Morrison Maierle
engineers • surveyors • planners • scientists

ADDENDUM NO. 1

PROJECT:	**Brooks Street Greenspace**
OWNER:	**Sheridan County**
PROJECT NO.:	**6017.002**
ENGINEER:	**Morrison-Maierle, Inc.** **1470 Sugarland Drive, Suite 1** **Sheridan, WY 82801**
ADDENDUM DATE:	**March 29, 2023**
BID DATE:	**10:00 AM – April 5, 2023**

The Contract Documents for the work are modified by the following and become a part of the original Project Manual and Drawings, taking precedence over the items which may conflict. The bidder shall note receipt and make acknowledgment of this Addendum on the Bid Proposal, incorporating these provisions in the bid.

GENERAL

Included with this addendum are the minutes (including the attendance list) from the pre-bid conference held at 10:00 am on March 22, 2023

Also included is the geotechnical engineering report referenced in the Project Manual. The geotechnical report consists of the Original Report dated July 7, 2022.

BIDDER QUESTIONS

LANDSCAPE

1. Is there a preferred source of specific type desired for the landscape boulders?

   Response:
   - *No preferred source. Locally available granite boulders are to be provided. Photo submittals will be required during construction.*

2. Section 329300 Part 3.3 E states that containerized trees will not be acceptable. If the Caliper of tree meets the required spec, can there be an exception to this?

   Response:
   - *Yes, if it can be demonstrated that the container is the proper size and root growth has not been hampered by the container.*

3. Can compost be substituted in lieu of peat moss as stated in Section 329300 Part 2.4 B?

   Response:
   - *Yes, if the proposed compost complies with the accompanying compost specifications. All testing is the bidder's responsibility.*

4. Section 329300 Part 2.2 B calls for 2.5"-4" limestone provided by Montana Limestone Company. The company states that there are substantial size variations in this ranging up to 6", as well as this particular product having a large amount of dirt and sand mixed in. Can we get clarification on the desired size as well as the desired type of limestone ie. Construction or Industrial?

   Response:
   - *Industrial #1 (5-1/2" x 3-1/2"). Dirt, sand, fines, etc are to be removed prior to placement in planter areas.*

5. The notes on the plant schedule on sheet L4 have PIN (Piney Island Native Plants) listed as the vendor for 12 plant species. Can a substitute vendor be used if the plant species and sizes match accordingly?

   Response:
   - *Yes.*

   IRRIGATION

6. Which is the desired emitter on this project? The emitter schedule on sheet L6 calls for an emitter by GPH Irrigation products, and sheet L7 #1 calls for a Salco brand emitter.

   Response:
   - *GPH*

PLANS

Item 1: Plan Sheet C-4, Storm Drain System Key Note #2

- Remove the INV. IN (E) = 3752.43; and replace with

  INV. IN (E) = 3751.57

- Revise Pipe Slope between CI-1 and CI-2:

  From: 23.4 LF 12" RCP -2.76%; *To: 23.4 LF 12" RCP -0.90%.*

PROJECT MANUAL

Item 2: SECTION 01060 - PERMITS

Replace this section in its entirety with the attached Section 01060 – Permits (1 page), dated 3/29/2023.

Item 3: SECTION 329300 – TREES, SHRUBS AND GROUND COVERS

Add the following section:

2.5 ORGANIC MATERIAL:

A. All organic material shall be commercially prepared compost. Compost shall be a well decomposed, stable, weed free organic matter source and meet the following parameters.

1. pH	5.5 – 8.5
2. Soluble Salts	< 5 dS/m (mmhos/cm)
3. Sodium Absorption Ratio (SAR)	< 10
4. Carbon to Nitrogen Ratio	< 25:1
5. Moisture Content	25 – 50% (wet weight basis)
6. Organic Matter	> 35 %% (dry weight basis)
7. Inert Contaminants	< 1% (dry weight basis)
8. Particle Size	100% passing 1/2” screen
9. Free of substances that are toxic to plants.	

Compost test results shall be submitted to the Owner’s Representative. Test results are to be presented in the units listed above or include a conversion summary provided by the testing agency noting the conversion factors. The Owner's Representative shall approve all organic material at the source before any organic material is delivered to the job site. All testing is the responsibility of the Contractor.

Attachments:

- Pre-Bid Meeting Minutes with Attendance List (6 pages)
- Revised Section 01060 – Permits (1 page; describing City of Sheridan Building Permit Requirements)
- Geotechnical Engineering Report (46 pages; dated 7/7/2022)

End of Addendum No. 1

PRE-BID CONFERENCE MINUTES

PROJECT: Brooks Street Greenspace
Morrison-Maierle Project No. 6017.002

OWNER: Sheridan County

DESIGN ENGINEER: Morrison-Maierle
1470 Sugarland Drive, Suite 1
Sheridan, WY 82801

DATE: Wednesday, March 22, 2023

TIME: 10:00 am

1. Recording of attendees name, firm represented, address and phone number. Introduce Owner and Engineer personnel.

2. Plans/Specs available on QuestCDN on M-M's website. Please provide any questions in writing prior to 12 PM on March 31.

3. Brief summary of project:

    a. Remove existing pavement and sidewalk on Brooks Street between Whitney and Burkitt to create a greenspace area with pathway, stairs, lighting, heated concrete, retaining walls, concrete parking lot, landscaping, and enhancements.

4. General overview of any addendum items identified to date or issued.

    a. *No addendums have been issued to date. One will be issued following the meeting with at least the minutes to the meeting attached.*

5. Bid opening date, time and location.
    a. **Virtual Bid Opening on Wednesday, April 5, 2023; 10:00 am**, local time;

    b. A link is provided on the bidding website: (https://m-m.net/about/projects-bidding/, Project #8410708); See Also Below:

    https://www.microsoft.com/en-us/microsoft-teams/join-a-meeting?rtc=1
    Meeting ID: 262 278 171 068
    Passcode: 9KBVqG

    Or call in (audio only)
    +1 406-318-5699, 467829609# United States, Billings
    Phone Conference ID: 467 829 609#

6. Bid Submission Form
    a. Electronic Bidding (no paper bids)
        - When uploading files, name the PDF's to match the document (e.g. – "*Bidder Name*_Bid Form.pdf")

    b. Review Project Manual Section 00100 – Instruction to Bidders,
        - Sub-section 14, Bid Form

- Sub-section 15, Obtaining Bidding Documents and Submission of Bids

c. Review Project Manual Section 00300 – Bid Form
    - Submit Bid Form Electronically on bidding website
    - Note: Bid Worksheet to be filled out on the website

d. Complete bidder qualifications/references and anticipated subcontractor information
    - Include experience with Segmental Retaining Wall design and construction

7. Bid Security
    a. 5% Bid Bond, Certified Check or Cashier's Check (submitted virtually with bid).

8. Contract Time
    a. See Section 00100.10, Instruction to Bidders.
    b. Substantial Completion by **July 31, 2024 & 160 calendar day** window
    c. Final Completion: 14 days after Substantial Completion

9. Liquidated Damages
    a. $500 per calendar day until Substantial Completion and $500 per calendar day until Final Completion.

10. Contract Award
    a. Owner will consider qualifications and experience of the Bidders and Subcontractors (specifically experience with Segmental Retaining Wall Design and Construction)
    b. Award of project is dependent upon available funding.
    c. Award will be to one Contractor

11. Contract Security and Insurance
    a. Performance and Payment Bonds will be required (see Sections 00610 and 00620)
    b. Note Insurance requirements (see Section 00810)

12. State Laws and Regulations
    a. See Section 00100, Instructions To Bidders, Sub-section 27

13. General Requirements
    a. Permits (See Section 01060 – Permits)

        - Contractor responsible for all permits.
            - DEQ General Permit for Storm Water Discharges associated with Construction Activities

            - Erosion and Sediment Control Plan per Section 01560

            - City of Sheridan Building Permit & Licensing:
                a. This project **Does Not Require** a City of Sheridan General Contractor License for the overall project (or the prime bidder if not performing electrical, mechanical, structural, etc. work)
                    i. *This will be included in Addendum #1 with the meeting minutes.*

b. Certain portions of the project will **Require Licensing and a Building Permit.**
    i. For example, lighting will require a licensed electrician through the City of Sheridan and an electrical building permit.

    ii. Review licensing requirements on City of Sheridan's website and coordinate with the City.

b. Method of Measurement and Basis of Payment
    - Need to thoroughly review the Method of Measurement and Basis of Payment section (01150) in the project manual and plan notes to understand how the various bid items are measured and paid for, as well as items that are incidental to other work items.

14. Quality Control
    a. Contractor to provide Quality Control testing as defined in the specifications and Special Provisions.

15. Traffic Control
    a. Bid as a lump sum and paid out as a percentage of contract completed.
    b. Review Temporary Traffic Control (Section 02060) and the General Notes in the Construction Plans for traffic control/pedestrian access requirements.
    c. *There is a lot of pedestrian traffic to and from the county building. See notes on plans.*

16. Plans/Details

    a. Retaining Wall System
        - Design by WY Licensed PE
        - Review the Geotechnical Reports/information
        - *M-M provided a conceptual design with recommendations from the geotechnical engineer.*

    b. Overhead Structure
        - Design by WY Licensed PE
        - Review the Geotechnical Reports/information
        - Coordination with existing/proposed utilities
        - *Steiner-Theusen described the overhead structure and highlighted that the supports will need to be located such to avoid conflict with the existing/proposed site utilities and the design needs to be stamped by a WY PE.*

    c. Pathway
        - Grades
        - Handrail
        - Steps

    d. Coordiation between disciplines
        - Electrical
            - Lighted bollards and decorative lights
            - Coordination w/ other disciplines

- *Reviewed electrical work on the project. Electrical specs are shown on the plan sheets.*

- Mechanical
  - Heated sidewalk for snow melt
  - Coordination with other disciplines
  - *Reviewed the mechanical work on the project. Mechanical specs are shown on the plan sheets.*

- Landscape
  - All topsoil will need to be imported. Contractor to provide testing and fertilizer/amendment recommendations per 329300. Required testing agency is spelled out in specs.
  - *Steiner-Theusen reviewed the landscape work and reiterated that there is no topsoil on the site.*

e. Review general and project notes in the plans.
   - Staging Area
     - *County said that the contractor that is awarded the project will need to share a staging area with two other contractors. The staging area is planned to be on Whitney Street between Brooks St and South Main St. Renee would like to see the south area of the staging area be used for materials and the north end for contractor workers.*

