AMERICAN
ENGINEERING TESTING

Report of Geotechnical Exploration
Proposed Building Project
Decker Drive & Dovetail Lane
Sheridan, Wyoming

AET Project No. P-0006531

Date:
February 1, 2022

Prepared for:

StoneMill Construction, LLC.

Swayne Redinger

2727 Coffeen Avenue
Sheridan, Wyoming 82801

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Forensic • Environmental
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February 1, 2022

StoneMill Construction, LLC.
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Attn: Mr. Swayne Redinger
swayne@stonemillconstruction.com

RE: Report of Geotechnical Exploration
Proposed Riverstone Park Development
Decker Drive & Dovetail Lane
Sheridan, Wyoming
AET Project No. P-00066531

Dear Mr. Swayne:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for the above referenced proposed Riverstone Park Development Project, north of Sheridan Wyoming on Dovetail Lane. These services were performed in general accordance with our proposal to you dated September 24, 2021 and your written authorization to proceed on September 28, 2021. We are submitting one (1) electronic copy of the report to you.

Please contact me if you have any questions about the report. I can also be contacted for arranging observation and testing services during construction of the project. We highly recommend testing and observations be performed during construction at this site.

Sincerely,
American Engineering Testing, Inc.

Brian Freed

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SIGNATURE PAGE

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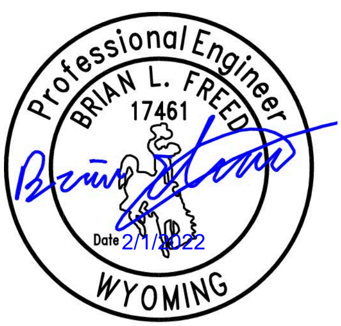


Reviewed by:

Robert Temme, VP, PE
West Region BD Director

TABLE OF CONTENTS

TABLE OF CONTENTS

1.0 INTRODUCTION

We understand you are proposing the construction of new housing project at the Riverstone Park Development, in Sheridan Wyoming. It is our understanding the proposed construction will be 63 lots on 25 acres of agricultural land along the north side of Dovetail Lane and west of Decker Drive located north of the Sheridan Wyoming. The subdivision lots will be accessed with a paved loop roadway and underground utilities will be installed with the construction activities

To assist with the planning and design, American Engineering Testing, Inc. (AET) has been authorized to conduct a subsurface exploration program at the site, conduct soil laboratory testing, and perform a geotechnical engineering review for the project. This report presents the results of the above services and provides our engineering recommendations based on this data.

2.0 SCOPE OF SERVICES

AET's services were performed in general accordance with our proposal dated October 13, 2021. The authorized scope consists of the following:

- eighteen (18) Standard Penetration Test (SPT) borings across the proposed subdivision project site to depths ranging from approximately 15-20 feet below existing grade.
- Soil laboratory testing.
- Geotechnical engineering analysis based on the gained data and preparation of this report.

These services are intended for geotechnical purposes only. The scope is not intended to explore for the presence or extent of environmental contamination in the soil or groundwater.

3.0 PROJECT INFORMATION

Based on the information provided, we understand the project will include the construction of up to 63 residential structures. We expect some residential structures will include basement levels. An asphalt paved road is proposed to be constructed through the development as well as various utilities.

It is our assumption that minor site grading will be completed as part of the site work.

The purpose of the geotechnical study was to determine the subsurface conditions at the site and to evaluate the suitability of the site soils for their use in constructing the proposed structure. Our foundation design assumptions include a minimum factor of safety of 3 with respect to the ultimate bearing capacity.

The previously stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from that described so that we can evaluate whether modifications to our recommendations are appropriate.

4.0 SUBSURFACE EXPLORATION AND TESTING

4.1 Field Exploration Program

The subsurface exploration program conducted for the project consisted of eighteen (18) standard penetration test (SPT) borings drilled on October 19th through October 22nd, 2021. The borings were drilled at locations selected by AET personnel based upon conversations with and information provided by Stonemill Construction.

The logs of the borings and details of the methods used appear in Appendix A. The logs contain information concerning soil layering, soil classification, geologic origins, and moisture condition. A density description or consistency is also noted for the natural soils, which is based on the standard penetration resistance (N-value).

The boring locations and temporary benchmark (TBM) are shown on Figure 2: Boring Location Map is included in Appendix A. Surface elevations were provided to AET from survey data.

4.2 Laboratory Testing

The laboratory test program included natural moisture content, dry density, Atterberg Limits, sieve analysis, percent passing the No. 200 sieve, and swell-consolidation tests. The test results appear in Appendix A on the individual boring logs adjacent to the samples upon which they were performed or on the data sheets following the logs.

5.0 SITE CONDITIONS

5.1 Surface Observations

At the time of our field work, the site primarily consisted of an agricultural field with gravels and cobbles visible on the surface. The site is relatively flat, with slight drainage to the south- southeast. To the south of the project site is Dovetail Lane under construction at the time of our field work. To the east of the project site is a residential building with various farming structures.

5.2 Subsurface Soils/Geology

Below a thin layer of topsoil, the subsurface soils encountered within the borings consisted of native site alluvial soils. The alluvial deposits are underlain by the Tongue River Member of the Fort Union Formation. The alluvial soils consisted of lean clay, clayey sand, sand, and gravels. Cobble sized material was also encountered often during drilling, primarily with the gravel layers. The soils encountered in the Tongue River Member of the Fort Union Formation consisted of stiff to hard sandy clays and dense to very dense clayey sands. The Subsurface Boring Logs included in Appendix A give a more detailed description of the soils encountered within the borings.

5.3 Groundwater

At the time of our field work, ground water was encountered within boring depths explored during subsurface exploration. Of the eighteen borings completed groundwater was encountered in five (5) borings during the time of our subsurface exploration. Water levels ranged from 9 feet to 11 feet below ground surface. The water levels measured in each boring are shown on the boring logs in Appendix A.

The presence or lack of groundwater noted at the boring locations should not be taken as an accurate representation of the actual groundwater levels. Groundwater levels can fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors. A long period of time may be required for groundwater to stabilize in the soils present at the site; this period of time is generally not available during a typical subsurface exploration program.

6.0 RECOMMENDATIONS

6.1 Discussion

Our recommendations in the following sections are intended to minimize, to varying degrees, movement related problems for the proposed foundations and floor slabs. Even if our recommendations are followed, we cannot guarantee that some movement will not occur. The present state of the art is such that the risk of movement cannot be accurately assessed. It depends on a number of uncontrolled variables such as climatic conditions during and after construction, long term fluctuations of the groundwater level, utility line leakage, landscaping, and other similar aspects. The risk of detrimental movement must be assumed by the project owner.

The following recommendations are based on the soil conditions observed, and in the samples collected from the soil borings advanced at the time of the field activities. The location of the borings and the recommendations provided, were based on the information available to AET at the time of our field work. The soils encountered in each boring location and the soils encountered during excavation and site grading may vary due to the surficial geology of the site. Further, changes in climatic conditions between the time of exploration and the time of construction may also affect subsurface conditions, particularly groundwater levels and the moisture content of the soils. Due to the potential variations, we recommend that AET be retained to verify the soil conditions encountered during excavations match the information gained during our field investigation.

Final grading such as cuts and fills made on the site during construction may have a direct impact on the performance of the structures and the following recommendations. AET must be allowed to review the final grading plans of the site to verify the following recommendations will remain applicable and/or if additional recommendations apply. Also note that modifications made to the completed structures and site, such as future additions and grade and drainage changes, may result in a direct impact to the performance of the original structures and site and cannot be addressed at this time.

Also, the following recommendations must be verified and observed in the field by the geotechnical engineer during construction. As the cost associated with the construction observations and testing will vary depending on the size and complexity of the structures and site, AET must be allowed to provide a proposal for these services during construction. The costs associated with the observations and testing services need to be included in the overall project construction cost.

To reduce the risk of movement of the bearing strata, good drainage must be maintained during and after construction. We recommend the final site grading be designed with positive drainage away from the buildings for at least a distance of 10 feet. We also recommend the excavations be left open a minimal amount of time to reduce the possible amount of surface water to accumulate in the base of the excavation.

6.2 Site Preparation/ Mass grading

We recommend existing topsoil and any organic matter be removed from within the construction limits of the new structures and all areas to receive fill. Topsoil may be stockpiled on site for reuse once grading is complete; however, any organic material, and any old construction debris encountered should be wasted from the site.

We anticipate that minimal cuts and fills will be required outside of the building footprints. Where required, grading should continue to the desired construction elevations. All exposed subgrades need to be scarified to a depth of approximately 8 to 12-inches, the moisture content of the scarified soils adjusted to within 3% of their optimum moisture content and the scarified soils compacted to at least 95% of their standard Proctor dry density (ASTM D 698).

The excavated soils, cleaned of all unsuitable/organic materials and rocks greater than 3-inches in nominal size, may be used obtain final grades or stockpiled on-site and reused as utility trench backfill and overlot fill. We recommend the soils to be used as fill be moisture conditioned to within 3% of optimum moisture and compacted to at least 95% of the maximum dry density. Imported fill material, if required, should be approved by the geotechnical engineer prior to use.

To reduce the potential for movement related distress and to provide a uniform bearing surface, we recommend, the concrete slab-on-grade floors systems bear on at least 1 foot of compacted granular engineered fill material. We also recommend that the footings bear on at least 1 to 2 feet or more, as indicated in the following section, of compacted granular engineered fill, placed directly on the recompacted site soils.

The imported granular engineered fill should be pre-approved by the geotechnical engineer prior to its use. The granular engineered fill above the water table, should be a non-expansive material with a maximum size of 2-inches, 40% to 85% passing the #4 sieve, and no more than 20% passing the #200 sieve, with a liquid limit of less than 30. All granular engineered fill to be placed above the water table, whether from on-site or imported, should be placed in 8-inch thick maximum loose lifts; the moisture content should be conditioned to within ±3% of optimum moisture and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density.

We recommend all final cut and fill slopes be constructed with 3H:1V slopes or flatter. It is our opinion temporary cut slopes can be cut to slopes of 2H:1V.

As noted, groundwater was encountered across the site. Temporary dewatering of excavations will be necessary if groundwater is encountered, or surface drainage is allowed to accumulate in the excavations. Contractors working on the project should be prepared to have equipment on-site that will lower and maintain the groundwater level a minimum of two feet below the base of the excavations. We recommend that the groundwater levels be check prior to and during construction operations on site.

For more information on site preparation see the Standard Sheets section of this report.

6.3 General Foundation Design

Based on the information obtained from the borings and laboratory testing, as well as our analysis, it is our opinion the structures that do not have a basement may be founded on conventional spread footing foundation systems placed a minimum of 1 foot of a granular non-expansive engineered fill. The engineered fill should be moisture conditioned and compacted as described in section 6.2.

It is our understanding that if basement levels are to be constructed the basement floor slab will be no more than 6 to 7 feet below the existing ground surface. Based upon the groundwater levels measured during the course of our field exploration groundwater levels ranged from approximately 9 to 11 feet below the existing ground surface. However as mentioned previously, groundwater levels can fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors. A long period of time may be required for groundwater to stabilize in the soils present at the site; this period of time is generally not available during a typical subsurface exploration program.

If a basement level is to be constructed, we recommend that it be placed on a conventional spread footing foundation system placed on a minimum of 2 feet of a granular engineered fill. Additionally, any structure with a basement level should have a perimeter drain system placed at the bottom outside edge of the granular engineered fill, the perimeter drain system should be routed to a sump pumping system to remove water from below the basement level. It should be anticipated that a sump pumping system will run near constantly due to the shallow groundwater encountered across the site.

