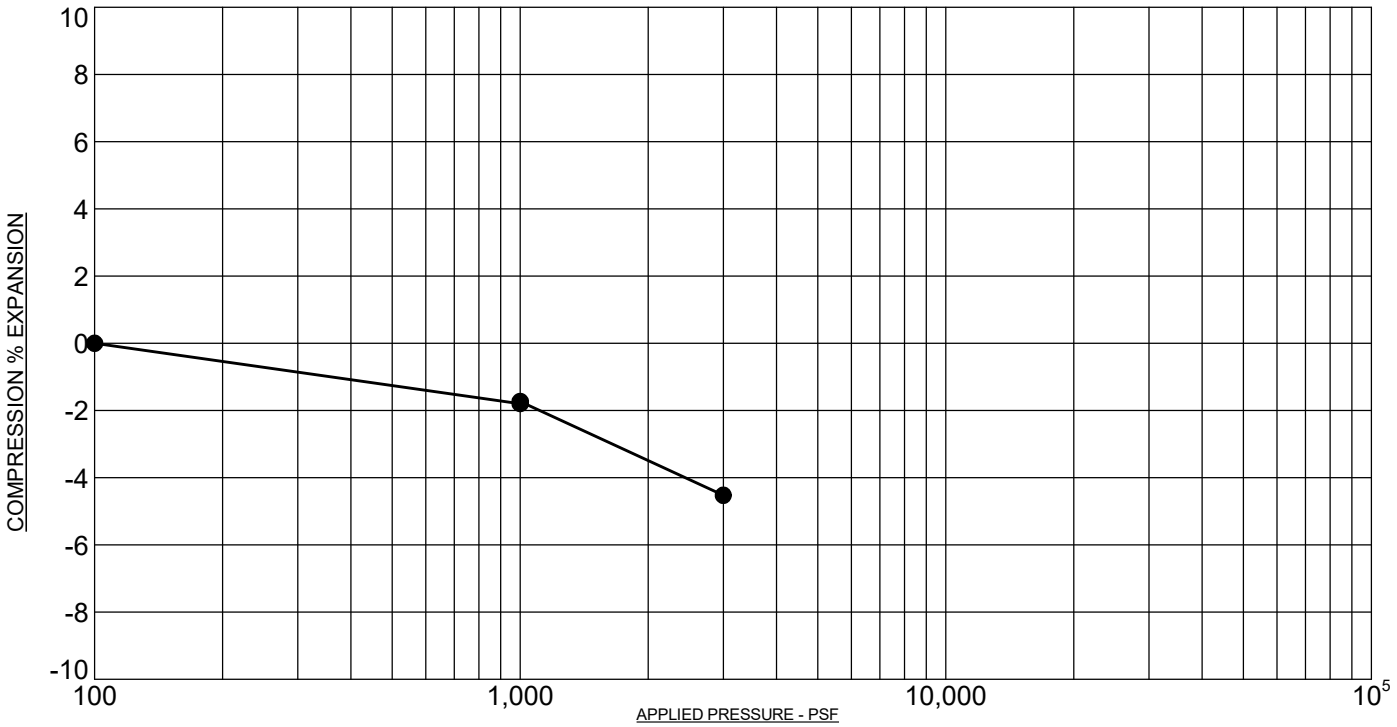
FIGURE No. 23

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-11 @ 29 FT**
NATURAL DRY UNIT WEIGHT: **97.9 PCF**
NATURAL MOISTURE CONTENT: **21.5%**
PERCENT SWELL/COMPRESSION: **3.4**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Clayey Sand**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-14 @ 9 FT**
NATURAL DRY UNIT WEIGHT: **117.1 PCF**
NATURAL MOISTURE CONTENT: **6.3%**
PERCENT SWELL/COMPRESSION: **0.1**

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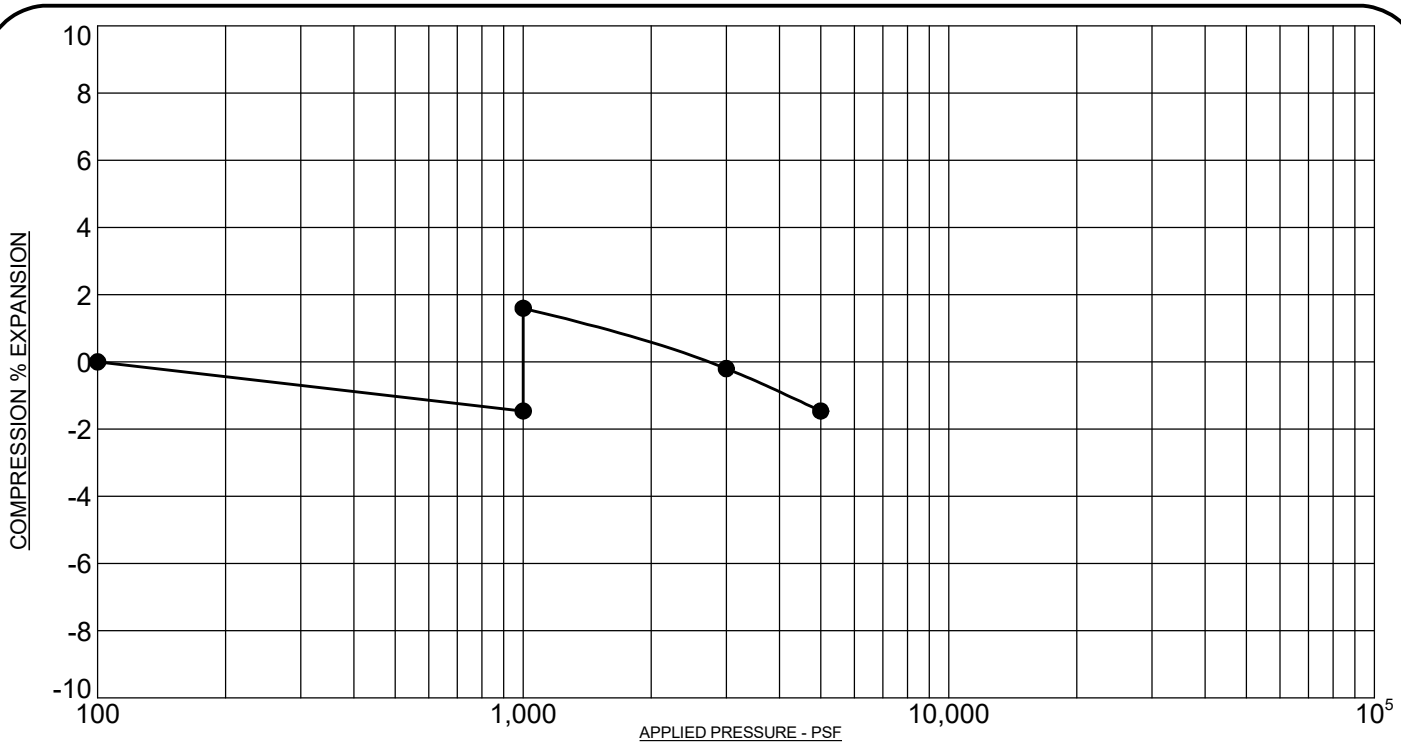
JOB No. 186966