17. General Items
    a. Electronic Files (given after award)
       - Survey Control
       - Existing and Proposed Surfaces (*.xml)
       - Plan file(s) (*.dwg)

18. Receipt of questions from bidders and other interested parties.
    a. Is there a source for the topsoil?
       - *No, it is contractor provided*

    b. How were the quantities calculated for the unclassified excavation?
       - *Earthwork quantities were calculated based on a surface to surface comparison of the existing and proposed ground 3D surfaces. Refer the notes on the plans describing the earthwork quantities.*

    c. Is there an engineer's estimate?
       - *Approximately $1.85 million.*

19. Tour of project site – following Pre-Bid if anyone is interested and weather allows.

ATTENDANCE LIST

PROJECT: Brooks Street Greenspace

DATE: Wednesday, March 22, 2023 (10 am); Sheridan County Public Mtg Room

	Name: Company:	Address: City: State: Zip:	Phone: Email:
1	Tim Brugger, Tre LaBossiere, Jeff Feck *Morrison-Maierle*		307-675-7708 (Tim office) tbrugger@m-m.net
2	Renee' Obermueller, Ken Muller, Mike Miller *Sheridan County*		
3	Water and Environmental Technologies	Sheridan WY	spassini@waterenvtech.com
4	Jacob Fritz Mountain View Building, Inc.	237 N. Main St. Ste 200 Sheridan, WY 82801	307-675-1822 Jacob.fritz@mvb.team
5	Nathan Kysar MEI – Mikes Electric	2555 Heartland Dr Sheridan, WY 82801	307-674-7373 nathan@meiwyo.com
6	Swayne Redinger	1150 Dovetail Ln Sheridan, WY 82801	swayne@stonemillconstruction.com
7	S&S Builders LLC	400 Enterprise Gillette, WY 82716	307-686-5659 aperterson@ssbuildersllc.com estamating@ssbuildersllc.com
8	Modern Electric	2007 Valvista Sheridan, WY 82801	307-266-1711 bids@modern-electric.com
9	JR Civil, LLC	PO Boc 7295 Sheridan WY	terry.o@jrcivil.com
10	Todd Shelley LJS Concrete and Excavating	Sheridan WY	307-751-3588

	Name: Company:	Address: City: State: Zip:	Phone: Email:
11	Highland Inc.	Sheridan	307-751-0965 Hli1@vcn.com
12	Northern Underground	Sheridan WY	307-751-1046 marcus@nucontractors.com
13	Wagner Ranch Services	9 Industrial Ln Sheridan WY, 82801	willie@wagnerranchservices.com
14	Ryan Thomson, Mechanical Terry Jiracek, Electrical *Morrison-Maierle*		
15	Nathan Steiner, Landscape Architect *Steiner-Theusen*		
16			
17			
18			
19			
20			
21			

PART 1 - GENERAL

The CONTRACTOR shall be responsible for obtaining all permits and licenses, except as noted below, necessary for the completion of this Work. This refers to all permits that are required as of the date of the bid opening. Any costs associated with these permits shall be included as part of the Contract Price. No separate payment shall be made for compliance with permits.

The CONTRACTOR is to abide by all permit conditions of OWNER obtained permits, as well as his or her own permits. The OWNER will provide the CONTRACTOR copies of permits he or she obtains. The CONTRACTOR shall provide the ENGINEER copies of all permits he or she obtains.

The CONTRACTOR's superintendent, or the owner of the contracting company, shall be licensed through the City of Sheridan to perform *Utility and Excavation* construction as outlined in the Sheridan City Code, Section 7-11 and 7-12. The CONTRACTOR shall provide a copy of the license as part of the submittal process.

The following permits have been obtained by the OWNER:

1. None

The following permits are required to be obtained by the CONTRACTOR:

1. DEQ Stormwater Pollution Prevention Plan per Section 01560 (if required based upon disturbance area).

2. Erosion and Sediment Control Plan per Section 01560.

3. A City of Sheridan building permit will be required for this project.
    a) The plans and specifications have been submitted to the City of Sheridan for a preliminary plan review, however, it will be the responsibility of the Contractor to submit the plans and specifications and secure the official permit(s) for the construction.

    b) The contractor provided stamped retaining wall and overhead structure designs will need to be submitted to the building department as well as contractor provided stamped as-built drawings.

    c) Any costs, coordination, licensing, inspections or as-built drawings associated with the permit(s) will be the responsibility of the Contractor and are incidental to the project bid items.

    d) A City of Sheridan General Contractor License will not be required for the overall project (or prime bidder if not performing electrical/mechanical/structural/etc work), however, certain portions of the project will require City of Sheridan licensing and an individual permit. For example, lighting will require a licensed electrician through the City of Sheridan and an electrical building permit for this project. Review licensing requirements on City of Sheridan's website and coordinate with the City.

END OF SECTION 01060

Report of Geotechnical Exploration
Proposed Brooks Street Greenspace
Brooks Street
Sheridan, Wyoming

Revision No. 1

AET Project No. P-0004856

Date:
July 7, 2022

Prepared for:

Morrison- Maierle

1470 Sugarland Drive, Suite 1
Sheridan, Wyoming 82801

Geotechnical • Materials
Forensic • Environmental
Building Technology
Petrography/Chemistry

American Engineering Testing
7 Gable Way
Sheridan, Wyoming 82801
TeamAET.com • 307.675.1862

July 7, 2022

Morrison- Maierle
1470 Sugarland Drive, Suite 1
Sheridan, Wyoming 82801

Attn: Mr. Tim Brugger
TBrugger@m-m.net

Report of Geotechnical Exploration
Proposed Brooks Street Greenspace
Sheridan, Wyoming
AET Project No. P-0004856

Dear Mr. Brugger:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for the Brooks Street Greenspace Project in Sheridan, Wyoming. These services were performed in general accordance with our proposal to you dated August 15, 2021 and with a task order providing your written authorization to proceed on August 19, 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, MS, PE
Engineer II, Construction Materials Manager
bfreed@teamaet.com
Phone: (612)-244-0083

7 Gable Way | Sheridan, WY 82801
Phone (307) 675-1862 | (800) 972-6364 | Fax (605) 388-0064 | teamAET.com | AA/EEO

SIGNATURE PAGE

Prepared for:
Morrison Maierle
1470 Sugarland Drive, Suite 100
Sheridan, Wyoming 82801

Attn: Mr. Tim Brugger

Prepared by:
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(307) 675-1862
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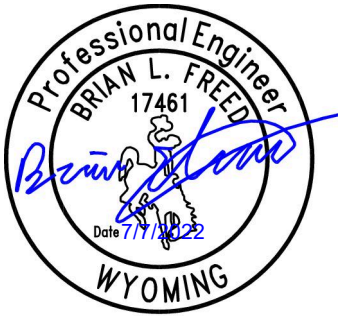
Authored by:

Brian L. Freed, MS, PE
Geotechnical Engineer II



Reviewed by:

Robert Temme, VP, PE
West Region Business Development

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1.0 INTRODUCTION

We understand the proposed project will consist of the removal of the existing Brooks Street and associated curb, gutter and sidewalk. After removal of the existing infrastructure the reconstruction is expected to include multiple retaining wall structures both structural and decorative, a raised section for a parking lot, multiple concrete walking paths across the project site, a round leveled pavilion area, a utility pad to support a generator and possibly a transformer and a utility access road for county use. The project is located along the County building in Sheridan, Wyoming, on the existing Brooks Street section. Please refer to Figure 1, Site Location Map within Appendix A for the approximate location of this site.

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 August 15, 2021. The authorized scope consists of the following:

- Four (4) Standard Penetration Test (SPT) borings across the project site to approximately 10 to 25 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

We understand the proposed project will consist of the removal of the existing site infrastructure to include the existing street asphalt surface, concrete sidewalk, concrete curb and gutter, and the concrete retaining wall along the east upper section of the project. Additionally, some trees are planned to be removed from the area to the west of Brooks Street between the county parking lot and the Funeral home at the top of the hill.

Multiple concrete walking paths are planned throughout the project site. The pathways extend from the proposed parking lot at the south end of Brooks Street to the County parking lot and the existing sidewalks along W Burkitt Street at the north end of the project. The walking paths are proposed to switchback across the slope and will include some sections of stairways.

The south end of the project is planned to be raised to match the existing grade of the parking are to the south of the County Building. It is anticipated that there will be approximately 10 feet of fill required. Imported fill will need to be brought in to raise the grade for the proposed parking lot area.

At the approximate midpoint of the project, a circular level area is planned to be constructed. This level area is planned to be used as an outdoor seating area. It is anticipated that the surface of this section will be concrete.

A utility access road is planned as part of the improvements for this project. The access road will connect the existing county parking lot to the county building at approximately the midpoint of the existing Brooks Street. The proposed access road will have a steep grade approximately 20% and is anticipated to be a concrete surface. The access road will have low amounts of traffic, consisting mainly of pickup trucks, however, may see occasional use by heavy utility trucks for overhead electrical maintenance.

A generator pad is also part of the planned improvements to the project. The generator pad is planned to support a Generac 400 kW emergency backup generator. It is anticipated that the generator will be approximately 18 feet by 6 feet in size and weigh approximately 13,000 lbs. The generator will be located along the south side of the existing county parking lot and located to the west of the proposed connection with the utility access road. An electrical transformer may also be placed on the proposed concrete pad along with the generator.

As the project site is located on a steep hill, multiple retaining walls are planned to be used across the site for various purposes. Smaller 2 foot to 4-foot decorative retaining walls are planned across the site for aesthetic purposes and will be used mainly for support of landscaped areas. These smaller decorative retaining walls will be Versa-Lok construction. The proposed parking lot at the south end of the project will be constructed on up to 10 feet of fill supported by a Versa-Lok retaining wall, up to 10 feet in height. The final retaining wall will be a larger wall that extends from the existing Brooks Street along

the proposed utility road and past the proposed Generator pad location. This retaining wall will be supporting the existing hillslope below the funeral home. It is anticipated that this wall will be up to 8 feet in height.

A conceptual layout of the project improvements in relation to our boring locations is included in Figure 3 within Appendix A.

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 four (4) standard penetration test (SPT) borings drilled on March 30th, 2022. The borings were drilled at locations selected during a site visit/meeting between AET, Sheridan County and Morrison-Maierle.