Due to the location of the groundwater on the site in relation to the basement floor slabs, it is likely that during excavations for basement levels groundwater will be encountered. Groundwater levels should be checked prior to construction and the contractor should be prepared to lower and maintain the groundwater level a minimum of two feet below the base of any excavations, during construction. It is likely that soft soils will be encountered at or near the groundwater level, as such it is recommended that the geotechnical engineer be retained to observe and provide recommendations if soft soils are encountered at the base of any excavations extending near the groundwater level

All footing excavations should be oversized at a 1H:1V ratio. Footings can be designed for an allowable bearing capacity of 3,000 pounds per square foot (psf). We recommend all footings be placed at least 42-inches below final grades for frost protection. As constructed, the above loading should provide a theoretical safety factor of three or more with respect to a general shear or base failure of the footings.

6.4 Basement Wall Design Considerations

If basement levels are constructed, the basement or lower-level walls will be subject to lateral earth pressure from the backfill. These types of walls are normally designed for the "at-rest" earth pressure condition because the walls are restrained from rotating. If the site soils are used as backfill, a value of 60 pounds per square foot, per foot of depth, should be used for the at-rest lateral earth pressure against the basement walls. The lateral earth pressure does not include any factor of safety and it not applicable for submerged conditions or hydrostatic loading

6.5 Floor Slab Design

As previously indicated, floor slabs should be placed on at least 1 foot of compacted granular engineered fill. Prior to placement we recommend the exposed subgrade be scarified to a depth of one foot and moisture conditioned to within -3% to +3% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density. We also recommend the floor slabs be constructed independent of the foundations in the event some movement does occur.

We also recommend providing a 6-inch thick continuous sand and/or gravel cushion layer directly below the floor slab to prevent capillary moisture rise to the slab. This free-draining granular fill should contain less than 12% by weight passing the #200 sieve, and less than 40% passing the #40 sieve. This 6-inch thick sand and/or gravel cushion layer can be incorporated into the 1 feet of engineered fill, where appropriate.

Refer to the "Floor Slab Moisture/Vapor Protection" document in the Standard Sheets section of this report for additional information.

6.6 Utility Trench and Exterior Backfill Considerations

It is our opinion utility trench backfill and exterior backfill around the addition may consist of the excavated alluvial soils. Based on the existing moisture content of the site soils, processing and drying of the material will very likely be required prior to re-use as backfill material.

All recommendations are based on the standard Proctor method (ASTM: D698).

1. All backfill should be free of deleterious/frozen material, and construction debris, and have a maximum aggregate size of 2-inches.
2. Site clays soils should be moisture conditioned to within -1 to +3% of the optimum moisture content. All granular backfill should be moisture conditioned to within ±3% of optimum moisture content prior to being placed.
3. All backfill should be placed in loose lift thicknesses of 8-inches or less. If hand-operated compaction equipment is used, the loose lift thickness should be reduced to 4-inches or less.
4. Each lift should be compacted to at least 95% of maximum proctor density. We recommend the final lift of backfill be compacted to at least 97% of the maximum dry density.
5. Compaction density tests should be performed on alternating lifts to ensure the minimum density is maintained.
6. .Utility lines entering or exiting the structures should be leak tested prior to the placement of the slab.

6.7 Trench Excavation

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce side slope erosion or running which could require slope maintenance. For trench excavations, it is our opinion the site clayey sand soils, can be classified as Type C soils with recommended slope laybacks of 1.5H:1V.

These classifications should be considered preliminary and should be verified in the field on a daily basis by the contractor and/or geotechnical engineer. Excavations deeper than 20 feet and/or in saturated soils or below the ground water table should be considered on an individual basis. Water levels, due to climatic conditions should be evaluated at the time of construction. If the above trench layback recommendations are not feasible, due to space limitations or other factors, the OSHA rules should be consulted for alternative trench stabilization methods. Trench boxes or shoring in compliance with OSHA rules may be acceptable alternatives.

6.7 General Site Recommendations

6.7.1 Surface Water Management

Surface water runoff is important to the long-term performance of the foundation system and paved surfaces. The site should slope away from all structures constructed on site, directing water away from all foundation elements. All hard surfacing should have a minimum slope of 1% to facilitate the rapid removal of water from these surfaces. In landscaped areas, a minimum slope of 2% should be maintained, directing water away from any structures on site. Additionally, in landscaped areas, water should not be allowed to pond behind any curb and gutter systems on site. We recommend that a French drain be installed in areas where water would be likely to pond on landscaped areas.

6.7.2 Site Excavations and Deleterious Soils

We anticipate that the soils encountered on site, within the depths explored during our field services will be able to be excavated using conventional earth moving equipment. If deleterious soils/material is encountered it should be removed from the construction limits, site soils cleaned of all deleterious substances may be used for backfilling, in areas where deleterious substances are encountered. The following are considered deleterious substances/soils; coal, lignite, organic material, construction debris, mud, site soils significantly disturbed by construction traffic, any material greater than 6 inches in diameter, and any site soils with moisture content greater than 6% above the optimum moisture as determined by ASTM D698. If coal or lignite is encountered during site excavations and grading the geotechnical engineer should be contacted to observe and assist in developing a plan for removal and replacement with suitable material.

During construction, operations care should be taken to avoid unnecessary disturbance of the site soils. Disturbance of the site soils may result in additional over excavation and replacement of the disturbed soils. Excessively disturbed soils may occur from construction traffic over unprotected soft or wet subgrades, excessive erosion, deposition and scouring from surface water runoff during construction. To mitigate potential disturbed soils during construction operations, we recommend that construction traffic be limited to the minimum necessary for construction of the project, and in areas where high construction traffic is anticipated we recommend that a temporary gravel/rock surfacing be used to minimize potential damage to subgrade soils.

6.7.3 Site Landscaping Recommendations

We suggest avoiding the planting of deep rooted trees within 10 feet of the structure to minimize changes in the moisture content of the subsurface soils. We recommend that hard surfacing be placed directly against the structure extending a minimum of 5 feet away from foundation walls, and sloping away from the structure. Additionally, we recommend that any landscape sprinkler systems be designed so that no water from the sprinklers is spread within 5 feet of any structures on site.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Potential Difficulties

7.1.1 Soft Subgrade Soils

Depending on the time of year in which construction takes place, unstable subgrade soils could be encountered during the site and building grading operations. If encountered, additional conditioning of the soils may be required to obtain moisture contents which allow for firm and unyielding subgrade and/or compaction.

Localized areas of soft wet subgrades can be remedied with additional excavation to expose firmer soils, placement of coarse rock to provide a solid base on which to place additional fill and/or the use of geotextiles between the soft soils and the overlying fill and/or pavement sections. The appropriate means of subgrade stabilization should be evaluated by the geotechnical engineer at the time of construction.

7.1.2 Runoff Water in Excavation

Water can be expected to collect in the excavation bottom during times of inclement weather or snow melt. To allow observation of the excavation bottom, to reduce the potential for soil disturbance, and to facilitate filling operations, we recommend water be removed from within the excavation during construction. Based on the soils encountered, we anticipate the groundwater can be handled with conventional sump pumping.

7.1.3 Disturbance of Soils

The on-site soils can be disturbed under construction traffic, especially if the soils are wet. If soils become disturbed, they should be subcut to the underlying undisturbed soils. The subcut soils can then be dried and recompacted back into place, or they should be removed and replaced with drier imported fill.

7.2 Excavation Backsloping

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, "Excavations"* (can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce sideslope erosion or sloughing which could require slope maintenance.

7.3 Observation and Testing

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density testing should also be performed on new fill placed in order to document that project specifications for compaction have been satisfied.

8.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, expressed or implied, is intended. Important information regarding risk management and proper use of this report is given in Appendix B entitled “Geotechnical Report Limitations and Guidelines for Use.”

Standard Sheets

EXCAVATION AND REFILLING FOR STRUCTURAL SUPPORT

EXCAVATION

Excavations for structural support at soil boring locations should be taken to depths recommended in the geotechnical report. Since conditions can vary, recommended excavation depths between and beyond the boring location should be evaluated by geotechnical field personnel. If groundwater is present, the excavation should be dewatered to avoid the risk of unobservable poor soils being left in-place. Excavation base soils may become disturbed due to construction traffic, groundwater or other reasons. Such soils should be subcut to underlying undisturbed soils.

Soil stresses under footings spread out with depth. Therefore, the excavation bottom and subsequent fill system should be laterally oversized beyond footing edges to support the footing stresses. A lateral oversize equal to the depth of fill below the footing (i.e., 1:1 oversize) is usually recommended. The lateral oversize is usually increased to 1.5:1 where compressible organic soils are exposed on the excavation sides. Variations in oversize requirements may be recommended in the geotechnical report or can be evaluated by the geotechnical field personnel.

Unless the excavation is retained, the backslopes should be maintained in accordance with OSHA Regulations (Standards-29 CFR), Part 1926, Subpart P, "Excavations" (found on www.osha.gov). Even with the required OSHA sloping, groundwater can induce sideslope raveling or running which could require that flatter slopes or other approaches be used.

FILLING

Filling should proceed only after the excavation bottom has been approved by the geotechnical engineer/technician. Approved fill material should be uniformly compacted in thin lifts to the compaction levels specified in the geotechnical report. The lift thickness should be thin enough to achieve specified compaction through the full lift thickness with the compaction equipment utilized. Fine grained soils are moisture sensitive and are often wet (water content exceeds the "optimum moisture content" defined by a Proctor test). In this case, the soils should be scarified and dried to achieve a water content suitable for compaction. This drying process can be time consuming, labor intensive, and requires favorable weather.

Filling operations for structural support should be closely monitored for fill type and compaction by a geotechnical technician. Monitoring should be on a full-time basis in cases where vertical fill placement is rapid; during freezing weather conditions; where groundwater is present; or where sensitive bottom conditions are present.

EXCAVATION/REFILLING DURING FREEZING TEMPERATURES

Soils that freeze will heave and lose density. Upon thawing, these soils will not regain their original strength and density. The extent of heave and density loss depends on the soil type and moisture condition; and is most pronounced in clays and silts. Foundations, slabs, and other improvements should be protected from frost intrusion during freezing weather. For earthwork during freezing weather, the areas to be filled should be stripped of frozen soil, snow and ice prior to new fill placement. In addition, new fill should not be allowed to freeze during or after placement. For this reason, it may be preferable to do earthwork operations in small plan areas so grade can be quickly attained instead of large areas where much frost stripping may be needed.

FREEZING WEATHER EFFECTS ON BUILDING CONSTRUCTION

GENERAL

Because water expands upon freezing and soils contain water, soils which are allowed to freeze will heave and loose density. Upon thawing, these soils will not regain their original strength and density. The extent of heave and density/strength loss depends on the soil type and moisture condition. Heave is greater in soils with higher percentages of fines (silts/clays). High silt content soils are most susceptible, due to their high capillary rise potential which can create ice lenses. Fine grained soils generally heave about 1/4" to 3/8" for each foot of frost penetration. This can translate to 1" to 2" of total frost heave. This total amount can be significantly greater if ice lensing occurs.

DESIGN CONSIDERATIONS

Clayey and silty soils can be used as perimeter backfill, although the effect of their poor drainage and frost properties should be considered. Basement areas will have special drainage and lateral load requirements which are not discussed here. Frost heave may be critical in doorway areas. Stoops or sidewalks adjacent to doorways could be designed as structural slabs supported on frost footings with void spaces below. With this design, movements may then occur between the structural slab and the adjacent on-grade slabs. Non-frost susceptible granular soils (with less than 12% passing a #200 sieve) can be used below such areas. Depending on the function of surrounding areas, the granular soil layer may need a thickness transition away from the area where movement is critical. With granular soil placement over slower draining soils, subsurface drainage would be needed for the granular layer. High density extruded insulation could be used within the granular soils to reduce frost penetration, thereby reducing the granular soil thickness needed. We caution that insulation placed near the surface can increase the potential for ice glazing of the surface.