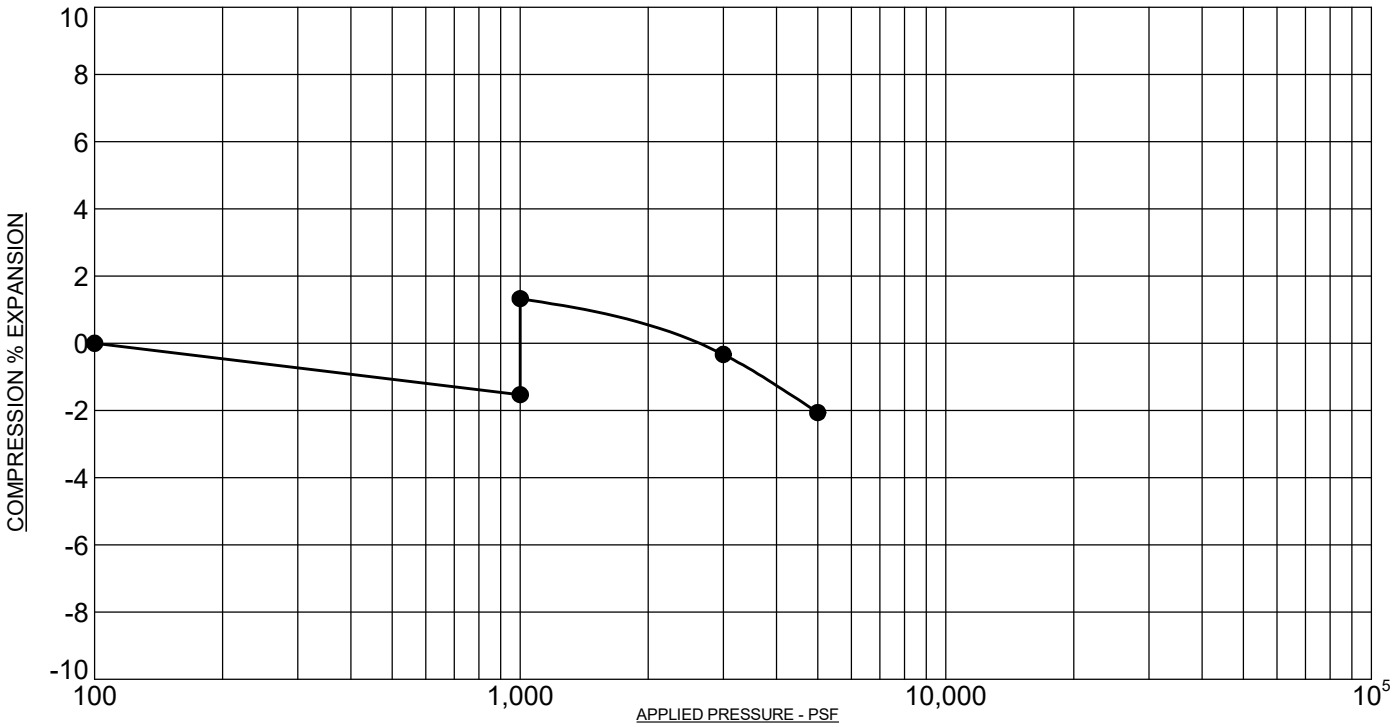
FIGURE No. 24

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-15 @ 29 FT**
NATURAL DRY UNIT WEIGHT: **98.3 PCF**
NATURAL MOISTURE CONTENT: **30.8%**
PERCENT SWELL/COMPRESSION: **3.1**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Sandy Clay**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-16 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **121.1 PCF**
NATURAL MOISTURE CONTENT: **8.7%**
PERCENT SWELL/COMPRESSION: **2.9**