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 2 and Figure 3: Boring Location Map included in Appendix A.

4.2 Laboratory Testing

The laboratory test program included natural moisture content, dry density, Atterberg Limits, sieve analysis, percent passing the No. 200 sieve, swell consolidation, moisture-density relationships (Proctor) and California Bearing Ratio (CBR) tests. The test results for the moisture content, dry density, Atterberg Limits and percent passing the No. 200 sieve appear in Appendix A on the individual boring logs adjacent to the samples upon which they were performed. The results of the gradation, Proctor and CBR tests are presented on separate data sheets following the logs.

A bulk sample was taken from Boring B-1 on which the proctor and CBR tests were run.

The three- point CBR test was remolded to approximately 95% of the maximum dry density at the optimum moisture content for the specific boring/material. Results of the Proctor and CBR test are summarized as follows:

Boring	Soil Classification	Optimum Moisture Content, % [1]	Maximum Dry Density, pcf [1]	CBR Value 95%
B-1	Lean Clay, w/ sand gray (CL)	17.4	107.5	2.0

[1] Based on ASTM D 698 (standard proctor)

It should be noted the bulk soil samples represents a mixture of the soils encountered within the upper 5 feet of the borehole. As such, the soil classification as presented on the Moisture-Density Relationship and CBR data sheets may differ from the classifications of the individual soil layers identified on the respective Subsurface Boring Log.

The swell/consolidation test is commonly performed to evaluate the swell or consolidation potential of soils or bedrock for determining foundation and concrete slab-on-grade design criteria. In this test, relatively undisturbed samples obtained directly from the ring barrel sampler are placed in a laboratory device and saturated under a predetermined load of either 0.9 Kips per square foot to 1 Kip per square foot.

The swell-index is the resulting amount of swell (+) as a percent of the sample's thickness after the saturation period. Conversely, the consolidation index is the amount of consolidation (-) as a percent of the sample's thickness after consolidation under the confining load.

It should be noted that low to moderately expansive soils were encountered in multiple borings and at multiple depths throughout the site. The recommendations in the following sections are intended to the mitigate the effect of these expansive soils. Test results of the swell test is summarized as follows:

Boring No.	Depth (ft)	Natural W/C (%)	USCS	Moist Density (pcf)	Dry Density (pcf)	Swell Press. (psf)	Swell (%)	Swell Class
B-1	2.5	8.9	CL-CH	122.8	112.8	NA	-1.5	NA
B-2	12.5	27.9	CH	114.1	89.2	2100	2.1	Mod

5.0 SITE CONDITIONS

5.1 Surface Observations

At the time of our field work, the project site consisted of a section of Brooks Street, the section of road within the project was closed to traffic due to the steep grade. The existing surfacing was worn asphalt, and the street was bordered with concrete curb and gutter and sidewalks. Along the top (south) end of the project site, there are two existing retaining walls along each side of Brooks Street. These retaining walls are constructed of concrete and range in height up to approximately 6 feet. The Sheridan County parking lot is located to the west of the north end of the project. The parking lot is a concrete surface. To the south of the parking lot is a vegetated hillside with a mix of mature wooded growth, grasses, and brush. In general, the project site is a steep slope with the southern side of the project being the high side.

5.2 Subsurface Soils/Geology

Below the existing asphalt surfacing, in borings B-1 and B-3, the soils consisted of blended native site soils reworked and placed as fill during the initial construction of Brooks Street. The fill ranged in depth from approximately 2.5 feet to 10 feet in B-1 and B-3 respectively. Native site soils were encountered below the fill in these two borings. In borings B-2 and B-4, native site soils were encountered from the surface of the boring. The native site soils consisted of generally fine grained colluvial deposits, comprised of a mix of clayey sands, and sandy lean to fat clays. Below the colluvial deposits, weathered bedrock consistent with the Fort Union Formation was encountered. The weathered bedrock consisted primarily of weathered sandstones and claystones.

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, groundwater was not encountered in any of the soil borings. A temporary piezometer was installed in Boring B-2. The water level in piezometer B-2 was measured one-time following completion of drilling and was found to be dry. The piezometer was left in place, we recommend that groundwater levels be checked prior to any construction activities on site, and periodically during construction.

The 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

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 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 potential variations, we recommend that AET be retained to verify the soil conditions encountered during excavations match the information gained during our field exploration.

To reduce the risk of movement related to soil moisture content changes within the subgrade layer, good drainage must be maintained during and after construction. For this reason, we recommend that the excavations be left open a minimal amount of time during the construction phase.

6.2 General Site Preparation and Grading

We recommend the existing concrete asphalt and any organic matter be removed from within the construction limits. Any construction rubble and any organic material and any old construction debris encountered should be wasted from the site.

We anticipate excavations of up to approximately 4-6 feet are anticipated to allow for placement of the footings and gravel pad to support retaining walls.

We also anticipate that minimal cuts and fills will be required outside of the proposed pathway areas, primarily for landscaping. 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 2% of their optimum moisture content and the scarified soils compacted to at least 90% of their standard Proctor dry density (ASTM D 698) in areas to be landscaped, and to a minimum of 95% of their standard Proctor Dry Density (ASTM D 698) in areas below pavements.

All areas to receive fill should be benched prior to the placement of any subsequent lifts to provide a level surface to compact against. All fills should be placed in thin lifts not to exceed 8 inches loose, moisture conditioned to within 2% of their optimum moisture content and compacted to at least 90% of their standard Proctor dry density (ASTM D 698) in areas to be landscaped, and to a minimum of 95% of their standard Proctor Dry Density (ASTM D 698) in areas below pavements.

The excavated soils, cleaned of all unsuitable/organic materials and rocks greater than 3-inches in nominal size, may be used obtain final grades in landscape areas or stockpiled on-site and reused as utility trench backfill and overlot fill.

We recommend that all engineered fill to be used on the project meet the grading and quality requirements of City of Sheridan Crushed Base Coarse.

6.3 Foundation Recommendations – Generator pad

Based on the information obtained from the borings and laboratory testing, as well as our analysis, it is our opinion the structure may be founded on monolithic slab foundation system placed on a minimum of 2 feet of a granular non-expansive engineered fill. The engineered fill should be moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 98% of maximum standard Proctor (ASTM D 698) dry density. The engineered fill should be placed in thin lifts not to exceed 8 inches loose.

We recommend that a geotextile fabric be placed between the native subgrade and engineered fill, we recommend the use of a Mirifi RS-380i or equivalent be used. The geotextile fabric should be extended laterally a minimum of 3 feet each direction outside of the generator pad. Prior to placement we recommend the exposed subgrade be scarified to a depth of one foot and moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density.

All footing excavations should be oversized at a 1H:1V ratio. Footings can be designed for an allowable bearing capacity of 1,800 pounds per square foot (psf). 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.

We recommend that the monolithic slab used to support the generator be constructed with reinforced concrete and be designed by a structural engineer to support the actual

loads anticipated from the generator and any additional equipment that may be placed on the slab.

The finished surface surrounding the generator pad should be either hard surfacing or graded to allow water to flow away from the generator pad. Water should not be allowed to drain into the engineered fill.

6.4 Retaining Wall Recommendations

The project is expected to include multiple retaining walls with multiple types and uses. The following sections provide general recommendation for the retaining wall construction, however further engineering design will need to be completed by the retaining wall designer and/or design team.

Each type of retaining wall will have specific recommendation for construction and design.

6.4.1 Small Block Landscaping Walls

It is our understanding that the small landscaping retaining walls are planned to be constructed using the Versa-Lok retaining wall system. This system involves a combination of interlocking blocks and geosynthetic reinforcement behind the wall. Versa-Lok Walls should be constructed and installed following the recommendations of Versa-Lok. The following recommendations are in general accordance with the recommendations provided in the Versa-Lok Design and Installation guidelines.

We recommend that all small block landscaping retaining walls be founded a minimum of 2 feet below the proposed grade at the toe of the wall. If steep downward slopes are planned at the toe of the retaining wall it may be necessary to increase the embedment depth of the retaining wall block in those areas. The bottom course of block should be placed on a minimum of 1.5 feet of engineered fill. The engineered fill should be moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 98% of maximum standard Proctor (ASTM D 698) dry density. The engineered fill should be placed in thin lifts not to exceed 8 inches loose. Prior to placement of engineered fill, we recommend the exposed subgrade be scarified to a depth of one foot and moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density.

We recommend the placement of a perforated drain along the back of the bottom course of retaining wall block. The drain should be sloped to allow for the removal of any water captured from behind the retaining wall. The drains should be connected and allowed to

discharge away from any retaining walls or connected into a storm water drainage system.

In addition to the drain at the base of the retaining wall, we recommend the placement of a minimum 1-foot-wide drainage layer of clean gravel drain rock immediately behind the retaining wall. The clean gravel drain rock should be clean washed rock with a maximum size of 1” and a maximum of 10% passing the #4 sieve. We recommend a filter fabric be placed between the interface of the back of the clean drain rock and the wall system backfill. Clean gravel drain rock should be placed in thin lifts not to exceed 1 foot loose and compacted using small equipment. Compaction should continue until no consolidation of the rock is observed.

For backfill behind the drain rock we recommend existing site soils be moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density. Care should be taken to minimize the amount of fine material mixed with the clean drain rock.

Geosynthetic reinforcement may be required for some or all of these small retaining walls, each wall should be analyzed to determine if geosynthetic reinforcement will be needed once the final size, heights, and location are known.

6.4.2 Large Block Structural Wall (Parking Lot)

It is our understanding that the larger retaining wall below the planned parking area is planned to be constructed using the Versa-Lok retaining wall system previously described. To allow for adequate Geosynthetic support of the proposed Versa-Lok retaining wall, we recommend the removal of the existing concrete retaining wall along the east side of Brooks Street where it will be behind the proposed block wall.

We recommend that this Versa-Lok retaining wall be founded a minimum of 3 feet below the proposed grade at the toe of the wall. If steep downward slopes are planned at the toe of the retaining wall it may be necessary to increase the embedment depth of the retaining wall block in those areas. The bottom course of block should be placed on a minimum of 2 feet of engineered fill. The engineered fill should be moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 98% of maximum standard Proctor (ASTM D 698) dry density. The engineered fill should be placed in thin lifts not to exceed 8 inches loose. Prior to placement of engineered fill, we recommend the exposed subgrade be scarified to a depth of one foot and moisture

conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density.