The possible effects of adfreezing should be considered if clayey or silty soils are used as backfill. Adfreezing occurs when backfill adheres to rough surfaced foundation walls and lifts the wall as it freezes and heaves. This occurrence is most common with masonry block walls, unheated or poorly heated building situations and clay backfill. The potential is also increased where backfill soils are poorly compacted and become saturated. The risk of adfreezing can be decreased by placing a low friction separating layer between the wall and backfill.

Adfreezing can occur on exterior piers (such as deck, fence or other similar pier footings), even if a smooth surface is provided. This is more likely in poor drainage situations where soils become saturated. Additional footing embedment and/or widened footings below the frost zones (which include tensile reinforcement) can be used to resist uplift forces. Specific designs would require individual analysis.

CONSTRUCTION CONSIDERATIONS

Foundations, slabs, and other improvements which may be affected by frost movements should be insulated from frost penetration during freezing weather. If filling takes place during freezing weather, all frozen soils, snow, and ice should be stripped from areas to be filled prior to new fill placement. The new fill should not be allowed to freeze during transit, placement, or compaction. This should be considered in the project scheduling, budgeting, and quantity estimating. It is usually beneficial to perform cold weather earthwork operations in small areas where grade can be attained quickly rather than working large areas where a greater amount of frost stripping may be needed. If slab subgrade areas freeze, we recommend the subgrade be thawed prior to floor slab placement. The frost action may also require reworking and recompaction of the thawed subgrade.

FLOOR SLAB MOISTURE/VAPOR PROTECTION

Floor slab design relative to moisture/vapor protection should consider the type and location of two elements, a granular layer and a vapor membrane (vapor retarder, water resistant barrier or vapor barrier). In the following sections, the pros and cons of the possible options regarding these elements will be presented, such that you and your specifier can make an engineering decision based on the benefits and costs of the choices.

GRANULAR LAYER

In American Concrete Institute (ACI) 302.1-96, a "base material" is recommended, rather than the conventional cleaner "sand cushion" material. The manual maintains that clean sand (common "cushion" sand) is difficult to compact and maintain until concrete placement is complete. ACI recommends a clean, fine graded material (with at least 10% to 30% of particles passing a #100 sieve) which is not contaminated with clay, silt or organic material. We refer you to ACI 302.1-96 for additional details regarding the requirements for the base material.

In cases where potential static water levels or significant perched water sources appear near or above the floor slab, an underfloor drainage system may be needed wherein a drain tile system is placed within a thicker clean sand or gravel layer. Such a system should be properly engineered depending on subgrade soil types and rate/head of water inflow.

VAPOR MEMBRANE

The need for a vapor membrane depends on whether the floor slab will have a vapor sensitive covering, will have vapor sensitive items stored on the slab, or if the space above the slab will be a humidity controlled area. If the project does not have this vapor sensitivity or moisture control need, placement of a vapor membrane may not be necessary. Your decision will then relate to whether to use the ACI base material or a conventional sand cushion layer. However, if any of the above sensitivity issues apply, placement of a vapor membrane is recommended. Some floor covering systems (adhesives and flooring materials) require a vapor membrane to maintain a specified maximum slab moisture content as a condition of their warranty.

VAPOR MEMBRANE/GRANULAR LAYER PLACEMENT

A number of issues should be considered when deciding whether to place the vapor membrane above or below the granular layer. The benefits of placing the slab on a granular layer, with the vapor membrane placed below the granular layer, include reduction of the following:

- Slab curling during the curing and drying process.
- Time of bleeding, which allows for quicker finishing.
- Vapor membrane puncturing.
- Surface blistering or delamination caused by an extended bleeding period.
- Cracking caused by plastic or drying shrinkage.

The benefits of placing the vapor membrane over the granular layer include the following:

- The moisture emission rate is achieved faster.
- Eliminates a potential water reservoir within the granular layer above the membrane.
- Provides a "slip surface", thereby reducing slab restraint and the associated random cracking.

If a membrane is to be used in conjunction with a granular layer, the approach recommended depends on slab usage and the construction schedule. The vapor membrane should be placed above the granular layer when:

- Vapor sensitive floor covering systems are used or vapor sensitive items will be directly placed on the slab.
- The area will be humidity controlled, but the slab will be placed before the building is enclosed and sealed from rain.
- Required by a floor covering manufacturer's system warranty.

The vapor membrane should be placed below the granular layer when:

- Used in humidity controlled areas (without vapor sensitive coverings/stored items), with the roof membrane in place, and the building enclosed to the point where precipitation will not intrude into the slab area. Consideration should be given to slight sloping of the membrane to edges where draintile or other disposal methods can alleviate potential water sources, such as pipe or roof leaks, foundation wall damp proofing failure, fire sprinkler system activation, etc.

Appendix A

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
Figure 1: Site Location Map
Figure 2: Boring Location Map
Subsurface Boring Logs
Sieve Analysis Test Results
Swell-Consolidation Results

Appendix A
Geotechnical Field Exploration and Testing
AET Project No. P-0006531

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling 3 standard penetration test borings. The locations of the borings appear on Figure 2, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS) - Calibrated to N_{60} Values

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586 with one primary modification. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value. Our method uses a modified hammer weight, which is determined by measuring the system energy using a Pile Driving Analyzer (PDA) and an instrumented rod.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in this system. This converted energy then provides what is known as an N_{60} blow count.

The most recent drill rigs incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. By using the PDA energy measurement equipment, we are able to determine actual energy generated by the drop hammer. With the various hammer systems available, we have found highly variable energies ranging from 55% to over 100%. Therefore, the intent of AET's hammer calibrations is to vary the hammer weight such that hammer energies lie within about 60% to 65% of the theoretical energy of a 140-pound weight falling 30 inches. The current ASTM procedure acknowledges the wide variation in N-values, stating that N-values of 100% or more have been observed. Although we have not yet determined the statistical measurement uncertainty of our calibrated method to date, we can state that the accuracy deviation of the N-values using this method is significantly better than the standard ASTM Method.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as "DS" or "SU" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of "topsoil" layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 LABORATORY TEST METHODS

A.5.1 Water Content Tests
Conducted per AET Procedure 01-LAB-010, which is performed in general accordance with ASTM: D2216 and AASHTO: T265.

A.5.2 Atterberg Limits Tests
Conducted per AET Procedure 01-LAB-030, which is performed in general accordance with ASTM: D4318 and AASHTO: T89, T90.

A.5.3 Sieve Analysis of Soils (thru #200 Sieve)
Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method A.

A.5.4 Particle Size Analysis of Soils (with hydrometer)
Conducted per AET Procedure 01-LAB-050, which is performed in general accordance with ASTM: D422 and AASHTO: T88.

A.5.5 Unconfined Compressive Strength of Cohesive Soil
Conducted per AET Procedure 01-LAB-080, which is performed in general accordance with ASTM: D2166 and AASHTO: T208.

A.5.6 Laboratory Soil Resistivity using the Wenner Four-Electrode Method
Conducted per AET Procedure 01-LAB-090, which is performed using Soil Box apparatus in the laboratory in general accordance with ASTM: G57

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

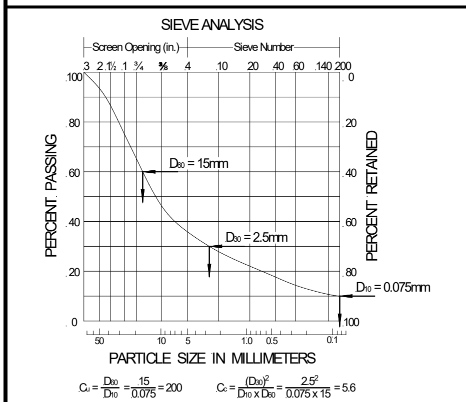
A.7 SAMPLE STORAGE

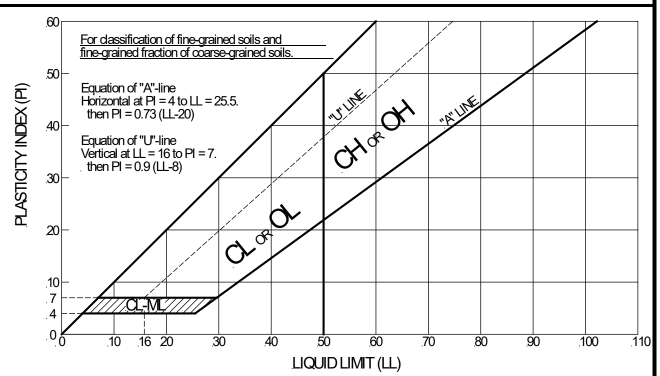
Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.

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





Plasticity Chart

Notes

[A]Based on the material passing the 3-in (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]$Cu = D_{60} / D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[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 is hatched area, soils 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.

[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	**N-Value, BPF**
Very Loose	**0 - 4**
Loose	**5 - 10**
Medium Dense	**11 - 30**
Dense	**31 - 50**
Very Dense	**Greater than 50**

Moisture/Frost Condition (MC Column)

D (Dry):	Absence of moisture, dusty, dry to touch.
M (Moist):	Damp, although free water not visible. Soil may still have a high water content (over "optimum").
W (Wet/ Waterbearing):	Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.
F (Frozen):	Soil frozen

Layering Notes

Laminations:	Layers less than ½" thick of differing material or color.
Lenses:	Pockets or layers greater than ½" thick of differing material or color.

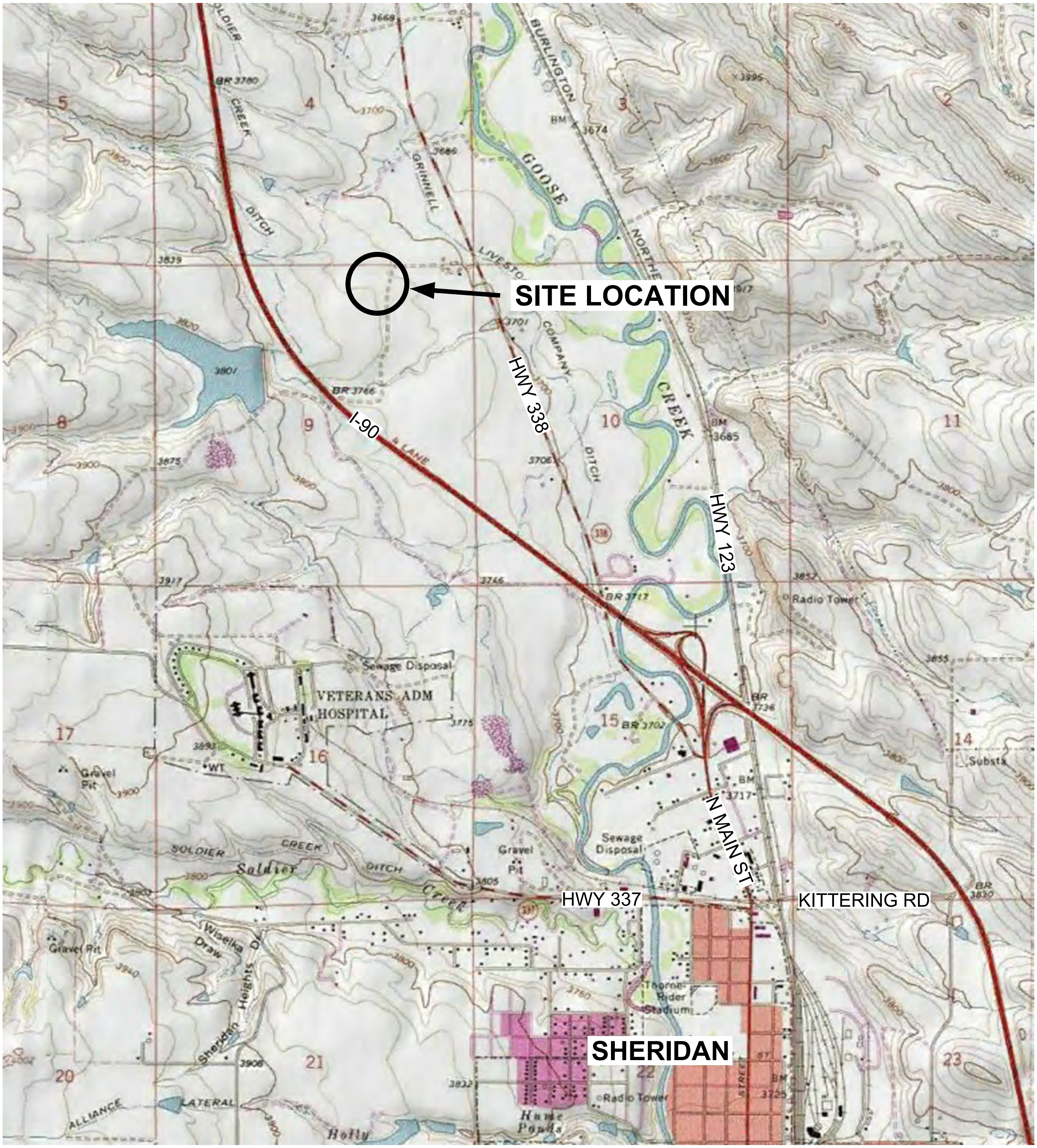
Fiber Content of Peat

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic/Roots Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the soil properties. *Slightly organic* used for borderline cases.

