ADDENDUM No. 1

January 29, 2025. The following changes and additional information shall be incorporated into the Contract Documents and Specifications for the **Detention Pond 6 & East Airport Drainage** project. These modifications shall supersede any existing specifications as detailed herein.

Additions:

Addition #1: *Geotechnical Report*
See attached Geotechnical Report Williston Square Development Work Order #2 AET No. 37-20560 dated March 26, 2020.

Addition #2: *Concrete Ditch - Control and Expansion Joints*
The contractor is to install control joints as indicated in the attached detail, which outlines the installation requirements for the control and expansion joints in the East Airport Drainage Ditch.

Clarifications:

Clarification #1: *.xml Surfaces for Grading Areas*
The requested .xml files are included with this addendum in the link below. Bidders are to understand that the digital files provided are for bidding assistance only, do not necessarily represent the most current design, and are not approved for construction. Bidders understand that these files are to be used at their own risk and there are no warranties, express or implied, from the Owner or Alliance Consulting regarding these files. The following digital files are included in the link:

- Detention Pond 6A (1-28-25).xml
- East Airport Drainage Channel (1-28-25).xml

https://www.dropbox.com/scl/fo/ths5xst4w4sjv4r8duhnn/AN_vk2fV28tGyf0a0chok0U?rlkey=fw8ya7227ra65oonvs702ysa6&st=f92b5vxq&dl=0

Clarification #2: *Prebid Conference – Virtual Meeting Link*
The link to attend the pre-bid conference virtually being held on January 30, 2025, at 9:00 AM Central Daylight Time is provided below. If you are unable to access the meeting or encounter any issues, please contact 435-359-6407 for assistance.

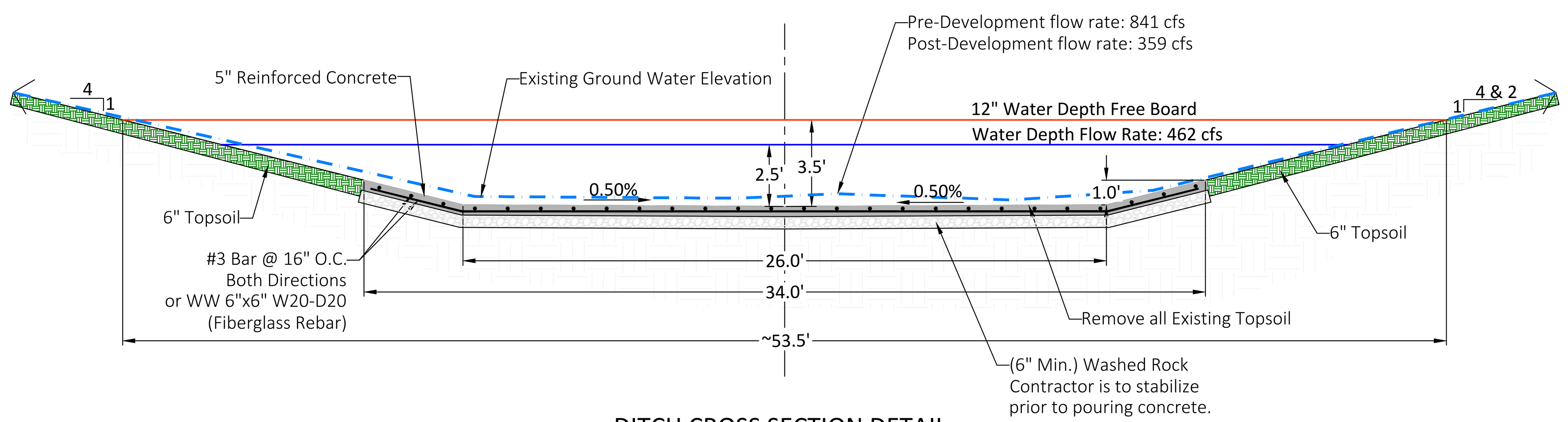
https://teams.microsoft.com/l/meetup-join/19%3ameeting_NDJhZmMzN2ItZDc1NS00MjI4LTlhZTctNTExYzk5NWFmMTE2%40thread.v2/0?context=%7b%22Tid%22%3a%222ec53a4a-6f3d-4bfe-b7ed-b903ae1c87a3%22%2c%22Oid%22%3a%223e36253b-979f-4575-9fe3-e9217944fefa%22%7d

Microsoft Teams Meeting ID: 214 400 479 910
Passcode: q5hV33fQ

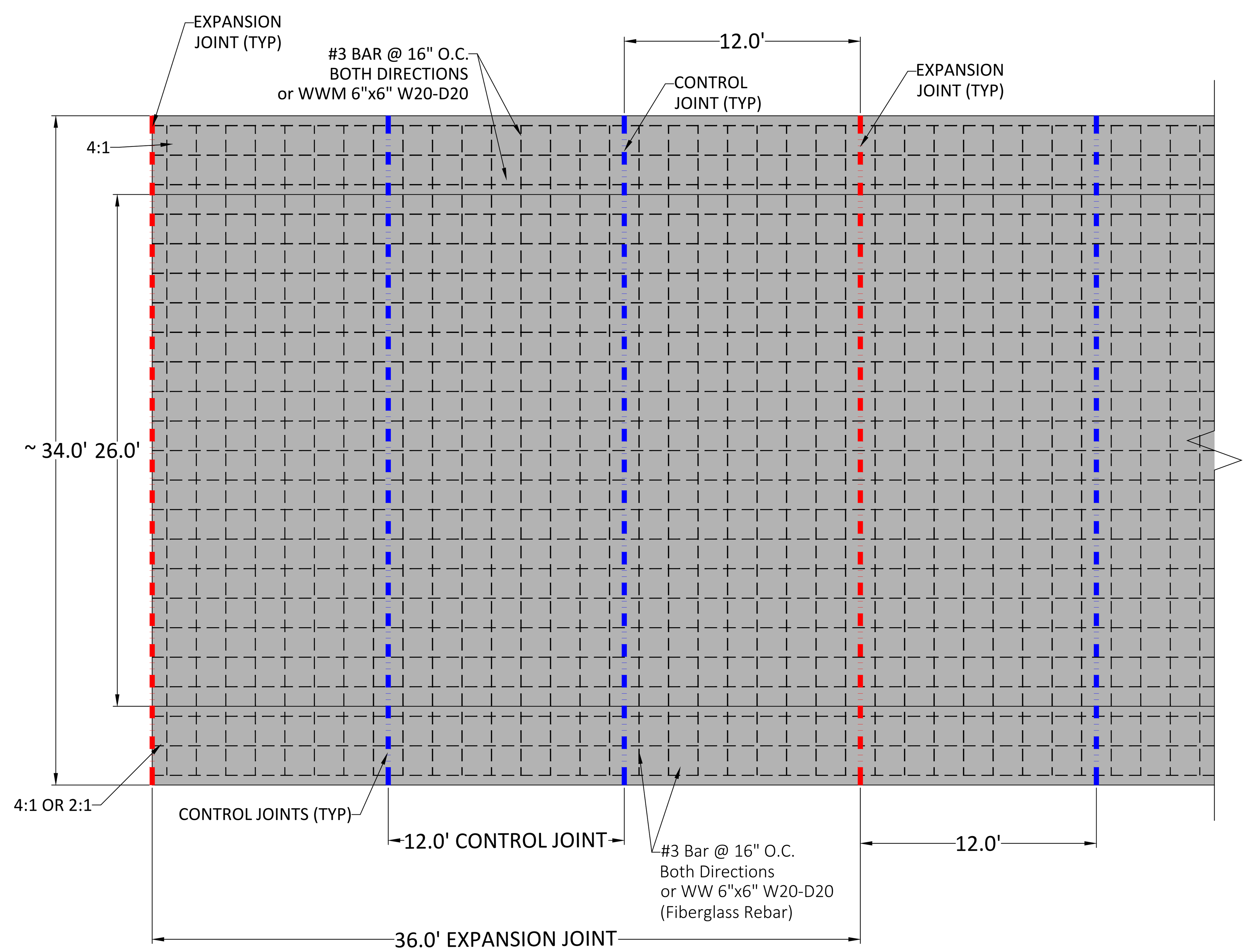
All bidders shall acknowledge receipt and acceptance of this Addendum by submitting this signed Addendum with the bid package. Bid forms received without this Addendum will be considered informal.

ALLIANCE CONSULTING		CONTRACTOR	
Signature:	Josh Williams	Signature:	
Title:	Project Engineer	Title:	
Date:	January 29, 2025	Date:	

A
C300
CONCRETE DITCH DETAIL
SCALE: NONE



DITCH CROSS SECTION DETAIL



GENERAL NOTES

1. The Contractor shall be solely responsible for construction means, methods, techniques, sequences, and procedures.
2. The Contractor shall be responsible for verification of all dimensions, conditions, and elevations with the project drawing prior to the start of construction. The Contractor shall inform the owner of any such discrepancies or omissions on the drawings. Omission of variation not reported shall be the responsibility of the contractor.
3. It shall be the Contractor's sole responsibility to design and provide adequate shoring, bracing, and form work, etc., as required for the protection of life and property during the construction.
4. Back fill around the ditch shall not be placed until after the concrete is cured.
5. The Contractor is responsible for all surface/ground water mitigation required during the construction of the project.

CONCRETE NOTES

FORM WORK

All form work shall conform to the lines and grades shown on the drawings and in accordance with local building codes, ACI 301 and ACI 318.

CONCRETE MIX AND PLACEMENT

Minimum concrete 28 day compressive strength shall be 3500 PSI.
6 bag max minimum.

Cement to conform with ASTM C150, TYPE II.
No structure member shall be cut, notched, bored or otherwise weakened, except as allowed by the UNIFORM BUILDING CODE, unless otherwise shown on plans. When the mean daily temperature is expected to drop below 40°F for three or more successive days, the concrete shall comply with the cold weather concreting standard (ACI 306). Place no concrete against frozen earth.

Concrete mixing and placing operations shall conform with ACI 301, ACI 304, and ACI 318.

Provide sleeves for conduit and pipe openings in concrete prior to placement of concrete. DO NOT move reinforcing bars without prior written approval of the Engineer.