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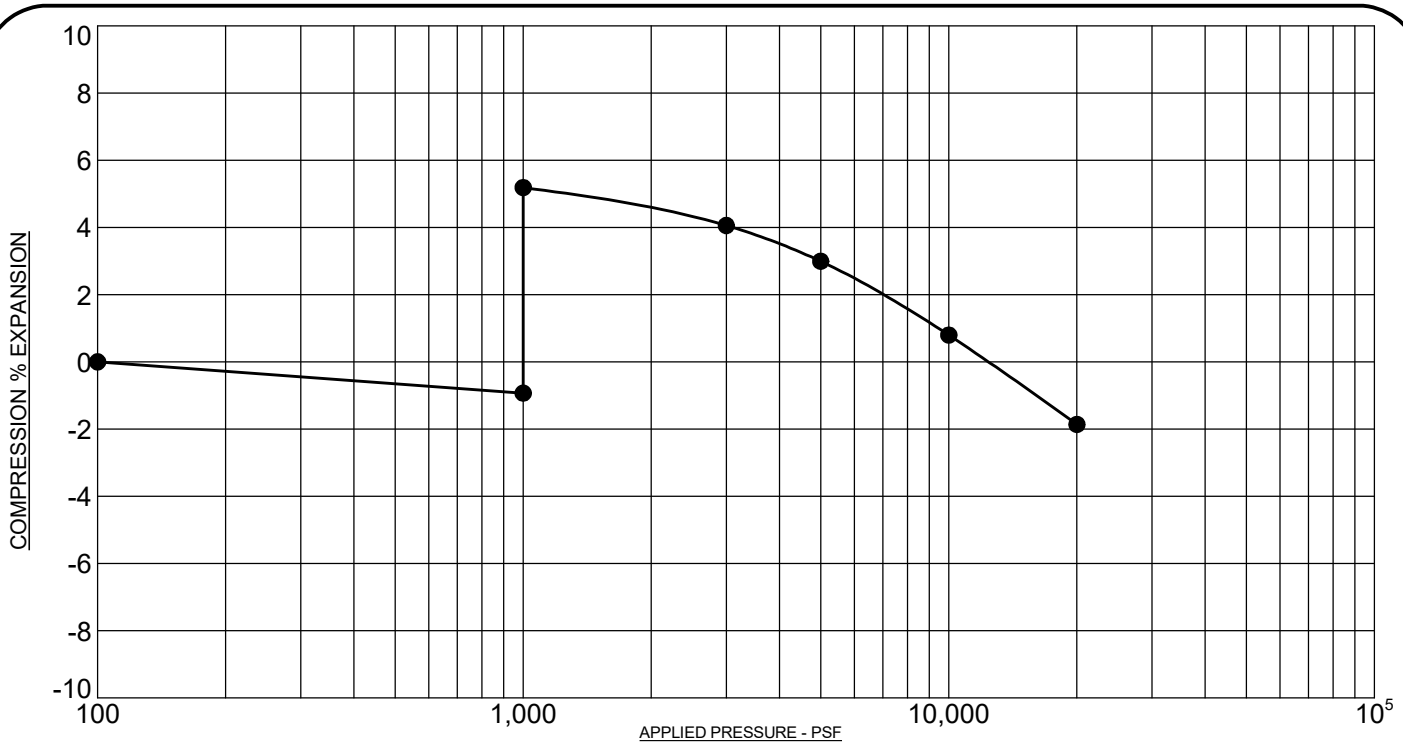
JOB No. 186966