With roots:	Judged to have sufficient quantity of roots to influence the soil properties.
Trace roots:	Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.



SCALE
(FEET)
0 2,400

N

USGS TOPOGRAPHIC MAP
CREATED FROM GOOGLE EARTH PRO
EARTH POINT TOPO MAP
DATED: 1985

AMERICAN ENGINEERING TESTING

PROJECT: RIVERTON DEVELOPMENT SHERIDAN, WYOMING		PROJECT NO.: P-0006531
SUBJECT: SITE LOCATION MAP	DRAWN BY: M. TAYLOR	DATE: DECEMBER 28, 2021
SCALE: AS NOTED	REVIEWED BY: B. FREED	FIGURE: 1

12/28/2021 2:47:00 PM - C:_PROJECTS FROM SERVER__19 - SHERIDAN PROJECTS\P-0006531 RIVERSTONE DEVELOPMENT SFR GT\DRAFTING\P-0006531 FIGURES.DWG - TAYLOR, MARIE

LEGEND:

B-1 EXPLORATORY BORINGS DRILLED OCTOBER 19 thru 22, 2021

SCALE
(FEET)
0 160

N

AERIAL PHOTO'S
CREATED FROM GOOGLE EARTH PRO
DATED: 6/25/2017

AMERICAN ENGINEERING TESTING

PROJECT: RIVERTON DEVELOPMENT SHERIDAN, WYOMING		PROJECT NO.: P-0006531
SUBJECT: BORING LOCATION MAP	DRAWN BY: M. TAYLOR	DATE: DECEMBER 28, 2021
SCALE: AS NOTED	REVIEWED BY: B. FREED	FIGURE: 2

12/28/2021 2:47:42 PM - C:_PROJECTS FROM SERVER_19 - SHERIDAN PROJECTS\P-0006531 RIVERSTONE DEVELOPMENT SFR GT\DRAFTING\P-0006531 FIGURES.DWG - TAYLOR, MARIE

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-1 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84808112** E **-106.97809592**

Surface Elevation **3724.1**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–1	TOPSOIL (3 inches thick) / CLAYEY SAND, dark brown, medium dense (SC)	TOPSOIL / ALLUVIAL DEPOSITS	M	12	16	SS	50					
3			D	29	39	CAL	40	10		37	18	
6			D	24	32	SS	70	10	98			29.8
6.5	Cobbles and gravel present at 6.5 feet											
7.5	Very dense at 7.5 feet											
8			D/M	84	112	CAL	60					
10–12	POORLY-GRADED SAND with gravel, brown, very dense (SP)		M/W	49	65	SS	15	6				
12.5–20	POORLY-GRADED SAND with clay and gravel, brown, dense to very dense (SP-SC)		W	31	41	CAL	80	5				
16			M	68	91	SS	60					
17.5				50/0		CAL						
19–20	Auger refusal at 20 feet due to very dense gravel and cobbles											

END OF BORING: 20 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
20.0	**3.25" HSA**	**10/20/21**	**16:40**	**17.5**	**NA**	**NA**	**NA**	**11.0**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/20/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

AMERICAN ENGINEERING TESTING

SUBSURFACE BORING LOG

AET No: **P-0006531** Log of Boring No. **B-2 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84859573** E **-106.97872233**

Surface Elevation **3727.5**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL (4 inches thick)	TOPSOIL										
1	CLAYEY SAND, light brown, medium dense (SC)	ALLUVIAL DEPOSITS	M	13	17	SS	90	14	94			
3	POORLY-GRADED SAND, trace clay, light brown, medium dense (SP)		D	20	27	CAL	60	8				
5	CLAYEY SAND, light brown/white, medium dense (SC)		D	16	21	SS	80					
7.5	Light brown at 7.5 feet		D	16	21	CAL	40	13		43	22	19.8
10			D/M	19	25	SS	80					
12.5	Dense with cobbles and gravel at 12.5 feet		D/M	39	52	CAL	30	20	89			
15	SANDY LEAN CLAY, grayish brown, very stiff (CL)	WEATHERED FORT UNION FORMATION	M	19	25	SS	80					
20	Gray and hard at 20 feet		M	42	56	CAL	70					

END OF BORING: 21.5 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/19/21**	**13:15**	**20.0**	**NA**	**NA**	**NA**	**None**

BORING COMPLETED: **10/19/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AET No: **P-0006531**　　Log of Boring No. **B-3 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger**　　Coordinates: N **44.84863333** E **-106.98042770**

Surface Elevation **3742.1**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–0.25	TOPSOIL, grass present (3 inches thick)	TOPSOIL										
0.25–2.5	CLAYEY SAND, dark brown, medium dense (SC)	ALLUVIAL DEPOSITS	M	14	19	SS	30					
2.5–5	CLAYEY SAND, light brown with white parts, dense (SC)		D	28	37	CAL	50	9				
5–7.5	GRAVELLY SAND, tan, dense (SG)		D	47	63	SS	75					
7.5–10	CLAYEY SAND, trace cobbles, dark brown, medium dense (SC)		D	11	15	CAL	60	20				
10–15	LEAN CLAY, dark brown with yellow streaks, very stiff (CL)		M	19	25	SS	30	24		46	30	11.4
			M	22	29	CAL	75					
15–21.5	SANDY LEAN CLAY with pockets of coal, dark brown, very stiff (CL)		M	22	29	SS	50	34				
20	Dark gray and hard at 20 feet		D	80	107	CAL	75					

END OF BORING: 21.5 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD
21.5	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/21/21	12:30	20.0	NA	NA	NA	None
10/28/21		20.0	NA	NA	NA	11.0

BORING COMPLETED: **10/21/21**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

DR: **J. Stamper**　　LG: **Max Lube**　　Rig: **D-50**

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-4 (p. 1 of 1)**
Project: **Riverstone Development - Sheridan, Wyoming**
Client: **Swayne Redinger** Coordinates: N **44.84913592** E **-106.97946074**

Surface Elevation **3730.8**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL (3 inches thick)	TOPSOIL										
1	POORLY-GRADED SAND with clay, brown, medium dense (SP-SC)	ALLUVIAL DEPOSITS	M	14	19	SS	30					
3			D	23	31	CAL	70					
6			D	13	17	SS	60					
8			D	23	31	CAL	40					
11			M	18	24	SS	80	15	90			
12.5	Trace gypsum at 12.5 feet		M	14	19	CAL	100	18		33	17	18.0
15	Loose at 15 feet		M	9	12	SS	85	20	102			
19	CLAYEY SAND with gravel, brown, very dense (SC)		W	50/0.42		CAL	70	6		22	16	9.4

END OF BORING: 20.92 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
20.9	**3.25" HSA**	**10/19/21**	**14:31**	**20.0**	**NA**	**NA**	**NA**	**None**

BORING COMPLETED: **10/19/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-5 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84949569** E **-106.97842713**

Surface Elevation **3720.7**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–0.25	TOPSOIL, grass present (3 inches thick)	TOPSOIL										
0.25–2.5	CLAYEY SAND, dark brown, medium dense (SC)	ALLUVIAL DEPOSITS	M	17	23	SS	20					
2.5–5	GRAVELY SAND, white, dense (SG)		D	30	40	CAL	40	8				
5–10	CLAYEY SAND, trace gravel, white/light brown, very dense (SC)		D	67	89	SS	60	8	117			23.8
	Hard with gravel and cobbles at 7.5 feet		D	50/0		CAL	0					
10–12.5	GRAVELY SAND, white/light brown, very dense (SP)	WEATHERED FORT UNION FORMATION	D	72	96	SS	70	3				18.2
12.5–15	CLAYEY SAND, trace gravel, light brown, very dense (SC)		D	45/0.5		CAL	10					
15–21.5	CLAYEY SAND, gray, very dense (SC)		M	52	69	SS	40	12	94	38	18	
			M	64	85	CAL	80					

END OF BORING: 21.5 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/21/21**	**7:51**	**20.0**	**NA**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/21/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** | Log of Boring No. **B-6 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** | Coordinates: N **44.84983809** E **-106.97744338**

Surface Elevation **3716.8**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
	TOPSOIL (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, trace gravel, brown, dense (SC)	ALLUVIAL DEPOSITS	M	38	51	SS	90					
3	GRAVELY SAND, trace cobbles, whitish, very dense (SP)		D	50/0.5		CAL	30	1				
6			D	40/0.5		SS	30					
8	CLAYEY SAND, light brown, medium dense (SC)		D/M	19	25	CAL	70	14				43.3
11	CLAYEY SAND, brown, medium dense (SC)		M	12	16	SS	80					
13	CLAYEY SAND, trace gravel, light brown/whitish, very dense (SC)		M	48	64	CAL	70	18				
15	Contains gravel and cobbles at 15 feet											
16				50/0.5		SS	0					
20				45/0.5		CAL	0					

END OF BORING- 20.5 FEET

NOTE: The N Values shown for the california sample has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
20.5	**3.25" HSA**							
		10/20/21	**8:45**	**20.0**	**NA**	**NA**	**NA**	**None**
		10/28/21		**20.0**	**NA**	**NA**	**NA**	**10.7**

BORING COMPLETED: **10/20/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-7 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.85017179** E **-106.97648128**

Surface Elevation **3713.8**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
	TOPSOIL (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, trace gravel, white/tan, medium dense (SG)	ALLUVIAL DEPOSITS	D/M	26	35	SS	60					
2												
3	GRAVELY SAND, trace clay, white/tan, medium dense (SG)		D	24	32	CAL	40	13				1.7
4												
5												
6			D	13	17	SS	40	5				
7												
8	GRAVELY SAND, trace clay and cobbles, light brown, dense (GP)		D	31	41	CAL	20					
9												
10	GRAVELY SAND, light brown, medium dense (SG)	WEATHERED FORT UNION FORMATION										
11			W	13	17	SS	30					
12												
13	Brown with black streaks, dense, trace oxidation at 12.5 feet		M	32	43	CAL	60	17		40	21	18.5
14												
15	Brown/gray, very dense at 15 feet											
16			M	59	79	SS	90					
17												
18												
19												
20	Gray											
21			M	54	72	CAL	90	78	38			

END OF BORING: 21.5 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/22/21**	**9:15**	**20.0**	**NA**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/22/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-8 (p. 1 of 1)**
Project: **Riverstone Development - Sheridan, Wyoming**
Client: **Swayne Redinger** Coordinates: N **44.85027189** E **-106.97538309**

