CITY OF OAK HILL
FAYETTE COUNTY, WEST VIRGINIA

OAK HILL FIRE STATION ADDITION

ADDENDUM #2

JULY 7, 2023

THRASHER PROJECT #T60-11032

TO WHOM IT MAY CONCERN:

A Pre-Bid Conference was held on Thursday, June 8, 2023, on the above-referenced project. The following are clarifications and responses to questions posed by contractors for the above reference project.

A. GENERAL

1. The Geotechnical Report is attached for informational purposes.
2. The Bid Time has been moved to 3:00pm on July 11, 2023.
3. Building shall be fully sprinkled by a wet pipe system that meets applicable code. This work shall be included in the base bid. The contractor shall hydraulically design each area based upon its respective hydraulic requirement. All penetrations through fire/smoke rated construction shall be sealed with a listed fire rated caulk equal to or exceeding the construction fire rating. Sprinkler contractor shall be aware that ceiling space is limited in the existing building. Sprinkler and drain piping should be coordinated with all existing and new mechanical and electrical systems. Contractor shall provide offsets, transitions and auxiliary drains as required to complete installation. Any existing ductwork and sloped pipe shall not be relocated for sprinkler piping unless absolutely required. Site water information shall be confirmed by contractor from actual flow test for this building. Contractor to coordinate head type with the new and existing ceiling conditions.

B. SPECIFICATIONS

None on this Addendum.

C. DRAWINGS

None on this Addendum.

D. QUESTIONS AND RESPONSES

Question 1.
Drawings indicate to provide a Fire Alarm system for the new work by expanding the existing system, and that the existing system is to remain operable during construction. There does not appear to be an existing Fire Alarm system to add anything to. Should a new Fire Alarm system be provided for the entire building?
Answer 1.
There is no existing Fire Alarm system in the building. Contractors should plan to provide a new Fire Alarm system throughout the facility to bring the building in line with current code requirements.

Question 2.
Would Hubbell be considered as an acceptable manufacturer for UTP Cable in Specification Section 260523?
Answer 2.
Yes.

Question 3.
Is there a specific glazing required for the sectional doors?
Answer 3.
Glazing for the full vision door is described in Section 083613.2.3.C. Provide light gray tint to match the existing apparatus bay door glass.

Question 4.
Section 083613.2.K gives several finish options for the sectional doors. Please clarify.
Answer 4.
Full-vision aluminum sectional doors are to be anodized dark bronze to match the existing apparatus bay doors. Steel sectional doors are to be baked enamel or powder coated, whichever is the manufacturer's standard finish.

Question 5. Is there a Geotech report for this project?
Answer 5. Yes. The Geotech report providing technical data only, is attached to this addendum for informational purposes.

Question 6. Are there exterior pipe sizes, water, sanitary?
Answer 6. The relocated fire protection waterline shall be a 6" and the sanitary service shall be a 4" line.

Question 7. Can the bid opening be pushed back to 3:00 PM? Electric and HVAC subcontractors don't receive their supplier quotes until the day of the bid. There's not adequate time to finalize the estimate before fully completing bid forms and turning the bid in at 10:00 AM.
Answer 7. Yes, the bid opening will be at 3:00 PM.

Question 8. There is a small amount of exposed spiral duct in the Weight Room. I know you typically use single wall for this type of application, but we were wanting to see if we could get clarification that single wall is your intent for this duct.
Answer 8. Single wall is acceptable

E. CLARIFICATIONS

None on this Addendum.

If you have any questions or comments, please contact Tesla Smith, tdsmith@thethrashergroup.com at your earliest convenience. As a reminder, bids will be received until 3:00 p.m. on July 11, 2023, at Oak Hill City Hall, 100 Kelly Ave. Oak Hill, WV. Good luck to everyone and thank you for your interest in the project.

Sincerely,

THE THRASHER GROUP, INC.

Philip M Freeman, AIA, NCARB, LEED Green Associate
Project Architect

SUBSTITUTION REQUEST
(During the Bidding/Negotiating Phase)

PROJECT: Oak Hill Fire Department
Oak Hill, WV

TO: Thrasher Group
Bridgeport, WV

RE: Product Substitution Request

SUBSTITUTION REQUEST NUMBER: [A/E Use]

FROM: Daniel Cassidy DHT

DATE: 06/15/23

A/E PROJECT NUMBER:

CONTRACT FOR:

SPECIFICATION TITLE: Door Hardware

DESCRIPTION: Power Supplies

SECTION: 087100

PAGE: 14

ARTICLE/PARAGRAPH: 2.9

PROPOSED SUBSTITUTUION: AQL Series Power Supplies

MANUFACTURER: Securitron

ADDRESS: 10027 S. 51st Street, Suite 102, Phoenix, AZ 85044

PHONE: (623) 582-4626

TRADE NAME: Door Hardware

MODEL NO.: AQL

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.
Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.

SUBMITTED BY: Daniel Cassidy DHT

SIGNED BY: dan.cassidy@assaabloy.com (Email Address Represents Digital Signature)

FIRM: DSS Tri-State

ADDRESS: 335 Pierce Street, Kingston, PA 18704

TELEPHONE: (570) 693-3323

A/E's REVIEW AND RECOMMENDATION:

- (●) Approve Substitution—Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- ( ) Approve Substitution as noted—Make submittals in accordance with Specification Section 01 33 00 Submittal Procedures.
- ( ) Reject Substitution—Use specified materials.
- ( ) Substitution Request received too late—Use specified materials.