We recommend the placement of a perforated drain along the back of the bottom course of retaining wall block. The drain should be sloped to allow for the removal of any water captured from behind the retaining wall. The drains should be connected and allowed to discharge away from any retaining walls or connected into a storm water drainage system.

In addition to the drain at the base of the retaining wall we recommend the placement of a minimum 1-foot-wide drainage layer of clean gravel drain rock immediately behind the retaining wall. The clean gravel drain rock should be clean washed rock with a maximum size of 1” and a maximum of 10% passing the #4 sieve. We recommend a filter fabric be placed between the interface of the back of the clean drain rock and the wall system backfill. Clean gravel drain rock should be placed in thin lifts not to exceed 1 foot loose and compacted using small equipment. Compaction should continue until no consolidation of the rock is observed.

For backfill behind the drain rock we recommend that an imported fill be used. The imported fill should be a granular soil with a maximum size of 1.5”, the soil should have a maximum of 20% passing the Number 200 sieve with a maximum liquid limit of 30. The imported fill should be moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density.

Geosynthetic reinforcement will be required for this retaining wall and should be analyzed to determine the spacing and type of geosynthetic reinforcement needed once the final size, heights, and location are known. We recommend that the existing site soils be removed from behind the retaining wall for a minimum of 10 feet behind the drain layer, or 1 foot past the geogrid length (whichever is greater), at the base of the retaining wall block. The existing site soils should be excavated to create a flat level surface for placement of engineered fill. The excavation should be constructed in benches to gradually reduce the thickness of the engineered fill until it reaches W Whitney Street, where the engineered fill depth should meet the base coarse depth for the selected pavement section. Prior to placement of engineered fill, we recommend the exposed subgrade be scarified to a depth of one foot and moisture conditioned to within -2% to +2% of the optimum moisture content and compacted to at least 95% of maximum standard Proctor (ASTM D 698) dry density.

6.4.3 Large Structural Wall (Along Utility Access Roadway)

Due to the space constraints caused by the location and size of the retaining wall proposed along the utility access road, we do not recommend that Versa-Lok retaining wall be used in this location. The primary concern with using the Versa-Lok system in this area is the extent that the excavation to install the block wall and geosynthetic reinforcement behind the wall would require. Any significant excavation behind the proposed wall location could have detrimental effects on the hill slope and the funeral home structure located at the top of the hill. We recommend that a retaining wall constructed with minimal excavation into the hill before stabilization be used in this location.

The following are three potential options for retaining wall types that may be suitable options. The following options should be further evaluated once the exact size and location of the proposed retaining wall is known. Slope stability analysis should be conducted as part of the evaluation process and should evaluate the slope stability before, during and after construction. Design of this retaining wall should be completed by a structural engineer and done in collaboration with a geotechnical engineer and potentially a specialty contractor experienced in these types of construction. As a general recommendation, we recommend that the construction of this retaining wall not be completed during the spring or early summer, as the rainfall during that time period could have severe impacts on the stability of the hillside during construction activities.

Option 1 - A drilled soldier pile wall with lagging, could be used. To construct this type of retaining wall, concrete drilled shafts would be advanced into competent bedrock, from the existing site grade. Steel I-beams would be embedded in the concrete drilled shafts and extend above the existing ground surface to the planned top of wall elevation. Once the concrete is cured, timber or steel lagging would be placed between the flanges of the I-beam, and soil would be excavated from the front of the wall as the lagging is moved from the top down. Based on the soils encountered we would anticipate concrete drilled shafts up to 25 to 30 feet in length before competent bedrock. We recommend that a drainage system be included in the design of this wall to aid in the removal of water that may collect behind the retaining wall. Decorative facing could be applied to the finished wall to match the other elements on the project site.

Option 2 - A Steel Sheet Pile Wall may also be an alternative to consider. A sheet pile wall can be constructed by driving steel sheeting into the hillside from the existing site grade. The sheet piles would be driven to the required depth and the soils on the front

side would then be excavated to the required elevations for the construction of the utility access road. We recommend that a drainage system be included in the design of this wall to aid in the removal of water that may collect behind the retaining wall. Decorative facing could be applied to the finished wall to match the other elements on the project site.

Option 3 - Reinforced Concrete Wall with Helical Pier Foundation may be an option for this wall. For this type of wall, we recommend that helical piers be installed below the footings of the reinforced concrete wall. The helical pier tops should be incorporated into a pier cap and connected to the reinforcing within the footing and wall. We anticipate that helical pier lengths of up to approximately 20 feet may be required to reach the required torque. However, the required torque, length, configuration, and size for the helical piers will need to be determined by the installer when specific information about the wall size and loads is known. We recommend that the footings for this type of wall be placed a minimum of 42 inches below the final ground surface for frost protection. We recommend that a minimum of 1 foot of engineered fill be placed below the reinforced concrete footing. Battered helical piers may be required to support the reinforced concrete wall, however this will need to be determined during the design of the wall. Due to the need to excavate to install the helical piers and footing, additional slope stability modeling will need to be completed to model the stability of the cut slope during construction, additionally care will need to be taken to ensure that no additional excavation other than what is require and modeled is done.

6.4.4 Soil Parameters

Lateral Earth Pressures

Below are the recommended lateral earth pressures for use in design, these values should be used in conjunction with the recommendations contained within the previous sections. The lateral earth pressures given do not include any factor of safety and are not applicable for submerged conditions or hydrostatic loading. The lateral earth pressures given in the table below are for soils compacted to 95% of the maximum dry density at the optimum moisture content determined by the standard proctor test (ASTM D698). Excess compaction or higher moisture contents will result in higher lateral earth pressure than given in the table below.

Lateral Earth Pressure	Native Site Soils		Engineered Fill	
	Lean Clay (CL)	Clayey Sand (SC)	Imported Fill	Base Coarse
Active Pressure (pcf/ft)	60	55	35	45
At-Rest Pressure (pcf/ft)	80	75	55	70
Passive Pressure (pcf/ft)	260	300	500	655

6.5 Pavements

6.5.1 Considerations

The following pavement sections are designed based on the 1993 AASHTO Empirical Equation for Flexible Pavements and Rigid Pavements. In design calculations, a 20-year design life was used along with a correlation of 1500 x CBR value to estimate the resilient modulus (M_R).

It is anticipated that pavement subgrade soils will consist of the site sandy gravels to gravely sand blended with any existing base material. Based on the laboratory test results, a California Bearing Ratio (CBR) value of 2.0 was used in the pavement design analysis utilizing the site Silty Sand soils as the subgrade material. We have used a correlation of 1500 x CBR value to estimate the resilient modulus (MR).

As there are no anticipated traffic volumes or ESAL available at this time, and based on our understanding of the project, we have assumed mainly cars, pickups, and occasional parcel/delivery trucks within the upper parking lot, and mainly light pickups and occasional heavy electrical utility truck will use the utility access road. Therefore, we have assumed a 20-year traffic count of 50,000 equivalent single axle load (ESAL). Please notify us if any of the parameters used in the pavement design do not adequately define the anticipated conditions.

The 20-year design period is considered to be the interval over which, with proper maintenance, the pavement will not require major repairs. A continuing regular maintenance program should be implemented to maintain satisfactory serviceability over the design life. The maintenance program should include sealing cracks and repairing minor deficiencies. Please notify us if any of the parameters used in the pavement design do not adequately define the anticipated conditions.

6.5.2 Subgrade Preparation

The subgrade soils should be scarified, moisture conditioned to within ±2% of optimum and compacted to a minimum of 95% of maximum density as determined by the standard proctor method (ASTM D:698). Once complete, the subgrade soils should be proof rolled to verify a firm and unyielding subgrade has been obtained prior to the placement of new engineered fill. Any areas that "pump" under the “standard loaded dump truck field test” should be evaluated by the geotechnical engineer to determine whether additional excavation and replacement with a course, clean crushed durable rock, is warranted. Once the exposed subgrade has been proof-rolled and approved by the AET’s onsite geotechnical engineer, gravel base coarse fill may be placed. See Aggregate Base Coarse section below for recommendations for placement of base material.

6.5.3 Aggregate Base Course

Aggregate base course should be moisture conditioned to within ±2% of optimum and compacted to a minimum of 98% of maximum density as determined by the standard proctor method (ASTM D:698) and should meet the requirements for grading and quality specified for .

6.5.4 Pavement Section Recommendations

Based on the above stated information and our analysis, we recommend the following pavement sections be used for this project:

Recommended Pavement Section Thickness (inches)				
Traffic Area	**Flexible (Asphalt), in.**	**Rigid (Concrete), in**	**Aggregate Base Course, in.**	**Total, in.**
Sidewalks/Walking Areas	--	4	6	11
Utility Access Road	--	6	6	12
Parking Areas	4	--	6	10
	--	6	4	10

6.5.5 Asphalt Paving Considerations

The asphalt pavement mix, at a minimum should meet the design criteria as specified in Section 02525 “Asphalt Pavement” of the City of Sheridan Standard Specifications and Details for Street and Utility Construction, current edition.

6.5.6 Concrete Paving Considerations

If Portland Cement Concrete (PCC) pavement is selected for use at this site, it should be obtained from an approved mix design conforming to Section 03040 “Portland Cement Concrete Pavement” of the City of Sheridan Standard Specifications and Details for Street and Utility Construction, current edition. All concrete slabs should be designed with reinforcing steel and doweled between any construction joints

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 site 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 soils should be moisture conditioned to within -2 to +2% of the optimum moisture content. All granular backfill should be moisture conditioned to within ±2% 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.
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 silty 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.

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.