DEPTH IN FEET	Surface Elevation 3711.5 MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–1	TOPSOIL (3 inches thick); CLAYEY SAND, brown, medium dense (SC). Gravel and cobbles lense from 1.5 to 3.5 feet	TOPSOIL; ALLUVIAL DEPOSITS	M	20	27	SS	50	15	91	31	17	15.4
3			M	50/0.5		CAL	0					
5–6	CLAYEY SAND, tan, medium dense (SC)		M	16	21	SS	75	19	79			
8			M	12	16	CAL	60					
10–11	CLAYEY SAND, gray/tan, medium dense to dense (SC)	WEATHERED FORT UNION FORMATION	M	18	24	SS	70	19				
13			M	42	56	CAL	100					
15–16			M	38	51	SS	100					
20–21	Very dense at 20 feet		M	61	81	CAL	100					

END OF BORING: 21.5 FEET

NOTE: The N Values shown for the California samples has been converted to the equivalent SPT N Value.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	3.25" HSA	10/22/21	10:30	20.0	NA	NA	NA	None

(WATER LEVEL MEASUREMENTS)

BORING COMPLETED: **10/22/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-9 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84970437** E **-106.97518355**

Surface Elevation **3713.5**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, brown, medium dense (SC)	ALLUVIAL DEPOSITS	D	21	28	SS	70					
2.5	Cobbles and gravel at 2.5 feet			40/0.5		CAL	0					
5	GRAVELLY SAND, trace clay, brown, medium dense (SP)		D	25	33	SS	60	7				
7.5	POORLY-GRADED SAND, trace clay, brown, medium dense (SP)		D	22	29	CAL	10	12				47.2
10	CLAYEY SAND, brown, medium dense to dense (SC)		M	23	31	SS	80					
12.5	Slight oxidation		D/M	40	53	CAL	80	16				
15			D/M	34	45	SS	100					
20	Very dense		D/M	71	95	CAL	100					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/19/21**	**9:30**	**20.0**	**20.0**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/19/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AET No: **P-0006531** Log of Boring No. **B-10 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84916991** E **-106.97500761**

Surface Elevation **3714.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–0.25	TOPSOIL, grass present (3 inches thick)	TOPSOIL										
0.25–2.5	CLAYEY SAND, brown, medium dense, trace oxidation (SC)	ALLUVIAL DEPOSITS	M	23	31	SS	75					
2.5–5	SANDY GRAVEL, trace cobbles,whitish, very dense (GP)		D	40/0.5		CAL	30					
5–10	GRAVELLY SAND, white-powder lite, very dense (SP)		D	45/0.5		SS	15	2				
	Becomes medium dense at 7.5 feet			26	35	CAL						
10–15	CLAYEY SAND, light brown, medium dense (SC)		M	18	24	SS	80	18	93			
	Light brown with black streaks, heavy oxidation at 12.5 feet		M	29	39	CAL	70	17		48	21	18.1
15–20	CLAYEY SAND, orangish brown, dense, oxidation (SC)	WEATHERED FORT UNION FORMATION	D/M	41	55	SS	90					
20–21.5	CLAYEY SAND with coal, gray, very dense (SC)		M/W	69	92	CAL	80					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/20/21**	**13:30**	**20.0**	**NA**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/20/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AET No: **P-0006531** Log of Boring No. **B-11 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84891792** E **-106.97582974**

DEPTH IN FEET	Surface Elevation 3714.7 MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–1	TOPSOIL, grass present (3 inches thick)	TOPSOIL										
1–2	CLAYEY SAND, brown, medium dense (SC)	ALLUVIAL DEPOSITS	D	18	24	SS	70					
3	GRAVELLY SAND, trace cobbles, light brown/tan, very dense (SP)		D	59	79	CAL	40	2				
6				45/0.5	67	SS						
7.5	Trace clay, dense at 7.5 feet		D	31	41	CAL	90	21				9.2
10	CLAYEY SAND, brown with streaks of black, medium dense (SC)		M	28	37	SS	90					
12.5	Light brown, dense, heavy oxidation at 12.5 feet		M	38	51	CAL	80	16				
15	Medium dense at 15 feet		M	47	63	SS	90					

END OF BORING: 16.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**10/20/21**	**11:45**	**15.0**	**NA**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/20/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-12 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84852186** E **-106.97695231**

Surface Elevation **3717.3**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL, grass present (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, dark brown, medium densen (SC)	ALLUVIAL DEPOSITS	M	22	29	SS	90					
3	GRAVELLY SAND, light brown, very dense (SP)		D	58	77	CAL	50	2				
5	Cobbles at 5 feet											
6				40/0.5		SS						
8	CLAYEY SAND, trace gravel, brown, medium dense (SC)		M/W	17	23	CAL	20	7		36	19	21.5
10	CLAYEY SAND, brown with orange and black streaks, medium dense (SC)		M	16	21	SS	80	22	69			
13	CLAYEY SAND, trace gravel, light brown, very dense (SC)		M	47	63	CAL	90					
15	CLAYEY SAND, light brown, medium dense to very dense (SC)		M/W	21	28	SS	90	21	77			
21				45	60	CAL	0					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/20/21**	**10:15**	**20.0**	**NA**	**NA**	**NA**	**None**
		10/28/21		**20.0**	**NA**	**NA**	**NA**	**11.3**

BORING COMPLETED: **10/20/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-13 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84893192** E **-106.97732787**

Surface Elevation **3716.9**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL (3 inches thick)	TOPSOIL										
0–2.5	CLAYEY SAND, brown, medium dense (SC)	ALLUVIAL DEPOSITS	D	16	21	SS	30					
2.5–5	GRAVELY SAND, white, dense (SP)		D	53	71	CAL	30					
5–7.5	GRAVELY SAND, white/tan, very dense (SP)		D	55	73	SS	30	2				
7.5–10	CLAYEY SAND with cobbles, light brown, dense (SC)		M	15	20	CAL	40	21	75			
10–20	CLAYEY SAND, brown with black streaks, medium dense (SC)		M	13	17	SS	50					
	Dense at 12.5 feet		D/M	37	49	CAL	60					
			M	46	61	SS	80					
20–21.5	CLAYEY SAND, gray, very dense (SC)	WEATHERED FORT UNION FORMATION	M	62	83	CAL	100					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/21/21**	**13:45**	**20.0**	**NA**	**NA**	**NA**	**None**
		10/28/21		**20.0**	**NA**	**NA**	**NA**	**9.0**

BORING COMPLETED: **10/21/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-14 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84929993** E **-106.97628482**

Surface Elevation **3714.7**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
	TOPSOIL (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, brown, medium dense (SC)	ALLUVIAL DEPOSITS	M	17	23	SS	50					
2												
3	POORLY-GRADED SAND, trace clay, light brown, dense (SP)		D	31	41	CAL	80					
4												
5	Medium dense at 5 feet											
6			D	19	25	SS	75	5				
7												
8	CLAYEY SAND, trace gravel, brown, medium dense (SC)		D/M	11	15	CAL	50	17				
9												
10												
11	CLAYEY SAND, light brown, medium dense (SC)		M	16	21	SS	90					
12												
13	CLAYEY SAND, brownish gray, dense (SC)	WEATHERED FORT UNION FORMATION	D/M	44	59	CAL	90	17		42	23	
14												
15	Light brown at 15 feet											
16			M	46	61	SS	90					
17												
18												
19												
20	Gray, very dense at 20 feet											
21			D/M	83	111	CAL	70					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/20/21**	**10:45**	**20.0**	**NA**	**NA**	**NA**	**None**

BORING COMPLETED: **10/19/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

AMERICAN ENGINEERING TESTING

SUBSURFACE BORING LOG

AET No: **P-0006531** Log of Boring No. **B-15 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84976962** E **-106.97592818**

Surface Elevation **3713.5**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, light brown, medium dense (SC)	ALLUVIAL DEPOSITS	D	16	21	SS	50					
2.5	GRAVELY SAND, light brown, very dense (SP)		D	59	79	CAL	50					
5	CLAYEY SAND, trace gravel, light brown, medium dense (SC)		D	28	37	SS	60	3				
7.5	No gravel, brown at 7.5 feet		D/M	22	29	CAL	90	19				
10	Brown with black streaks at 10 feet		M	20	27	SS	90					
12.5	CLAYEY SAND, light brown with black pockets, dense, mild oxidation (SC)		D/M	40	53	CAL	40					
15	CLAYEY SAND, brown with streaks of black, dense (SC)	WEATHERED FORT UNION FORMATION	M	44	59	SS	80					
20	CLAYEY SAND, gray with black pockets, very dense (SC)		M	56	75	CAL	90					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/22/21**	**7:55**	**20.0**	**NA**	**NA**	**NA**	**None**

(WATER LEVEL MEASUREMENTS)

BORING COMPLETED: **10/22/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-16 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84942553** E **-106.97699163**

Surface Elevation **3716.4**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0–0.25	TOPSOIL, grass present (3 inches thick)	TOPSOIL										
0.25–5	CLAYEY SAND, brown, medium dense (SC)	ALLUVIAL DEPOSITS	D/M	18	24	SS	90					
			M	17	23	CAL	80					
5–7.5	POORLY-GRADED SAND, trace clay, light brown, medium dense (SP)		D	18	24	SS	50	12	82			27.6
7.5–10	GRAVELLY SAND with cobbles, light brown/tanish, dense (SG)		D	29	39	CAL	40					
10–12.5	CLAYEY SAND, light brown, medium dense, mild oxidation (SC)		M	20	27	SS	80	18	84			
12.5–15	CLAYEY SAND, light brown, very dense (SC)		M	58	77	CAL	25					
15–20	CLAYEY SAND, brown with streaks of black patches, dense, mild oxidation (SC)	WEATHERED FORT UNION FORMATION	M	40	53	SS	60					
20–21.5	CLAYEY SAND, gray, very dense (SC)		D/M	77	103	CAL	80					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD
21.5	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10/20/21	7:15	20.0	NA	NA	NA	None

BORING COMPLETED: **10/20/21**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

SUBSURFACE BORING LOG

AMERICAN ENGINEERING TESTING

AET No: **P-0006531** Log of Boring No. **B-17 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84906744** E **-106.97800656**

Surface Elevation **3720.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, brown, loose (SC)	ALLUVIAL DEPOSITS	D/M	10	13	SS	40					
3	POORLY-GRADED SAND, trace clay, whitish, dense (SP)		D	36	48	CAL	40					
5	GRAVELLY SAND, light brown, dense (SP)		D	43	57	SS	60					
7.5	Cobbles at 7.5 feet			50/0.5		CAL						
10	GRAVELLY SAND, trace clay, light brown, dense (SP)		M	47	63	SS	70					
12.5	SANDY LEAN CLAY, grayish brown, very stiff (CL)	WEATHERED FORT UNION FORMATION	M	26	35	CAL	80					
15	Light brown, hard at 15 feet		M	40	53	SS	90					
20	POORLY-GRADED SAND, gray, brittle, very dense (SP)		D	85	113	CAL	80					

END OF BORING: 21.5 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.5	**3.25" HSA**	**10/19/21**	**11:50**	**20.0**	**NA**	**NA**	**NA**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/19/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22

AMERICAN ENGINEERING TESTING

SUBSURFACE BORING LOG

AET No: **P-0006531** Log of Boring No. **B-18 (p. 1 of 1)**

Project: **Riverstone Development - Sheridan, Wyoming**

Client: **Swayne Redinger** Coordinates: N **44.84905279** E **-106.97422775**

Surface Elevation **3712.5**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	WC (%)	DD (psf)	LL	PL	-#200 (%)
0	TOPSOIL, grass precent (3 inches thick)	TOPSOIL										
1	CLAYEY SAND, trace gravel, brown, medium dense (SC)	ALLUVIAL DEPOSITS	D/M	23	31	SS	80					
2.5	Cobbles at 2.5 feet											
3.5				40/0.5		CAL						
5	SANDY GRAVEL, white-powder like, very dense (GP)		D	40/0.5		SS	30	2				
7.5	CLAYEY SAND, light brown/tanish, very dense (SC)		D	52	69	CAL	70	13				
10	Light brown, dense at 10 feet		M	34	45	SS	80					
12.5	Mild oxidation at 12.5 feet		M	38	51	CAL	100	17		45	23	13.8
15	FAT CLAY, dark brown, very stiff, mild oxidation (CH)	WATSATCH FORMATION	M	29	39	SS	90					
20	FAT CLAY, trace sand, gray, hard (CH)		M	98/0.83		CAL						

END OF BORING: 21.33 FEET

NOTE: The N Values show for the California sampler have been converted to equivalent SPT N Values.