SIGNED BY: [signature]

DATE: 2023-07-07

SUPPORTING DATA ATTACHED: ☐ Drawings ■ Product Data ☐ Samples ☐ Tests ☐ Reports

■ https://content.assaabloyusa.com/AssetLibrary?constraints=dDocName:AADSS1062104~AADSS1156350

SUBSTITUTION REQUEST
(During the Bidding/Negotiating Phase)

PROJECT: Oak Hill Fire Department
Oak Hill, WV

TO: Thrasher Group
Bridgeport, WV

RE: Product Substitution Request

SUBSTITUTION REQUEST NUMBER: [A/E Use]

FROM: Daniel Cassidy DHT

DATE: 06/15/23

A/E PROJECT NUMBER:

CONTRACT FOR:

SPECIFICATION TITLE: Door Hardware

DESCRIPTION: Power Supplies

SECTION: 087100

PAGE: 14

ARTICLE/PARAGRAPH: "2.10"

PROPOSED SUBSTITUTUION: Access 3 Cylinders-Keying

MANUFACTURER: Corbin Russwin

ADDRESS: 225 Episcopal Road, Berlin, CT 06037-4004

PHONE: (800) 543-3658

TRADE NAME: Door Hardware

MODEL NO.: Access 3

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.
Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
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SUBMITTED BY: Daniel Cassidy DHT

SIGNED BY: dan.cassidy@assaabloy.com (Email Address Represents Digital Signature)

FIRM: DSS Tri-State

ADDRESS: 335 Pierce Street, Kingston, PA 18704

TELEPHONE: (570) 693-3323

A/E's REVIEW AND RECOMMENDATION:

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- [ ] Reject Substitution—Use specified materials.
- [ ] Substitution Request received too late—Use specified materials.

SIGNED BY: [signature] **DATE:** 2023/07/07

SUPPORTING DATA ATTACHED: [ ] Drawings [x] Product Data [ ] Samples [ ] Tests [ ] Reports

[x] https://content.assaabloyusa.com/AssetLibrary?constraints=dDocName:AADSS1170117~AADSS1004758

SUBSTITUTION REQUEST
(During the Bidding/Negotiating Phase)

PROJECT: Oak Hill Fire Department
Oak Hill, WV

TO: Thrasher Group
Bridgeport, WV

RE: Product Substitution Request

SUBSTITUTION REQUEST NUMBER: [A/E Use]

FROM: Daniel Cassidy DHT

DATE: 06/15/23

A/E PROJECT NUMBER:

CONTRACT FOR:

SPECIFICATION TITLE: Door Hardware

DESCRIPTION: Exit Devices

SECTION: 087100

PAGE: 13

ARTICLE/PARAGRAPH: 2.7

PROPOSED SUBSTITUTUION: ED4000/ED5000 Series Exit Devices

MANUFACTURER: Corbin Russwin

ADDRESS: 225 Episcopal Road, Berlin, CT 06037-4004

PHONE: (800) 543-3658

TRADE NAME: Door Hardware

MODEL NO.: ED4000/ED5000

Attached data includes product description, specifications, drawings, photographs, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified.
Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The Undersigned certifies:
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
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SUBMITTED BY: Daniel Cassidy DHT

SIGNED BY: dan.cassidy@assaabloy.com (Email Address Represents Digital Signature)

FIRM: DSS Tri-State

ADDRESS: 335 Pierce Street, Kingston, PA 18704

TELEPHONE: (570) 693-3323

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SIGNED BY: [signature]

DATE: 2023/07/07

SUPPORTING DATA ATTACHED: [ ] Drawings [x] Product Data [ ] Samples [ ] Tests [ ] Reports

[x] https://content.assaabloyusa.com/AssetLibrary?constraints=dDocName:AADSS1170117~AADSS1004819

ADDED: Addendum 2
July 7, 2023

American Geotech, Inc.
601 Ohio Avenue
Charleston, WV 25302
(304) 340-4277
Fax 340-4278

AMERICAN GEOTECH, INC.

Geotechnical, Environmental and Testing Engineers

REPORT OF

GEOTECHNICAL EXPLORATION AND ANALYSIS
OAK HILL FIRE DEPARTMENT 120' X 32' ADDITION
OAK HILL, WEST VIRGINIA

Prepared For

THE THRASHER GROUP, INC.
BRIDGEPORT, WEST VIRGINIA
NOVEMBER - 2022

(This report contains 10 pages, plus appendices)

AMERICAN GEOTECH, INC.

GEOTECHNICAL, ENVIRONMENTAL AND TESTING ENGINEERS

601 OHIO AVENUE
CHARLESTON, WV 25302
(304) 340-4277
Fax (304) 340-4278

November 18, 2022

Mr. Craig M. Baker
The Thrasher Group, Inc.
P.O. Box 940
Bridgeport, WV 26330

Re: Report of Geotechnical Exploration and Engineering Analysis
Proposed 120' x 32' L-Shaped Addition
Existing Oak Hill Fire Department
99 Virginia Street
Oak Hill, West Virginia

Dear Mr. Baker:

In accordance with your request and authorization, American Geotech, Inc. (AGI) has performed a geotechnical subsurface exploration and engineering analysis for the proposed 120' x 32' addition at the existing Oak Hill Fire Station in Oak Hill, West Virginia. The detailed geotechnical report is attached herewith.