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
Moisture-Density Relationships
California Bearing Ratios

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

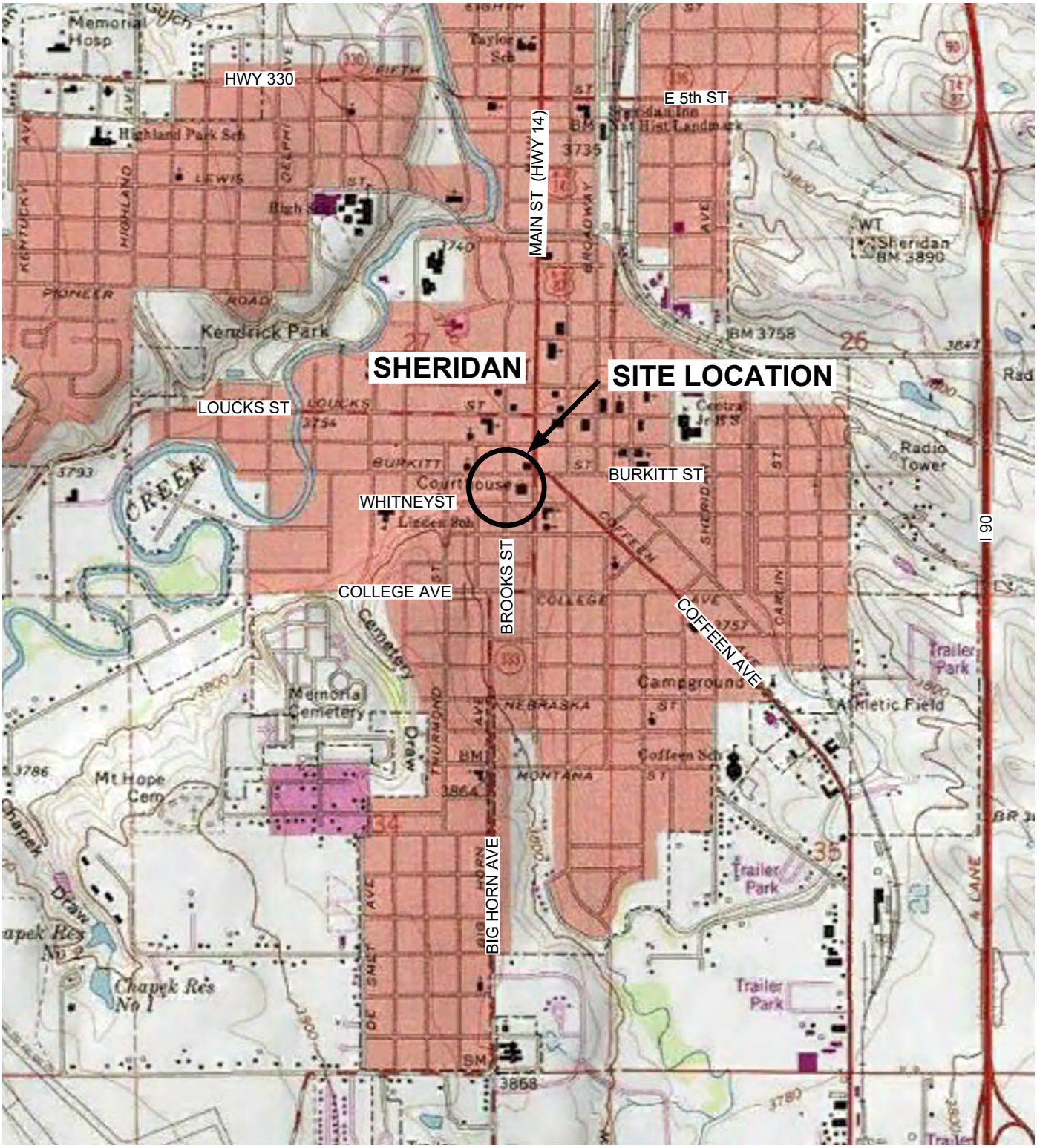
Conducted per AET Procedure 01-LAB-090, which is performed using Soil Box apparatus in the laboratory in general accordance with ASTM: G57

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.



SCALE
(FEET)
0 1,600

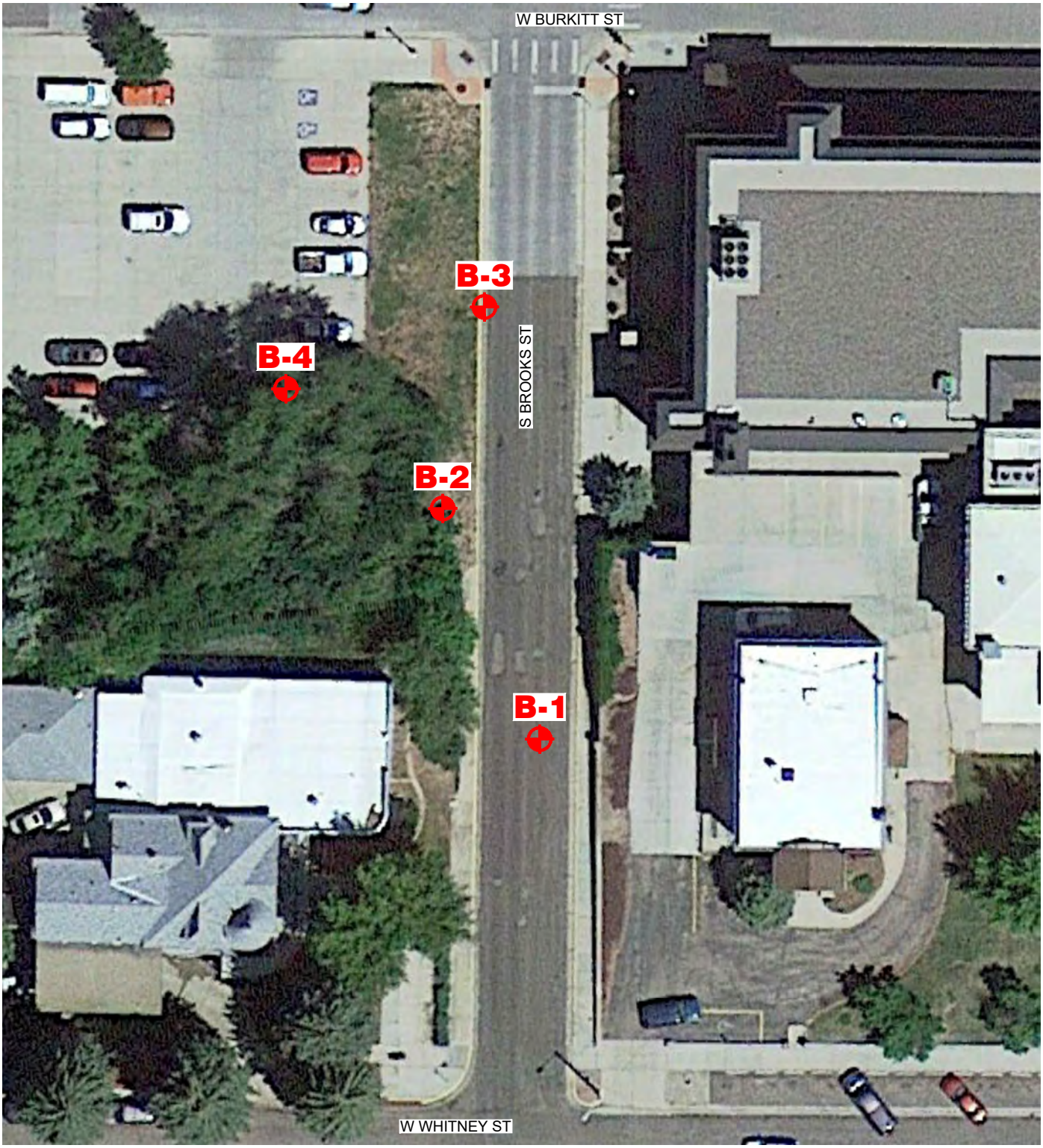
N

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

3/31/2022 1:06:17 PM - C:_PROJECTS FROM SERVER__19 - SHERIDAN PROJECTS\P-0004856 MM BROOKSTREET GREENSPACE GT\DRAFTING\P-0004856 FIGURES.DWG - TAYLOR, MARIE

AMERICAN ENGINEERING TESTING

PROJECT: BROOKS STREET GREEN SPACE PROJECT BETWEEN BURKITT STREET AND WHITNEY STREET SHERIDAN, WYOMING		PROJECT NO.: P-0004856
SUBJECT: SITE LOCATION MAP	DRAWN BY: M. TAYLOR	DATE: MARCH 31, 2022
SCALE: AS NOTED	REVIEWED BY: B. FREED	FIGURE: 1



LEGEND:

B-1 EXPLORATORY BORINGS DRILLED MARCH 30, 2022

SCALE (FEET)

0 40

N

AERIAL PHOTO CREATED FROM GOOGLE EARTH PRO DATED: 6-25-2017

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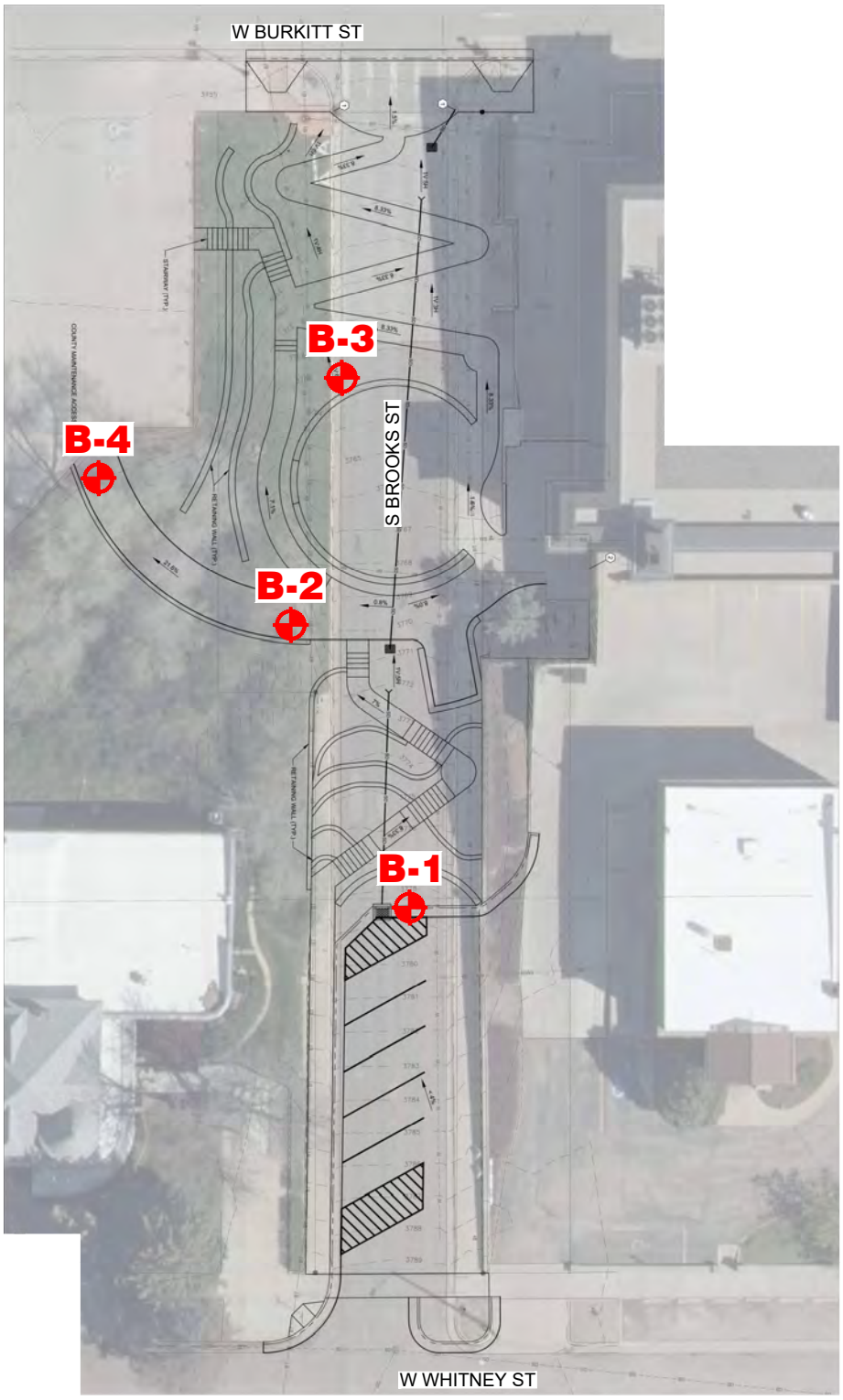
AMERICAN ENGINEERING TESTING