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
21.3	3.25" HSA	10/20/21	14:35	20.0	20.0	NA	NA	None

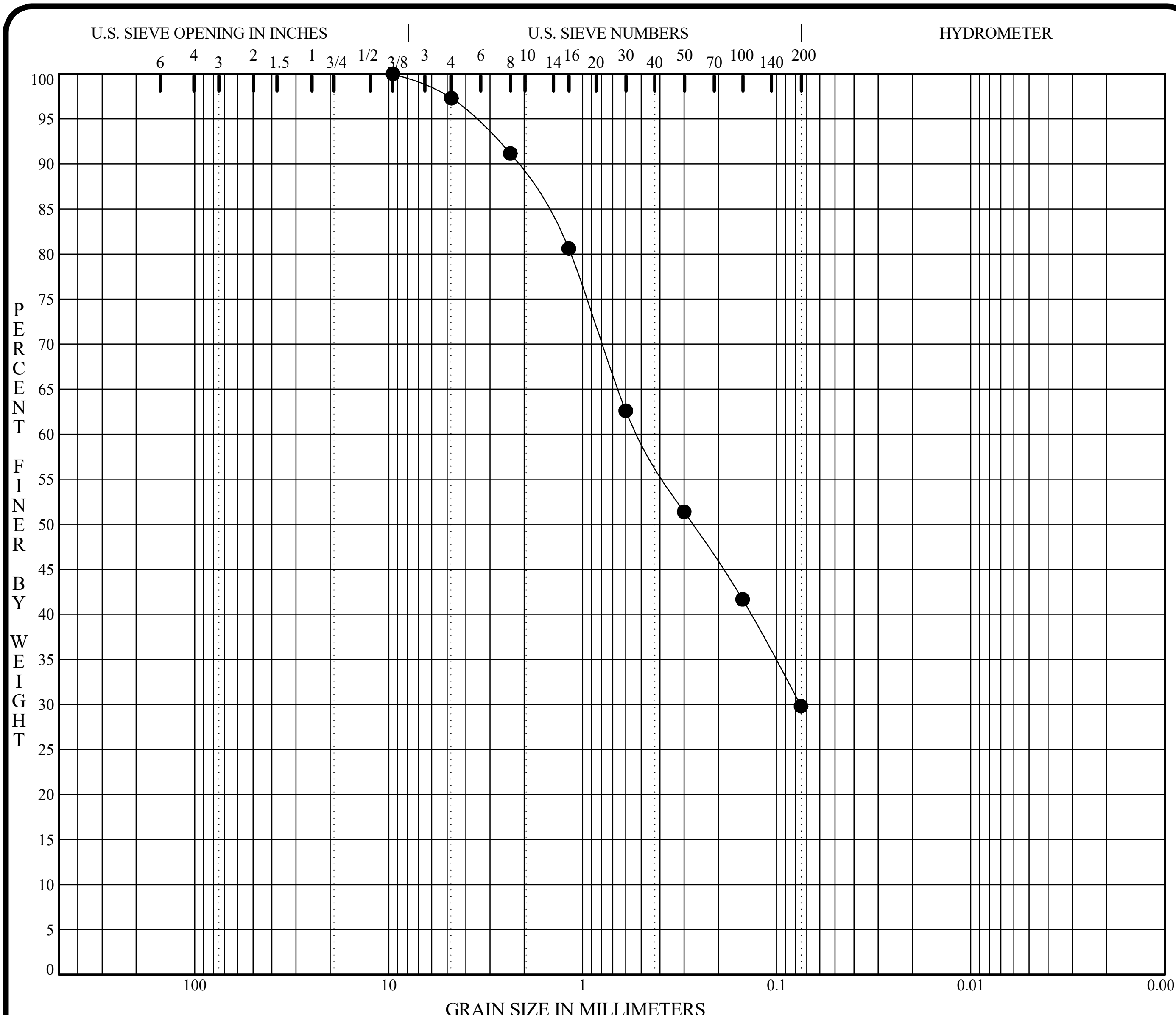
WATER LEVEL MEASUREMENTS

BORING COMPLETED: **10/20/21**

DR: **J. Stamper** LG: **Max Lube** Rig: **D-50**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET-CORP (BLOWS/FT-N60-MC-UTM COOR_(R) P-0006531 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 1/6/22



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● B-1	5.0'	Clayey Sand (SC)	10					

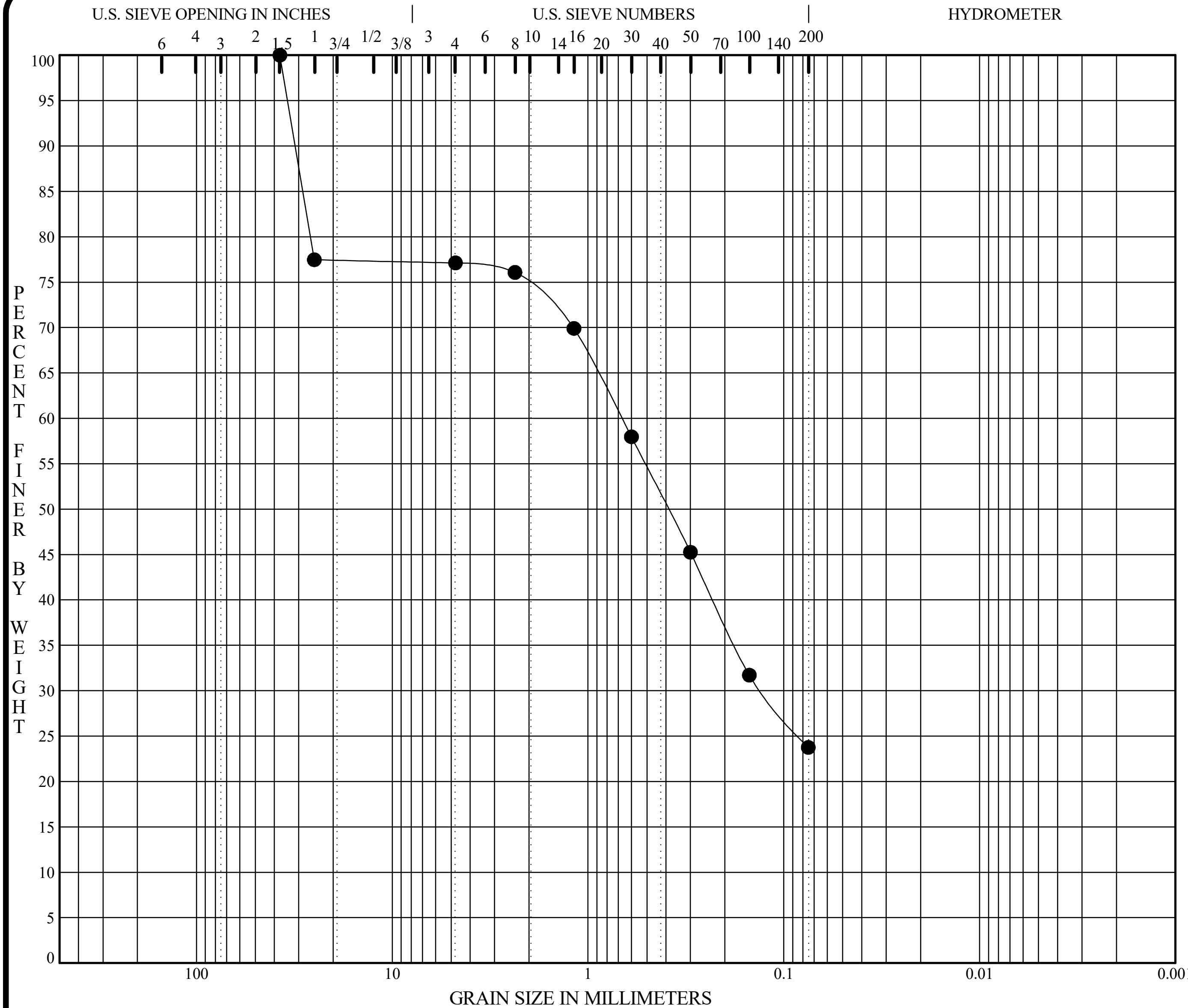
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	5.0'	9.50	0.51	0.076		2.7	67.5	29.8	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/20/21**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-5**	**5.0'**	Clayey Sand with Gravel (SC)	**8**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-5**	**5.0'**	**37.50**	**0.67**	**0.129**		**22.9**	**53.4**	**23.8**	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/21/21**

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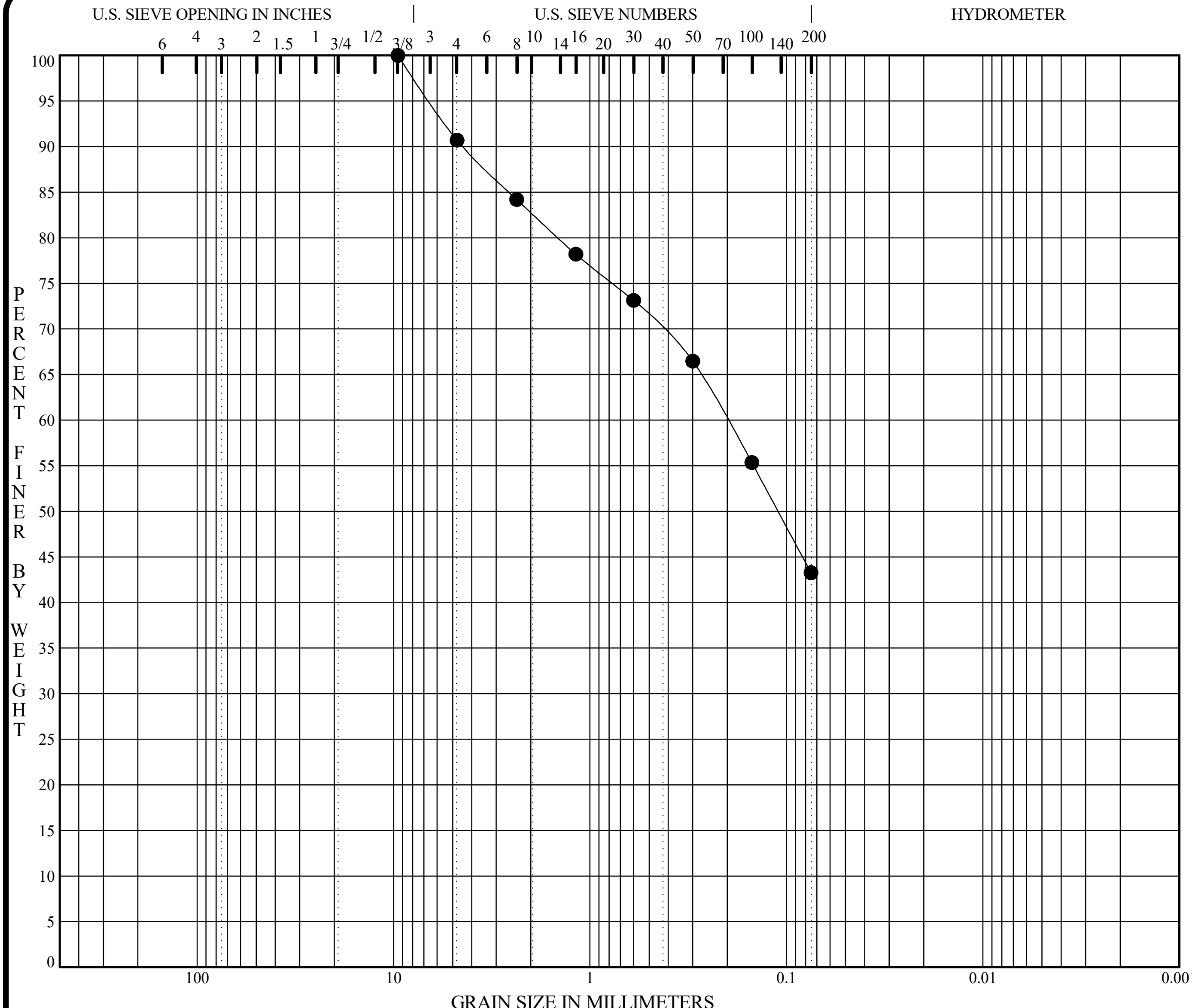
GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-6**	**7.5'**	Clayey Sand (SC)	**14**					