It is recommended that the contract documents must follow International Building Code (IBC) requirements, including a Schedule of Special Inspection Services for soils and foundations in the plans. At a minimum, the Geotechnical Engineer of Record (GER) shall provide on-site observation, testing, and special inspection services during helical pile and grade beam installation.

We appreciate the opportunity of providing these services to you. If you have any questions concerning the information in this report, or should questions develop as the design proceeds, please contact our office at 304-340-4277.

Thank you for your consideration.

Respectfully Submitted,

AMERICAN GEOTECH, INC.

Kanti S. Patel, M.S.C.E., P.E.
Principal Engineer

GEOTECHNICAL ENGINEERING EXPLORATION AND ANALYSIS

PROPOSED 120' X 32' ADDITION
OAK HILL, WEST VIRGINIA

EXECUTIVE SUMMARY

A brief summary of our recommendations for this project is presented below. This summary should be read in context with the entire report for proper interpretation.

Special Issues

- It is recommended that the contract documents must follow International Building Code (IBC) requirements, including a Schedule of Special Inspection Services for soils and foundations in the plans. At a minimum, the Geotechnical Engineer of Record (GER) shall provide on-site observation, testing, and special inspection services during helical pile and grade beam installation.
- Our exploration encountered complex subsurface conditions due to the previous filling of the property. These complex conditions include relatively shallow fill materials and underlying wet and soft natural soils with a shallow groundwater table.
- A deep foundation system extended to bedrock will be required to support the proposed fire station addition. Subsurface obstructions will be present in other areas and may require installing additional piles next to refused piles.
- Due to the lateral stability requirements, all piles must be installed with the minimum recommended grout caps below the grade beams.

Foundations

- The proposed addition should be supported on a grade beam and helical pier foundation system extended to rock refusal or torque refusal conditions on medium hard rock. A typical helical pier installed to medium hard bedrock can carry a load of 40 kips (20 tons).
- The helical piles should consist of Magnum Piering Helical Piles (MH325BR) with an uncased grout cap of 18 inches in diameter and 2 feet deep.
- The end bearing pressure is dependent on the properties of the helix size selected and the torque applied to install the piers. The bedrock under the site can provide an allowable end bearing pressure of 4,000 pounds-per-square-foot (psf) if installed to the rated torque of 8,500 ft-lbs and all bearing plates encounter bedrock.
- The pier refusal depths at this site should range from approximately 8 to 13 feet below the existing ground surface (not accounting for any new fill).
- Grout caps should be filled with wet grout and helical piles should be installed through the wet grout immediately after filling.
- We estimate that 10% of the piles will refuse at shallower depths as a result of buried boulders, requiring additional piles to be provided on both sides of the refused pile. Provisions should be included in the project specifications to allow

for installation of any required additional piles.

- The base of all grade beams should be at least 36 inches below the final exterior grade for adequate frost protection.

Floor Slab Support

- Due to loads from fire trucks and other equipment, the floor slab should be at least 6 inches thick with reinforcement.
- Slab-on-grade floors can be supported on the existing fill or new controlled, engineered fill subgrade, following the recommended subgrade preparation.
- A slab-on-grade floor can be designed for a subgrade modulus of reaction of 100 pounds-per-cubic-inch (PCI).
- Periodic raising or leveling of slabs may be required within the floor slab sections due to the underlying weak subgrade materials.

INTRODUCTION

This report presents the results of our geotechnical subsurface exploration and engineering analysis for the proposed addition to the Oak Hill Fire Station in Oak Hill, West Virginia. The purpose of this exploration was to generally define the subsurface conditions at this site and to characterize these conditions for the proposed structure.

The exploration included the drilling of two (2) Standard Penetration Test borings, visual observations of the general project site, the associated laboratory testing of the representative samples, and the report preparation. The exploration was authorized by Mr. Craig Baker of Thrasher Group, and the work was performed in accordance with our proposal/agreement dated June 2, 2022.

This report is intended to provide detailed information concerning subsurface conditions within the proposed construction site, sufficient for the basic design of the foundation system, and to provide geotechnical engineering recommendations for the site preparation, foundation design, and floor slab support.

PROJECT INFORMATION

It is proposed to construct an addition to the existing fire station at the referenced site. The addition will consist of a pre-engineered steel frame structure with metal siding and some exterior masonry. The new addition will house an exercise room, laundry facility, two rear garage bays for fire department equipment/trailers, and a large fire truck and apparatus garage bay. The finished floor elevation will match with the existing fire station building. The floor will be constructed as an industry standard slab-on-grade. Minimal new engineered fill will be required after site stripping to achieve the required subgrade elevation.

The site is located on the southern side of Virginia Street at Summerlee Avenue and on the general eastern side of the fire station building. The ground surface is level across the project site. It is our understanding that the project site has historically been low bottom land and the site was filled to existing grade using random mine related fill and coal refuse. Prior to the construction of the fire station, the low ground along the stream, which runs just south of the rear parking lot location, was filled using random mine related materials.