PROJECT: BROOKS STREET GREEN SPACE PROJECT BETWEEN BURKITT STREET AND WHITNEY STREET SHERIDAN, WYOMING		PROJECT NO.: P-0004856
SUBJECT: BORING LOCATION MAP	DRAWN BY: M. TAYLOR	DATE: MARCH 31, 2022
SCALE: AS NOTED	REVIEWED BY: B. FREED	FIGURE: 2



LEGEND:

B-1 EXPLORATORY BORINGS DRILLED MARCH 30, 2022

SCALE (FEET)

0 40

N

IMAGE PROVIDED BY Morrison Maierle

DWG C-2: DATED 3-1-2022

3/31/2022 1:07:24 PM - C:_PROJECTS FROM SERVER__19 - SHERIDAN PROJECTS\P-0004856 MM BROOKSTREET GREENSPACE GT\DRAFTING\P-0004856 FIGURES.DWG - TAYLOR, MARIE

AMERICAN ENGINEERING TESTING

PROJECT: BROOKS STREET GREEN SPACE PROJECT BETWEEN BURKITT STREET AND WHITNEY STREET SHERIDAN, WYOMING		PROJECT NO.: P-0004856
SUBJECT: BORING LOCATION MAP	DRAWN BY: M. TAYLOR	DATE: MARCH 31, 2022
SCALE: AS NOTED	REVIEWED BY: B. FREED	FIGURE: 2

SUBSURFACE BORING LOG

AET No: **P-0004856** Log of Boring No. **B-1 (p. 1 of 1)**

Project: **Brooks Street Green Space Project - Between Burkitt and Whitney Streets - Sheridan, WY**

Client: **Morrison Maierle** Coordinates: N **44.79489** E **-106.95721**

DEPTH IN FEET	Surface Elevation **3778.0** MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	FIELD & LABORATORY TESTS WC (%)	DD (psf)	LL	PL	-#200 (%)
1	ASPHALTIC PAVEMENT (8 inches thick)	ASPHALTIC PAVEMENT	M	6	8	SS	80	21		35	20	45.8
2	CLAYEY SAND, gray/ brown, loose (SC)	FILL										
3	LEAN TO FAT CLAY, gray, blocky, medium stiff (CL-CH)	WEATHERED FORT UNION FORMATION	M	13	17	BULK CAL	25	19				
6	CLAYEY SAND, tan, blocky, medium dense to dense (SC)		M	27	36	SS	60					
8			M	41	55	CAL	50	10				
10	CLAYEY SAND, gray, dense (SC)		M	33	44	SS	90					
13	LEAN CLAY with sand, trace coal, dark brown, very stiff (CL)		M	27	36	CAL	100	17	79			
15	CLAYEY COAL, brown/black, soft		M	3	4	SS	20					
20	FAT CLAY, trace coal, gray, hard (CH)		M	49	65	CAL	100	19				
25		FORT UNION FORMATION		50/0.4		SS						
26	**END OF BORING - 26.5 feet**											

NOTE: The N Values shown for the California samples have 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
26.5	**3.25" HSA**	**3/30/22**	**12:50**	**26.5**	**26.5**	**NA**	**NA**	**None**
BORING COMPLETED: **3/30/22**								
DR: **JS** LG: **CC** 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) P-0004856 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 5/5/22

SUBSURFACE BORING LOG

AET No: **P-0004856** Log of Boring No. **B-2 (p. 1 of 1)**

Project: **Brooks Street Green Space Project - Between Burkitt and Whitney Streets - Sheridan, WY**

Client: **Morrison Maierle** Coordinates: N **44.79511** E **-106.95728**

Surface Elevation **3773.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	FIELD & LABORATORY TESTS WC (%)	DD (psf)	LL	PL	-#200 (%)
1–2	CLAYEY SAND, tan, loose, mild oxidation (SC)	COLLUVIAL DEPOSITS	D/M	10	13	SS	80					
3–4	LEAN CLAY, trace sand, blocky, very stiff to hard, mild oxidation, gypsum crystals (CL)	WEATHERED FORT UNION FORMATION	M	23	31	CAL	80	16				
5–6			M	31	41	SS	40	15	108			
7–8	LEAN CLAY, brown, flaky, hard (CL) (Weathered bedrock - organic content)		M	31	41	CAL	100	21	85			
9–11	CLAYEY COAL matrix, thin clay material, brown, flaky, very stiff (Organic content)		M	25	33	SS	35					
12–13	SILTY SAND, with fat clay laminations, dense, gray, trace coal (SM)		M	38	51	CAL	70	28		47	37	15.3
14–16	CLAYEY COAL, brown, hard		D/M	40	53	SS	80					
17–21	CLAYEY SAND, gray, very dense, (SC)	FORT UNION FORMATION	D	50/0.3		CAL	90					
22–26			M/W	81	108	SS	100					
	END OF BORING - 26.5 feet											

NOTE: The N Values shown for the California samples have 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
26.5	**3.25" HSA**	**3/30/22**	**1100**	**26.5**	**25.0**	**NA**	**NA**	**None**
		4/15/22	**1600**	**26.5**	**25.0**	**NA**	**NA**	**None**

BORING COMPLETED: **3/30/22**

DR: **JS** LG: **CC** 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) P-0004856 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 5/5/22

SUBSURFACE BORING LOG

AET No: **P-0004856** Log of Boring No. **B-3 (p. 1 of 1)**

Project: **Brooks Street Green Space Project - Between Burkitt and Whitney Streets - Sheridan, WY**

Client: **Morrison Maierle** Coordinates: N **44.79525** E **-106.95725**

Surface Elevation **3762.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	FIELD & LABORATORY TESTS WC (%)	DD (psf)	LL	PL	-#200 (%)
1	ASPHALTIC PAVEMENT (3 inches thick)	ASPHALTIC PAVEMENT	M	4	5	SS	20	12				
2	CLAYEY SAND, brown, very loose to loose (SC) Trace gravel at 2.5 feet	FILL										
3			M	6	8	CAL	30					
4												
5												
6			M	4	5	SS	20	18		28	19	18.5
7												
8	Loose at 7.5 feet	WEATHERED FORT UNION FORMATION	M	8	11	CAL	50	14				
9												
10	Medium dense at 10 feet											
11			M	12	16	SS	25	12				
12												
13				12	16	CAL						
14												
15	CLAYEY SAND, tan/gray, medium dense (SC) (Weathered bedrock)											
16			M	26	35	SS	70					
17												
18												
19												
20	Gray, very dense at 20 feet	FORT UNION FORMATION										
21			M/W	50/0.4		CAL	60					
	END OF BORING - 21.5 feet											

NOTE: The N Values shown for the California samples have 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
3/30/22	**15:00**	**21.5**	**20.0**	**NA**	**NA**	**None**

BORING COMPLETED: **3/30/22**

DR: **JS** LG: **CC** 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) P-0004856 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 5/5/22

SUBSURFACE BORING LOG

AET No: **P-0004856** Log of Boring No. **B-4 (p. 1 of 1)**

Project: **Brooks Street Green Space Project - Between Burkitt and Whitney Streets - Sheridan, WY**

