THRASHER | ENGINEERING
ARCHITECTURE
FIELD SERVICES

HARRISON HILLS CITY SCHOOL DISTRICT
HARRISON COUNTY, OHIO
HARRISON HILLS CITY SCHOOL DISTRICT OUTDOOR CLASSROOM

ADDENDUM #1
November 9, 2022

THRASHER PROJECT #030-10454

TO WHOM IT MAY CONCERN:

A Mandatory Pre-Bid Conference was held on Tuesday, November 1, 2022, on the above-referenced project, a copy of the sign in sheet is included in this Addendum. The following are clarifications and responses to questions posed by contractors for the above reference project.

A. GENERAL

1. The Geotechnical Investigation Report is attached to this Addendum for reference.

B. SPECIFICATIONS

1. Updated Bid Opening Requirements are attached.
2. **ADD** Section 05400 Cold-Formed Metal Framing as attached to this Addendum.

C. DRAWINGS

1. Sheet C2.01, Site Description Notes, Note 9 Anticipated Start/End Dates, **REVISE** to read as follows; "9.1 December 2022/June 2023".
2. Sheet C2.02, **ADD** this sheet as attached to this Addendum.
3. Sheet S500, **OMIT** Detail 11/S500.
4. Sheet A2.01, Markerboard Legend, **REVISE** dimensions to read, 4'-0"T x 8'-0"W.

D. QUESTIONS AND RESPONSES

1. **QUESTION**
   The specs say "precast stone veneer" but not what type of stone. Please advise.

   RESPONSE
   The 047200 'Cast Stone Masonry' is a MasterSpec format and the name is mis-leading. There is no cast 'stone' on this project, it applies to the pre-cast concrete caps that top the masonry walls indicated on the drawings. There are 2) pre-cast concrete cap profiles indicated on Sheet A5.02.

2. **QUESTION**
   The BOD for the plank seating was noted on the plans with a manufacturer, but no spec was provided in the spec book. Would the attached manufacturer be acceptable for the bid?

RESPONSE
Yes. The Sturdisteel system is acceptable.

3. **QUESTION**
The plans indicate the visual marker boards (MB1) to be 3' x 6', however the specs call out for 4' x 8'. Which is correct?

RESPONSE
A3: 4' x 8' is correct. Clarification provided in this Addendum.

4. **QUESTION**
In the specs I didn't see the Ohio Code Drug Free Workplace Conformance Affidavit (BOR-5 &6) or the Affidavit of Non-Collusion (BOR -7). Can you please provide me with these documents.

RESPONSE
BOR Documents have been updated in this Addendum.

E. CLARIFICATIONS

None on this Addendum

F. ESTIMATE

The approximate work to be bid upon is described as follows;

Outdoor Classroom areas with a Storage Building, covered Stage, and stepped Seating area, defined by a series of poured in place concrete retaining walls with masonry veneer, concrete sidewalks, pads, and ramps with handrails and guardrails. Project includes supplemental site lighting, power feeds, network system upgrades, video display and limited plumbing work.

The Engineer's opinion of probable construction cost is: $1,411,714.

.If you have any questions or comments, please feel free to contact me at your earliest convenience. As a reminder, bids will be received until 1:30 p.m. on Tuesday, November 22, 2022, at Harrison Hills City School District, 100 Huskies Way, Cadiz, OH. Good luck to everyone and thank you for your interest in the project.

Sincerely,

THE THRASHER GROUP, INC.

MARCUS CARNEGIE, PLA
Project Manager

STATE OF OHIO
MATTHEW S. BREAKEY
1616710
REGISTERED ARCHITECTS
11/9/2022

HARRISON HILLS CITY SCHOOL DISTRICT
HARRISON COUNTY, OHIO
HARRISON HILLS CITY SCHOOL DISTRICT-OUTDOOR CLASSROOM

MANDATORY PRE-BID CONFERENCE
Tuesday, November 1, 2022

Thrasher Project #030-10454

Name	Representing	Phone #	Email Address
Bryan Hyndman	Cattrell	740 317-7211	bhyndman@cattrell.com
T.J. Tharp	& Build	740-359-3200	TJTHARP@AND-BUILD.com
Walt Byron	Border Patrol	740-317-3353	waterworksconstruction1@gmail.com
James McKeegan	Grae-Con	740-282-6830	jmckeegan@graecon.com
Thomas Cutlip	South East Security	330-233-1373	TCutlip@SouthEastsecurity.com
John McCart	McCart Construction	740-381-4340	mccartconst@gmail.com
Thomas Del	& Build	216-372-9954	TDEL@AND-BUILD.com

**HARRISON HILLS CITY SCHOOL DISTRICT OUTDOOR CLASSROOM
FOR THE
HARRISON HILLS CITY SCHOOL DISTRICT
HARRISON, OHIO**

THRASHER PROJECT # 030-10454

A two-envelope system will be used. Envelope No. 1 will be opened first and the Bid Opening Requirement items checked for compliance, as outlined on this page. If such documents are found to be in order, sealed Envelope No. 2 "Bid Proposal", which shall also be placed inside of Envelope #1, will then be opened and will be publicly read aloud. If the documents required to be contained in Envelope No. 1 are not in order, Envelope No. 2 "Bid Proposal" will not be opened and the Bid will be considered non-responsive and will be returned to the Bidder. At that time, the Owner will declare the Bidder non-responsive. The lowest responsive, responsible Bidder shall be the Bidder who has completed all of the requirements of the "Bid Opening Requirements" and has the lowest total bid.

Item		**Completed Satisfactory (Check if completed)**
1.	Bid submitted on time…………………………………………………	☐
2.	Bid Bond (BOR 2-3) …………………………………….….…….	☐
3.	Certification of receipt of all addenda to Plans and Specifications. (BOR-4)…………………………………………………………………	☐
4.	Equal Opportunity Employment Form (BOR-5) ………………………..	☐
5.	Non-Collusion Affidavit (BOR-6)……………………………………….	☐
6.	Bidder's Affidavit: Foreign Corporation (BOR-7)………………………	☐
7.	Proof of Coverage under Ohio Workman's Compensation (BOR-8)…..	☐
8.	Proof of Drug-Free Workplace Program (BOR-9)……………………..	☐
9.	Certification Regarding Debarment, Suspension & other Responsibility Matters (BOR-10)………………………………………..	☐
10.	Certification of Nonsegregated Facilities (Over $100,000) (BOR 11-13)	☐
11.	Certification of Eligibility (BOR 14)…………………………………….	☐

PROPOSED
HARRISON HILLS CITY SCHOOL DISTRICT OUTDOOR CLASSROOM

FOR THE

HARRISON HILLS CITY SCHOOL DISTRICT
HARRISON COUNTY, OHIO

Certification of Receipt of Addenda

In submitting this Bid, Bidder represents, as more fully set forth in the Agreement, that:

(a) Bidder certifies that they understand completely and have all questions answered concerning the bidding and contract award procedures for the above project and
(b) Bidder has examined copies of all the Contract Documents and the following addenda:

Date	**Number**

Signature Date

Name and Title of Signer
(Please Type)

To Be Submitted in Envelope No. 1

Equal Opportunity Employment
Assurance of Compliance

_________________________(Hereinafter called "Bidder") Hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.S. 88-352) to the end that in accordance with Title VI of that Act and the regulation, no person in the United States shall, on the ground of race, color, creed or national origin be excluded from employment by the Bidder and hereby gives assurance that it will immediately take any measure to effectuate this agreement.

This assurance is given in consideration of and for the purpose of complying with the Equal Opportunity Employment section in the Instructions to Bidders and to generally qualify the Bidder for award of the contract. The Bidder recognizes and agrees that such contracts or purchase agreement will be extended in reliance on the representations and agreements made in this assurance, and that Morgan County shall reserve the right to seek judicial enforcement of this assurance. This assurance is binding on the Bidder, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign this assurance on behalf of the Bidder.

________________ ________________________________

Date Signature

____

Title

____

Firm

HARRISON HILLS CITY SCHOOL DISTRICT OUTDOOR CLASSROOM

AFFIDAVIT OF NON-COLLUSION

THIS AFFIDAVIT IS TO BE FILLED OUT AND EXECUTED BY THE BIDDER:
IF THE BID IS MADE BY A CORPORATION, THEN BY ITS
PROPERLY AUTHORIZED AGENT

State of Ohio, County of _______________:

____
(Name of Authorized Individual Making Bid)

residing at ____, being duly

sworn does depose and say that ____
(Give Name of Bidder or Bidders)

____
(Business Address)
____, and,

____
(Give Names and Addresses of All Other Persons, Firms or Corporations Interested in the Bid.)

_____________________________________ is or are the only person or persons interested with sharing in the profits of the herein contained Bid; that the said Bid is made without any connection or interest in the profits thereof with any other persons making any bid or proposal for said work; that said bid is on our part, in all respects fair and without collusion or fraud; and also that no member of, head of any department or Bureau, or employee therein, or any Officer of Harrison Hills City School District is directly or indirectly interested therein.