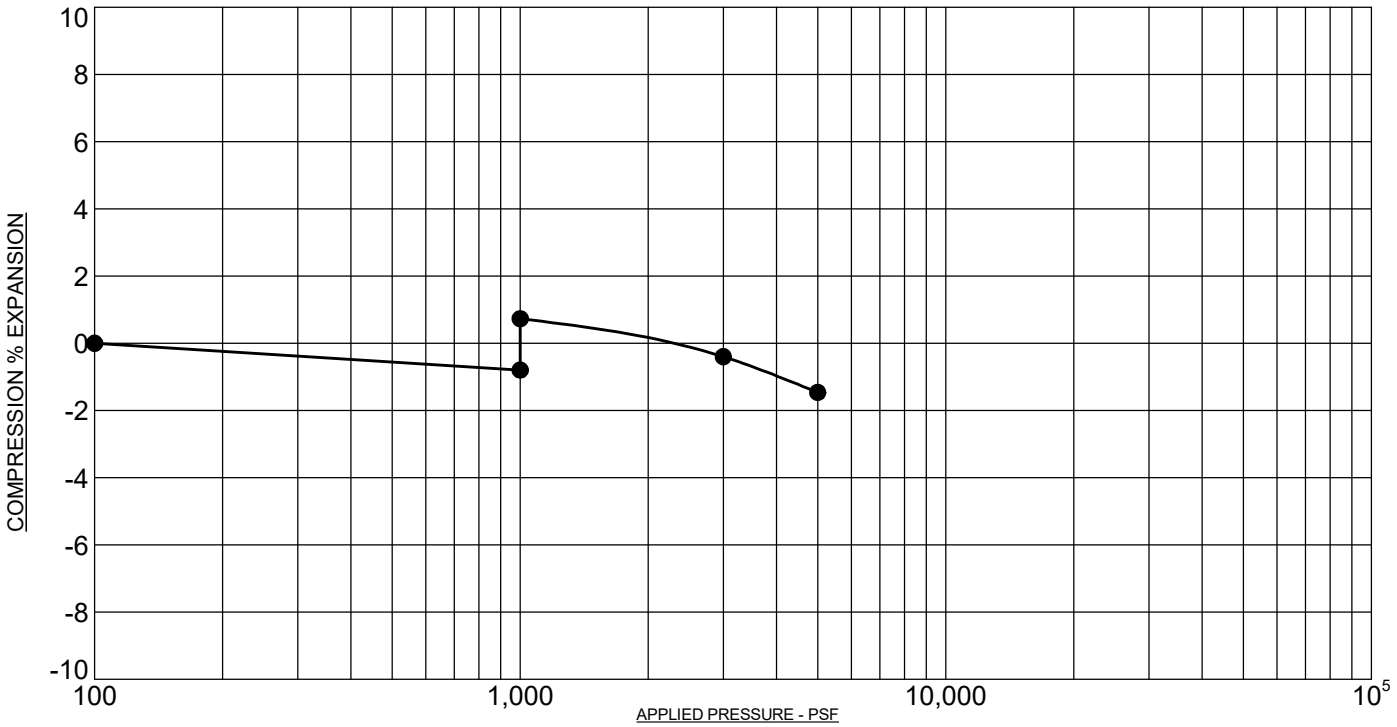
FIGURE No. 25

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-19 @ 19 FT**
NATURAL DRY UNIT WEIGHT: **117.1 PCF**
NATURAL MOISTURE CONTENT: **15.6%**
PERCENT SWELL/COMPRESSION: **6.1**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-20 @ 19 FT**
NATURAL DRY UNIT WEIGHT: **100.9 PCF**
NATURAL MOISTURE CONTENT: **21.1%**
PERCENT SWELL/COMPRESSION: **1.5**

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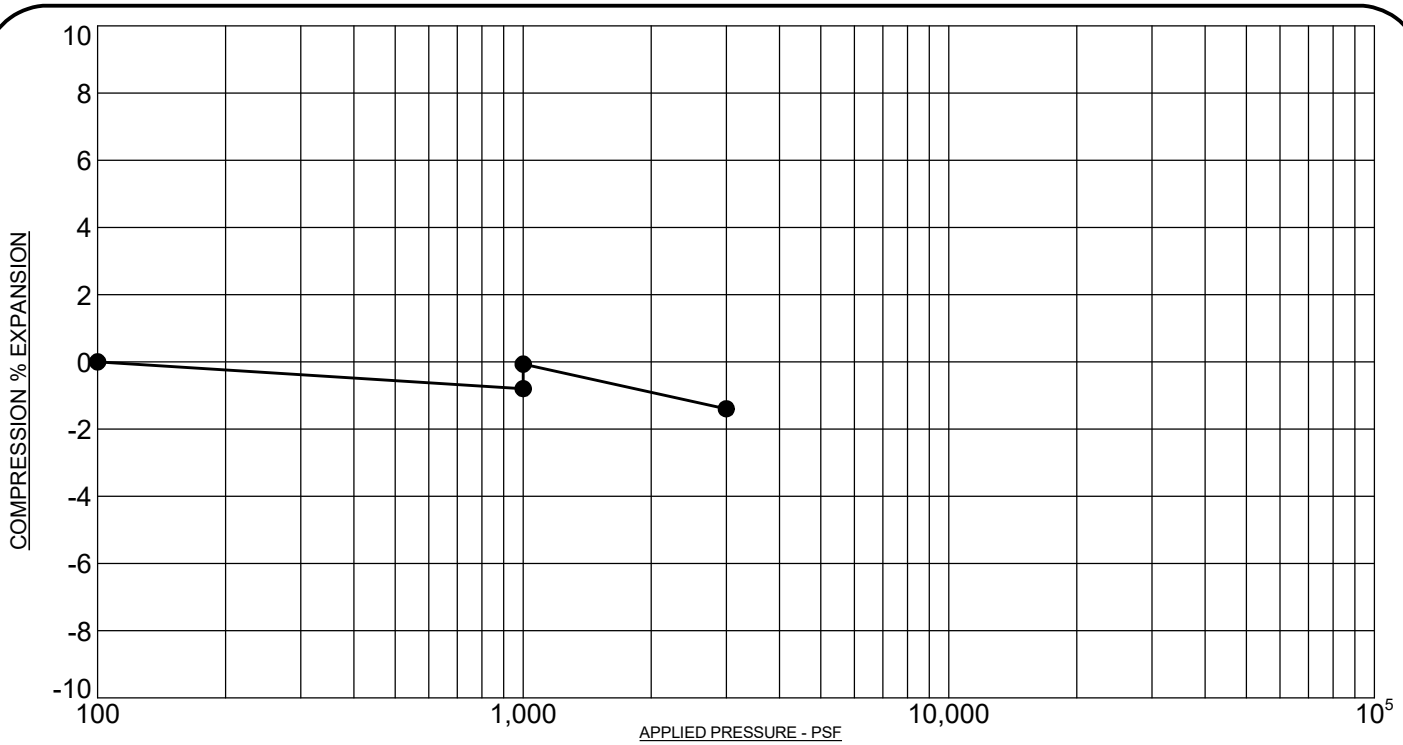
SWELL/CONSOLIDATION TEST RESULTS