SUBSURFACE EXPLORATION

Two (2) Standard Penetration Test soil borings were drilled by AGI at the approximate locations shown on the attached Test Boring Location Plan. The test borings were drilled using a track-mounted drill rig on November 9, 2022. The test boring locations were staked in the field by AGI personnel referencing the site plan provided by the client. The test borings were advanced, and the bore holes were stabilized, using 2.25-inch interior diameter hollow stem augers. Sampling was accomplished in the undisturbed material below the bottom of the augers using a split-spoon sampler. The split-spoon sampler, having an exterior diameter of 2.0-inches and an

interior diameter of 1⅜-inch, was driven with a 140-pound automatic hammer falling 30 inches, in accordance with ASTM D 1586. The soil samples were recovered at 2.5 foot intervals within the upper 10 feet. The test borings were drilled to completion depths of 10.8 to 12.5 feet below the present site grades.

Upon completion of the test borings, the holes were backfilled using the auger cuttings and the soil samples were returned to our soil mechanics laboratory, where they were visually examined and grouped by the project engineer. The laboratory testing program included moisture contents and pocket penetrometer readings on the representative samples.

The attached test boring logs were then prepared by the project engineer, using the recovered soil samples, the results of the laboratory testing, and notes taken by the drill foreman during the drilling operations. The classified logs and the basis for recommendations are included in the appendix. Each log gives the depth, thickness, and visual description of the soil and rock strata penetrated, along with the sample identification data.

SUBSURFACE CONDITIONS

The test boring encountered approximately 8 inches of asphaltic pavement and 4 inches of stone base materials at the surface. Existing unengineered mine fill materials were encountered and extended to depths of approximately 5.0 to 7.0 feet below the existing ground surface (bgs). Natural soil was present below the existing fill. Generally, the subsurface profile can be described as fill materials underlain by soft and wet natural alluvial soils that extend to weathered bedrock at relatively shallow depths.

The test borings encountered existing random mine related fill consisting of an uneven mixture of dark gray and black sandy clay, rock, coal and brick fragments and trace glass and cobbles. The unengineered mine fill was noted as moist to very moist and loose to medium dense in relative density. The Standard Penetration Test (SPT) results ranged from 5 to 13 blows-per-foot (bpf). Moisture contents within the fill stratum varied from 13.4% to 20.5%. Pocket penetrometer readings ranged from 0.75 to 2.25 tons-per-square-foot (tsf).

Natural alluvial soils were present in both borings at depths of approximately 5.0 to 7.0 feet below the existing pavement surface. The natural soils in B-1 were described as soft tan sandy clay with very loose dark gray silty sand with organics below 5.5 feet. In B-2, the natural soils consisted of very loose brown and gray clayey sand underlain by soft orangish-brown and gray silty clay at 9.5 feet. Very loose gray silty fine sand was encountered at 10.5 feet in B-2 and extended to the top of bedrock. These strata were noted as very moist to wet, having moisture contents ranging from 13.9% to 26.0%. The samples also produced pocket penetrometer readings of 0.0 to 0.5 tsf. The natural soils extended to the top of weathered bedrock at depths of 8.0 to 11.5 feet bgs.

Weathered bedrock consisted of brown and gray sandstone. This weathered formation was classified as tough to medium hard in relative hardness. B-1 was extended to split spoon refusal

at a depth of 10.8 feet below the existing pavement surface. B-2 was extended to auger refusal at a depth of 12.5 feet below the existing pavement surface.

Groundwater was encountered during drilling at depths of 6.0 to 7.0 feet in both test borings. We should state, however, that fluctuations in the location of the groundwater table, as well as perched or trapped water, can occur as a result of seasonal variations in precipitation, evaporation, surface runoff, and other factors not immediately apparent at the time of our exploration.

ANALYSIS AND RECOMMENDATIONS

Our exploration encountered complex subsurface conditions due to the previous filling of the property. The complex conditions include the relatively shallow random unengineered mine related fill materials underlain by soft and wet alluvium across the building site and a shallow groundwater table. The proposed addition should be supported on a helical pier foundation bearing on the underlying weathered bedrock. Due to the lateral stability requirements, all piles must be installed with the minimum recommended grout caps below the grade beams. Subsurface obstructions may be present in some areas and will require installing additional piles next to refused piles.

Foundation Design

It is our opinion that a reinforced grade beam and steel helical pier foundation system will provide adequate support for the proposed addition. The helical pier and grade beam system should be designed by a licensed structural engineer. All helical pier installation must be verified independently by the geotechnical engineer.

The proposed addition can be founded on a steel helical pier and grade beam foundation system bearing on the underlying bedrock. The helical piers should consist of Magnum Piering Helical Piles (MH325BR) with an uncased grout cap of 18 inches in diameter and 2 feet deep below the bottom of the grade beam. The MH325BR (8,500 ft-lbs. maximum torque rating) Magnum Piering Helical Pile should have three (3) helical bearing plates (8", 10", & 12" diameters). Piles should be installed to rock refusal or torque refusal conditions on the underlying bedrock. A typical MH325BR Magnum Piering Helical Pile with a grout cap will have an allowable axial capacity of 40 kips, tension (uplift) of 20 kips, and lateral capacity of 2 kips. The underlying bedrock surface is present at approximately 8 to 12 feet below the existing surface grades. The pier refusal depths at this site should range from approximately 8 to 13 feet below the existing ground surface (not accounting for any new fill). The helical piles should be tied to the grade beams using minimum 8 inch by 8 inch square plates and bolted connections capable of 20 tons compression and 15 tons uplift. The base of all grade beams should be at least 36 inches below the final exterior grade for adequate frost protection.