____
(Signature of Authorized Individual Making Bid)

Subscribed and sworn to this ________________ day of _____________________, 20_____,

before ____
(Notary Public)

Bidder's Affidavit: Foreign Corporation

The undersigned certifies that ___________________________________ is a foreign corporation incorporated in the State of ___________________, with a principal place of business located at ____ and is required to obtain authorization to conduct business in the State of Ohio.

The undersigned bidder further certifies that said authorization has been obtained and is in effect and the bidder has a designated statutory agent upon whom process against bidder corporation may be served within the State of Ohio. The designated statutory agent is:

____
Name

____.
Address

Process served upon the designated statutory agent named above shall be effective service, unless the Owner has been informed, by certified mail or its equivalent (return receipt), of a change in the agent upon whom process can be served.

Corporations not incorporated in the State of Ohio are considered a foreign corporation.

____
Date

____
Signed

____
Title

PROPOSED
HARRISON HILLS CITY SCHOOL DISTRICT OUTDOOR CLASSROOM

FOR THE
HARRISON HILLS CITY SCHOOL DISTRICT
HARRISON COUNTY, OHIO

PLEASE PROVIDE YOUR PROOF OF COVERAGE UNDER OHIO WORKMAN'S COMPENSATION TO FULFILL BOR-8 REQUIREMENT.

PROPOSED
HARRISON HILLS CITY SCHOOL DISTRICT OUTDOOR CLASSROOM

FOR THE
HARRISON HILLS CITY SCHOOL DISTRICT
HARRISON COUNTY, OHIO

PLEASE PROVIDE YOUR PROOF OF DRUG-FREE WORKPLACE PROGRAM TO FULFILL BOR-9 REQUIREMENT.

CONTRACTOR'S CERTIFICATION OF ELIGIBILITY

The bidder/offeror certifies, by submission of this proposal or acceptance of this contract, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. It further agrees by submitting this proposal that it will include this clause without modification in all lower tier transactions, solicitations, proposals, contracts, and subcontracts. Where the bidder/offer/contractor or any lower tier participant is unable to certify to this statement, it shall attach an explanation to this solicitation/proposal.

That, the information above is true and complete to the best of my knowledge.

____

Name and Title (Please Print)

Signature ____________________________ Date ____________________

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing framing.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

   1. Cold-formed steel framing materials.
   2. Exterior non-load-bearing framing.
   3. Power-actuated anchors.

B. Shop Drawings:

   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product certificates.

C. Product test reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers; Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. Clark/Diedrich Metal Framing

2. SCAFCO Steel Stud Company
3. Steel Construction Systems
4. Architect approved equivalent.

2.2 PERFORMANCE REQUIREMENTS

A. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:
   1. Headers: AISI S212.
   2. Lateral Design: AISI S213.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

   1. Grade: As required by structural performance.
   2. Coating: G60.

B. Steel Sheet for Vertical Deflection Clips: ASTM A653, structural steel, zinc coated, of grade and coating as follows:

   1. Grade: As required by structural performance.
   2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Anchor Bolts: ASTM F1554, Grade 55, threaded carbon-steel hex-headed bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A153/A153M, Class C.

C. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A780/A780M or SSPC-Paint 20.

B. Cement Grout: Portland cement, ASTM C150/C150M, Type I; and clean, natural sand, ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.2 INSTALLATION OF EXTERIOR NON-LOAD-BEARING FRAMING

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure.

B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:

1. Stud Spacing: 16 inches, and as required for wind loads indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.

E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.3 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 REPAIRS

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner may engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

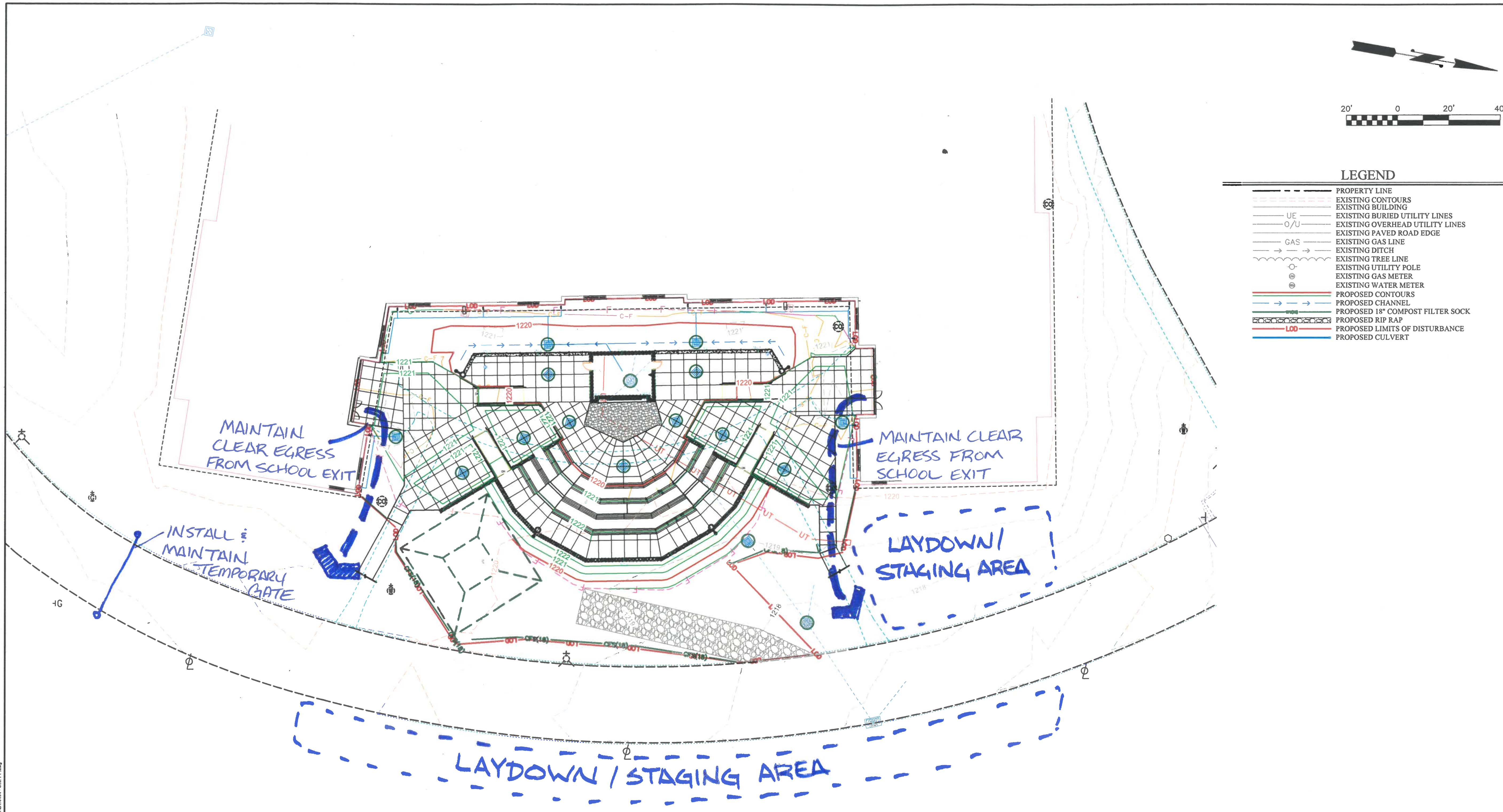
C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 054000

This page is intentionally blank.



LEGEND

- PROPERTY LINE
- EXISTING CONTOURS
- EXISTING BUILDING
- EXISTING BURIED UTILITY LINES
- EXISTING OVERHEAD UTILITY LINES
- EXISTING PAVED ROAD EDGE
- EXISTING GAS LINE
- EXISTING DITCH
- EXISTING TREE LINE
- EXISTING UTILITY POLE
- EXISTING GAS METER
- EXISTING WATER METER
- PROPOSED CONTOURS
- PROPOSED CHANNEL
- PROPOSED 18" COMPOST FILTER SOCK
- PROPOSED RIP RAP
- PROPOSED LIMITS OF DISTURBANCE
- PROPOSED CULVERT

THRASHER
600 WHITE OAKS BLVD.
P.O. BOX 940
BRIDGEPORT, WV 26330

P (304) 624-4108
F (304) 624-7831

www.thethrashergroup.com

NO.	BY	DATE	DESCRIPTION

HARRISON HILLS CITY SCHOOL DISTRICT - OUTDOOR CLASSROOM

HARRISON HILLS CITY SCHOOL DISTRICT

CADIZ, OHIO

OCTOBER 2022

CONSTRUCTION DOCUMENTS

DRAWN: CK DATE: 10/11/22
CHECKED: MIC DATE: 10/12/22
APPROVED: MIC DATE: 10/13/22

PROJECT No. 030-10454

SITE ACCESS PLAN

SHEET No.

C2.02

Resource International, Inc.