JOB No. 186966

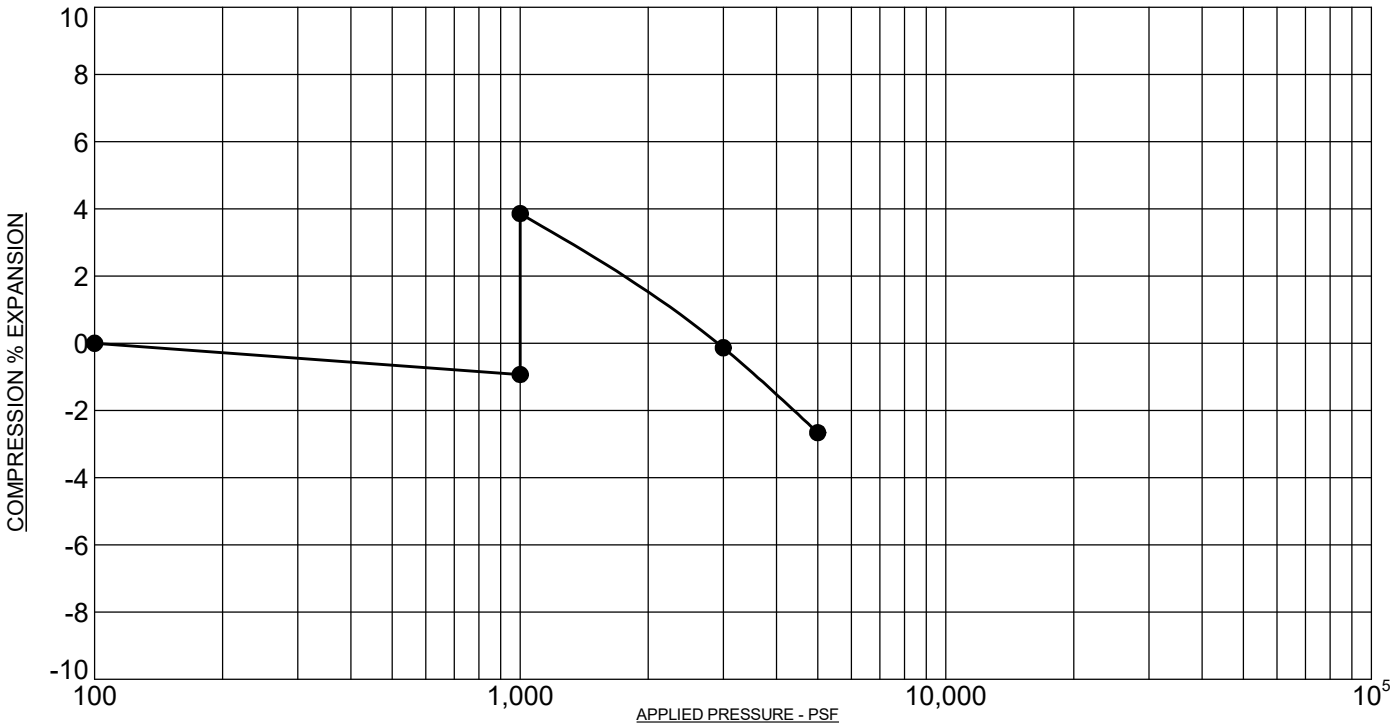
FIGURE No. 26

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Sandy Clay**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-22 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **105.9 PCF**
NATURAL MOISTURE CONTENT: **19.0%**
PERCENT SWELL/COMPRESSION: **0.7**



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Claystone**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-23 @ 4 FT**
NATURAL DRY UNIT WEIGHT: **99.8 PCF**
NATURAL MOISTURE CONTENT: **13.2%**
PERCENT SWELL/COMPRESSION: **4.8**

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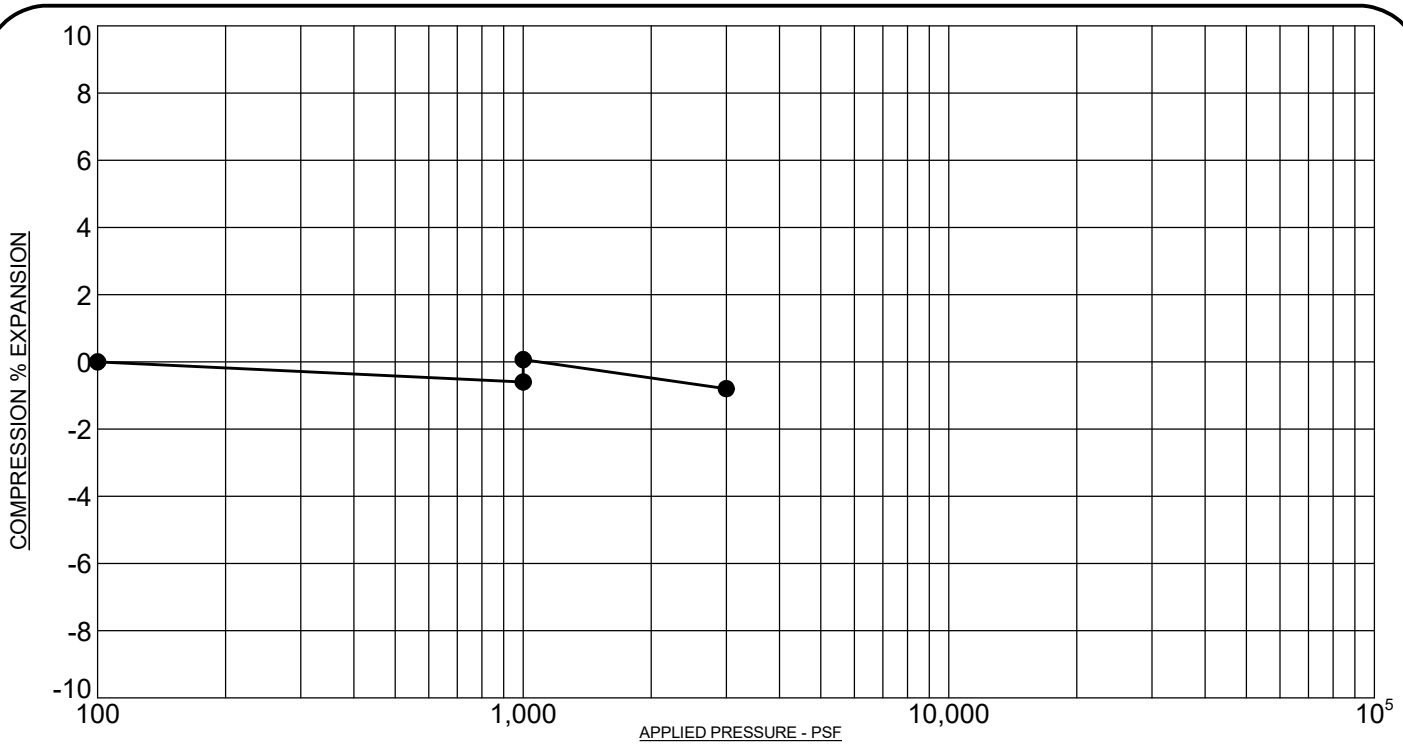
FIGURE No. 27