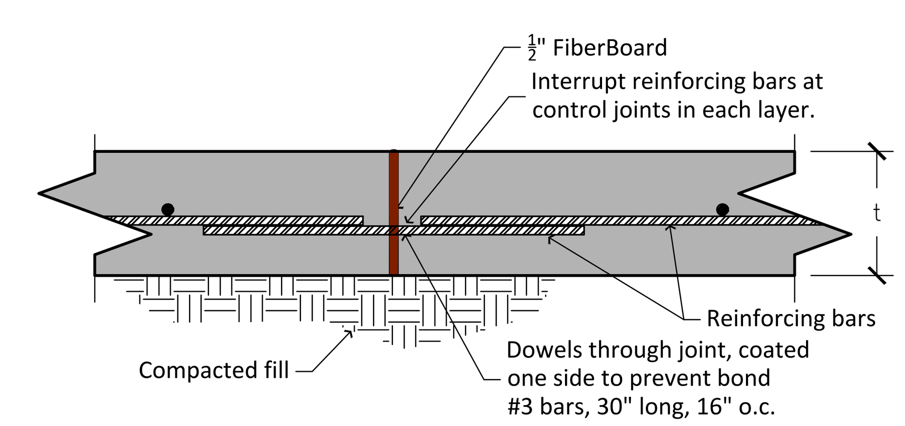
Shrinkage of concrete, when tested in accordance with ASTM C157, shall not exceed 000040 IN./IN. slump shall be 1" minimum, 4" maximum.

Finish concrete in accordance with ACI 304: Broomed finish for exterior concrete, and hard trowel for interior concrete.

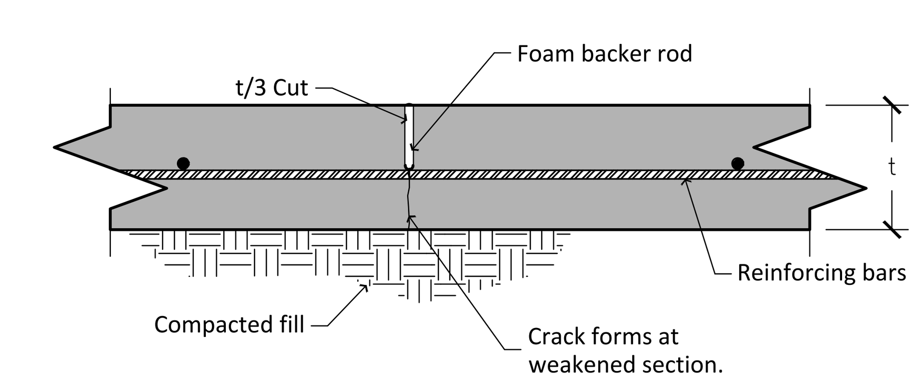
Construct control joints in 225 sq. ft. maximum intervals with maximum distance between joints of 15 feet. Tool 1" deep joints or saw cut t/3 deep joints within 12 hours of pour.

Splices of reinforcement at points of maximum stress shall be avoided wherever possible. Minimum overlap for lapped splices shall be 30 bar diameters unless otherwise noted. All construction joints shall be located so as not to impair the strength of the structure. Unless noted on the drawings, all reinforcement shall be continuous through the joints. Each construction joint shall be keyed before concrete is poured check with all trades to insure proper placement of all openings, sleeves, conduits, curbs, etc. relating to the work.

Typical Concrete Expansion Joint



Typical Concrete Control Joint



Date: 1-28-2025

REVISIONS

No.	Date	by	Description

File Name
Airport Drainage Channel.dwg

ALLIANCE CONSULTING
A PLANNING AND ENGINEERING FIRM

UTAH
2303 N CORAL CANYON BLVD
SUITE 201,
WASHINGTON, UT 84780
435-673-8060

NORTH DAKOTA
621 26th STREET W.
WILLISTON, ND 58801
701-572-8100

CONCRETE DITCH
JOINT DETAIL

FOR
CITY OF WILLISTON
LOCATED IN SEC 12
T 154 NORTH, R 101 WEST 5 P.M.
CITY OF WILLISTON, WILLIAMS COUNTY, ND

ADDENDUM NO.1

Drawn By: AZ
Scale: NONE
Client No. 5149
Project No. 5149
Drawing Sheet
C300

Sheet 2 of 5 Sheets

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

REPORT OF PRELIMINARY GEOTECHNICAL EXPLORATION

Williston Square Development Work Order #2

Williston, North Dakota

AET No. 37-20560

Date:

March 26, 2020

Prepared for:

City of Williston
22 East Broadway
Williston, North Dakota 58801

www.amengtest.com

March 26, 2020

City of Williston
22 East Broadway
Williston, North Dakota 58801

Attn: Mr. David Tuan

RE: Preliminary Geotechnical Exploration
Williston Square Development
Work Order #2
Williston, North Dakota
AET No. 37-20560

Greetings Mr. Tuan:

American Engineering Testing, Inc. (AET) is pleased to present the results of our preliminary subsurface exploration program and geotechnical engineering review for the Williston Square Development, Work Order #2 project in Williston, North Dakota. These services were performed according to our proposal to you dated January 8, 2020.

We are submitting one electronic copy of the report to you. Additional copies can be sent out at your request. Once the laboratory testing is completed, we will issue the final report.

Please contact me if you have any questions about the report. I can also be contacted for arranging site specific geotechnical engineering services and construction observation and testing services during construction.

Sincerely,
American Engineering Testing, Inc.

Harvey Fitzgerald

Harvey T. Fitzgerald, P.E.
Engineer II
Phone: (701) 572-3324
hfitzgerald@amengtest.com

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
- ENVIRONMENTAL
- GEOTECHNICAL
- MATERIALS
- FORENSICS

SIGNATURE PAGE

Prepared for:

City of Williston
22 East Broadway
Williston, North Dakota 58801

Attn: Mr. David Tuan

Prepared by:

American Engineering Testing, Inc.
322 47th Street West
Williston, North Dakota 58801
(701) 572-3324/www.amengtest.com

Authored by:

Harvey Fitzgerald

Harvey T. Fitzgerald, P.E.
Engineer II

Reviewed by:

Jon C. Howell

Jon C. Howell, M.S., P.E.
Senior Geotechnical Engineer
Gillette Manager

REGISTERED PROFESSIONAL ENGINEER
HARVEY T. FITZGERALD
Harvey Fitzgerald
PE-27999
DATE 3/26/2020
NORTH DAKOTA

TABLE OF CONTENTS

1.0 INTRODUCTION

The city of Williston is proposing to develop the former Sloulin Field International Airport in Williston, North Dakota. To assist planning and design, you have authorized American Engineering Testing, Inc. (AET) to conduct a preliminary subsurface exploration program at the site, conduct soil laboratory testing, and perform a general geotechnical engineering review for the project. This report presents the results of the above services and provides our preliminary engineering recommendations based on this data.

2.0 SCOPE OF SERVICES

AET's services were performed according to our proposal to you dated January 8, 2020, which you authorized on February 13, 2020. The authorized scope consists of the following.

- Twenty (20) standard penetration test borings to depths of 16.5 feet below existing grade at each location.
- Soil laboratory testing
- Preliminary Geotechnical engineering review based on the 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

The project consists of developing the former Sloulin Field International Airport, about 615 acres, in Williston, North Dakota. The site will be zoned for commercial development in the north to northeast portion of the site; commercial, retail, and health care services in the southeast; and residential in the western portions of the site. Based on our December 5, 2019 meeting with Alliance Consulting, the intent of this report is to provide preliminary subsurface soil information to the City of Williston and to potential developers. This report is for preliminary information only. Because of the unpredictable nature of geology and the vertical and horizontal variability of local stratigraphy, site specific geotechnical engineering exploration and evaluations is vital to the long-term performance of structures planned for specific developments.

The above stated information represents our general understanding of the proposed development and planning of the area. 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 preliminary recommendations are appropriate.

4.0 PRELIMINARY SUBSURFACE EXPLORATION AND TESTING

4.1 Field Exploration Program

The preliminary subsurface exploration program conducted for the project consisted of twenty (20) standard penetration test borings. Alliance Consulting provided the number of borings and depths, and AET coordinated with Alliance Consulting on the boring locations. 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 are shown on Figure 1 in Appendix A. The borings were staked in the field by Alliance Consulting.

4.2 Laboratory Testing

The laboratory test program included natural moisture contents, relative densities, Atterberg Limits, gradations (sieve analysis), and 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

The borings were located throughout the former Sloulin Field International Airport, as shown in Figure 1 in Appendix A. The site is surfaced with prairie grass and generally drains towards to the south. A large drainage feature is located west of the former crosswind runway and slopes downward to the southwest corner of the property. In addition, there are slight rolling hills in the west portion of the property, north and south of the former runway. The hills drain towards the former runway. There are rows of trees located along the south property boundary.

5.2 Subsurface Soils/Geology

The site geology primarily consists of glacial outwash, weather till, and till. The subsurface soil primarily consisted of lean clay and sand with occasional pockets of gravels, cobbles, and boulders. We did encounter silt in Borings B-7 and B-14. The topsoil ranged from 5 to 18 inches in thickness. Fill was encountered near the former airfield pavements in Boring B-20. Frost extended to approximate depths ranging from 0 to 2 feet. Below the frost line, the soils were generally moist, the relative consistency of the cohesive soils ranged from soft to hard, and the relative density of the coarse-grained soils ranged from loose to very dense. Based on our laboratory testing, the liquid limits of the native lean clay soil ranges from 21 to 26% with plasticity indices ranging from 7 to 12%.

5.3 Groundwater

At the time of drilling, we encountered groundwater in Boring B-10 at a depth of 12.5 feet below the existing grade. It should be noted our subsurface exploration occurred in March, and seasonal changes and locally heavy precipitation could change groundwater conditions. The developers and contractors shall be prepared to address any changes in groundwater elevations that may have occurred between the time of the field exploration and the time of construction.