HARRISON CENTRAL JR./SR. HIGH SCHOOL OUTDOOR CLASSROOM
CADIZ, OHIO

GEOTECHNICAL INVESTIGATION REPORT

Prepared For:
The Thrasher Group, Inc.
600 White Oaks Blvd
Bridgeport, WV 26330

Prepared By:
Resource International, Inc.
6350 Presidential Gateway
Columbus, OH 43231

Rii Project No. W-22-057

July 2022

Planning, Engineering, Construction Management, Technology
6350 Presidential Gateway, Columbus, Ohio 43231
P 614.823.4949

RESOURCE INTERNATIONAL, INC.
6350 Presidential Gateway
Columbus, Ohio 43231
Ph: 614.823.4949

Planning

Engineering

Construction Management

Technology

July 7, 2022

Mr. Marcus Carnegie, PLA
Project Manager
The Thrasher Group, Inc.
600 White Oaks Blvd
Bridgeport, WV 26330

Re: Geotechnical Investigation Report
Harrison Central Jr./Sr. High School Outdoor Classroom
Cadiz, Ohio
Rii Project No. W-22-057

Mr. Carnegie:

Resource International, Inc. (Rii) is pleased to submit this geotechnical investigation report for the above-referenced project. Engineering logs have been prepared and are attached to this report along with field and laboratory test results. This report includes recommendations for the design and construction of the proposed Outdoor Classroom for the Harrison Central Jr./Sr. High School located in Cadiz, Ohio.

We sincerely appreciate the opportunity to be of service to you on this project. If you have any questions concerning the geotechnical investigation or this report, do not hesitate to contact us.

Sincerely,

RESOURCE INTERNATIONAL, INC.

Johnnatan Garcia-Ruiz
Staff Engineer

Daniel Karch, P.E.
Project Manager– Geotechnical Services

Enclosure: Geotechnical Investigation Report

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION

This report is a presentation of the geotechnical investigation performed for the design and construction of the outdoor classroom for the Harrison Central Jr./Sr. High School located in Cadiz, Ohio. The site of the proposed new spaces is within the existing grounds and sidewalks located on the east side of the existing school (east-wing). A vicinity map depicting the location of the site is provided on the boring plan in Appendix I.

Based on the project information provided, it is understood that the development will include a covered stage area with an annexed storage room, two outdoor classrooms, and a fixed, amphitheater style, seating area.

1.1 Existing Site Conditions

The proposed site is located within Harrison Central High School property, off Liggett Ln, less than a mile to the west of Cadiz in Harrison County, Ohio. The surface topography of the area is characterized by flat areas with low relief, having an average surface elevation around 1200 feet mean sea level (msl). Based on a separate Environmental Site Assessment report of the area prepared by Resource International, Inc. (Rii), it is understood that the proposed area was previously a surface mining operation as early as 1960 with continual operations until mid-1990s. Regionally, the area slopes to the east and north toward Mill Run Creek.

1.2 Site Geology

Physiographically, the site lies within the unglaciated portion of Ohio, within the Appalachian Plateaus Province, and within the Little Switzerland Plateau district. This district contains a topography that is highly dissected with high-relief, with mostly fine-grained rocks, including red shales and red soils that are prone to landslides. The soil encountered at the project site consists of undocumented fill classified to be spoils from the previously mining operations.

Based on the Bedrock Topography and Geology Maps, obtained from the Ohio Department of Natural Resources (ODNR), the underlying bedrock at the sites consist of two formations, the Monongahela Group and the Conemaugh Group. Both of these units are of Upper Pennsylvanian-age and are characterized by lithologies that commonly intertongue and intergrade and change rapidly both vertically and horizontally in rock types. The Monongahela Group, which is the younger unit of the two, is comprised of interbedded shale, siltstone, sandstone, mudstone, limestone (non-marine), and coal and can be as thick as 350+ feet. The Conemaugh Group is comprised of interbedded shale, siltstone, sandstone, mudstone and lesser amounts of limestone and coal and can be as thick as 350 to 490 feet. The mudstones in both units are subject to severe surface weathering. Red shales and red soils are common and prone to landslides, especially where bedrock is exposed.

The top of bedrock in the project vicinity generally follows the rolling site terrain, generally with thin overburden soil on hilltops and slopes and deeper soils in valley bottoms. All of the borings contained various types of rock fragments throughout. One of the borings, B-1, encountered bedrock at a depth of 42.0 feet below the ground surface, and the bedrock was cored. Three of the deeper borings, B-2, B-3 and B-5, encountered auger refusal at depths between 23.2 and 40.0 feet below the ground surface. The bedrock surface can be weathered, and thus irregular, with surficial rock being softer and augerable, which produces pulverized rock fragments and soil making the exact bedrock surface difficult to determine without coring of the rock throughout the project site.

2.0 SUBSURFACE INVESTIGATION

Between May 25 and 26, 2022, a total of six (6) soil borings were performed for the proposed outdoor classroom, extended to depths ranging from 15.0 to 47.0 feet below the existing ground surface. The borings were performed at the locations illustrated on the boring plan provided in Appendix I. During the field reconnaissance, Rii personnel documented the existing site conditions and mapped the boring locations. Rii utilized a handheld GPS unit to obtain northing and easting coordinates at the boring locations. Approximate ground surface elevations at the boring locations were determined using topographic information from the basemap provided by the Thrasher Group. A summary of the boring locations and ground surface elevations is illustrated in Table 1.

Table 1. Boring program

Boring Number	Structure Reference	Northing	Easting	Ground Elevation [1] (feet msl)	Boring Depth (feet)
B-1	Stage Roof / Stage Mat	220790.482	2389172.215	1220.3	47.0
B-2		220818.462	2389167.823	1220.4	33.4
B-3	Storage Building	220798.727	2389143.321	1220.3	40.0
B-4	Fixed Seating Area	220759.609	2389198.988	1220.7	20.0
B-5		220814.294	2389221.769	1219.5	23.5
B-6		220857.334	2389182.225	1220.3	15.0

1. Ground surface elevations at boring locations were determined using topographic information provided by The Thrasher Group.

The borings were drilled with an ATV-mounted (CME-750X) rotary drilling machine utilizing a 3.25-inch inside diameter hollow stem auger and a 4.5-inch outside diameter continuous flight auger to advance the holes. Standard penetration test (SPT) and split spoon sampling was performed at 2.5-foot increments to depths of 15.0 feet in borings B-1 and B-2, and to depths of 10.0 feet in the remaining borings. Split spoon sampling then continued at 5.0-foot increments thereafter to the boring termination depths. The SPT, per the American Society for Testing and Materials (ASTM) designation D1586, is conducted using a 140-pound hammer free falling 30 inches to drive a 2.0-inch outside diameter split spoon sampler 18 inches. Rii utilized a calibrated automatic drop hammer to generate consistent energy transfer to the sampler. Driving resistance is recorded on the boring logs in terms of blows per 6.0-inch interval of the driving distance. The second and third intervals are added to obtain the number of blows per foot (N). SPT blow counts aid in estimating soil characteristics used to calculate bearing capacities and settlement potential. Measured blow count (N_m) values are corrected to an equivalent (60 percent) energy ratio, N_{60}, by the following equation. Both values are represented on boring logs presented in Appendix III.

$$N_{60} = N_m*(ER/60)$$

Where:
N_m = measured N value
ER = drill rod energy ratio, expressed as a percent, for the system used

The hammer for the CME-750X ATV-mounted drill used for this project was calibrated on March 31, 2022 and has a drill rod energy ratio of 84.2 percent.

For instances of no recovery from standard SS interval, a 2.5-inch O.D. split spoon is driven the full length of the standard SS interval plus an additional 6.0 inches to obtain a representative sample. Only the final 6.0 inches of sample is retained. Blow counts from 2S sampling are not correlated with N_{60} values.

Hand penetrometer readings, which provide a rough estimate of the unconfined compressive strength of the soil, were reported on the boring logs in units of tons per square foot (tsf) and were utilized to classify the consistency of the cohesive soil in each layer. An indirect estimate of the unconfined compressive strength of the cohesive split spoon samples can be made from a correlation with the blow counts (N_{60}). Please note that split spoon samples are considered to be disturbed and the laboratory determination of their shear strengths may vary from undisturbed conditions.

The depth to bedrock was determined by split sampler refusal. Split sampler refusal is defined as exceeding 50 blows with less than 6.0 inches of penetration by the split spoon sampler. Where the borings required rock core samples, an NQ2-sized double-tube diamond bit core barrel (utilizing wire line equipment) was used to core the bedrock. Coring produced a 2.0-inch diameter core from which the type of rock and its geological characteristics were determined.

The rock cores obtained from the boring B-1 were logged in the field and visually classified Rii's laboratory. The retrieved core was analyzed to identify the type of rock, color, mineral content, bedding planes and other geological and mechanical features of interest in this project. The Rock Quality Designation (RQD) for each rock core run was calculated according to the following equation:

$$RQD = \frac{\sum \text{segments equal to or longer than 4.0 inches}}{\text{core run length}} \times 100$$

The RQD value aids in estimating the general quality of the rock and is used in conjunction with other parameters to designate the quality of the rock mass. Additionally, an unconfined compressive strength test was conducted on the rock core obtained from boring B-1.