DATE Dec/22/2021



PROJECT: **Parklands Village Harvest Rd, Aurora, CO**
SAMPLE DESCRIPTION: **Sandy Clay**
NOTE: SAMPLE WAS INUNDATED WITH WATER AT 1000 PSF

SAMPLE LOCATION: **B-25 @ 14 FT**
NATURAL DRY UNIT WEIGHT: **127.2 PCF**
NATURAL MOISTURE CONTENT: **7.7%**
PERCENT SWELL/COMPRESSION: **0.7**

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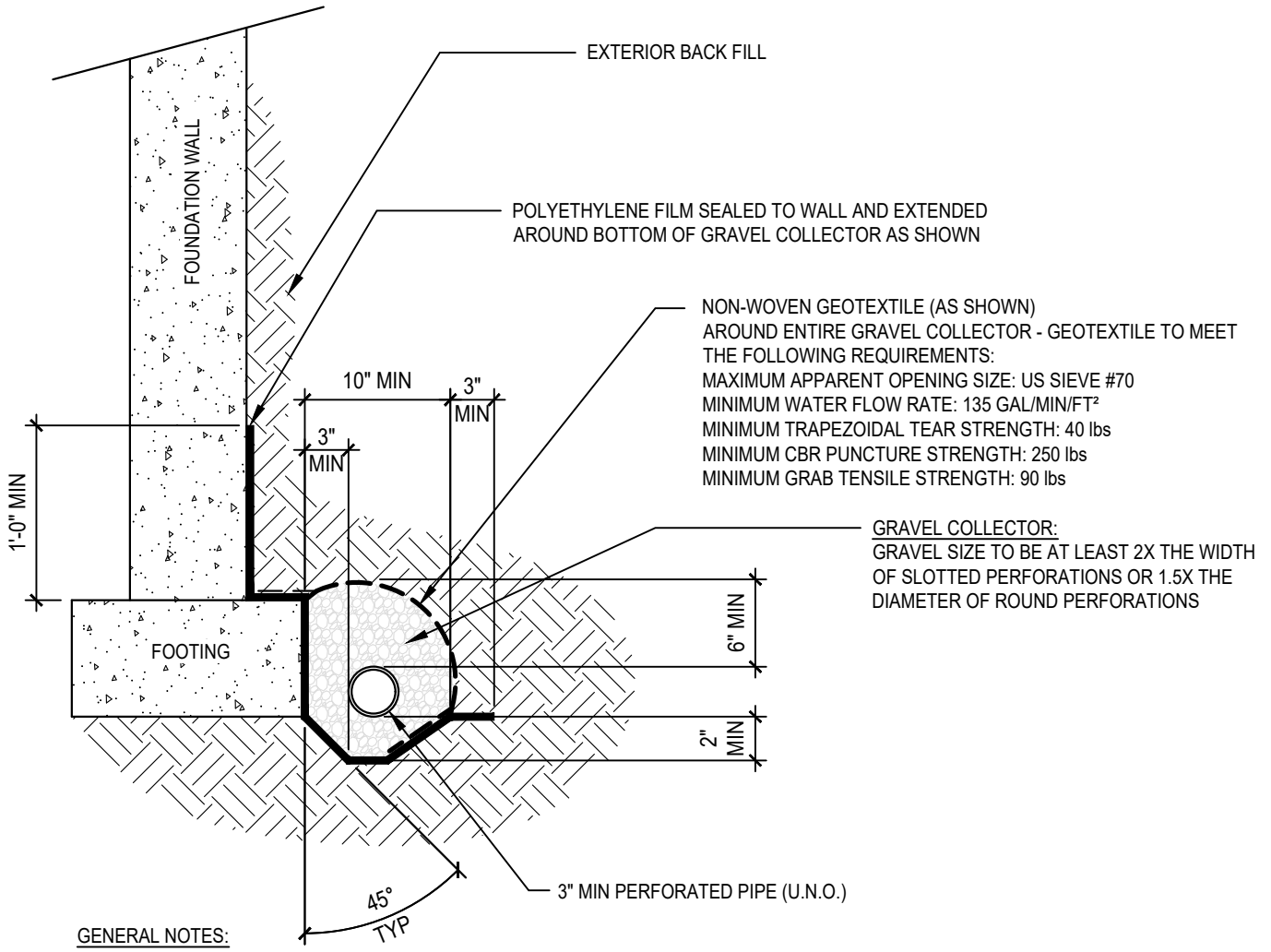
FIGURE No. 28

DATE Dec/22/2021



GENERAL NOTES:

1. BOTTOM OF DRAIN PIPE SHALL BE AT OR BELOW BOTTOM OF FOOTING AT ALL LOCATIONS
2. ALL DRAIN PIPE SHALL BE PERFORATED PLASTIC, WITH THE EXCEPTION OF THE DISCHARGE PORTION WHICH SHALL BE SOLID, NON-PERFORATED PIPE.
3. DRAIN PIPE SHALL HAVE POSITIVE FALL THROUGHOUT.
4. DRAIN PIPE SHALL BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. IF A GRAVITY OUTFALL CANNOT BE ACHIEVED, THEN A SUMP PIT AND PUMP SHALL BE USED. THE OUTFALL SHOULD EXTEND PAST BACKFILL ZONES AND DISCHARGE TO A LOCATION THAT IS GRADED TO DIRECT WATER OFF-SITE.
5. ALL DRAIN COMPONENTS SHALL BE RATED/APPROVED BY THE MANUFACTURER FOR THE INSTALLED DEPTH AND APPLICATION
6. DRAIN SYSTEM, INCLUDING THE OUTFALL OF THE DRAIN, SHALL BE OBSERVED BY QUALIFIED PERSONNEL PRIOR TO BACKFILLING TO VERIFY INSTALLATION.
7. A VERTICAL SEGMENT OF PERFORATED DRAIN PIPE, CAPPED AT THE TOP, SHALL EXTEND TO FINISH GRADE WITHIN ALL WINDOW WELLS.