The minimum 18 inch diameter grout caps should be made below the bottom elevation of the grade beams. All loose soils should be removed from the grout cap to allow the cap to function as a grout reservoir during pile installation. Grout caps should be filled with wet grout and

helical piles should be installed through the wet grout immediately after filling. The level in the cap/reservoir will need to be topped-off during pile installation to replace wet grout that is pulled down with the advancing pile. We recommend a minimum compressive strength of 4,000 psi grout be used for the grout cap.

The end bearing pressure is dependent on the properties of the helix size selected and the torque applied to install the piers. The bedrock under the site can provide an allowable end bearing pressure of 4,000 pounds-per-square-foot (psf) if installed to the rated torque of 8,500 ft-lbs and all bearing plates encounter bedrock. Piers should be advanced to the maximum torque rating or rock refusal conditions as specified by the structural engineer.

The helical pier and grade beam foundation system should be designed by a licensed structural engineer. It is our opinion that the helical pier sections for this project should be equivalent to Magnum Piering Helical Piles MH325BR shafts with the minimum required grout caps below the grade beams. The structural engineer should evaluate the need for more heavy duty pier sections or larger grout caps, due to potential lateral stability concerns and seismic design considerations.

The torque motor shall have a torque capacity of 15% greater than the torsional strength rating of the central shaft to be installed. The torque, as measured during installation, shall not exceed the torsional strength rating of the central steel shaft. If the helical pier refuses or deflects on subsurface obstructions at shallow depths, then installation shall be terminated and the pile removed. The obstruction should be removed, if feasible, and the helical pier re-installed. If the obstruction can't be removed, the helical pier shall be installed at an adjacent location, subject to review and acceptance by the owner and engineer. In fact, we expect that 10% of the helical piles may refuse on buried boulders or obstructions.

For a foundation system designed and constructed as recommended above, the differential settlement should be on the order of 0.25 inch. This would result in an angular distortion of approximately 0.001 inch-per-inch across a distance of 20 feet. The potential for cracking in masonry walls can be minimized by providing control/construction joints at critical locations and every 20 feet along the walls. At a minimum, the control/construction joints should be placed where changes in the wall height or loading conditions occur.

Seismic Soils Classification and Seismic Hazard Evaluation

Site Class D is recommended for the seismic design considerations, based upon our test borings, our knowledge and understanding of the area geology, and Table 1613.5.2 of the 2015 International Building Code (IBC). The overburden soils at this site are identified as Site Class D. The depth of weathered bedrock at this site varies from 8 to 12 feet below the present surface and belongs to Site Class B. Although the IBC site classification is based on the average soil conditions within the top 100 feet of the subsurface profile, the IBC permits the soil properties to be estimated by a geotechnical engineer based upon known regional geologic conditions where site-specific data is not available to the depth of 100 feet. A 100 foot deep test boring, possibly in conjunction with more sophisticated laboratory testing or field geophysical testing, would be required to more accurately determine the soil properties and soil site class. The actual seismic

design should be performed by a structural engineer. The following potential seismic hazards resulting from earthquake motions have been evaluated.

1. A slope stability analysis was not included in the scope of this exploration. The ground surface within the building area is level and appears to be stable.

2. The groundwater table was encountered at an average depth of 6 feet during our subsurface exploration and is expected to fluctuate with the seasons. The structural engineer should evaluate the potential effects of liquefaction on the proposed piers.

3. As no ponds and low lying areas are present within the proposed building footprint, lateral spreading is unlikely.

4. As no faults are present within the site area, surface rupture is unlikely.

The following seismic design recommendations are offered based on seismic design maps prepared and provided by IBC 2015.

- Mapped Acceleration Parameters
  $S_S = 0.173$
  $S_1 = 0.073$
- Site Coefficients
  $F_a = 1.6$
  $F_v = 2.4$
- Seismic Design Parameters
  $S_{MS} = 0.277$
  $S_{M1} = 0.176$
  $S_{DS} = 0.185$
  $S_{D1} = 0.118$

Site Preparation

All structural areas (as defined by the limits of the new addition and 5 feet beyond in all directions) should be stripped of all surface pavement, curbs, vegetation, soft/wet soils, utilities and related backfill, and any otherwise deleterious materials. Upon completion of the stripping, the exposed surface area should be proof-rolled using a loaded dump truck or smooth drum vibratory roller, under the supervision of qualified geotechnical personnel. The proof-rolling equipment should weigh at least 20 tons and make passes over the entire subgrade area in each of two perpendicular directions. Localized soft or yielding areas identified during the proof-rolling activities should then be undercut 2 feet and replaced with controlled, compacted, engineered fill as needed, in order to provide a firm subgrade.

It is recommended that all engineered fill required to reach the subgrade elevation within the building footprint be placed in maximum 8-inch lifts and compacted to 98% of the standard Proctor maximum density, as determined by ASTM D-698, and substantiated by on-site testing. The lift thickness should be reduced to 4 inches wherever hand operated equipment is used. The

fill materials should be maintained within ±3% of the optimum moisture content during placement. All engineered fill materials should have a liquid limit less than 40, a plasticity index less than 15, and a maximum aggregate particle size of 4 inches in any dimension.