Upon completion of drilling, the borings were backfilled with the soil cuttings generated during the drilling process.

During drilling, field personnel prepared field logs showing the encountered subsurface conditions. Soil samples obtained from the drilling operation were preserved in sealed glass jars and delivered to the soil laboratory. In the laboratory, the soil samples were visually classified and select soil samples were tested as noted in Table 2.

Table 2. Laboratory Test Schedule

Laboratory Test	Test Designation	Number of Tests Performed
Natural Moisture Content	ASTM D2216	12
Plastic and Liquid Limits	ASTM D4318	4
Gradation – Hydrometer	ASTM D422	4
Unconfined Compression (Rock)	ASTM D2938	1

These tests are necessary to classify the soil and rock based on the Unified Soil Classification System (USCS) in accordance with ASTM D2487. The results are also used to estimate engineering properties needed to provide foundation design recommendations and soil and rock related construction considerations. Results of the laboratory testing are presented in Appendix IV and, in part, on the boring logs in Appendix III. A description of the soil terms used throughout this report is presented in Appendix II.

3.0 SUBSURFACE PROFILE

Interpreted engineering logs have been prepared based on the field logs, visual classification of samples and laboratory test results. Classification of the borings follows the current USCS specifications. The following is a summary of what was found in the test borings and what is represented on the boring logs.

3.1 Surface Materials

All borings were performed within the proposed outdoor classroom area and encountered between 4.0 to 6.0 inches of topsoil at the existing ground surface.

3.2 Subsurface Soils

Below the surficial material, existing fill material consisting of both cohesive and granular soils were encountered in the borings to the termination depths, ranging from 15.0 feet to 42.0 below existing ground surface. The existing fill materials were described as gray to brownish gray and brown sandy lean clay and sandy lean clay with gravel (USCS CL), and gray to dark gray and brownish gray, poorly graded gravel, silty gravel with sand, and silty sand with gravel (USCS GP, GM, SM). The fill contained limestone, shale, sandstone and coal fragments throughout the depth of the borings.

Given the history of the area, and this site in particular, the existing fill can be attributed to spoils from mining operations. Based on the uncontrolled nature of the fill, the following shear strength consistencies and relative densities may not be as reliable when compared to those of natural soils. Nevertheless, the reported field readings serve as an estimate of both consistency and relative density.

The shear strength and consistency of the cohesive fill materials are primarily derived from the hand penetrometer values (HP). The cohesive fill materials encountered ranged from very stiff ($2.0 < HP \leq 4.0$ tsf) to hard ($HP > 4.0$ tsf). The unconfined compressive strength of the cohesive fill materials samples tested, as estimated from the hand penetrometer, ranged from 2.25 to 4.5 tsf (limit of the instrument). The relative density of granular fill material is primarily derived from SPT blow count (N_{60}). Based on the SPT blow counts obtained, the granular fill materials encountered ranged from medium dense ($10 < N_{60} < 30$ blows per foot [bpf]) to very dense ($N_{60} > 50$ bpf). Blow counts recorded from the SPT sampling ranged from 25 bpf to split spoon refusal (higher than 50 bpf). Split spoon refusal is defined as exceeding 50 blows with less than 6.0 inches of penetration by the split spoon sampler.

It must be noted that higher blow counts corresponding to very dense granular soils were encountered at depths where limestone fragments cobbles or split spoon sampler refusal were encountered. The split spoon sampler upon encountering cobbles generally registers a higher blow count which is considered an anomaly and not representative of the actual shear strength of the soils.

Natural moisture contents of the fill material samples tested ranged from 7 to 23 percent. The natural moisture contents of the fill material samples tested for plasticity index ranged from 4 percent below to 2 percent below their corresponding plastic limits. In general, the fill materials exhibited natural moisture contents estimated in the range of slightly below optimum moisture levels.

3.3 Bedrock

In boring B-1, limestone was encountered at a depth of 42.0 feet (Elev. 1178.3 feet msl) below existing ground surface and extended to boring termination depth of 47.0 feet below ground surface. One (1) rock core (RC-1) was obtained from boring B-1. Based on the unconfined compressive strength performed on the intact rock core from boring B-1, the compressive strength of the limestone sample encountered was 4,582 psi. Additionally, the presence of limestone and shale fragments were observed at various depths within the soils in all the borings.

3.4 Groundwater

Seepage was encountered initially in boring B-1 at the depth of 35.5 feet beneath existing ground surface. The remaining borings were dry, meaning no appreciable amount of moisture was observed in the boreholes.

Please note that short-term water level readings are not necessarily an accurate indication of the actual groundwater level. In addition, groundwater levels or the presence of groundwater are considered to be dependent seasonal fluctuations in precipitation. A more comprehensive description of the subsurface conditions encountered during the drilling program can be found on the boring logs in Appendix III.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Data obtained from the drilling and testing program have been used to determine foundation support capabilities and the settlement potential for the soils and/or fill materials encountered at the site. These parameters have been used to provide guidelines for the design of the structure foundation systems, as well as the construction specifications related to the placement of foundation systems and general earthwork recommendations, which are discussed in the following paragraphs. Allowable bearing capacity considers the gross loading, which includes weight of foundation concrete for elements placed below the existing ground and the loading from the superstructures.

Based on information provided by The Thrasher Group, it is understood that the project will include a “canopy style” covered stage area, with an annexed storage room and two outdoor classrooms that will be constructed adjacent to the east side of the existing school building. It is understood that the proposed grade for the stage, storage room and outdoor classrooms is planned to be about 2.0 feet below existing ground surface. The project will also include a fixed seating area to be constructed to the east of the proposed stage and classrooms. It is also understood that the soil material from the stage, storage room, and outdoor classrooms area is intended to be used as a fill material to raise the grade of the fixed seating area, which is planned to be amphitheater style. Specific structural loading information was not available at the time of this report.

4.1 Stage and Storage Room – Foundation Recommendations

It is understood that the stage area (with exception of the stage roof) is planned to be constructed on a mat foundation. Additionally, it is understood that the storage room and the outdoor classrooms, delimited by a proposed low height sitting wall, are considered to be on slabs-on-grade with shallow foundations. It is understood also that the stage roof will be subjected to considerable wind loads, and therefore, a deep foundation system is preferred.

Due to the uncontrolled nature of the fill material encountered within the entire project area, attributed to spoils from mining operations, and the risk of differential settlement – which is difficult to quantify in an uncontrolled fill – this material is not considered suitable for support of a shallow foundation. To eliminate this risk, Rii typically recommends that the existing fill either be completely over excavated to expose underlying suitable natural soils or that a deep foundation system such as drilled shafts be installed. However, if the mass over excavation or deep foundation options are considered cost-prohibitive, then consideration may be given to partial over excavation and replacement of the undocumented fill soils; however, this option does NOT eliminate the risk of differential settlement, and this risk must be accepted by the owner. Consideration can also be given to the use of ground improvement techniques such as aggregate piers or stone columns as described in Section 4.3. Recommendations for the foundation of the proposed stage area, stage roof, storage room, and sitting wall delimiting the outdoor classroom are described in detail in the following subsections.

4.1.1 Stage Floor and Storage Room Shallow Foundation

Based on the subsurface soils encountered in borings B-1 through B-3 at the anticipated bearing elevation for conventional shallow foundations for the storage room and the sitting wall surrounding the outdoor classrooms, were found to consist predominantly of existing fill, described as sandy lean clay with gravel and sandy lean clay (USCS CL), and contained limestone, shale, and coal fragments.

As discussed, in order to support the proposed structures on a conventional shallow foundation system, consideration should be given to complete over excavation of the existing fill encountered at this site. However, given the depth of undocumented fill throughout the project area, complete over excavation of the existing fill may not be feasible or may be cost-prohibitive. Therefore, partial over excavation of a minimum of 3.0 feet below the bottom of the footings for the storage room and the sitting walls are recommended (i.e. about 8.0 feet below the existing ground surface). Similarly, considerations to partial over excavation of about 3 feet below the bottom of the turned down footings of the mat foundation may be considered. At this level, for the mat foundation, it is recommended to place geogrid followed by 18.0 inches of Item 304 stone.

The depth of any necessary over excavation must be verified in the field by the geotechnical engineer or representative thereof. The partial over excavation option would minimize, but NOT eliminate, the risk of future settlement since foundations supported on existing fill always poses a risk that the owner must be willing to accept.

Once any necessary over excavation has been completed, the bearing strata should be carefully inspected as soon as possible to assure adequacy. Inadequate bearing soil (soft/loose/organic), if encountered, should be over excavated to expose the underlying competent soils. The over excavations may then be backfilled with either compacted engineered fill in accordance with Section 4.6. If engineered fill is used, the over excavations should extend down and out from the bottom of the proposed foundation edge at a 45-degree plane to remove this material from within the zone of influence of the structure. Due to the nature of the fill material, attributed to spoils from mining operations, the engineered fill should be placed as soon as possible following the excavation to avoid potential water related damage. Consideration should be given to conducting testing for the expansion potential of the mine spoil, which was beyond the scope of this investigation.