6.0 RECOMMENDATIONS FOR FUTURE PLANNING

6.1 Approach Discussion

The following geotechnical opinions are presented to assist the preliminary planning, design, and development of the former Sloulin Field International Airport as stated in Section 3.0 Project Information. Our opinions are based on the results of our boring-based field exploration, field and laboratory testing, and our experience in the area with similar soil conditions. This report is for preliminary information only. Because of the unpredictable nature of geology and the vertical and horizontal variability of local stratigraphy, site specific geotechnical engineering exploration and evaluations is vital to the long-term performance of structures planned for each of the specific developments planned. <u>The City of Williston, present and future landowners, and all developers must perform a site-specific geotechnical engineering evaluation for each planned development. Site specific explorations should be designed and executed based on the structures, roads, utilities, infrastructure planned at each specific location.</u>

Exploration only allows observation of a small portion of the site subsurface conditions. Subsurface variations are possible between exploration locations and may not be apparent until construction. Where such variations exist, they may impact the opinions presented in this report, as well as construction timing and costs.

6.2 Site Development Feasibility

The subsurface soil encountered in the borings performed primarily consisted of stiff clays overlying loose to very dense sands and gravels, overlying lean clay glacial till. The topography of the site was relatively flat, except for the hills in the western portion of the site, and the drainage feature that runs from the crosswind runway to the southwest corner of the property. Generally, the site is suitable for development. Recommendations will vary as subsurface soil and groundwater conditions vary from structure to structure and from one specific development to another.

Conventional construction equipment, such as tracked excavators, should be able to make the required trench excavations within the site soils for utility trench installation. The site-specific geotechnical engineering explorations will enable the collection of more specific subsurface conditions which can be used to develop recommendations regarding the allowable temporary excavation slopes for performing utility construction per the Occupational Health and Safety Administration (OSHA). In addition, the site-specific geotechnical engineering evaluation should provide recommendations for utility subgrade preparation, pipe bedding, and backfilling at specific locations.

6.3 Preliminary Foundation Types

The subsurface soil at the bearing elevation for conventional shallow spread footings (placed below the frost depth) primarily consisted of stiff to hard clays and medium dense to very dense sands and gravels; however, Borings SB-2, SB-7 to SB-9, SB-11, SB-14, and SB-15 had N-values of 10 blows per foot or less. We also performed four consolidation tests on select soil samples at depths ranging from 5 to 10 feet below the existing grade. The results of the consolidation tests are provided in Appendix A.

Based on our experiences in the area with similar soil types, conventional shallow spread footings are feasible at this site, depending upon specific loading conditions and settlement limitations and constraints. The borings with N-values below 10 blows per foot may require additional foundational support, such as over-excavation and replacement with granular structural fill. Final grading plans containing finished floor elevations for structures and final grades for paving, drainage and infrastructure will have a major impact on final recommendations for foundation design recommendations. These design recommendations and parameters must be developed on a case by case basis according to the subsurface data collected at each specific location The site-specific geotechnical engineering evaluation should provide the design team with the localized subsurface soil and groundwater information necessary to develop detailed and location-specific foundation recommendations based upon subsurface exploration, laboratory testing, structural loading information, and project understanding for the site-specific construction.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Potential Difficulties

7.1.1 Soil Chemistry Information

In our laboratory testing for Work Order #1, American Engineering Testing, Inc. analyzed soil samples for water soluble sulfates, resistivity, and pH in the site soil in order to provide information for Portland cement concrete and buried metals. Sulfate attack is a deterioration resulting from chemical reactions occurring when concrete components react with sulfate ions (SO_4^{2-}) present in solution in contact with concrete. Table 1 below summarizes our laboratory testing from Work Order #1.

Table 1. Soil Chemistry Information

Boring # (depth)	Water Soluble Sulfates (ppm)	Resistivity (ohm-cm)	pH
B-7 (1'-5')	3,450	530	8.1
B-13 (1'-5')	1,010	4,050	8.3

Based on the results shown in the table above, concrete in contact with the on-site soil classifies as exposure class S2 according to ACI 318 Table 19.3.1.1. To achieve the required protection against sulfate related corrosion, we recommend specifying Type V cement, a maximum water-to-cement ratio of 0.45 (by weight, normal weight concrete), and a minimum compressive strength, *f'c*, of 4,500 pounds per square inch (psi). Details can be found in the above ACI reference and in the Portland Cement Association publication "Design and Control of Concrete Mixtures".

According to *Corrosion Life of Steel Foundation Products*, the soil ranges from moderately corrosive to highly corrosive to steel. We recommend buried metals be designed for corrosion. The results presented above in Table 1, represent soil chemistry at the specific boring locations and depths explored. Soils encountered in future explorations will be tested and conclusions revised as warranted.

7.1.2 Cobbles and Boulders

During our subsurface exploration, we encountered cobbles and boulders in Borings SB-5 and SB-15. The presence of cobbles and boulders can present construction difficulties for a number construction tasks. Examples of the difficulties which could be encountered are trench excavations for utilities, excavation for conventional foundations, installation of deep foundations such as drilled piers, driven piles. These types of difficulties may necessitate specialty equipment such as larger excavation and/or drilling equipment with rock bits, carbide teeth and similar attachments. The potential for these types of difficulties again will depend largely on the depth and extend of the cobbles and boulders encountered as well as final grade and floor slab elevations. Identification of these types of subsurface conditions, during future project specific geotechnical explorations is vital to the recommendations at each specific development location.

7.1.3 Organics Encountered During Exploration

During our subsurface exploration, we encountered topsoil that ranged from 5 to 18 inches thick, with roots extending to 18 inches in depths. The topsoil should be removed prior to construction. In addition, we encountered organic material in Boring SB-20 at a depth of 9 feet below the existing grade. Organic material in soil will decay over time, resulting in compressibility of the soil which can lead to settlement. We recommend consulting with the geotechnical engineer responsible for the site-specific geotechnical engineering evaluation if organic soils are encountered below structures.

7.1.4 Debris from the Former Airfield

As part of the airfield decommissioning, the airfield pavements and many of the structures were razed. Many of the former aviation hangar buildings, located in the eastern portion of the property, were removed, including the foundation elements. The City of Williston and the potential-developers should anticipate encountering below grade remnants, such as utility lines, in areas close to the former structures.

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, express 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.”

Appendix A

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
Figure 1 – Boring Locations
Subsurface Boring Logs
Atterberg Limits Tests
Sieve Analysis Tests
Consolidation Tests

Appendix A
Geotechnical Field Exploration and Testing
Report No. 37-20560

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling twenty (20) standard penetration test borings. The locations of the borings appear on Figure 1, 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 One-Dimensional Consolidation of Soils Using Incremental Loading
Conducted per AET Procedure 20-SOI-014, which is performed in general accordance with ASTM: D2435.

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.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
AR:	Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure.
B, H, N:	Size of flush-joint casing
CAS:	Pipe casing, number indicates nominal diameter in inches
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
DP:	Direct push drilling; a 2.125-inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground.
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RDA:	Rotary drilling with compressed air and roller or drag bit.
RDF:	Rotary drilling with drilling fluid and roller or drag bit
REC:	In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
SS:	Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after “falling” through drilling fluid
WH:	Sampler advanced by static weight of drill rod and hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94-millimeter wireline core barrel
▼:	Water level directly measured in boring

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES
(Calibrated Hammer Weight)

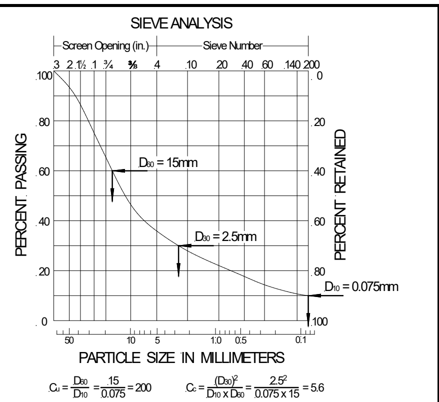
The standard penetration test consists of driving a split-spoon sampler with a drop hammer (calibrated weight varies to provide N_{60} values) and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

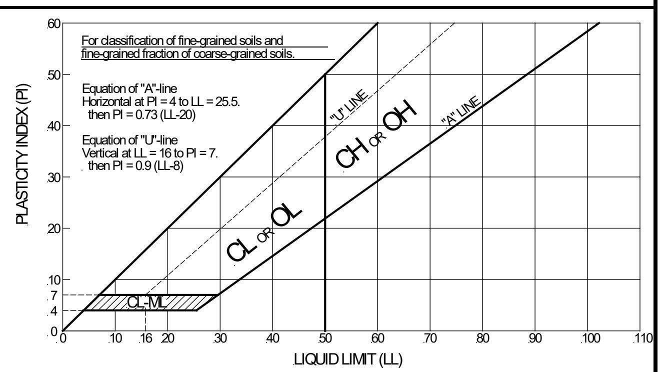
The length of sample recovered, as shown on the “REC” column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

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	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]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F.G.H]
			Fines classify as CL or CH	GC	Clayey gravel[F.G.H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and $1 > Cc > 3$[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, soil is a CL-ML silty clay.

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

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

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

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

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

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

[Q]PI plots below "A" line.