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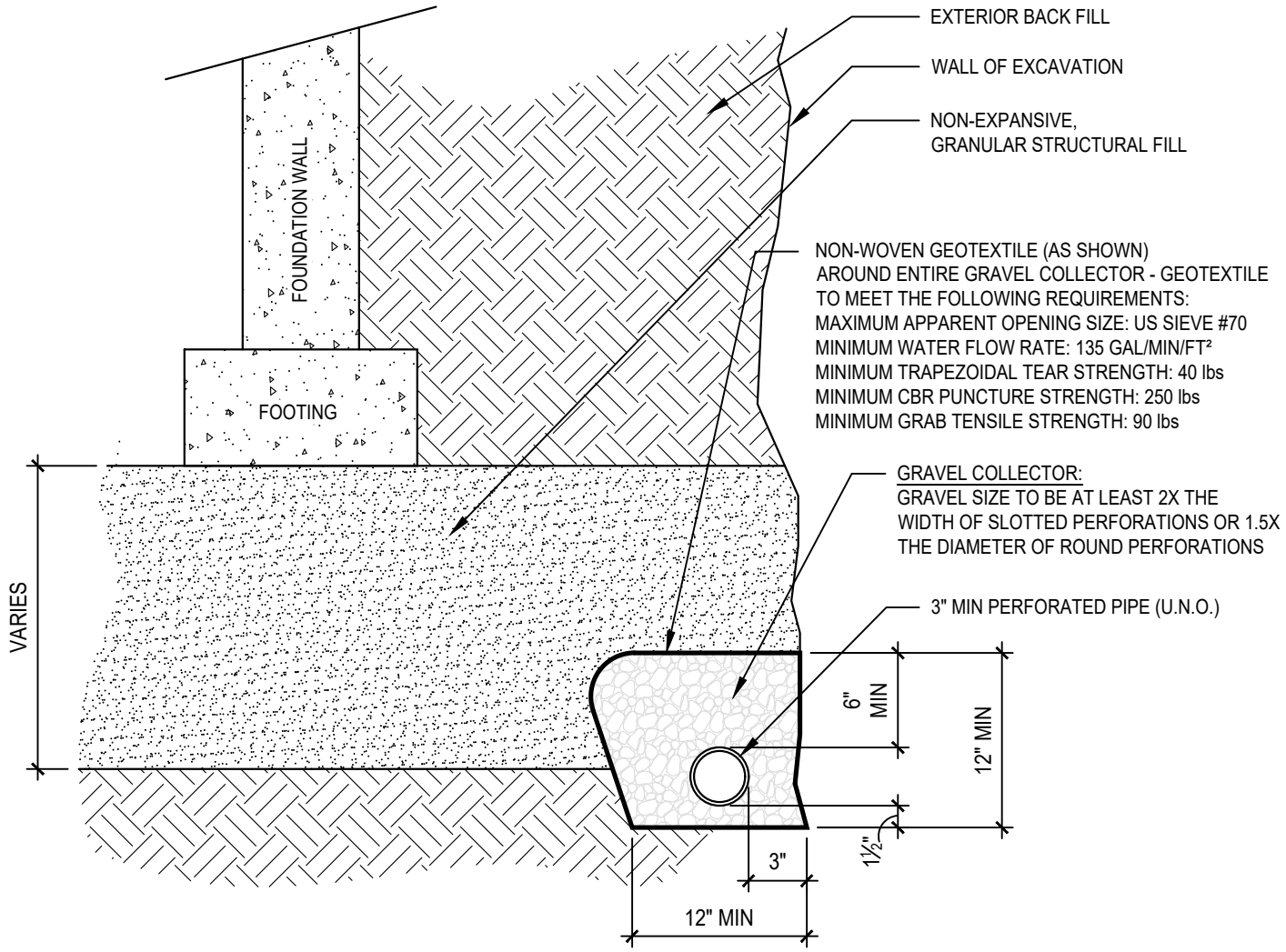
PERIMETER DRAIN

FIG No. 29



GENERAL NOTES:

1. ALL DRAIN PIPE SHALL BE PERFORATED PLASTIC, WITH THE EXCEPTION OF THE DISCHARGE PORTION WHICH SHALL BE SOLID, NON-PERFORATED PIPE.
2. DRAIN PIPE SHALL HAVE POSITIVE FALL THROUGHOUT.
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4. ALL DRAIN COMPONENTS SHALL BE RATED/APPROVED BY THE MANUFACTURER FOR THE INSTALLED DEPTH AND APPLICATION
5. DRAIN SYSTEM, INCLUDING THE OUTFALL OF THE DRAIN, SHALL BE OBSERVED BY QUALIFIED PERSONNEL PRIOR TO BACKFILLING TO VERIFY INSTALLATION.

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OVEREXCAVATION DRAIN

FIG No. 30

APPENDIX A

Guideline Site Grading Specifications

Description: Unless specified otherwise by local or state regulatory agencies, these guideline specifications are for the excavation, placement and compaction of material from locations indicated on the plans, or staked by the Engineer, as necessary to achieve the required elevations. These specifications shall also apply to compaction of materials that may be placed outside of the project.