Based upon an evaluation of the subsurface conditions encountered on the site, it is recommended that <u>for the storage room and sitting wall surrounding the outdoor classrooms</u>, conventional continuous shallow foundations bearing on engineered fill material be proportioned for a **maximum allowable bearing capacity of 3.0 ksf**.

In addition, it is recommended that <u>for the stage area</u> (which should be independent of the stage roof), a mat foundation with turned down footings bearing on the aforementioned engineered fill with geogrid system be proportioned for a **maximum modulus of subgrade reaction, K, of 15.0 pci**.

Foundations designed in accordance with the above-noted recommendations should experience a maximum total settlement of approximately 1.0 inch and differential settlements of less than 0.5 inch. It should again be noted that exact settlement values are not possible to accurately determine for undocumented fill bearing soils.

In order to protect against frost, exterior footings (and interior footings to be subjected to freeze-thaw effects during construction) should be placed at a minimum frost depth of 36.0 inches below the adjacent exterior grade, or in accordance with local codes. Interior footings, in heated areas not subject to freeze-thaw effects, should be placed at a minimum depth of 24.0 inches below the floor slab. A minimum width of 24.0 inches for continuous and 36.0 inches for spread footings is recommended.

Footing concrete should be placed as soon as possible following footing excavation, preferably the same day, to avoid potential water related damage. Footings should be kept dry and clean until footing concrete is placed in order to minimize damage to the bearing surface.

4.1.2 Stage Roof – Deep Foundation

As previously mentioned, it is understood that the stage roof will be subjected uplift forces due to wind loads. Therefore, for the stage roof, a deep foundation system such as drilled shafts, independent from the stage's mat foundation and the storage room, is recommended. Recommendations regarding the drilled shaft foundations are presented in the following subsections.

4.1.2.1 Drilled Shaft Foundations

Based on the subsurface investigation in borings B-1 and B-2, the soils encountered were found to consist of existing fill to the depth of bedrock and boring termination depth by auger refusal, respectively. The mine spoil fill materials in these two borings were generally described as sandy lean clay (USCS CL), poorly graded gravel, and silty gravel with sand, (USCS GP, GM) and contained limestone, shale, sandstone and coal fragments.

For the stage roof foundation, considering that uplifting forces produced by high winds are expected, Rii recommends that a deep foundation system consisting of drilled shafts be employed. Due to the nature of the uncontrolled nature of the fill materials encountered, it is recommended that drilled shaft foundations be socketed a minimum of 3 feet into bedrock, which in boring B-1 corresponds to an elevation of 1175.3 msl. **Drilled shafts extending to this elevation may be designed for a maximum allowable end bearing capacity of 13.0 ksf**. If additional capacity is required, an allowable downward side friction of 0.5 ksf may be used. For shafts extending to an elevation of 1175.3 ksf, an uplift capacity of 6.5 ksf in side friction for rock and 0.3 ksf in soil may be used. Side friction should be neglected in the upper 5.0 feet of the shaft, however.

The end bearing capacity presented is estimated using results of the rock testing conducted on the rock core taken at boring B-1. The drilled shaft capacities noted above were analyzed utilizing a factor of safety of 3.0. Drilled shaft lengths should measure a minimum of three (3) times the diameter. Drilled shafts should be designed in strict accordance with the current Ohio Building Code (OBC). Per the OBC the structural capacity of the shafts must be in compliance with the following guideline:

- Design load stresses in the concrete must not exceed 0.33 f'c.

For structure foundations supported on drilled shafts extended to the elevations noted above, total and differential settlements are estimated to be less than ½ inch if they are designed using the allowable bearing capacities provided.

4.1.2.2 Drilled Shaft Considerations

The minimum requirements for proper inspection of drilled shaft construction are as follows:

- A qualified inspector should record the material types being removed from the hole as excavation proceeds.
- When the bearing material has been encountered and identified and/or the design tip elevation has been reached, the shaft walls and base should be observed for anomalies, unexpected soft soil conditions, obstructions or caving.
- Concrete placed freefall should not be allowed to hit the sidewalls of the excavation or the rebar cage and should not pass through any water.
- Structural stability of the rebar cage should be maintained during the concrete pour to prevent buckling.
- The volume of concrete should be checked to ensure voids did not result during extraction of the casing (if utilized).
- The placement of all concrete for the drilled shafts shall follow the American Concrete Institute's Design and Construction of Drilled Piers (ACI 336.3R-93).
- If concrete is placed by tremie method, it must be done so with a rigid tremie pipe under adequate head pressure to displace water or slurry if groundwater has entered the caisson (all tremie procedures shall follow applicable ACI specifications).
- Pulling casing with insufficient concrete inside should be restricted.
- The bottom of drilled shaft excavation should be clean and free of loose material. Any loose material observed should be removed using a clean-out bucket (muck bucket).

Based on the nature and conditions of the fill materials encountered during drilling operation, attributed to spoils from mining operations that included the presence of granular materials, <u>Rii recommends the use of casing for drilled shafts, to maintained an open excavation,</u> especially below the groundwater table. In general, the use of casing is recommended under any of the following conditions:

- Caving material is encountered at any time during the drilling of the shaft.
- Groundwater is encountered at any time during the drilling of the shaft, or groundwater seepage occurs in the drilled shaft.

- Down hole inspection is planned (casing is required for this instance).

4.2 Seating Area (Amphitheater Style) – Embankment Settlement Evaluation

It is understood that the fixed seating to be constructed to the east of the proposed stage and classrooms, is planned to be a mounded area – amphitheater – style. It is also understood that the fill or "embankment" at its highest point is expected to have a height of approximately 10.0 feet above the existing ground surface and gradually step west to the proposed stage area grade elevation and east to the existing ground surface elevation.

As mentioned in previous sections, due to the uncontrolled nature of the fill material encountered within the entire project area, attributed to spoils from mining operations, it is difficult to quantified differential settlement. However, given the history of the area, and this site in particular, an estimated settlement evaluation was performed using the section information provided, in conjunction with the soil profile from boring B-4 through B-6.

It was assumed that the embankment will have a grade level length, extending east to west, of approximately 50 feet, with a 2H:1V front and back slopes. The estimated compressibility parameters utilized in the settlement analyses are provided in Table 3.

Table 3. Compressibility Parameters Utilized in Settlement Analysis

Material Type	γ (pcf)	LL (%)	C_c (1)	C_r (2)	e_o (3)	C_v (4) (ft^2/yr)	N_{60}	C' (5)
FILL: Very Stiff to Hard Sandy Lean Clay and Sandy Lean Clay with Gravel (ODOT A-4a)	115	39 to 43	0.261 to 0.297	0.039 to .045	0.577 to 0.608	75	N/A	N/A
FILL: Medium Dense to Very Dense Poorly Graded Gravel (ODOT A-1-a)	120	N/A	N/A	N/A	N/A	N/A	27	121

1. *Per Table 26 of FHWA GEC 5.*
2. *Estimated 15% of C_c per Section 5.4.2.5 of FHWA GEC 5.*
3. *Per Table 8-2 of Holtz and Kovacs (1981).*
4. *Per Figure 6-37, Section 6.14.2 of FHWA GEC 5.*
5. *Per Figure 10.6.2.4.2b-1 of 2020 AASHTO LRFD BDS.*

Results of the settlement analyses indicate total estimated settlements of up to 2.5 inches, and time rate of settlement indicates that less than 1.0 inch of settlement will be remaining after a period of 10 days following construction of the embankment.

4.3 Ground Improvement Stabilization Alternative

As an alternative to the considerable over excavations, deep foundations, and construction of mounded areas on generally uncontrolled fill of mine spoil material, the risk of differential settlement can also be minimized through the use of ground improvement techniques such as the inclusion of aggregate piers or stone columns, or if reinforced rigid inclusions.

The use of stone columns for ground improvement is a technique that consists of installing columns of crushed aggregate into the foundation soils within the footprint of the proposed structures, which is compacted into place either by tamping or by vibratory methods. The columns are typically spaced in a grid pattern at regular intervals within the footprint where the soil bearing capacity is to be improved. As the aggregate is placed and compacted, they typically displace the surrounding soil which exerts a confining pressure, improving the load bearing capacity and reducing settlement.

If vibration is to be used when installing the columns, it is imperative that instrumentation such as vibration monitoring, and/or settlement monitors be installed and monitored along the adjacent existing structure. The concern is that the vibrations could propagate horizontally to the existing structures, including any underground piping, and induce damage to the façade or the windows or cause settlement of the existing structure. Rii can assist with the specification of such instrumentation.