[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

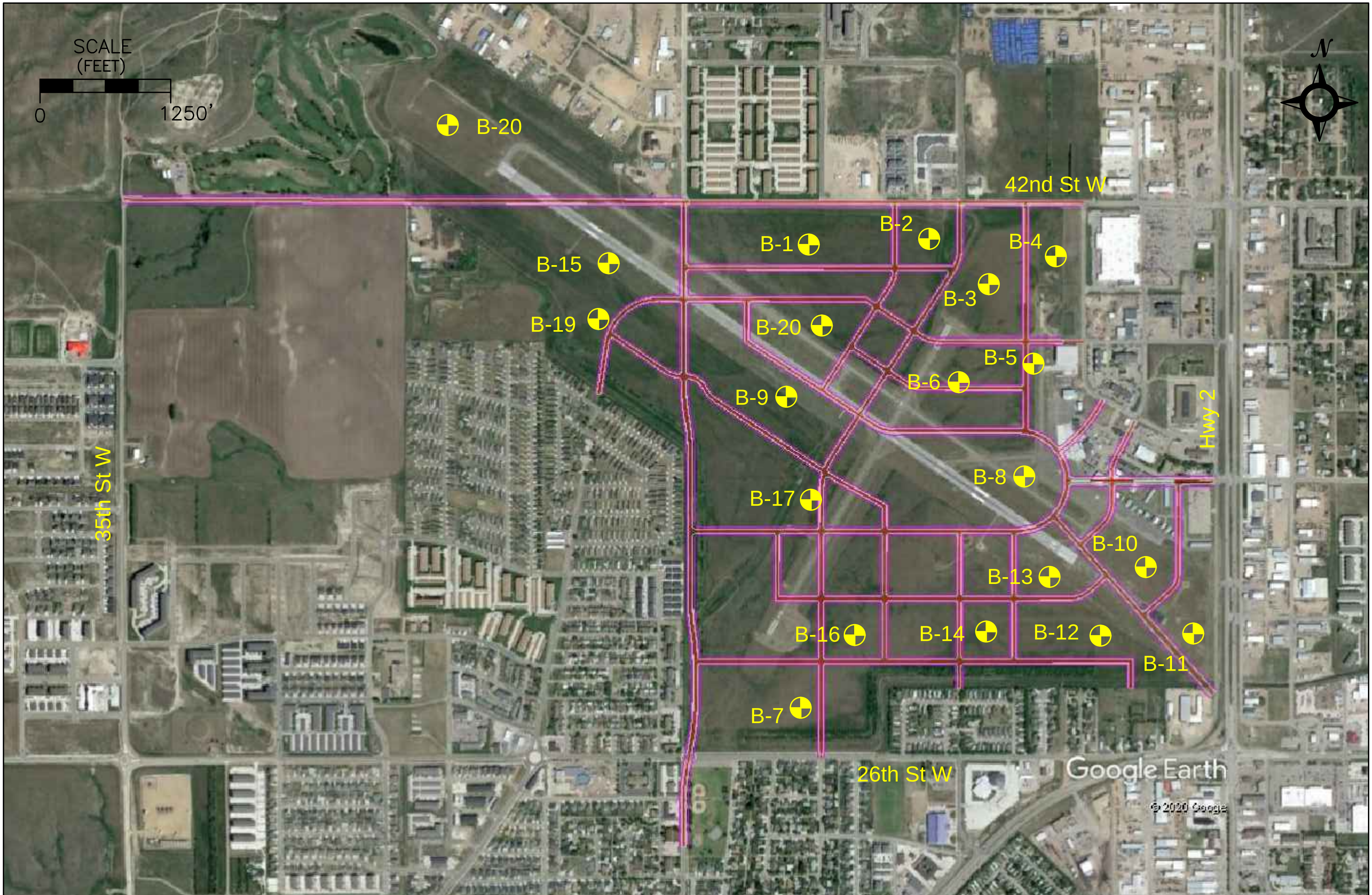
Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

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.

AMERICAN ENGINEERING TESTING, INC.	PROJECT: Williston Square Development Williston, North Dakota	PROJ. NO. 37-20560
	SUBJECT: Site Vicinity Map	DATE: March 10, 2020
	SCALE: Approximate Scale 1"=1 Mile / DRAWN BY: TT	REVIEWED BY: HF



AMERICAN ENGINEERING TESTING, INC.

PROJECT: Williston Square Development—Work Order #2 Williston, North Dakota	PROJ. NO. 37—20560
SUBJECT: Boring Location Map	DATE: March 10, 2020
SCALE: Approximate Scale 1"=1250' | DRAWN BY: TT	REVIEWED BY: HF

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-1 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1	**TOPSOIL**, sandy lean clay with trace gravel and roots, brown, frozen (12 inches)	TOPSOIL									
1–2.75	**LEAN CLAY with Sand**, hard, brown, moist (CL)	WEATHERED TILL	21	F	SS	22					
2.75–7.5	**POORLY-GRADED SAND** with trace gravel, medium dense, light brown, moist (SP)	OUTWASH	47	M	SS	14					
			28	M	SS	16	1				4.4
7.5–15	**Sandy LEAN CLAY**, hard, light brown, moist (CL)	WEATHERED TILL	47	M	SS	18					
			35	M	SS	16					
			41	M	MC		6	114			
15–16.5	**CLAYEY SAND** with trace gravel and laminations of silt, dense, light gray to brown, moist (SC)		39	M	SS	14					
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
16.5	**3.25" HSA**	**3/4/20**	**15:00**	**16.5**	**15.0**	**-**	**-**	**None**	

BORING COMPLETED: **3/4/20**

DR: **TB** LG: **CS** Rig: **CME 55**

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: 37-20560 | Log of Boring No. SB-2 (p. 1 of 1)

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ___ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1.5	**TOPSOIL**, lean clay with sand, trace roots, dark brown, frozen (18 inches)	TOPSOIL	19	F	SS	24					
1.5–2.5	**CLAYEY SAND** with trace gravel, loose, brown, moist (SC)	WEATHERED TILL									
2.5–5	**POORLY-GRADED SAND** with trace gravel, loose, light brown, moist (SP)	OUTWASH	4	M	SS	16					
5–16.5	**LEAN CLAY with Sand**, trace gravel, stiff, brown, moist (CL)	TILL	9	M	SS	12	4				
	Becomes firm at 7.5 feet 3.5 inch seam of sand at 8 feet		7	M	SS	16			26	14	
	Becomes stiff at 10 feet		11	M	MC		17	109			
			11	M	SS	14					
			8	M	SS	12					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	3.25" HSA	3/4/20	16:15	16.5	15.0	-	-	None

BORING COMPLETED: 3/4/20

DR: TB LG: CS Rig: CME 55

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-3 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1.5	**TOPSOIL**, sandy lean clay, roots extended to 18 inches, dark brown, frost extended to 12 inches (12 inches)	TOPSOIL	15	F	SS	14					
1.5–5	**Sandy LEAN CLAY**, trace sand and gravel, stiff, brown, moist (CL)	WEATHERED TILL	12	M	SS	18					
5–7.5	**SILTY CLAYEY SAND**, very dense, light brown, dry (SC-SM)	OUTWASH	59	M/D	SS	14	3		18	12	48.6
7.5–9	**SILTY SAND with Gravel**, dense, light brown, dry (SM)		31	D	SS	14					
9–16.5	**LEAN CLAY** with trace gravel, very stiff, brown, moist to dry (CL)	TILL	28	M	SS	12					
			25	D	SS	5					
	Trace lignite at 15 feet		18	M	SS	10					

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/5/20**	**8:45**	**16.5**	**15.0**	**-**	**-**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **3/5/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-4 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	TOPSOIL, lean clay, roots extended to 18 inches, dark brown, frozen (10 inches)	TOPSOIL									
1	**LEAN CLAY**, firm, brown to dark brown, moist (CL)	WEATHERED TILL	17	F	SS	18					
2											
3			7	M	SS	10	19				
4											
5	**WELL-GRADED GRAVEL**, dense, white, dry (GW)	OUTWASH									
6			47	D	SS	2					
7											
8	**SILTY SAND with Gravel**, dense, light brown to white, dry (SM)		47	D	SS	15					
9											
10	No gravel at 10 feet										
11			28	D	SS	10	2		15	12	24.1
12	**Sandy LEAN CLAY** with trace gravel, very stiff, brown, moist (CL)	TILL									
13			26	M	SS	14					
14											
15											
16			26	M	SS	8					
	End of Boring										

DEPTH:	DRILLING METHOD
16.5	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/4/20	**13:50**	**16.5**	**15.0**	**-**	**-**	**None**

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-5 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ___ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1	**TOPSOIL**, sandy lean clay, dark brown, frozen (12 inches)	TOPSOIL	32	F/M	SS	18					
1–5.5	**LEAN CLAY**, very stiff, dark brown, moist (CL)	WEATHERED TILL									
3	Encountered a boulder at 2.5 feet which resulted in auger refusal. Boring was moved 5 feet north and resumed drilling		21	M	SS	12	13				
5.5–10	**SILTY SAND** with trace gravel, dense, light brown, dry (SM)	OUTWASH	44	M/D	SS	18	16				
8			31	D	SS	18					
9	Trace gypsum at 9 feet										
10–16.5	**LEAN CLAY** with trace gravel, very stiff, brown, moist (CL)	TILL	24	M	SS	8					
13	Trace lignite at 13 feet		22	M	SS	12					
16			17	M	SS	14					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/5/20**	**9:20**	**16.5**	**15.0**	**-**	**-**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **3/5/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-6 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	TOPSOIL, sandy lean clay, roots extended to 15 inches, dark brown, frozen (8 inches)	TOPSOIL									
1	**Sandy LEAN CLAY** stiff, brown, moist (CL)	WEATHERED TILL	15	F/M	SS	18					
2											
3	**CLAYEY SAND**, loose, brown, moist (SC)	OUTWASH	8	M	SS	18					
4											
5											
6	**Sandy LEAN CLAY**, trace gypsum, stiff, brown, moist (CL)	TILL	14	M	SS	18					
7											
8	**SILTY SAND**, dense, light brown, dry (SM)	OUTWASH	38	D	SS	8					
9											
10											
11			28	D	SS	14					
12											
13			32	D	SS	18					
14											
15											
16	**CLAYEY SAND with Gravel**, dense, brown, dry (SC)		34	D	SS	8					
	End of Boring										

FIELD & LABORATORY TESTS: WC, DEN, LL, PL, %-#200

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/5/20**	**9:50**	**16.5**	**15.0**	**-**	**-**	**None**

WATER LEVEL MEASUREMENTS (DATE through WATER LEVEL columns)

BORING COMPLETED: **3/5/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-7 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1	**TOPSOIL** sandy lean clay, roots extended to 18 inches, dark brown, frozen (10 inches)	TOPSOIL									
1	**Sandy LEAN CLAY**, firm, brown, moist (CL)	WEATHERED TILL	15	F	SS	14					
3			7	M	SS	14					
5	Becomes stiff at 5 feet		10	D	MC	7					
8	Becomes very stiff at 7.5 feet		21	M	SS	10					
10	**SILT**, stiff, light brown, dry (ML)	OUTWASH	11	D	SS	18					
13			11	D	SS	18					
14	**POORLY-GRADED SAND**, fine-grained, medium dense to dense, light brown to white, dry (SP)										
16			33	D	SS	14					
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
16.5	**3.25" HSA**	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		3/4/20	**15:00**	**16.5**	**15.0**	**-**	**-**	**None**	
BORING COMPLETED: **3/4/20**									
DR: **IDS** LG: **HTF** Rig: **D50**									