Client: **Morrison Maierle** Coordinates: N **44.79510** E **-106.95750**

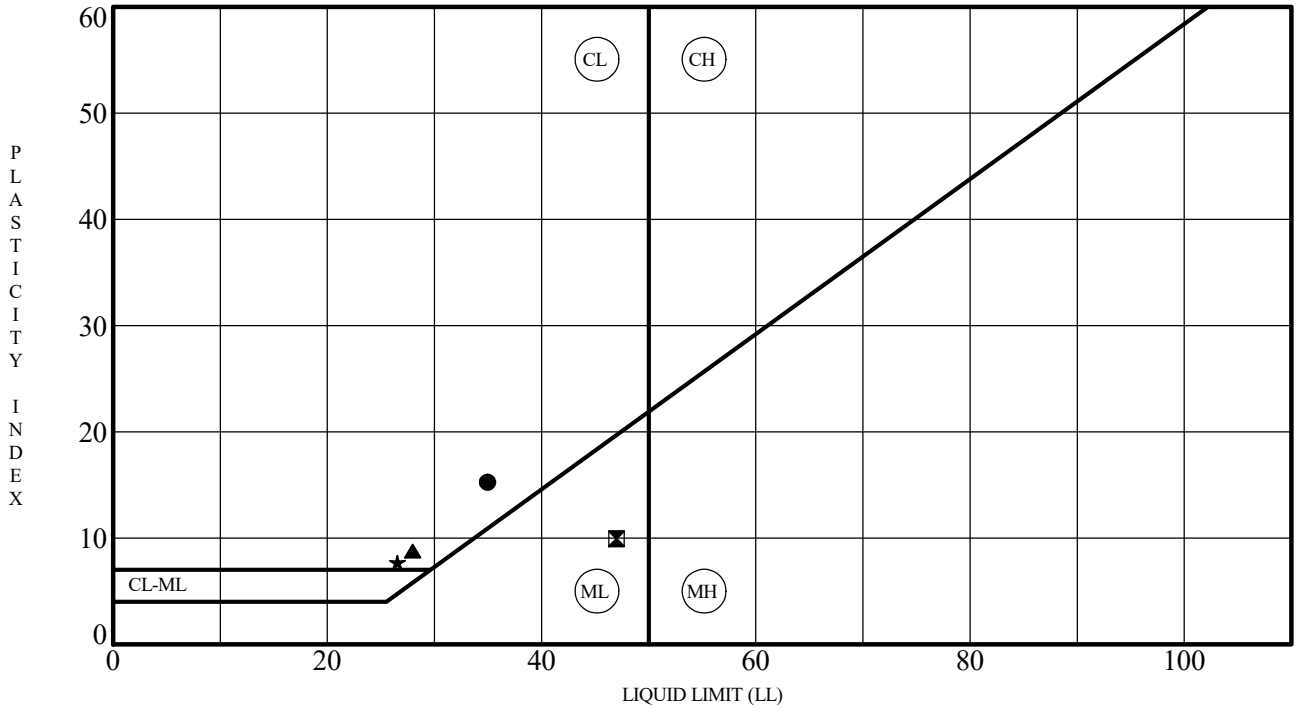
DEPTH IN FEET	Surface Elevation **3758.0** MATERIAL DESCRIPTION	GEOLOGY / REMARKS	MC	SPT N VALUE BLOWS /FOOT	N (60) VALUE	SAMPLE TYPE	REC (%)	FIELD & LABORATORY TESTS WC (%)	DD (psf)	LL	PL	-#200 (%)
1	CLAYEY SAND, dark brown, loose (SC)	COLLUVIAL DEPOSITS	M	7	9	SS	40					
3			M	5	7	CAL	100	10		27	19	29.1
6	SANDY LEAN CLAY, brown, firm (CL)		M	8	11	SS	100					
8	FAT CLAY, trace sand and coal, gray/brown, very stiff (CH)	WEATHERED FORT UNION FORMATION	M	23	31	CAL	100	28	81			
11				28	37	SS						
	END OF BORING - 11.5 feet											

NOTE: The N Values shown for the California samples have 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
11.5	**3.25" HSA**	**3/30/22**	**9:30**	**11.5**	**10.0**	**NA**	**NA**	**None**
BORING COMPLETED: **3/30/22**								
DR: **JS** LG: **CC** 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) P-0004856 LOGS.GPJ AET+CPT+WELL_20181012_JG.GDT 5/5/22



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**0.0'**	**35**	**20**	**15**	**45.8**	**CLAYEY SAND SC**
⊠	**B-2**	**12.5'**	**47**	**37**	**10**	**15.3**	**SILTY SAND SM**
▲	**B-3**	**5.0'**	**28**	**19**	**9**	**18.5**	**CLAYEY SAND SC**
★	**B-4**	**2.5'**	**27**	**19**	**8**	**29.1**	**CLAYEY SAND SC**

PROJECT **Brooks Street Green Space Project; Between Burkitt and Whitney Streets - Sheridan, WY**

AET JOB NO. **P-0004856**

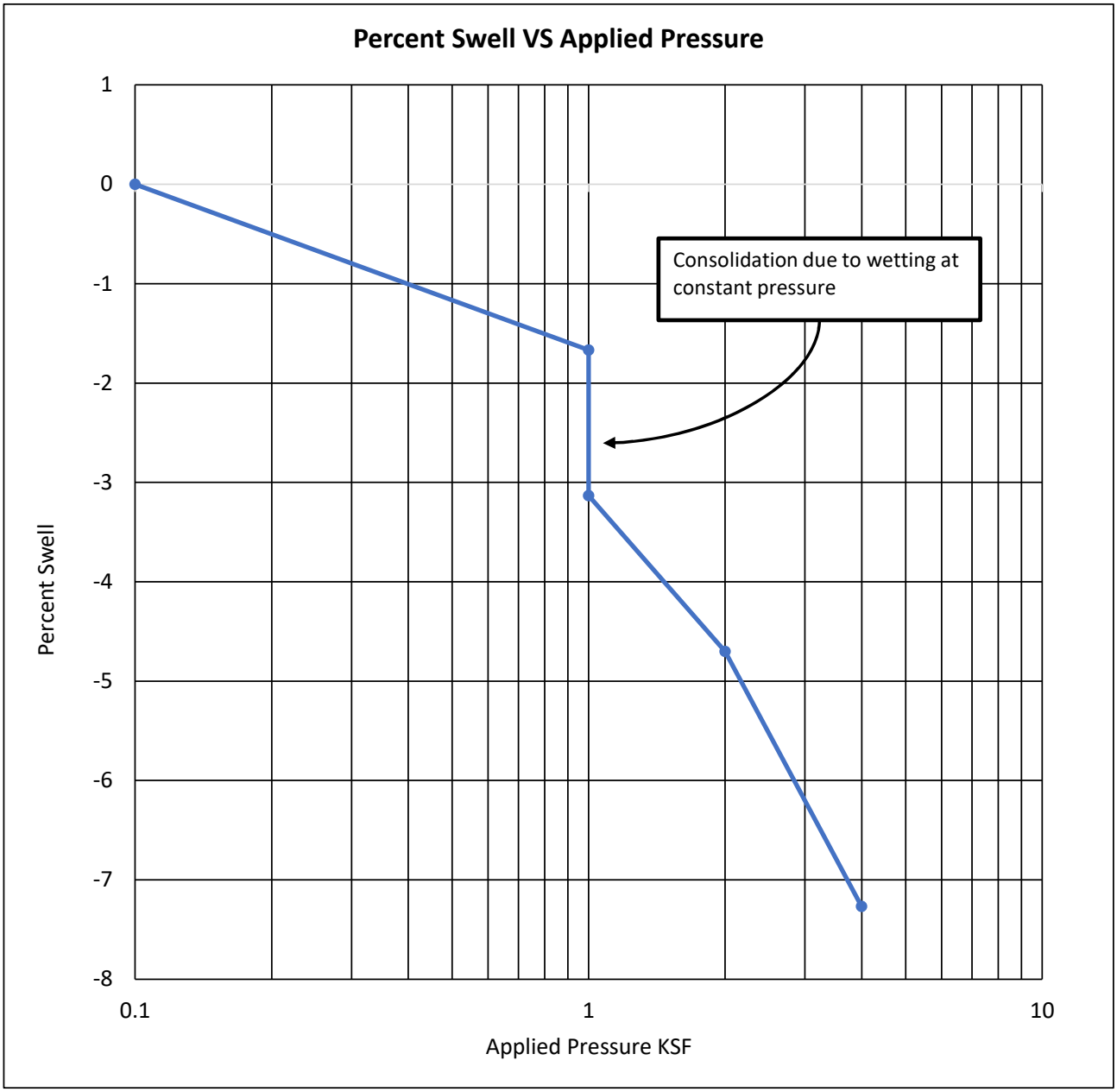
DATE **3/30/22**

AMERICAN ENGINEERING TESTING, INC.

ATTERBERG LIMITS RESULTS

AMERICAN
ENGINEERING TESTING

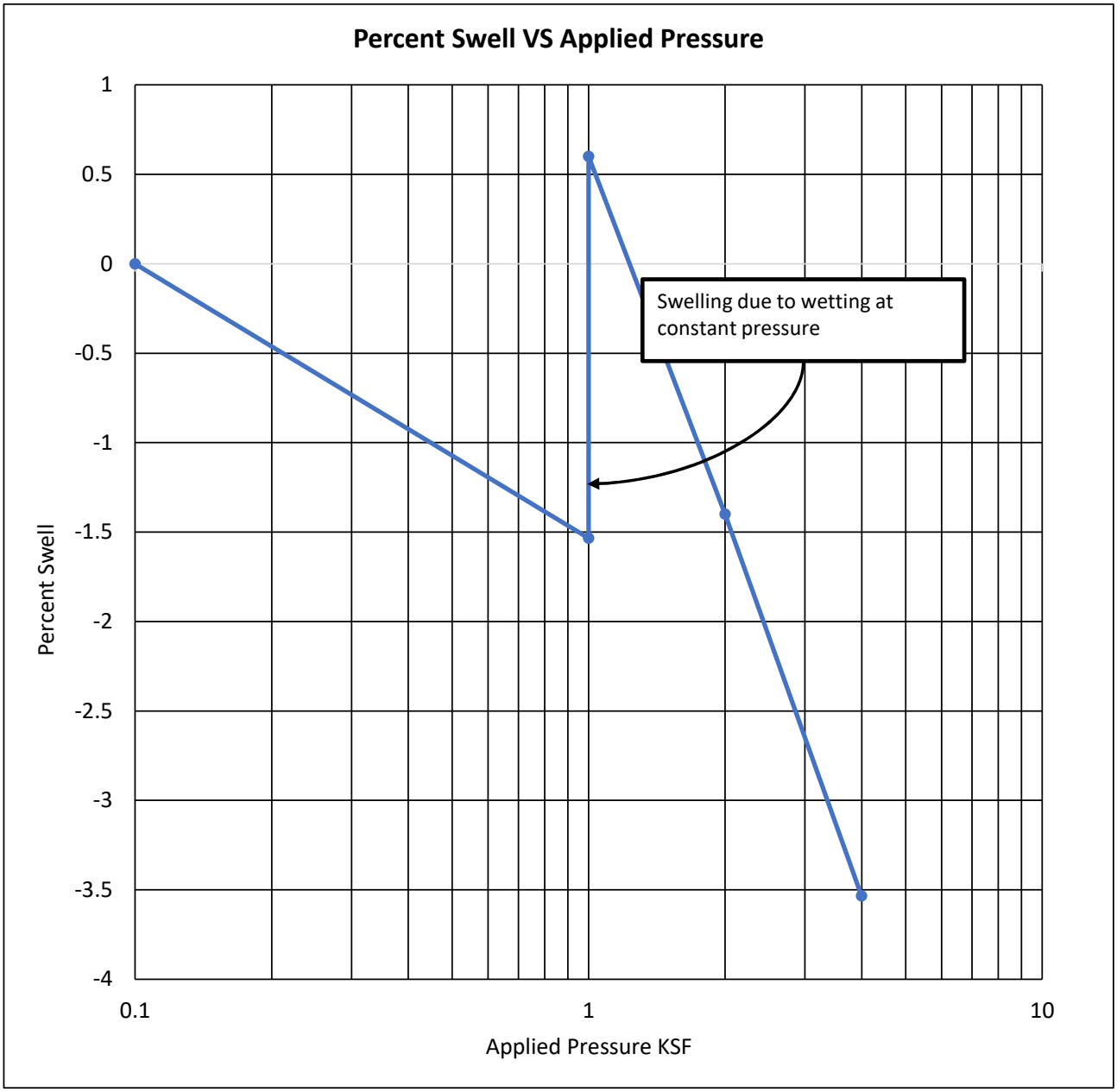
MOISTURE CONTENT:	8.9	percent
DRY UNIT WEIGHT:	112.8	pcf
BORING/DEPTH:	B-1, S-2 @2.5'	
SOIL DESCRIPTION:	Lean to Fat Clay, Gray (CL-CH)	
% Consolidation	1.5	percent
Swell Pressure:	NA	psf