The use of a reinforced rigid inclusion can be reserved for the areas where structures are subjected to high wind or seismic loads. In other areas where uplifting forces are not of concern, rigid inclusion can still be used with no need for reinforcing elements. The reinforcing of the rigid inclusion could be done through the use of centralized steel rebars, steel fibers, or steel cage (if necessary and extreme loading is expected). The centralized reinforcement is connected to the structure footing using an embedded steel plate. This system might also include a load transfer platform between the footing and the rigid inclusion. This technique will not only improve the bearing capacity and help control the settlement of the existing ground but also the capacity to resist the uplifting (tensile loads) or lateral forces.

Please note that these stabilization options are proprietary, design-build solutions performed by specialty geotechnical contractors that may offer cost savings over the mass over excavation and deep foundation methods. Rii can provide contact information for the various specialty geotechnical contractors that perform such work if the owner is interested in pursuing this option.

4.4 Slab-on-Grade Recommendations

Floor slabs within the project area (storage room, outdoor classrooms, and around the stage area) may be placed on the newly placed controlled fill, or improved ground provided that the subgrade has been proof rolled and prepared in accordance with Section 4.6.

Floor slabs should be designed and constructed as “floating” slabs that are structurally independent of building foundations. Adequate expansion joints should be incorporated into the floor slabs near the foundations so that the floor slabs do not impose additional loads on the foundations. The expansion joints would also allow the foundations and floor slabs to settle independently of each other.

Provided that the slab-on-grade is prepared in accordance with Section 4.6, a **modulus of subgrade reaction, K, of 120 pounds per cubic inch (pci) should be used** in the design of concrete floor slabs at this site (i.e. storage room, outdoor classrooms, and around the stage area). The use of vapor barriers or capillary breaks is recommended for two reasons:

- The installation of sheet vapor barriers or capillary breaks retards moisture migration from the soil subgrade into the concrete floor slab, reducing the moisture content of the floor slab and subsequently reducing the possible problems with the adhesion of vinyl floor tile (if applicable).

- In areas where no vinyl tile will be installed, vapor barriers or granular capillary breaks will reduce the likelihood of differential shrinkage of the floor slabs that can cause floors to curl.

Therefore, per ACI specifications, it is recommended to place a 6-mil visqueen capillary break over a minimum of 6.0-inches fine aggregate below all concrete slabs.

The subgrade soils should be thoroughly proof rolled to identify any soft, wet, or weak zones prior to placement of subbase stone or concrete.

4.5 Seismic Site Classification

Based on the soil conditions at the site, as indicated by the test borings and estimated from local geological references, the seismic analysis and design procedures for the proposed structure should be based on **Site Class D** (stiff soil profile) per the current Ohio Building Code.

4.6 Construction Considerations

The site work shall conform to the local specifications. If local specifications are not available, the latest ODOT CMS should be implemented. Site preparation should begin with general clearing, including the complete removal of all topsoil, vegetation, debris, existing concrete, unsuitable existing fill materials (as determined by a geotechnical engineer or an experienced soil technician), or any otherwise unsuitable materials from within the footprint of the proposed structure.

Prior to placing engineered fill, and/or the slab-on-grade, the proposed subgrade surfaces should be thoroughly proofrolled with sufficient proofrolling apparatus (preferably a fully loaded tandem axle dump truck). A geotechnical engineer or an experienced soil technician should be present during proofrolling. Deflection, cracking or rutting of the subgrade surface during a proofroll indicates inadequate subgrade stability.

Areas of excess yielding should be stabilized using one of the following options: 1) scarifying, drying and recompacting, 2) mixing wet soil with dry soil, 3) undercutting unsuitable surficial soil and replacing it with controlled engineered fill, 4) modifying the soil by adding a chemical such as lime, cement or lime kiln dust, or 5) using a geogrid subgrade reinforcement system in conjunction with granular fill. Other methods of subgrade stabilization are available and certainly may be effective (both physically and economically) in stabilizing the soil. The adequacy of any stabilization method should be verified through the construction of a test section. All proposed subgrade surfaces should be shaped to promote positive drainage, with a minimum slope of 2 percent or 0.25 inches per foot. Adequate drainage is necessary for maintaining the stability of the subgrade. Care should be taken during final grading so that no areas of potential ponding or standing water remain at the subgrade surface.

After materials are excavated to design grade, proper control of subgrade and new fill compaction should be performed by the geotechnical engineer and/or his/her representative. Generally, materials utilized for engineered fill should free of waste construction debris and other deleterious materials and meet the following requirements:

• Maximum Dry Density per ASTM D698	> 110 pcf
• Liquid Limit	< 40
• Plasticity Index	< 15
• Organic Matter	< 3 percent
• Maximum Particle Size	< 3 inches
• Silt Content (between 0.075 and 0.005 mm)	< 45 percent

Compacted granular fill shall meet the above specification and additionally shall have a maximum 35 percent passing the No. 200 sieve.

Due to the uncontrolled nature of the fill material encountered within the entire project area, attributed to spoils from mining operations, the site's soils are generally not considered to be suitable for reuse as structural fill in their current condition. Rii recommends further laboratory testing as well as close monitoring by a representative of the geotechnical engineer during excavation and fill placement to determine suitability of the in-situ mine spoils for use as structural fill.

Underground utilities should be bedded in crushed granular stone, such as No. 57 or No. 8 stone, extending from 4.0 inches below the pipe to the springline of the pipe or 12.0 inches above the pipe for concrete and PVC pipe, respectively. The stone will serve as a leveling course and will provide a stable working platform. Compaction of backfill material within trench excavations located beneath any structure area should be performed at no less than 98 percent of Standard Proctor using granular backfill placed in lifts no thicker than 8.0 inches.

4.6.1 Excavation Considerations

All trenching and excavation procedures should follow applicable Occupational Safety and Health Administration (OSHA) standards, including adequate safety precautions conforming to OSHA standards for the personnel installing underground lines. During excavation, if slopes cannot be laid back to OSHA Standards due to adjacent structures or other obstructions, trench boxes or temporary sheeting or shoring may be required. Table 4 should be utilized as a general guide for implementing OSHA guidelines when estimating excavation back slopes at the various boring locations. Actual excavation back slopes must be field verified by qualified personnel at the time of excavation in strict accordance with OSHA guidelines.

Table 4. Excavation Back Slopes

Soil	Maximum Back Slope	Notes
ALL Uncontrolled Cohesive Fill Material	2.0 : 1.0	None

For the soil types encountered in the borings, the "in-situ" unit weight (γ), cohesion (c), effective angle of friction (φ'), and lateral earth pressure coefficients for at-rest conditions (k_o), active conditions (k_a), and passive conditions (k_p) have been estimated and are provided in Table 5 and Table 6.

Table 5. Estimated Undrained (Short-term) Soil Parameters for Design

Soil Type[1]	γ (pcf) [2]	c (psf)	φ'	k_a	k_o	k_p
ALL Uncontrolled Cohesive Fill Material	115	1,750	0°	N/A	N/A	N/A
ALL Uncontrolled Granular Fill Material	120	0	28°	0.36	0.53	2.77
Compacted Cohesive Engineered Fill	120	2,000	0°	N/A	N/A	N/A
Compacted Granular Engineered Fill	130	0	33°	0.30	0.46	3.39

1. *Due to the nature of the uncontrolled fill, conservative parameters were estimated for all the cohesive fill materials regardless of their consistency and for all the granular fill materials regardless of their relative density.*
2. *When below groundwater table, use effective unit weight, $\gamma' = \gamma$ - 62.4 pcf and add hydrostatic water pressure.*

Table 6. Estimated Drained (Long-term) Soil Parameters for Design

Soil Type	γ (pcf) [1]	c (psf)	φ'	k_a	k_o	k_p
ALL Uncontrolled Cohesive Soil	115	0	26°	0.39	0.56	2.56
ALL Uncontrolled Granular Soil	120	0	28°	0.36	0.53	2.77
Compacted Cohesive Engineered Fill	120	0	28°	0.36	0.53	2.77
Compacted Granular Engineered Fill	130	0	33°	0.30	0.46	3.39

1. *Due to the nature of the uncontrolled fill, conservative parameters were estimated for all the cohesive fill materials regardless of their consistency and for all the granular fill materials regardless of their relative density.*
2. *When below groundwater table, use effective unit weight, $\gamma' = \gamma$ - 62.4 pcf and add hydrostatic water pressure.*

These parameters are considered appropriate for the design of all subsurface structures and any excavation support systems. Subsurface structures (where the top of the structure is restrained from movement) should be designed based on at-rest (k_o) conditions. For proposed temporary retaining structures (where the top of the structure is allowed to move), earth pressure distributions should be based on active (k_a) and passive (k_p) conditions. The values in these tables have been estimated from correlation charts based on minimum standards specified for compacted engineered fill materials. These recommendations do not take into consideration the effect of any surcharge loading or a sloped ground surface (a flat surface is assumed). Earth pressures on excavation support systems will be dependent on the type of sheeting and method of bracing or anchorage.