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-8 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	TOPSOIL, clayey sand, roots extended 12 inches, dark brown, frozen (6 inches)	TOPSOIL									
1	**CLAYEY SAND**, medium dense, brown, moist (SC)	WEATHERED TILL	20	F/M	SS	18					
2											
3	**Sandy LEAN CLAY**, hard, brown, moist (CL) 3 inchs seam of gravel at 3 feet, hard drilling to 5 feet		49	M	SS	18					
4											
5	Becomes stiff with laminations of sand and gravel at 5 feet										
6			12	M	SS	14					
7											
8	**LEAN CLAY** with trace gravel, stiff, brown, moist (CL)	TILL	10	M	SS	8					
9											
10											
11			14	M	MC	14	15	114			
12											
13			10	M	SS	18					
14											
15	2 inch seam of sand at 15 feet										
16			8	M	SS	18					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/5/20**	**10:20**	**16.5**	**15.0**	**-**	**-**	**None**

BORING COMPLETED: **3/5/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-9 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–0.4	**TOPSOIL**, Sandy LEAN CLAY, roots extended to 5 inches, brown, frozen (5 inches)	TOPSOIL									
1	**POORLY-GRADED SAND**, medium dense, light brown, dry (SP)	OUTWASH	30	F/D	SS	18					
3			12	NR	SS	NR					
4	**CLAYEY SAND**, loose, brown, moist (SC)										
6			9	M	SS	8					
7.5	**SILTY SAND with Gravel**, medium dense, light brown to white, dry (SM)		29	D	SS	12					
10	Becomes very dense with more gravel at 10 feet		62	D	SS	12					
12.5	**LEAN CLAY** with trace gravel, hard, brown, moist (CL)	TILL	31	M	SS	5					
16	Trace lignite at 16 feet		11	M	SS	18					
16.5	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/4/20**	**16:05**	**16.5**	**15.0**	**-**	**-**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: 37-20560 Log of Boring No. SB-10 (p. 1 of 1)

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation / MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1.5	**TOPSOIL**, sandy lean clay, roots extended to 18 inches, brown, frost extended to 12 inches (18 inches)	TOPSOIL	18	F	SS	14					
1.5–6	**Sandy LEAN CLAY**, stiff, brown, moist (CL)	WEATHERED TILL	9	M	SS	12	17				
			22	D	SS	12					
6–7.5	**SILTY SAND**, medium dense, light brown, dry (SM)	OUTWASH									
7.5–10	**Sandy LEAN CLAY**, stiff, brown, moist (CL)		12	D	SS	8					
10–12.5	**CLAYEY SAND**, medium dense, brown, moist (SC)		12	M	MC	4					
12.5–15.5	**POORLY-GRADED SAND**, loose, brown, wet (SP)		5	W	SS	10					
15.5–16.5	**LEAN CLAY**, stiff, brown, moist (CL)	TILL	8	W/M	SS	16					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**							
		3/4/20	**11:00**	**16.5**	**15.0**	**-**	**-**	**12.5**
		3/5/20	**10:45**	**-**	**-**	**12.0**	**-**	**-**

BORING COMPLETED: **3/5/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560**

Log of Boring No. **SB-11 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1.5	**TOPSOIL**, clayey sand, roots extended to 18 inches, brown, frost extended to 10 inches (18 inches)	TOPSOIL	15	F/M	SS	18					
1.5–7.5	**Sandy LEAN CLAY**, stiff, brown, moist (CL)	WEATHERED TILL									
	3 inch seam of poorly-graded sand with gravel at 3 feet		8	M	SS	18					
			10	M	MC	12	17	110			
7.5–16.5	**LEAN CLAY** with trace gravel, stiff, brown, moist (CL)	TILL	12	M	SS	20					
	Trace iron-oxide staining at 10 feet		14	M	SS	18					
			13	M	SS	12					
			13	M	SS	5					
	End of Boring										

DEPTH:	DRILLING METHOD
16.5	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/4/20	**11:25**	**16.5**	**15.0**	**-**	**-**	**None**

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: 37-20560 Log of Boring No. SB-12 (p. 1 of 1)

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
1	**TOPSOIL**, clayey sand, roots extended to 18 inches, brown, moist (18 inches)	TOPSOIL	18	M	SS	18					
2	**Sandy LEAN CLAY**, very stiff, brown, moist (CL)	OUTWASH									
3	**POORLY-GRADED SAND with Gravel**, medium dense, brown, dry (SP)		20	D	SS	14	4				
4											
5											
6	Hard drilling from 6 feet to 7.5 feet		25	D	SS	14					
7											
8	**Sandy LEAN CLAY with Gravel**, hard, brown with trace iron-oxide staining, dry (CL)	WEATHERED TILL	30	D	SS	12					
9											
10											
11			46	D	SS	14					
12											
13	**LEAN CLAY**, stiff, brown, moist (CL)	TILL	16	M	SS	12					
14											
15											
16			15	M	SS	12					
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
16.5	3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
		3/4/20	11:35	16.5	15.0	-	-	None	
BORING COMPLETED: 3/4/20									
DR: IDS LG: HTF Rig: D50									

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-13 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	TOPSOIL, clayey sand, brown, frozen to 6 inches (6 inches)	TOPSOIL									
1	**Sandy LEAN CLAY**, stiff, brown, moist (CL)	WEATHERED TILL	26	F	SS	18					
2											
3	**POORLY-GRADED SAND with Silt and Gravel**, medium dense, light brown, dry (SP)	OUTWASH	11	D	SS	8	3				10.3
4											
5	**LEAN CLAY** with trace gravel, stiff, brown, moist (CL)	WEATHERED TILL	13	M	SS	12					
6											
7											
8	**POORLY-GRADED SAND**, medium dense, light brown, moist (SP)	OUTWASH	12	M	SS	18					
9	**SILTY SAND**, medium dense, light brown, moist (SM)										
10			8	M	MC	15	28	88			
11	**LEAN CLAY** with trace gravel, stiff, brown, moist (CL)	TILL									
12											
13	**POORLY-GRADED SAND**, medium dense to very dense, light brown, dry (SP)	OUTWASH	16	M/D	SS	14					
14											
15	Becomes very dense at 15 feet										
16			50/4"	D	SS	8					
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/4/20**	**13:00**	**16.5**	**15.0**	**-**	**-**	**None**

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-14 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–0.8	**TOPSOIL**, clayey sand, roots extended to 10 inches, brown, frozen to 10 inches (10 inches)	TOPSOIL									
1	**LEAN CLAY**, very stiff, brown, moist (CL)	WEATHERED TILL	18	F/M	SS	15					
2											
3	**POORLY-GRADED SAND with Gravel**, medium dense, brown, dry (SP)	OUTWASH	29	D	SS	5					
4											
5	Becomes loose and coarse-grained at 5 feet										
6			8	D	SS	8					
7											
8	Becomes fine-grained with little gravel at 7.5 feet		10	D	SS	8					
9											
10	**SILT with Sand**, stiff, light brown, dry (ML)										
11			11	D	SS	12	5		NP	NP	70.3
12											
13	2 inch seam of lean clay at 12.5 feet		14	D	SS	14					
14											
15											
16			8	D	SS	4					
16–16.5	**Sandy LEAN CLAY**, stiff, light brown with trace iron-oxide staining, dry (CL)	TILL									
	End of Boring										

DEPTH:	DRILLING METHOD
16.5	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
3/4/20	13:20	16.5	15.0	-	-	None

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: 37-20560 Log of Boring No. SB-15 (p. 1 of 1)

Project: Williston Square Development; Williston, ND

DEPTH IN FEET	Surface Elevation ___ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–0.5	**TOPSOIL**, sandy lean clay, roots extended to 6 inches, dark brown, frozen (6 inches)	TOPSOIL									
1	Encountered a boulder at 0.5 feet resulting in auger refusal. Boring moved 15 feet west and continued exploration.	WEATHERED TILL	44	F	SS	18					
2–5	**Sandy LEAN CLAY**, hard, brown, moist (CL) 2 inch seams of gravel at 6 inches and 2.5 feet		36	M	SS	12	13				
5–9	**WELL-GRADED GRAVEL** with trace clay, loose, white, dry (GW)	OUTWASH	8	D	SS	5					
	Becomes medium dense at 7.5 feet		19	D/M	SS	8					
9–16.5	**LEAN CLAY** with trace gravel, stiff, brown, moist (CL)	TILL	8	M	SS	8					
			11	M	SS	18					
	Becomes gray at 16 feet		22	M	SS	2					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/4/20**	**17:15**	**16.5**	**15.0**	**-**	**-**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-16 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ___ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–1	**TOPSOIL**, clayey sand, roots extended to 12 inches, dark brown, frozen (8 inches)	TOPSOIL	18	F	SS	18					
1–5	**SANDY SILTY CLAY** with trace gypsum, stiff, brown, moist (CL-ML)	WEATHERED TILL	9	M	SS	6			21	14	
5–12.5	**SILTY SAND**, medium dense, light brown, moist (SM)	OUTWASH	20	M	SS	18					
			11	D	SS	14					
			13	D	SS	8					
12.5–16.5	**POORLY-GRADED SAND**, loose, light brown, dry (SP)		10	D	SS	12					
			9	D	SS	14					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/4/20**	**14:30**	**16.5**	**15.0**	**-**	**-**	**None**

(The column headings from DATE to WATER LEVEL appear under the printed heading WATER LEVEL MEASUREMENTS.)