Floor Slab Support

Due to loads from fire trucks and other equipment, the floor slab should be at least 6 inches thick with reinforcement. The existing fill subgrade or new engineered fill materials will be suitable for floor slab support following the recommended subgrade preparation activities. We recommend that any existing soft/wet materials, relict slabs, or foundations within the addition footprint be removed to the level of the underlying firm materials and be replaced with controlled, compacted, engineered fill. The floor slab subgrade should be prepared as outlined in the previous Site Preparation section. A floor slab-on-grade underlain with a subgrade prepared as outlined above can be designed utilizing a modulus of subgrade reaction of 100 pounds-per-cubic-inch (pci).

Additionally, we recommend that a minimum 6 inch thick freely-draining granular base course (#8 limestone chips) be placed beneath any floor slab. This granular layer will aid in the final grading of the slab subgrade, and help to inhibit any water from rising to the floor slab. Prior to the placement of concrete, we also recommend that a vapor barrier, conforming to ASTM E 1745, be placed on top of the granular material within any enclosed sections to provide additional moisture protection. The surface curing of the slab should also be given attention, so as to minimize uneven drying and the associated potential cracking. A conventional concrete floor slab-on-grade should be isolated from the associated building foundation system. This can be accomplished with the use of proper construction joints. Also, to help minimize the widths and propagation of any shrinkage cracks which may develop near the surface of the slab, fiber mesh reinforcement mixed with the slab concrete should be included in the floor slab design. Based on our evaluation, up to 0.5 inches of differential settlement could occur below the floor slab. Periodic raising or leveling of slabs may be required within the floor slab sections due to the underlying weak subgrade materials. Slabs can be lifted back into place using pressurized injection of lime paste grout slurry, often referred to as mud jacking.

Construction Considerations

The exposed subgrade soils can deteriorate and lose support when exposed to construction activity and environmental changes (this is particularly true for the fine grained fill soils). Subgrade soil deterioration can occur in the form of freezing, erosion, softening from ponded water, and rutting from construction traffic. If the exposed subgrade surface in the slab areas becomes softened and deteriorated, it must be properly repaired through scarification and re-compaction immediately prior to stone placement. If this has to be performed during wet weather conditions, it would be worthwhile to consider undercutting the disturbed soil and replacing it with cement stabilized fill, or providing a flowable fill "mud mat" working surface.

Construction Monitoring

Close testing and monitoring by geotechnical personnel will be a critical aspect of this project. As a minimum, these services should be provided during site preparation, structural fill placement, foundation and grade beam installation, and floor slab construction.

LIMITATIONS

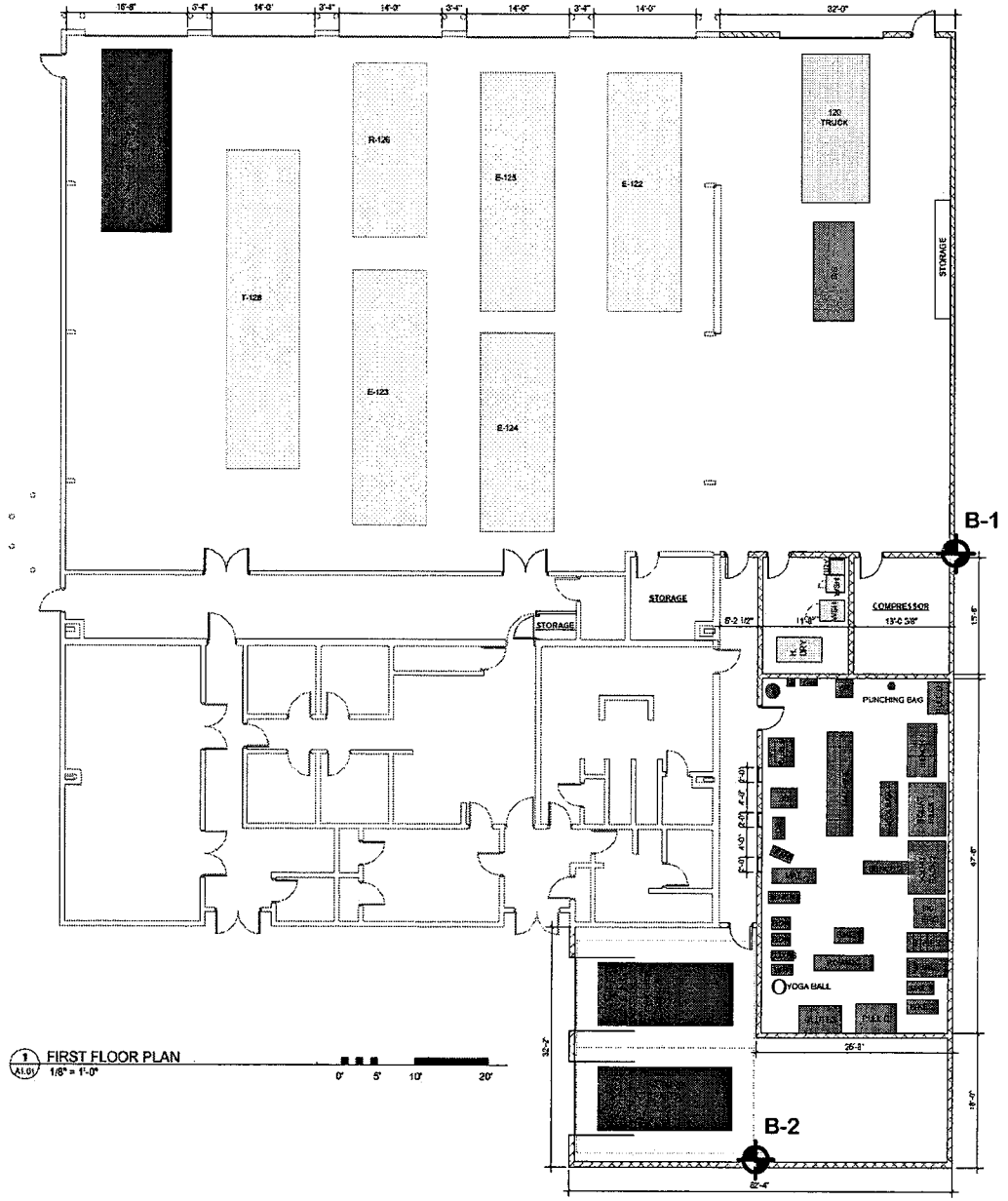
This report was prepared for use by Thrasher Group, and their authorized consultants, to aid in the design of this project. The report has been prepared in accordance with accepted geotechnical engineering practices and no other warranties, either expressed or implied, are made. The recommendations stated herein are contingent on American Geotech observing and evaluating all geotechnical aspects of the required work. We cannot be held responsible for any misinterpretations or improper implementation of our recommendations by other firms providing quality control services.