Project Number: P-0004856

AMERICAN
ENGINEERING TESTING

MOISTURE CONTENT:	27.9 percent
DRY UNIT WEIGHT:	89.2 pcf
BORING/DEPTH:	B-2, S-6 @12.5
SOIL DESCRIPTION:	Fat Clay, gray (CH)
% Swell	2.1 percent
Swell Pressure:	2100 psf



Project Number: P-0004856

American Engineering Testing, Inc.
Sheridan
72 E Ridge Rd Unit D
Sheridan, WY 82801
(607) 675-1862
www.teamAET.com

Material Test Report

Report No: MAT:AET-052838-S1

Client: Morrison Maierle, Inc. **CC:**

Project: Brooks St. Greenspace Re-construction

Sheridan WY

Job No: P-0004856

Draft Report - Subject to change pending final review

Date of Issue: 5/6/2022

Sample Details

Sample ID	AET-052838-S1
Field Sample ID	Bulk Sample B1
Date Sampled	3/31/2022
Source	
Material	SANDY LEAN CLAY, mottled gray/brown (CL)
Specification	Gradation + Hydrometer
Sampling Method	Existing Material Onsite
General Location	Bulk Sample B-1
Location	Brooks Street
Date Submitted	3/31/2022

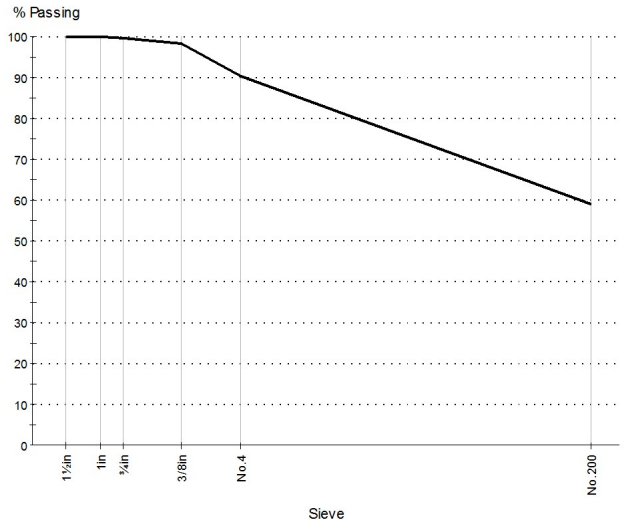
Sample Description:

SANDY LEAN CLAY, mottled gray/brown (CL)

Atterberg Limit:

Liquid Limit: 37
Plastic Limit: 21
Plasticity Index: 16

Particle Size Distribution



Grading: ASTM C 136, ASTM C 117

Date Tested: 4/7/2022
Tested By: Sara Ostrander

Sieve Size	% Passing	Limits
1½in	100.0	
1in	100.0	
¾in	99.7	
3/8in	98.5	
No.4	90.2	
No.200	59.0	

COBBLES	GRAVEL		SAND			FINES (59.0%)	
	Coarse	Fine	Coarse	Medium	Fine		
(0.0%)	(0.3%)	(9.4%)	(6.5%)	(11.7%)	(13.1%)	Silt	Clay

D85: 2.3791 **D60:** 0.0857 **D50:** N/A
D30: N/A **D15:** N/A **D10:** N/A

American Engineering Testing, Inc.
Sheridan
72 E Ridge Rd Unit D
Sheridan, WY 82801
(607) 675-1862
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Material Test Report

Report No: MAT:AET-052838-S1

Client: Morrison Maierle, Inc. **CC:**

Project: Brooks St. Greenspace Re-construction

Sheridan WY

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Draft Report - Subject to change pending final review

Date of Issue: 5/6/2022

Sample Details

Sample ID	AET-052838-S1
Field Sample ID	Bulk Sample B1
Date Sampled	3/31/2022
Source	
Material	SANDY LEAN CLAY, mottled gray/brown (CL)
Specification	Gradation + Hydrometer
Sampling Method	Existing Material Onsite
General Location	Bulk Sample B-1
Location	Brooks Street
Date Submitted	3/31/2022

Other Test Results

Description	Method	Result	Limits
Fineness Modulus	ASTM C 136, ASTM C 117	N/A	
Curvature Coefficient		N/A	
Uniformity Coefficient		N/A	
Approximate maximum grain size	ASTM D 4318	1"	
Material retained on 425µm (No. 40) (%)			
Method of Removal		Hand Sieving	
Grooving Tool Type		Metal	
Specimen preparation method		Dry	
Drying Method		Oven	
Special selection process			
Rolling Method for PL		Hand	
As Received Water Content (%)			
Liquid Limit Device Type		Manual	
Liquid Limit		37	
Plastic Limit		21	
Plasticity Index		16	
Liquid Limit Procedure		One-point (B)	
Date Tested		4/7/2022	
Maximum Dry Unit Weight (lbf/ft³)	ASTM D 698	107.5	
Corrected Maximum Dry Unit Weight (lbf/ft³)		111.3	
Optimum Water Content (%)		17.4	
Corrected Optimum Water Content (%)		15.7	
Method		A	
Preparation Method		Moist	
Retained Sieve No 4 (4.75mm) (%)		10	
Specific Gravity (Oversize)		2.65	

Sample Details

Comments

N/A

American Engineering Testing, Inc.
Sheridan
72 E Ridge Rd Unit D
Sheridan, WY 82801
(607) 675-1862
www.teamAET.com

Material Test Report

Report No: MAT:AET-052838-S1

Client: Morrison Maierle, Inc. **CC:**

Project: Brooks St. Greenspace Re-construction

Sheridan WY

Job No: P-0004856

Draft Report - Subject to change pending final review

Date of Issue: 5/6/2022

Sample ID	AET-052838-S1
Field Sample ID	Bulk Sample B1
Date Sampled	3/31/2022
Source	
Material	SANDY LEAN CLAY, mottled gray/brown (CL)
Specification	Gradation + Hydrometer
Sampling Method	Existing Material Onsite
General Location	Bulk Sample B-1
Location	Brooks Street
Date Submitted	3/31/2022

Other Test Results

Description	Method	Result	Limits
Specific Gravity (Fines)	Assumed	2.65	
Date Tested		4/7/2022	

Comments

N/A

American Engineering Testing, Inc.
Sheridan
72 E Ridge Rd Unit D
Sheridan, WY 82801
(607) 675-1862
www.teamAET.com

Proctor Report

Report No: PTR:AET-052838-S1

Client: Morrison Maierle, Inc. **CC:**

Project: Brooks St. Greenspace Re-construction

Sheridan WY

Job No: P-0004856

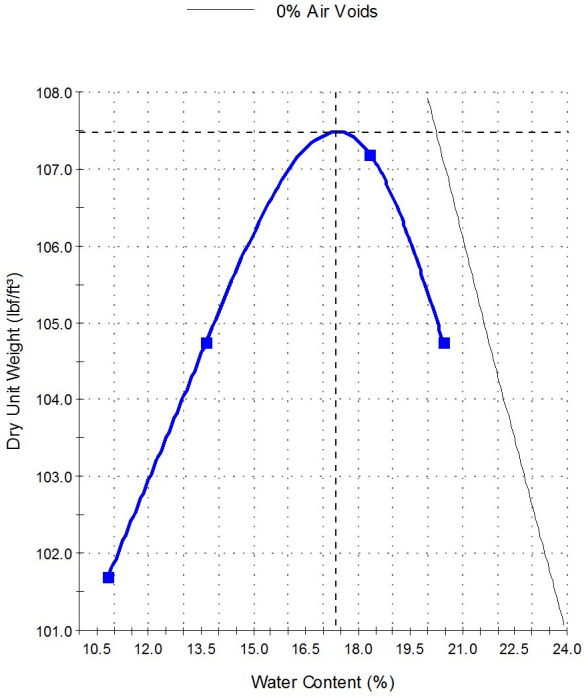
Draft Report - Subject to change pending final review

Date of Issue: 5/6/2022

Sample Details

Sample ID:	AET-052838-S1	**Field ID:**	Bulk Sample B1
Date Sampled:	3/31/2022		
Sampling Method:	Existing Material Onsite		
Material:	SANDY LEAN CLAY, mottled gray/brown (CL)		
Specification:	Gradation + Hydrometer		
Location:	Brooks Street		
Sampled By:	Brian Freed		

Dry Unit Weight - Water Content Relationship



Test Results

ASTM D 698

Maximum Dry Unit Weight (lbf/ft³):	**107.5**
Optimum Water Content (%):	**17.4**
Method:	A
Preparation Method:	Moist
Specific Gravity (Fines):	2.65
Specific Gravity Method:	Assumed
Retained Sieve No 4 (4.75mm) (%):	10
Passing Sieve No 4 (4.75mm) (%):	90
Tested By:	Sara Ostrander
Date Tested:	4/7/2022

ASTM D 4718

Corrected Maximum Dry Unit Weight (lbf/ft³):	**111.3**
Corrected Optimum Water Content (%):	**15.7**
Specific Gravity (Oversize):	2.65
Sieve Size (Oversize):	No 4
Oversize Particles (%):	10

ASTM D 4318

Liquid Limit (%):	37
Plastic Limit (%):	21
Plasticity Index (%):	16
Tested By:	Sara Ostrander
Date Tested:	4/7/2022

Comments

Appendix B

Geotechnical Report Limitations and Guidelines for Use

Appendix B
Geotechnical Report Limitations and Guidelines for Use
AET Project No. P-0004856

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.

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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.