4.6.2 Groundwater Considerations

Based on the groundwater observations made during and at the completion of drilling, groundwater may be encountered during construction of deep foundations, but is not anticipated during construction of shallow foundations and slab-on-grade elements. Where/if groundwater is encountered, proper groundwater control should be employed and maintained to prevent disturbance to excavation bottoms consisting of cohesive soil, and to prevent the possible development of a quick or "boiling" conditions where soft silts and/or fine sands are encountered. It is preferable that the groundwater level, if encountered, be maintained at least 36.0 inches below the deepest excavation. A proper dewatering system will be required to maintain a dry, workable condition within the excavations for the proposed waterline. Based on the soil conditions encountered at borings, Rii anticipates conventional sump and pump methods may be sufficient for groundwater control in local area.

5.0 LIMITATIONS OF STUDY

The above recommendations are predicated upon construction inspection by a qualified soil technician under the direct supervision of a professional geotechnical engineer. Adequate testing and inspection during construction are considered necessary to assure adequate construction of the structure foundations and slab subgrade.

Our recommendations for this project were developed utilizing soil information obtained from the test borings that were made at the proposed site. At this time we would like to point out that soil borings only depict the soil conditions at the specific locations and time at which they were made. The conditions at other locations on the site may differ from those occurring at the boring locations.

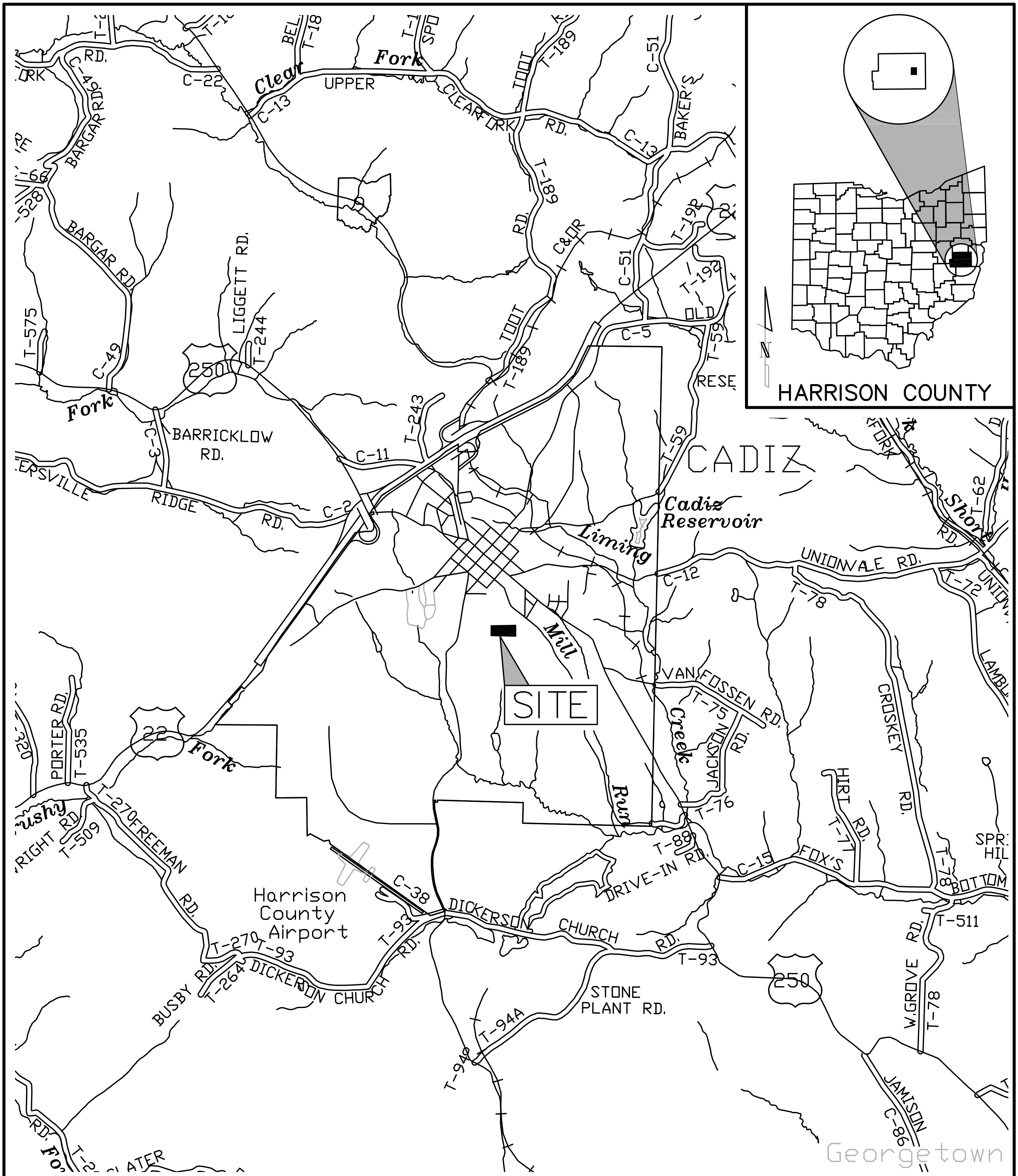
The conclusions and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the owner of the proposed project. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the geotechnical engineer.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test boring logs regarding odors, gases, staining of soils or other unusual conditions observed are strictly for the information of our client.

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. Resource International is not responsible for the conclusions, opinions or recommendations made by others based upon the data included.

Appendix I

VICINITY MAP AND BORING PLAN



VICINITY MAP

HARRISON CENTRAL JR./SR. HIGH SCHOOL OUTDOOR CLASSROOM

HARRISON, OHIO

RII PROJECT NO. W-22-057

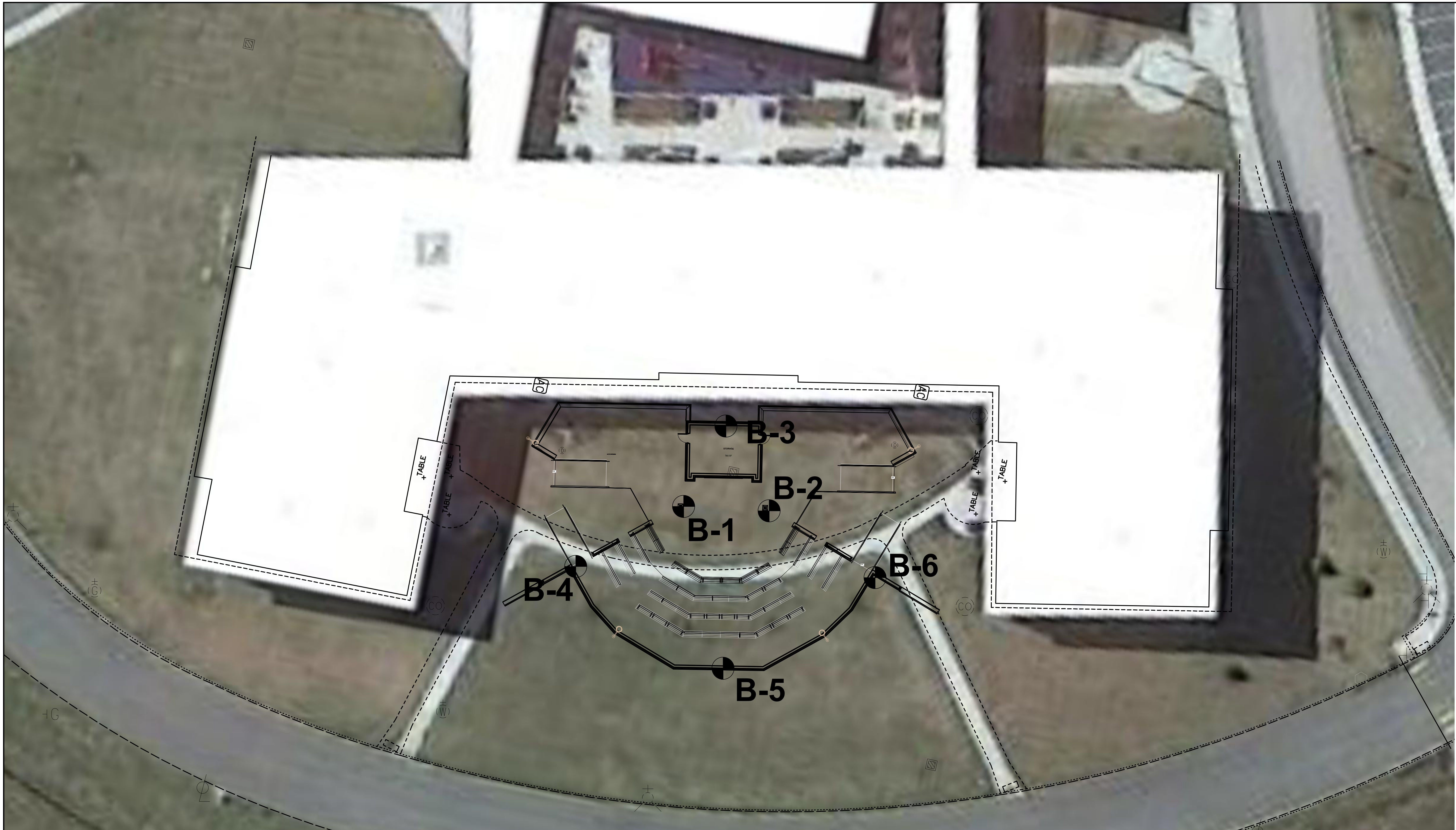
SCALE: 1"=5000'

0 2500 5000

DRAWN JAS

REVIEWED DEK

DATE 06-6-22



BORING PLAN
HARRISON CENTRAL HIGH SCHOOL OUTDOOR CLASSROOM
HARRISON COUNTY, OHIO

RII PROJECT NO. W-22-057		DRAWN JAS
SCALE: 1"=30' (0 15 30)	N	REVIEWED DEK
		DATE 06-6-22

RESOURCE INTERNATIONAL

Appendix II

DESCRIPTION OF SOIL TERMS

DESCRIPTION OF SOIL TERMS

The following terminology was used to describe soils throughout this report and is generally adapted from ASTM 2487/2488.