The recommendations presented in this report are based on data obtained from test borings made at the approximate locations shown on the Test Boring Location Plan. Variations which may exist between the test borings may not become evident until during construction. If significant variations are noted, we should be contacted so that the field conditions can be examined and the applicable recommendations revised, if necessary. Similarly, in the event of changes in the nature, design or location of the structure, or if other developments are planned, we should be notified so that we may review such changes to verify or make appropriate modifications to our previous conclusions and recommendations, which may be invalidated by any such changes.

We recommend that this complete report be provided to the various design team members, the contractors and the project owner. Potential contractors should be informed of this report in the "Instructions to Bidders" section of the bid documents. The report should not be included or referenced in the actual contract documents.

TEST BORING LOCATION

American Geotech, Inc.
601 Ohio Avenue
Charleston, West Virginia 25302



TEST BORING LOCATION PLAN	AMERICAN GEOTECH, INC.		
Proposed 120' x 32' Addition Oak Hill Fire Department Oak Hill, West Virginia	601 OHIO AVENUE CHARLESTON, WV 25302 (304) 340-4277	DATE 11-18-22	SCALE NONE
		DRAWN BY Thrasher	CHECKED BY KSP
		ADAPTED BY RDJ	SHEET 1 OF 1

Soil Test Boring Logs and Laboratory Data

American Geotech, Inc.
601 Ohio Avenue
Charleston, West Virginia 25302

Terminology

Grain Size

Soil Fraction		Particle Size	U.S. STD. Sieve Size
Boulders		Larger than 12"	Larger than 12"
Cobbles		3" to 12"	3" to 12"
Gravel	Coarse	¾" to 3"	¾" to 3"
	Fine	4.75 mm to ¾"	#4 to ¾"
Sand	Coarse	2.00 to 4.75 mm	#10 to #4
	Medium	0.425 to 2.00 mm	#40 to #10
	Fine	0.075 to 0.475 mm	#200 to #40
Fines	Clays & Silts	smaller than 0.075 mm	smaller than #200

Plasticity characteristics differentiate between silts and clays

Relative Density

Term	"N" Value
very loose	0 - 4
loose	5 - 10
medium dense	11 - 30
dense	31 - 50
very dense	over 50

Consistency

Term	ID Procedures	"N" Value
Soft	Easily penetrated by thumb	0 - 4
Medium Stiff	Penetrated by thumb with moderate effort	5 - 8
Stiff	Penetrated by thumb with great effort	9 - 15
Very Stiff	Readily indented by thumbnail	16 - 30
Hard	Indented by thumbnail with difficulty	31 - 50
Very Hard		over 50

Relative Moisture Description

Dry	Soil noticeably below optimum moisture
Moist	near optimum, but less then liquid limit
Damp	near or exceeding liquid limit
Wet	soil below water table

Symbols

Drilling and Sampling

RC - Rock Coring: Sizes AW, BW, NW, NQ
RQD - Rock Quality Designator
DC - Drive Casing
HSA - Hollow Stem Auger
FA - Flight Auger
AG - Auger
HA - Hand Auger
SS - 2" diameter Split Barrel Sampler
ST - 3" diameter Thin-Walled Tube Sampler
AS - Auger Sample
WS - Wash Sample
NR - No Recovery
S- Sounding
ATV - All Terrain Vehicle

Laboratory Tests

PP - Pocket Penetrometer Reading, Tons/ft^2
QU - Unconfined Strength, Tons/ft^2
W - Moisture Content, %
LL - Liquid Limit, %
PL - Plastic Limit,%
D - Dry Unit Weight, lbs/ft^3