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-17 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
1	**TOPSOIL**, clayey sand, roots extended to 18 inches, dark brown, frost extended 12 inches (18 inches)	TOPSOIL	19	F	SS	18					
2–3	**LEAN CLAY**, firm, brown, moist (CL)	WEATHERED TILL	7	M	SS	14					
4–7	**SILTY SAND**, medium dense, light brown, dry (SM) 2 inch seam of poorly-graded sand at 6.5 feet	OUTWASH	22	D	SS	14	3				
8–10	**SILTY SAND with Gravel**, dense, light brown, dry (SM)		41	D/M	SS	18					
10–11	Becomes medium dense at 10 feet		25	M	SS	18					
11–12	**LEAN CLAY with Gravel**, very stiff, brown, moist (CL)	WEATHERED TILL									
13–14	Becomes hard at 12.5 feet		46	D	SS	18					
15–16			27	NR	SS	NR					
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
16.5	**3.25" HSA**	**3/4/20**	**15:35**	**16.5**	**15.0**	**-**	**-**	**None**	

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-18 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ______ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	TOPSOIL, sandy lean clay, roots extended to 6 inches, frozen (6 inches)	TOPSOIL									
1	**Sandy LEAN CLAY**, brown, frozen to 2 feet (CL)	WEATHERED TILL	43	F	SS	18					
2	Becomes very stiff and moist at 2 feet										
3	Trace gravel at 2.5 feet		20	F/M	SS	16					
4											
5	2 inch lenses of sand and gravel from 5 to 10 feet										
6			22	M	SS	18	8				
7											
8			40	M	SS	14	8	120			
9											
10	**LEAN CLAY** with trace gravel, very stiff, brown, moist (CL)	TILL									
11			19	M	SS	14					
12											
13	Lenses of sand a gravel at 12.5 feet		22	M	SS	18					
14											
15											
16			17	M	SS	18					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/5/20**	**8:10**	**16.5**	**15.0**	**-**	**-**	**None**
BORING COMPLETED: **3/5/20**								
DR: **IDS** LG: **HTF** Rig: **D50**								

WATER LEVEL MEASUREMENTS

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-19 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

DEPTH IN FEET	Surface Elevation ____ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–0.5	**TOPSOIL**, sandy lean clay, roots extended 6 inches, brown, frozen (6 inches)	TOPSOIL									
1	**Sandy LEAN CLAY** with trace gravel, hard to very stiff, brown, moist (CL)	WEATHERED TILL	38	F/M	SS	18					
2											
3	2 inch rock in shoe at 2.5 feet		19	NR	SS	NR					
4											
5	**SILTY SAND** with trace gravel, medium dense, light brown, dry (SM)	OUTWASH									
6			13	D	SS	12	3				
7											
8	**Sandy LEAN CLAY** with trace gravel, hard, light brown with trace iron-oxide staining, dry (CL)	TILL	45	D	SS	14					
9											
10	Becomes very stiff at 10 feet										
11			28	D	SS	10					
12											
13	Becomes moist at 12.5 feet		23	M	SS	10					
14											
15	Becomes stiff at 15 feet										
16	Laminations of poorly-graded sand at 16 feet		15	M	SS	8					
	End of Boring										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/4/20**	**16:40**	**16.5**	**15.0**	**-**	**-**	**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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

AET_CORP 37-20560 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 3/24/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET No: **37-20560** Log of Boring No. **SB-20 (p. 1 of 1)**

Project: **Williston Square Development; Williston, ND**

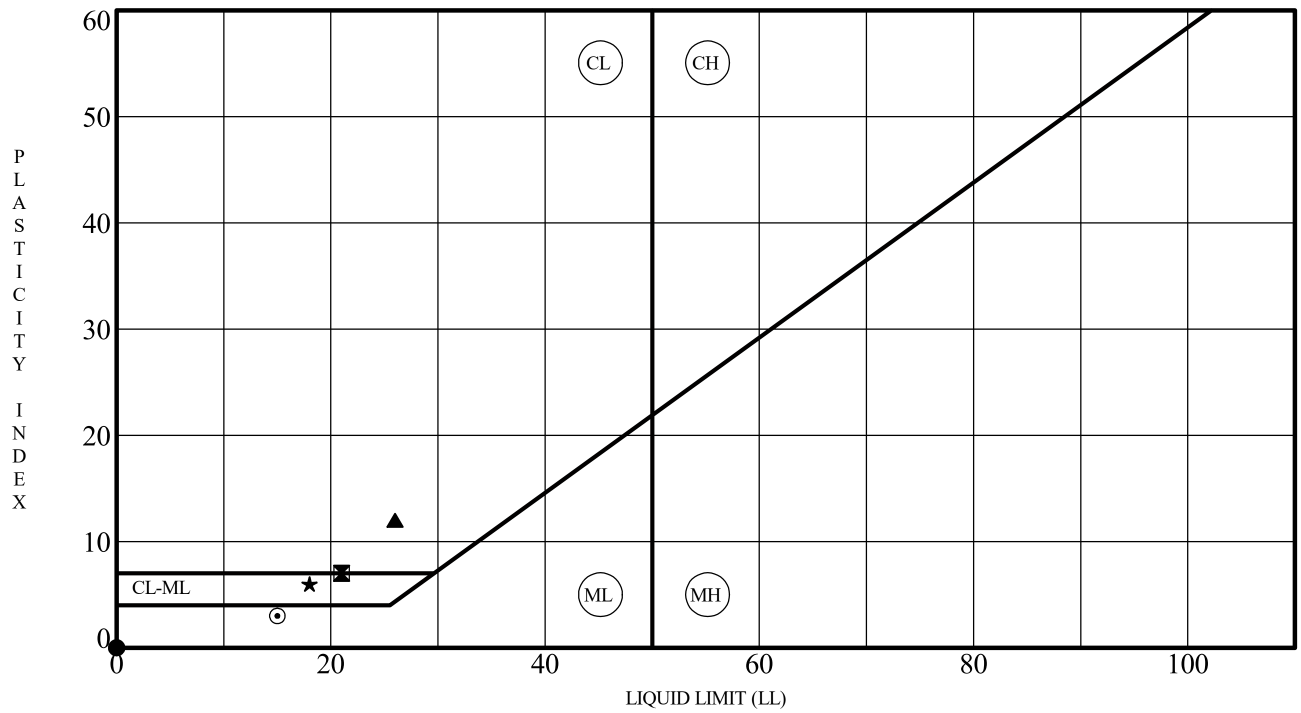
DEPTH IN FEET	Surface Elevation ___ MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
0–0.3	**TOPSOIL**, sandy lean clay with trace gravel, brown, frozen (4 inches)	TOPSOIL									
0.3–0.6	**AGGREGATE BASE COURSE**, red to orange, moist (3 inches)	FILL	35	F/M	SS	18					
0.6–8.5	**Sandy LEAN CLAY**, stiff, brown, moist (CL)	WEATHERED TILL									
3			9	M	SS	14					
5	Laminations of sand at 5 feet										
6			12	M	SS	18					
8.5	**LEAN CLAY** with trace organics, very stiff, black, moist (CL)		28	M	SS	18					
11			43	M	SS	14					
11	**WELL-GRADED GRAVEL**, dense, white, dry (GW)	OUTWASH									
12.5	**LEAN CLAY** with trace gravel, very stiff to stiff, brown, moist (CL)	TILL	16	M	SS	8					
16			13	M	SS	10					
16.5	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
16.5	**3.25" HSA**	**3/4/20**	**17:45**	**16.5**	**15.0**	**-**	**-**	**None**

BORING COMPLETED: **3/4/20**

DR: **IDS** LG: **HTF** Rig: **D50**

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



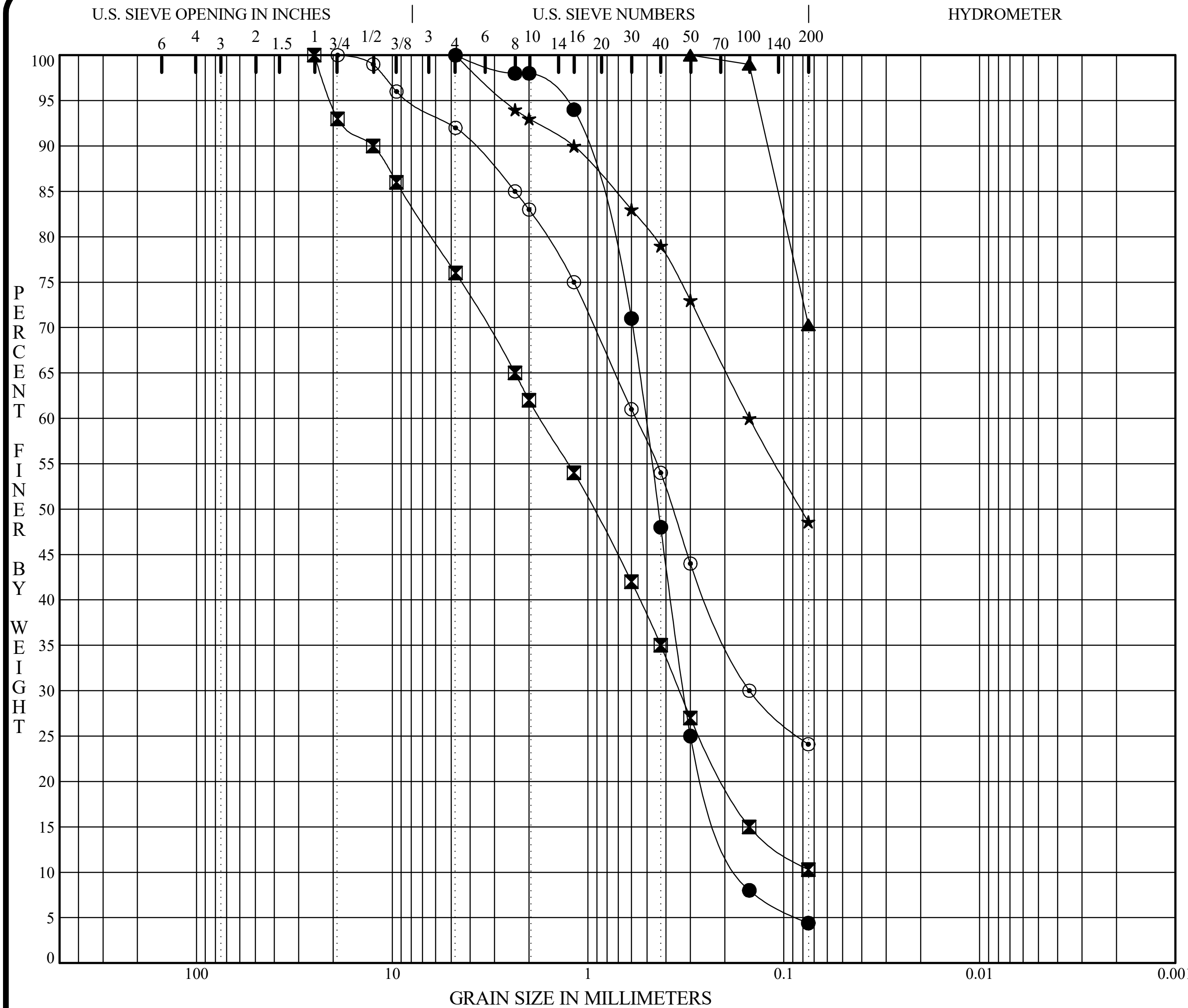
	Specimen Identification		LL	PL	PI	Fines	Classification
●	**SB-14**	**10.0'**	**NP**	**NP**	**NP**	**70.3**	**SILT with SAND ML**
⧗	**SB-16**	**2.5'**	**21**	**14**	**7**		
▲	**SB-2**	**7.5'**	**26**	**14**	**12**		
★	**SB-3**	**5.0'**	**18**	**12**	**6**	**48.6**	**SILTY, CLAYEY SAND SC-SM**
⊙	**SB-4**	**10.0'**	**15**	**12**	**3**	**24.1**	**SILTY SAND SM**

PROJECT **Williston Square Development; Williston, ND**

AET JOB NO. **37-20560**
DATE **3/4/20**

AMERICAN ENGINEERING TESTING, INC.