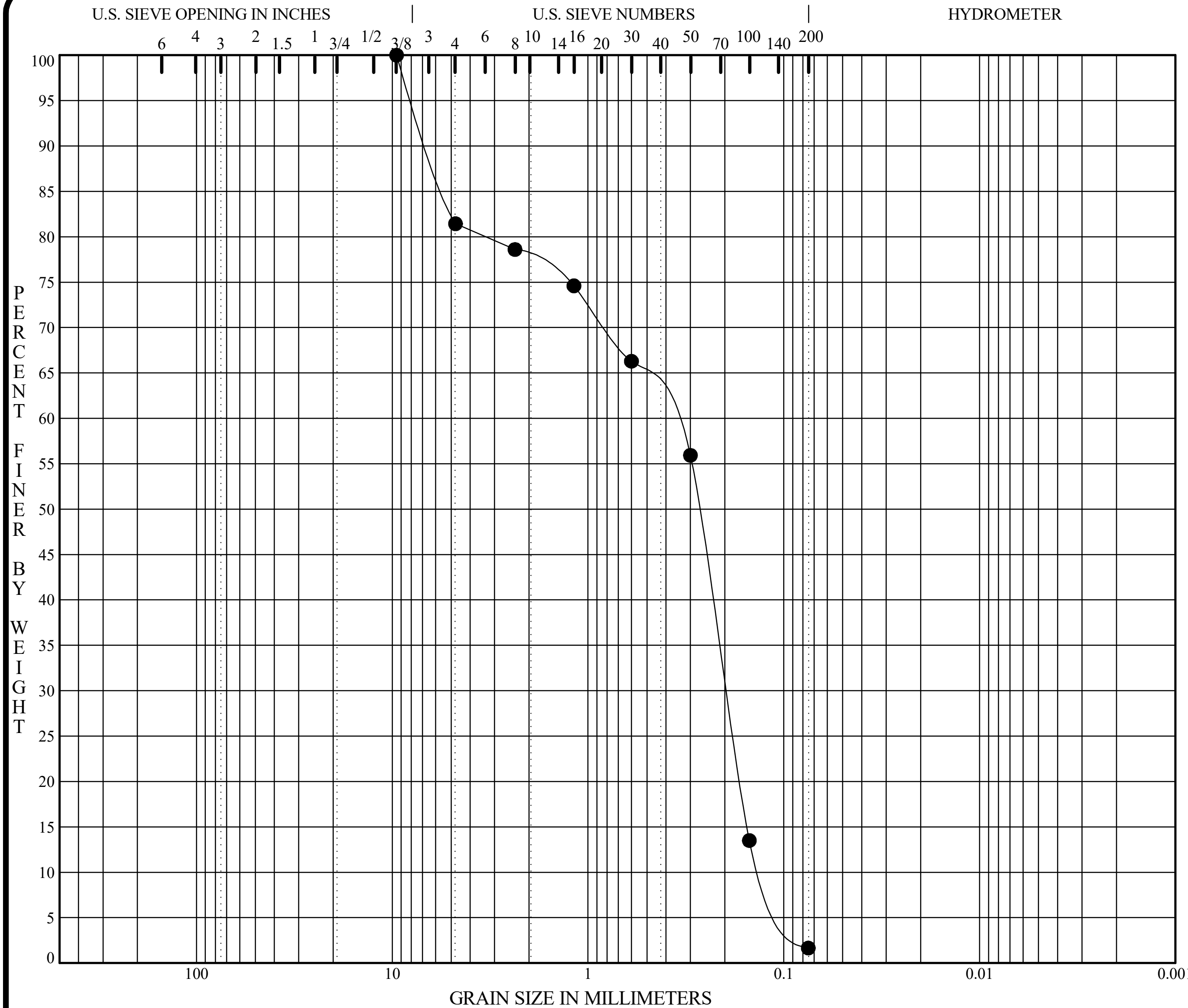
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-6**	**7.5'**	**9.50**	**0.20**			**9.3**	**47.4**	**43.3**	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/20/21**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-7**	**2.5'**	**POORLY GRADED SAND with GRAVEL SP**	**13**				**0.80**	**3.2**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-7**	**2.5'**	**9.50**	**0.39**	**0.196**	**0.1223**	**18.6**	**79.8**	**1.7**	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/22/21**

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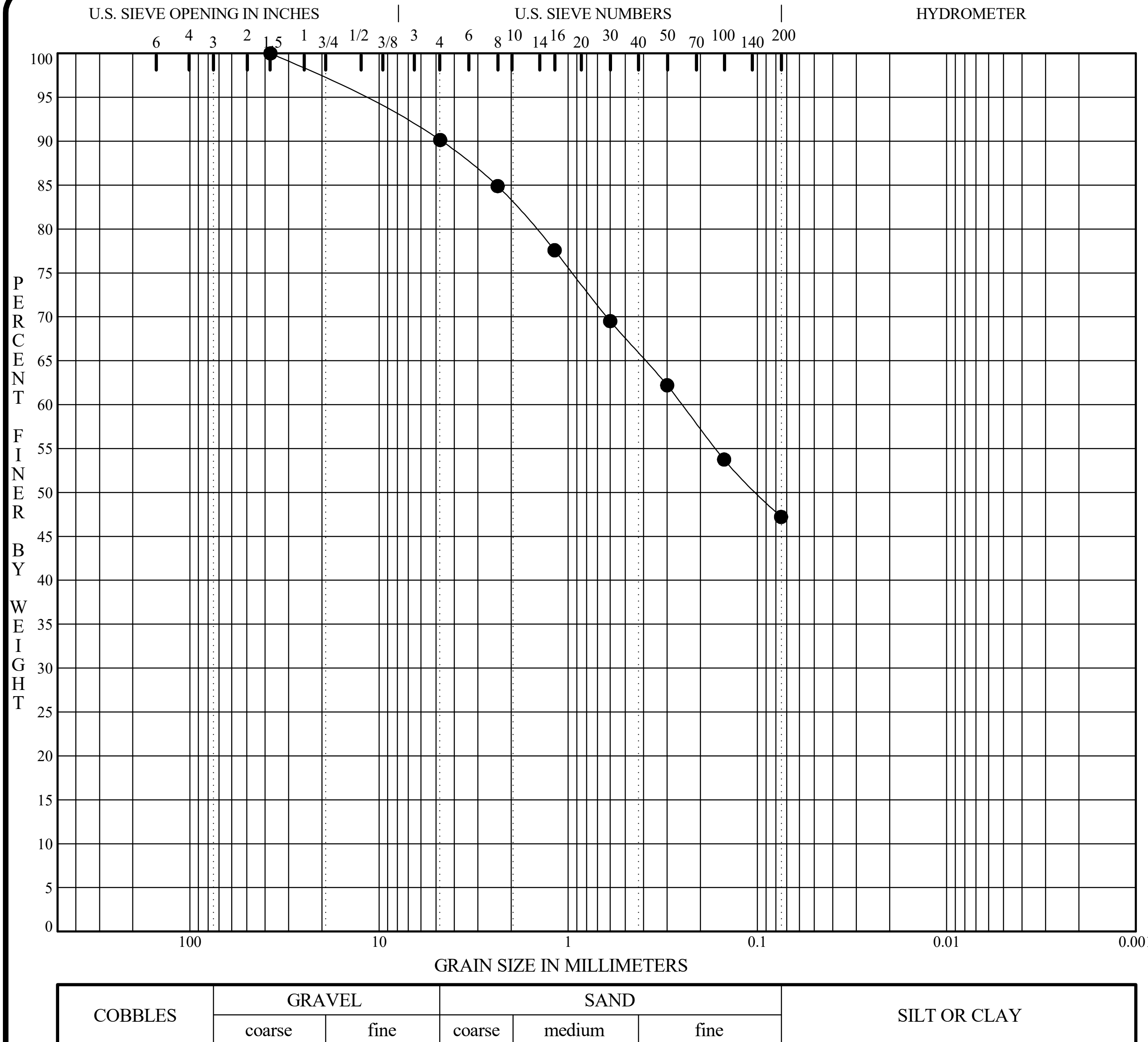
GRADATION CURVES



Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● B-9	7.5'	Clayey Sand (SC)	0					

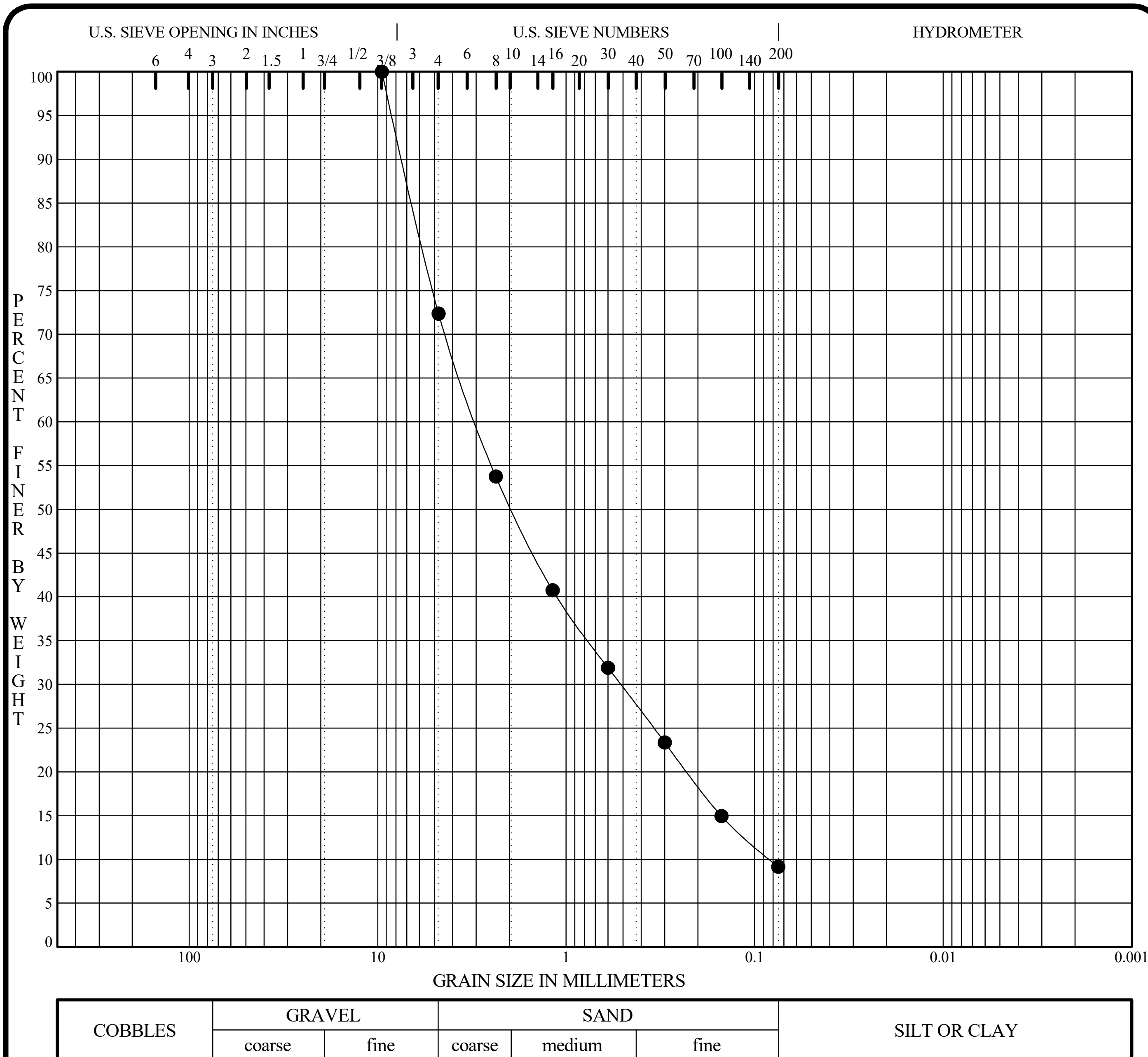
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-9	7.5'	37.50	0.25			9.9	42.9	47.2	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/19/21**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-11**	**7.5'**	Gravelly Sand (SP)	**0**				**1.07**	**36.0**