General: The Geotechnical Engineer shall approve fill materials, method of placement, moisture contents and percent compactions, and shall give written approval of the compacted fill.

Clearing Site: The Contractor shall remove trees, brush, rubbish, vegetation, topsoil and existing structures before excavation or fill placement is commenced. The Contractor shall dispose of the cleared material to provide the Owner with a clean job site. Cleared material shall not be placed in areas to receive fill or where the material will support structures. Clearing shall also include removal of existing fills that do not meet the requirements of this specification and existing structures.

Preparation of Slopes or Drainage Areas to Receive Fill: Natural slopes or slopes of drainage gullies where grades are 20 percent (5:1, horizontal to vertical) or steeper shall be benched prior to fill placement. Benches shall be at least 10 feet wide. Benches may require additional width to accommodate excavation or compaction equipment. At least one bench shall be provided for each 5 feet or less of vertical elevation difference. The bench surface shall be essentially horizontal perpendicular to the slope or at a slight incline into the slope.

Scarifying: Topsoil and vegetation shall be removed from the ground surface in areas to receive fill. The surface shall be plowed or scarified a minimum of 12 inches until the surface is free from ruts, hummocks or other uneven features which would prevent uniform compaction by the equipment to be used.

Compacting Area to Receive Fill: After the area to receive fill has been cleared and scarified, it shall be disked or bladed until it is free from large clods, moisture conditioned to a proper moisture content and compacted to the maximum density as specified for the overlying fill. Areas to receive fill shall be worked, stabilized, or removed and replaced, if necessary, in accordance with the Geotechnical Engineer's recommendations in preparation for fill.

Fill Materials: Fill material shall be free from organic material or other deleterious substances, and shall not contain rocks or lumps having a diameter greater than six inches. Fill materials shall be obtained from cut areas shown on the plans or staked in the field by the Engineer or imported to the site and shall be approved by the Geotechnical Engineer prior to placement. It is recommended that the fill materials have nil to low expansion potential, i.e., consist of silty to slightly clayey sand.

Moisture Content: Fill materials shall be moisture conditioned to within limits of optimum moisture content specified. Sufficient laboratory compaction tests shall be made to determine the optimum moisture content for the various soils encountered in borrow areas or imported to the site.

The contractor may be required to add moisture to the excavation materials in the borrow area if, in the opinion of the Geotechnical Engineer, it is not possible to obtain uniform moisture content by adding water to the fill material during placement. The Contractor may be required to rake or disk the fill soils to provide uniform moisture content through the soils.

The application of water to embankment materials shall be made with watering equipment, approved by the Geotechnical Engineer, which will give the desired results. Water jets from the spreader shall not be directed at the embankment with such force that fill materials are eroded.

Should too much water be added to the fill, such that the material is too wet to permit the desired compaction to be obtained, compacting and work on that section of the fill shall be delayed until the material has been allowed to dry to the required moisture content. The Contractor will be permitted to rework the wet material in an approved manner to hasten its drying.

Compaction of Fill Areas: Selected fill material shall be placed and mixed in evenly spread layers. After each fill layer has been placed, it shall be uniformly compacted to not less than the specified percentage of maximum density. Fill materials shall be placed such that the thickness of loose material does not exceed 10 inches and the compacted lift thickness does not exceed 6 inches.

Compaction, as specified above, shall be obtained by the use of sheepsfoot rollers, multiple-wheel pneumatic-tired rollers, or other equipment approved by the Geotechnical Engineer. Granular fill shall be compacted using vibratory equipment or other equipment approved by the Geotechnical Engineer. Compaction shall be accomplished while the fill material is at the specified moisture content. Compaction of each layer shall be continuous over the entire area.

Moisture Content and Density Criteria:

A. For fill soils supporting utilities and roadways, 95% maximum Standard Proctor dry density at 2% $\pm$ of optimum moisture content.

B. For granular, structural fill soils fills supporting future buildings, 92% maximum Modified Proctor dry density at 2% $\pm$ of optimum moisture content. For moisture-conditioned expansive fill soils supporting future buildings, 95% of maximum Standard Proctor dry density at 1% to 4% above optimum moisture content.

C. For general grading fills, 90% maximum Standard Proctor dry density or Modified Proctor dry density at 2% $\pm$ of optimum moisture content.

Compaction of Slopes: Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction operations shall be continued until slopes are stable, but not too dense for planting, and such that there is no appreciable amount of loose soil on the slopes. Compaction of slopes may be done progressively in increments of three to five feet in height or after the fill is brought to its total height. Permanent fill slopes shall not exceed 3:1 (horizontal to vertical).

Density Testing: Field density testing shall be performed by the Geotechnical Engineer at locations and depths of his choosing. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density tests shall be taken in compacted material below the disturbed surface. When density tests indicate the density or moisture content of any layer of fill or portion thereof is below that required, the particular layer or portion shall be reworked until the required density or moisture content has been achieved.

Observation and Testing of Fill: Observation by the Geotechnical Engineer shall be sufficient during the placement of fill and compaction operations so that he can declare the fill was placed in general conformance with Specifications. All observations necessary to test the placement of fill and observe compaction operations will be at the expense of the Owner.

Seasonal Limits: No fill material shall be placed, spread or rolled while it is frozen, thawing, or during unfavorable weather conditions. When work is interrupted by heavy precipitation, fill operations shall not be resumed until the Geotechnical Engineer indicates the moisture content and density of previously placed materials are as specified.

Reporting of Field Density Tests: Density tests made by the Geotechnical Engineer shall be submitted progressively to the Owner. Dry density, moisture content, percent compaction, and approximate location shall be reported for each test taken.