ATTERBERG LIMITS RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	MC%	LL	PL	PI	Cc	Cu
●	**SB-1**	**5.0'**	**POORLY GRADED SAND SP**	**1**				**1.26**	**3.1**
⧗	**SB-13**	**2.5'**		**3**				**0.93**	**24.4**
▲	**SB-14**	**10.0'**	**SILT with SAND ML**	**5**	**NP**	**NP**	**NP**		
★	**SB-3**	**5.0'**	**SILTY, CLAYEY SAND SC-SM**	**3**	**18**	**12**	**6**		
⊙	**SB-4**	**10.0'**	**SILTY SAND SM**	**2**	**15**	**12**	**3**		

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**SB-1**	**5.0'**	**4.75**	**0.51**	**0.324**	**0.1627**	**0.0**	**95.6**	**4.4**	
⧗	**SB-13**	**2.5'**	**25.00**	**1.75**	**0.342**		**24.0**	**65.7**	**10.3**	
▲	**SB-14**	**10.0'**	**0.30**				**0.0**	**29.7**	**70.3**	
★	**SB-3**	**5.0'**	**4.75**	**0.15**			**0.0**	**51.4**	**48.6**	
⊙	**SB-4**	**10.0'**	**19.00**	**0.57**	**0.150**		**8.0**	**67.9**	**24.1**	

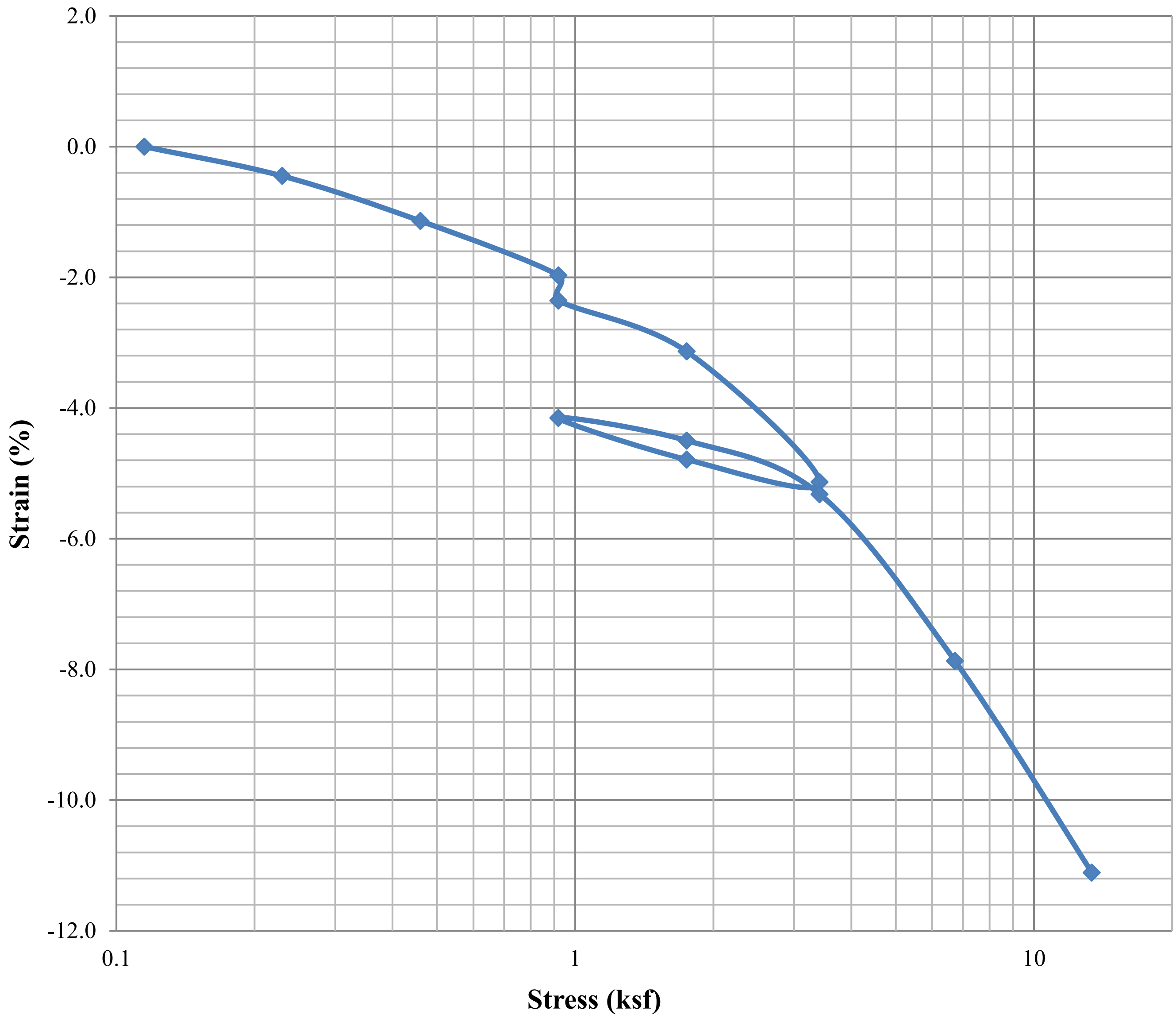
PROJECT **Williston Square Development; Williston, ND**

AET JOB NO. **37-20560**

DATE **3/4/20**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES



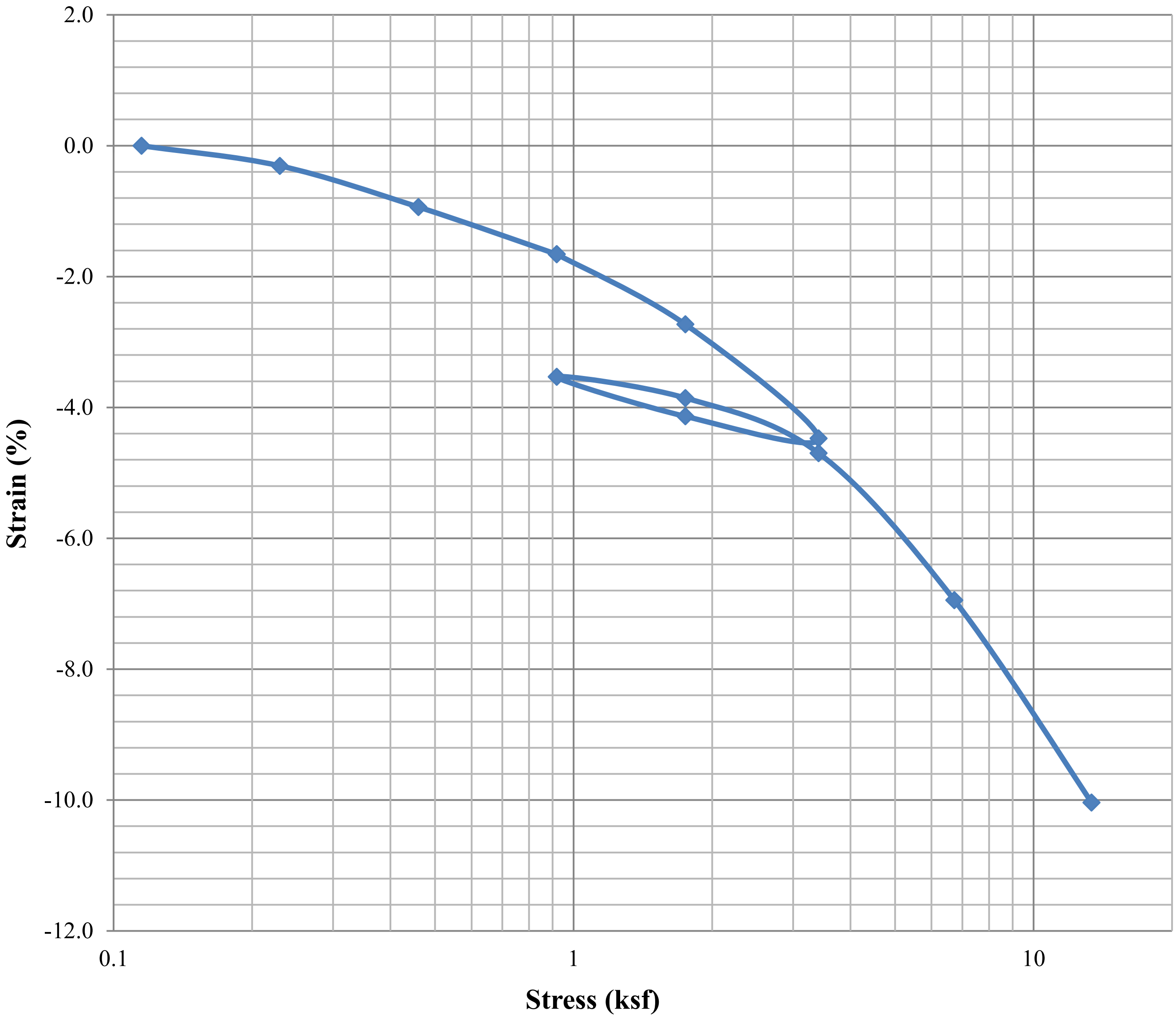
Water Content, %	16.5	Load at Saturation	920 psf
Dry Density	108.8	Sample Type:	CA
Diameter, in.	1.889	Description:	Brown Lean Clay with Sand and Minor Gravel
Height, in.	0.756	Assumed SpG	2.65

Client:	City of Williston		
Project:	Williston Square Development	**Sampled By:**	HF
Project Number:	37-20560	**Location:**	SB-2
Date Sampled:	3/5/2020	**Depth:**	10 to 11.5

AMERICAN ENGINEERING TESTING, INC.