Standard Penetration Test

The penetration resistance, or N-value as it is commonly referred to, is the summation of the number of blows required to drive the last two successive 6" penetrations of the 2" diameter -18" long split barrel sampler. The sampler is driven with a 140 lb. weight falling 30". The standard penetration test is performed in compliance with procedures as set forth in ASTM D-1586

Water Level Measurement

NW - No water encountered
WD - While drilling
BCR - Before casing removal
ACR - After casing removal
CW - Caved and wet
CM - Caved and moist
BP - Backfilled upon completion

LOG OF TEST BORING

CLIENT Thrasher Group, Inc. **BORING NO.** B – 1

PROJECT Proposed Oak Hill Fire Department Addition – Oak Hill, WV **DATE START** 11/9/22

BORING LOCATION As shown on plan **DATE COMP.** 11/9/22

ELEV. REF. None available **ORDER NO.**

ELEV. FT.	DEPTH FT.	DESCRIPTION OF MATERIALS	SAMPLE NO.	TP	DEPTH	BLOWS/6"	REC.
	0.0						
		1.0' Asphalt(8") and stone(4").					
	1.0						
		Dark gray to black sandy clay,					
		4.0' rock and coal fragments, and cobbles (FILL), moist, loose to medium dense.	1	ss	1.0' - 2.5'	3-4-4	16"
			2	ss	2.5' - 4.0'	14-10-3	13"
	5.0						
		0.5' Tan sandy clay, very moist, soft.					
	5.5						
		2.5' Dark gray silty sand, fine-grained, with organics, wet, very loose.	3	ss	5.0' - 6.5'	WOH	16"
			4	ss	7.5' - 8.4'	18-$^{50}/_{5"}$	11"
	8.0						
		Brown and gray sandstone,					
		2.8' medium-grained, weathered, fractured, tough.	5	ss	10.0' - 10.8'	17-$^{50}/_{4"}$	7"
	10.8						
		Boring completed.					

GENERAL NOTES
DRILLER J. Francis
RIG NO. CME-45
RIG TYPE Track
METHOD HSA/SS

AMERICAN GEOTECH, INC.
Geotechnical, Environmental & Testing Engineers
601 Ohio Avenue
Charleston, WV 25302
(304) 340-4277

WATER LEVEL OBSERVATIONS
IMMEDIATE 7.0 FT.
AT COMPLETION 6.0 FT.
AFTER BP HRS. NW FT.
WATER USED IN DRILLING - FT.

LOG OF TEST BORING

CLIENT Thrasher Group, Inc. **BORING NO.** B – 2

PROJECT Proposed Oak Hill Fire Department Addition – Oak Hill, WV **DATE START** 11/9/22

BORING LOCATION As shown on plan **DATE COMP.** 11/9/22

ELEV. REF. None available **ORDER NO.**

ELEV. FT.	DEPTH FT.	DESCRIPTION OF MATERIALS	SAMPLE NO.	TP	DEPTH	BLOWS/6"	REC.
	0.0						
		1.0' Asphalt(8") and stone(4").					
	1.0						
		Dark gray to black sandy clay,	1	ss	1.0' - 2.5'	5-3-2	17"
	6.0'	rock, coal and brick fragments,	2	ss	2.5' - 4.0'	1-6-6	18"
		trace glass (FILL), moist to very	3	ss	5.0' - 6.5'	5-3-3	16"
		moist, loose to medium dense.					
	7.0						
		2.5' Brown and gray clayey sand, fine-	4	ss	7.5' - 9.0'	WOH-2	14"
		grained, wet, very loose.					
	9.5						
		1.0' Orangish-brown and gray silty clay, wet, soft.					
	10.5						
		1.0' Gray silty sand, fine-grained, wet, very loose.	5	ss	10.0' - 11.5'	WOH-1	17"
	11.5						
		1.0' Bedrock, weathered, med. hard.					
	12.5	Auger refusal @ 12.5 feet.					
		Boring completed.					

GENERAL NOTES
DRILLER J. Francis
RIG NO. CME-45
RIG TYPE Track
METHOD HSA/SS

AMERICAN GEOTECH, INC.
Geotechnical, Environmental & Testing Engineers
601 Ohio Avenue
Charleston, WV 25302
(304) 340-4277

WATER LEVEL OBSERVATIONS
IMMEDIATE 6.0 FT.
AT COMPLETION 5.0 FT.
AFTER BP HRS. NW FT.
WATER USED IN DRILLING - FT.

AMERICAN GEOTECH, INC.
601 Ohio Avenue
Charleston, West Virginia 25302

The Thrasher Group, Inc.
Proposed Fire Department Addition
Oak Hill, West Virginia

TABULATION OF TEST DATA

Hole No.	Sample No.	Depth (ft.)	Unconfined Compressive Strength (tsf)	Failure Strain (%)	Dry Density (pcf)	Water Content (%)	Pocket Penetrometer (tsf)
B-1	S-1	1.0 - 2.5				13.4	2.0
	S-2	2.5 - 4.0				13.8	
	S-3	5.0 - 6.5				13.9	0.5
	S-4	7.5 - 9.0				21.4	
B-2	S-1	1.0 - 2.5				16.1	0.75
	S-2	2.5 - 4.0				20.5	2.25
	S-3	5.0 - 6.5				15.1	1.5
	S-4	7.5 - 8.4				22.3	
	S-5	10.0 - 10.8				26.0	0.0