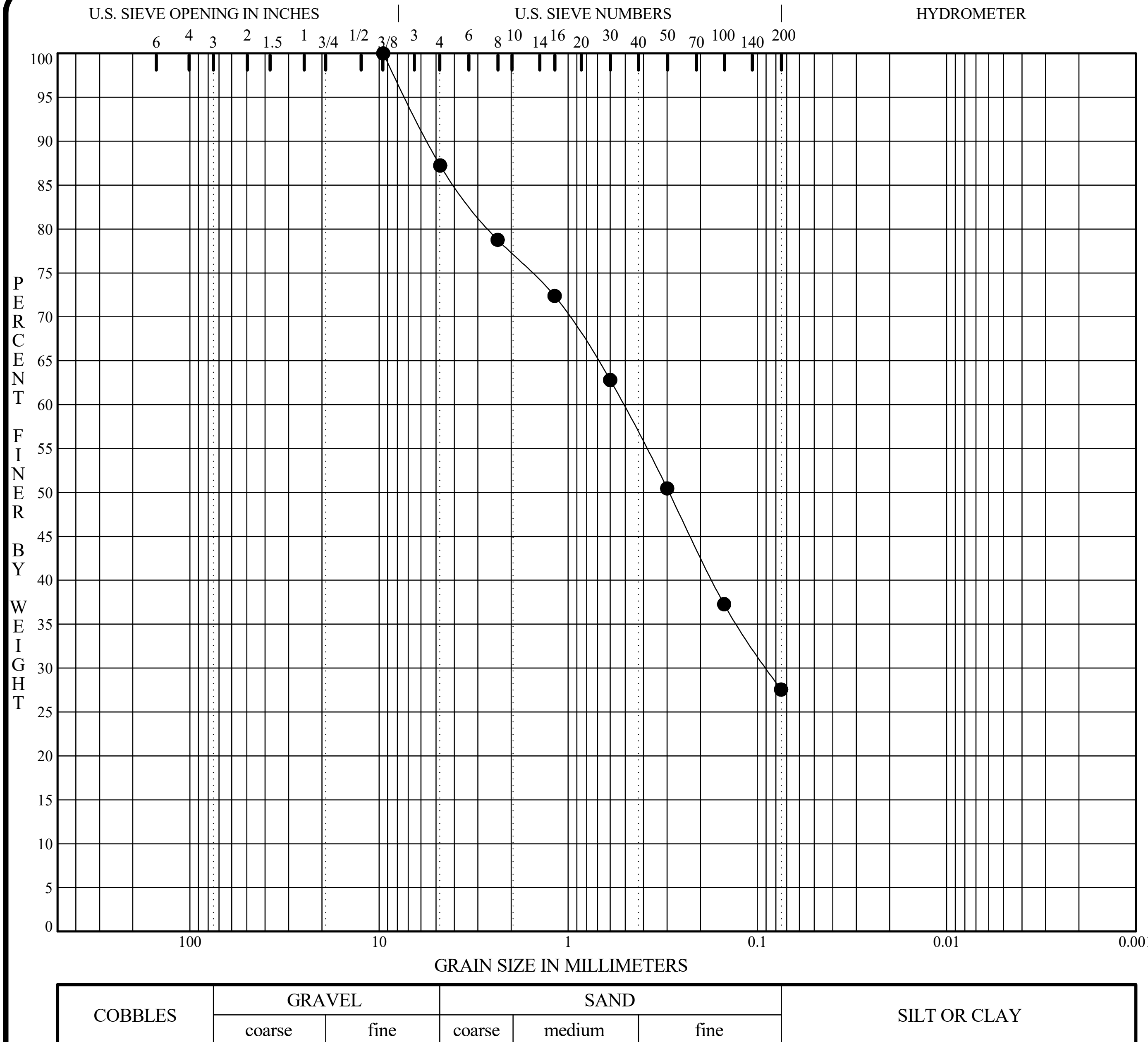
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-11**	**7.5'**	**9.50**	**2.98**	**0.515**	**0.0830**	**27.6**	**63.2**	**9.2**	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/20/21**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● **B-16**	**5.0'**	Clayey Sand with Gravel (SC)	**0**					

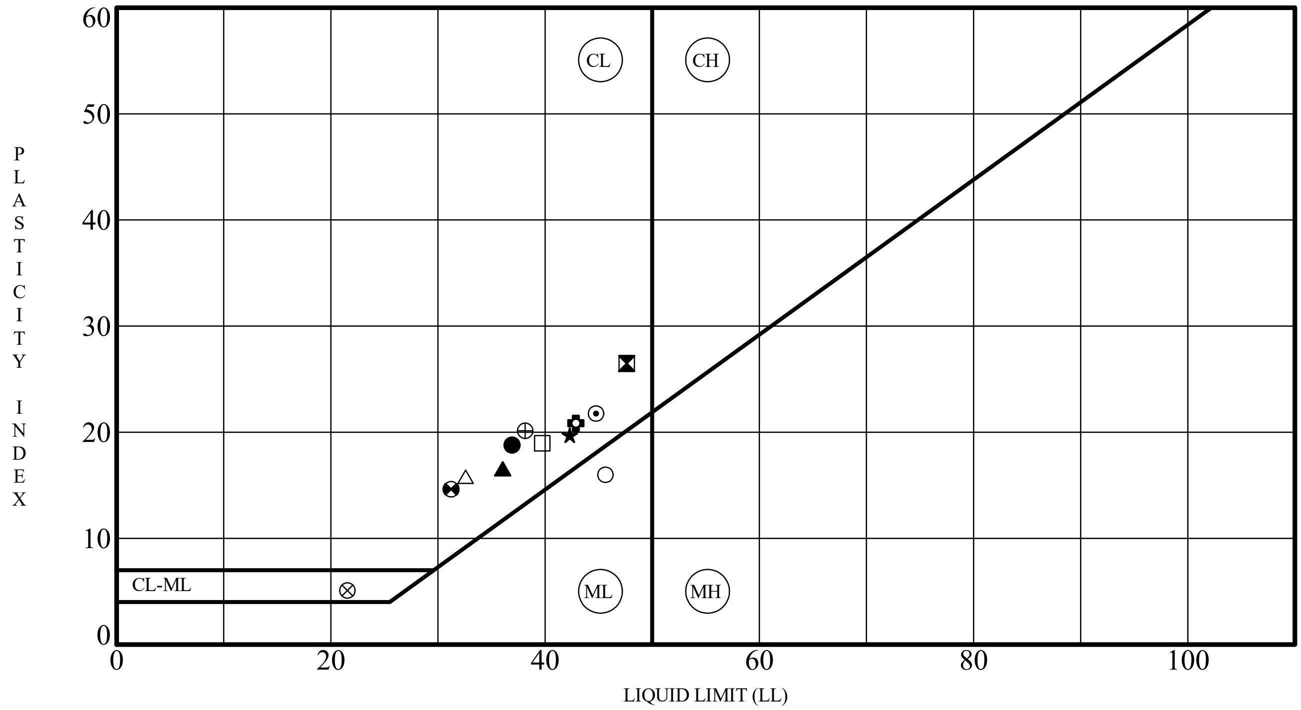
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-16**	**5.0'**	**9.50**	**0.51**	**0.089**		**12.8**	**59.7**	**27.6**	

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/20/21**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**2.5'**	**37**	**18**	**19**		
⧗	**B-10**	**12.5'**	**48**	**21**	**26**	**18.1**	**CLAYEY SAND SC**
▲	**B-12**	**7.5'**	**36**	**19**	**17**	**21.5**	**CLAYEY SAND SC**
★	**B-14**	**12.5'**	**42**	**23**	**20**		
⊙	**B-18**	**12.5'**	**45**	**23**	**22**	**13.8**	**CLAYEY SAND SC**
✿	**B-2**	**7.5'**	**43**	**22**	**21**	**19.8**	**CLAYEY SAND SC**
○	**B-3**	**10.0'**	**46**	**30**	**16**	**11.4**	
△	**B-4**	**12.5'**	**33**	**17**	**16**	**18.0**	**CLAYEY SAND SC**
⊗	**B-4**	**20.0'**	**22**	**16**	**5**	**9.4**	
⊕	**B-5**	**15.0'**	**38**	**18**	**20**		
□	**B-7**	**12.5'**	**40**	**21**	**19**	**18.5**	**CLAYEY SAND SC**
⊗	**B-8**	**0.0'**	**31**	**17**	**15**	**15.4**	**CLAYEY SAND SC**

PROJECT **Riverstone Development; Sheridan, Wyoming**

AET JOB NO. **P-0006531**
DATE **10/22/21**

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ATTERBERG LIMITS RESULTS

Appendix B

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
AET Project No. P-0006531

B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by GBA[1], of which, we are a member firm.

B.2 RISK MANAGEMENT INFORMATION

B.2.1 Understand the Geotechnical Engineering Services Provided for this Report

Geotechnical engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical engineering services is typically a geotechnical engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

B.2.2 Geotechnical Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client.

Likewise, geotechnical engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. If you are the least bit uncertain about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

1 Geoprofessional Business Association, 1300 Piccard Drive, LL14, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org, 2019

B.2.3 Read the Full Report

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. Read and refer to the report in full.

B.2.4 You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, always inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

B.2.5 Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

B.2.6 This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations only after observing actual subsurface conditions exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.

B.2.7 This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

B.2.8 Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical engineering report, along with any attachments or appendices, with your contract documents, but be certain to note conspicuously that you've included the material for information purposes only. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, only from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and be sure to allow enough time to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

B.2.9 Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled “limitations,” many of these provisions indicate where geotechnical engineers’ responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

B.2.10 Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a “phase-one” or “phase-two” environmental site assessment – differ significantly from those used to perform a geotechnical engineering study. For that reason, a geotechnical engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated subsurface environmental problems have led to project failures. If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

B.2.11 Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer’s services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, proper implementation of the geotechnical engineer’s recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. Geotechnical engineers are not building-envelope or mold specialists.