CONSOLIDATION/SWELL TEST

ASTM D 4546 METHOD C



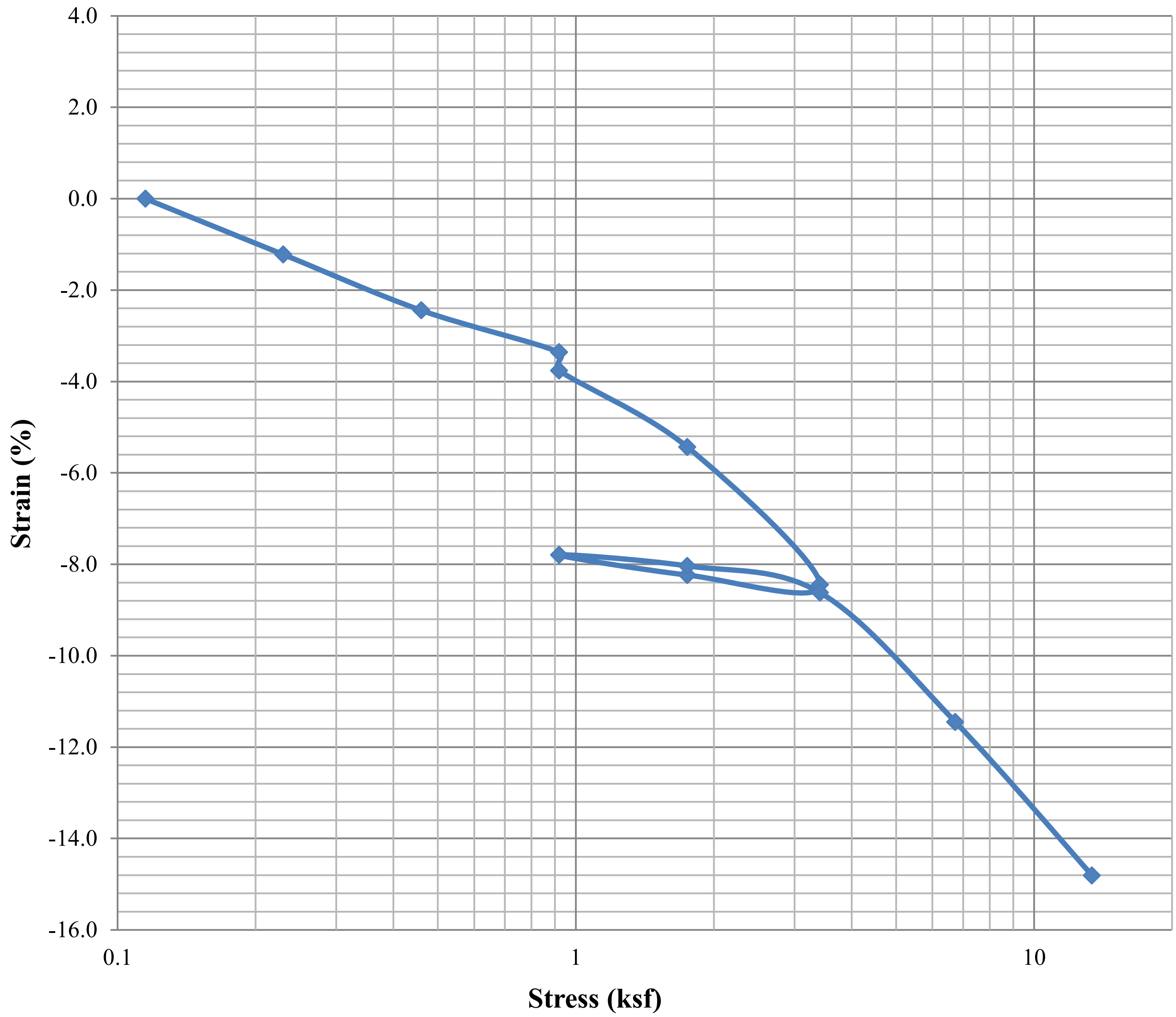
Water Content, %	15.3	Load at Saturation	920 psf
Dry Density	113.7	Sample Type:	CA
Diameter, in.	1.879	Description:	Brown Lean Clay
Height, in.	0.747	Assumed SpG	2.65

Client:	City of Williston		
Project:	Williston Square Development	**Sampled By:**	HF
Project Number:	37-20560	**Location:**	SB-8
Date Sampled:	3/5/2020	**Depth:**	10 to 11.5

AMERICAN ENGINEERING TESTING, INC.

CONSOLIDATION/SWELL TEST

ASTM D 4546 METHOD C



Water Content, %	16.7	Load at Saturation	920 psf
Dry Density	110.1 pcf	Sample Type:	CA
Diameter, in.	1.878	Description:	Brown Sandy Lean Clay with Minor Gravel
Height, in.	0.752	Assumed SpG	2.65

Client:	City of Williston		
Project:	Williston Square Development	**Sampled By:**	HF
Project Number:	37-20560	**Location:**	SB-11
Date Sampled:	3/5/2020	**Depth:**	5 to 6.5

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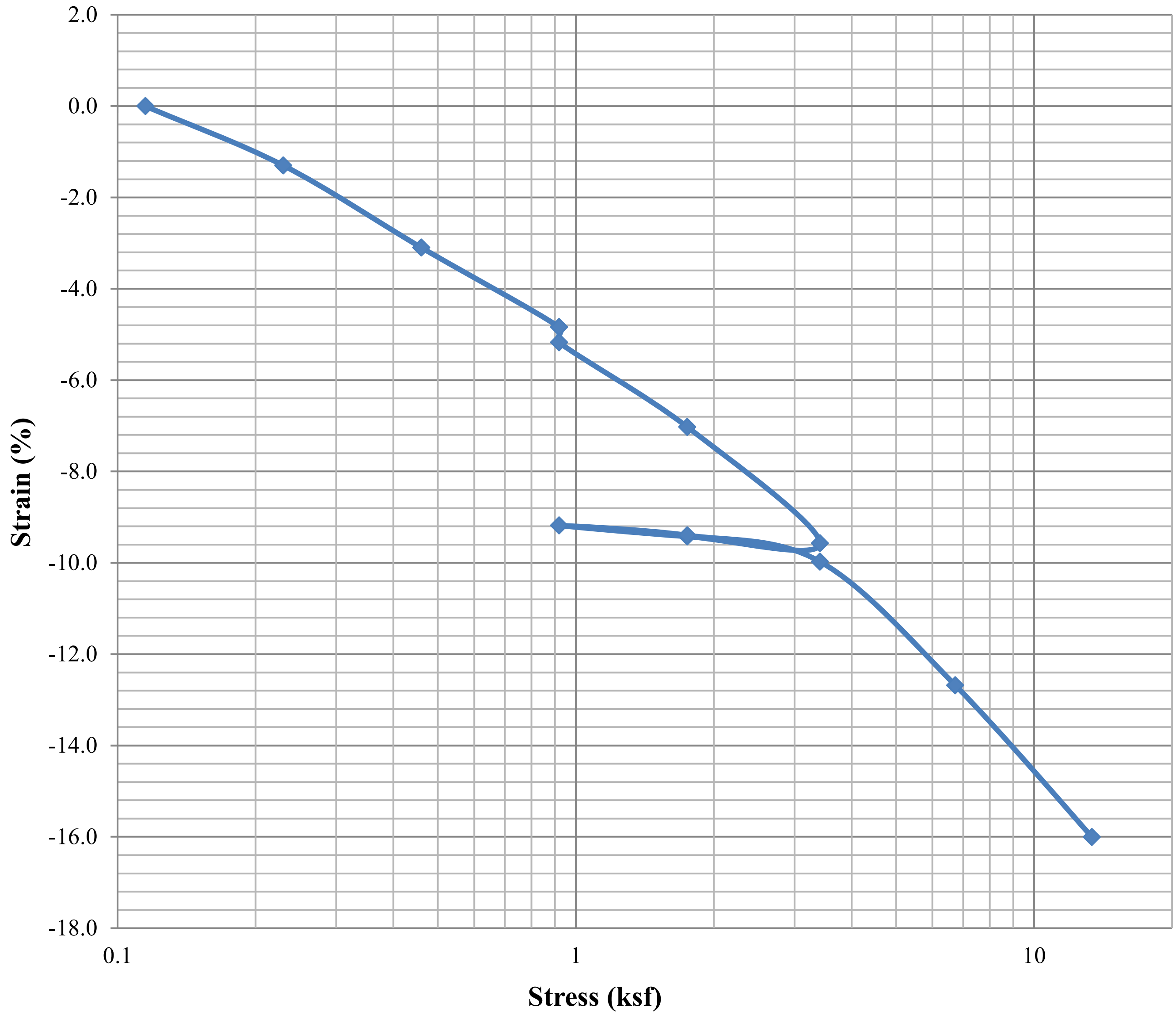
ASTM D 4546 METHOD C



Water Content, %	28.2	Load at Saturation	920 psf
Dry Density	87.7	Sample Type:	CA
Diameter, in.	1.886	Description:	Brown Lean Clay
Height, in.	0.746	Assumed SpG	2.65

Client:	City of Williston		
Project:	Williston Square Development	**Sampled By:**	HF
Project Number:	37-20560	**Location:**	SB-13
Date Sampled:	3/5/2020	**Depth:**	10 to 11.5

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ASTM D 4546 METHOD C

Appendix B

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
Report No. 37-20560

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 <u>not</u> 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.

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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 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.