Granular Soils – USCS GW, GP, GM, GC, SW, SP, SM, SC, ML (non-plastic)
The relative compactness of granular soils is described as:

Description	Blows per foot – SPT (N_{60})		
Very Loose	Below		5
Loose	5	-	10
Medium Dense	11	-	30
Dense	31	-	50
Very Dense	Over		50

Cohesive Soils – USCS ML, CL, OL, MH, CH, OH, PT
The relative consistency of cohesive soils is described as:

Description	Unconfined Compression (tsf)		
Very Soft	Less than		0.25
Soft	0.25	-	0.5
Medium Stiff	0.5	-	1.0
Stiff	1.0	-	2.0
Very Stiff	2.0	-	4.0
Hard	Over		4.0

Gradation - The following size-related denominations are used to describe soils:

Soil Fraction		Size
Boulders		Larger than 12”
Cobbles		12” to 3”
Gravel	coarse	3” to ¾”
	fine	¾” to 4.75 mm (¾” to #4 Sieve)
Sand	coarse	4.75 mm to 2.0 mm (#4 to #10 Sieve)
	medium	2.0 mm to 0.42 mm (#10 to #40 Sieve)
	fine	0.42 mm to 0.074 mm (#40 to #200 Sieve)
Silt		0.074 mm to 0.005 mm (#200 to 0.005 mm)
Clay		Smaller than 0.005 mm

Modifiers of Components – The following modifiers indicate the range of percentages of the minor soil components:

Term	Range		
Trace	0%	-	10%
Little	10%	-	20%
Some	20%	-	35%
And	35%	-	50%

Moisture Table - The following moisture-related denominations are used to describe cohesive soils:

Term	Range
Dry	0% to 10%
Damp	>2% below Plastic Limit
Moist	2% below to 2% above Plastic Limit
Very Moist	>2% above Plastic Limit
Wet	≥ Liquid Limit

Organic Content – The following terms are used to describe organic soils:

Term	Organic Content (%)
Slightly organic	2-4
Moderately organic	4-10
Highly organic	>10

Bedrock – The following terms are used to describe bedrock hardness:

Term	Parameter
Very Weak	Can be carved with knife and scratched by fingernail.
Weak	Can be grooved or gouged with knife readily.
Slightly Strong	Can be grooved or gouged 0.05 in deep with knife.
Moderately Strong	Can be scratched with knife or pick.
Strong	Can be scratched with knife or pick with difficulty.
Very Strong	Cannot be scratched by knife or pick. Hard repeated blows of hammer to detach specimen.
Extremely Strong	Cannot be scratched by knife or pick. Hard repeated blows of hammer to chip hand specimen.

DESCRIPTION OF ROCK TERMS

The following terminology was used to describe the rock throughout this report and is generally adapted from ASTM D5878 and the ODOT Specifications for Geotechnical Explorations.

Weathering – Describes the degree of weathering of the rock mass:

Description	Field Parameter
Unweathered	No evidence of any chemical or mechanical alteration of the rock mass. Mineral crystals have a right appearance with no discoloration. Fractures show little or not staining on surfaces.
Slightly Weathered	Slight discoloration of the rock surface with minor alterations along discontinuities. Less than 10% of the rock volume presents alteration.
Moderately Weathered	Portions of the rock mass are discolored as evident by a dull appearance. Surfaces may have a pitted appearance with weathering "halos" evident. Isolated zones of varying rock strengths due to alteration may be present. 10 to 15% of the rock volume presents alterations.
Highly Weathered	Entire rock mass appears discolored and dull. Some pockets of slightly to moderately weathered rock may be present and some areas of severely weathered materials may be present.
Severely Weathered	Majority of the rock mass reduced to a soil-like state with relic rock structure discernable. Zones of more resistant rock may be present but the material can generally be molded and crumbled by hand pressures.

Strength of Bedrock – The following terms are used to describe the relative strength of bedrock:

Description	Field Parameter
Very Weak	Can be carved with knife and scratched by fingernail. Pieces 1 in. thick can be broken by finger pressure.
Weak	Can be grooved or gouged with knife readily. Small, thin pieces can be broken by finger pressure.
Slightly Strong	Can be grooved or gouged 0.05 in deep with knife. 1 in. size pieces from hard blows of geologist hammer.
Moderately Strong	Can be scratched with knife or pick. 1/4 in. size grooves or gouges from blows of geologist hammer.
Strong	Can be scratched with knife or pick with difficulty. Hard hammer blows to detach hand specimen.
Very Strong	Cannot be scratched by knife or pick. Hard repeated blows of geologist hammer to detach hand specimen.
Extremely Strong	Cannot be scratched by knife or pick. Hard repeated blows of geologist hammer to chip hand specimen.

Bedding Thickness – Description of bedding thickness as the average perpendicular distances between bedding surfaces:

Description	Thickness
Very Thick	Greater than 36 inches
Thick	18 to 36 inches
Medium	10 to 18 inches
Thin	2 to 10 inches
Very Thin	0.4 to 2 inches
Laminated	0.1 to 0.4 inches
Thinly Laminated	Less than 0.1 inches

Fracturing – Describes the degree and condition of fracturing (fault, joint, or shear):

Degree of Fracturing

Description	Spacing
Unfractured	Greater than 10 feet
Intact	3 to 10 feet
Slightly Fractured	1 to 3 feet
Moderately Fractured	

Aperture Width

Description	Width
Open	Greater than 0.2 inches
Narrow	0.05 to 0.2 inches
Tight	Less than 0.05 inches

Surface Roughness

Description	Criteria
Very Rough	Near vertical steps and ridges occur on surface
Slightly Rough	Asperities on the surfaces distinguishable
Slickensided	Surface has smooth, glassy finish, evidence of Striations

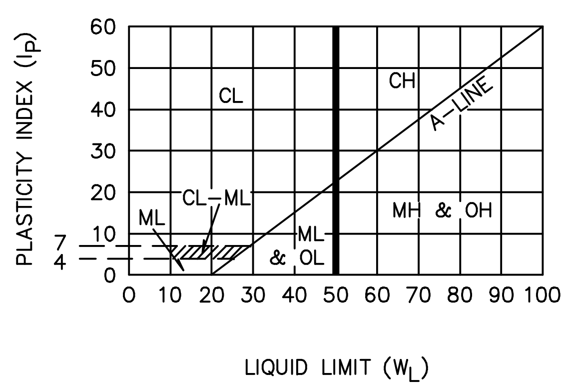
RQD – Rock Quality Designation (calculation shown in report) and Rock Quality (ODOT, GB 3, January 13, 2006):

RQD %	Rock Index Property Classification (based on RQD, not slake durability index)
0 – 25%	Very Poor
26 – 50%	Poor
51 – 70%	Fair
71 – 85%	Good
86 – 100%	Very Good

UNIFIED SOIL CLASSIFICATION SYSTEM
(ASTM D 2487)

MAJOR DIVISION			GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA	
COARSE–GRAINED SOILS MORE THAN 50% RETAINED ON 75µm (NO. 200) SIEVE	GRAVELS 50% OR MORE OF COARSE FRACTION RETAINED ON 4.75 mm (NO. 4) SIEVE	CLEAN GRAVELS	GW	WELL–GRADED GRAVELS AND GRAVEL–SAND MIXTURES, LITTLE OR NO FINES	CLASSIFICATION ON BASIS PERCENTAGE OF FINES LESS THAN 5% PASS 75 µm SIEVE: GW, GP, SW, SP MORE THAN 12% PASS 75 µm SIEVE: GM, GC, SM, SC 5% TO 12% PASS 75 µm SIEVE: BORDERLINE CLASSIFICATION REQUIRING USE OF DUAL SYMBOLS	$C_U = D_{60}/D_{10}$ GREATER THAN 4 $C_Z = \frac{(D_{30})^2}{D_{10} * D_{60}}$ BETWEEN 1 AND 3
			GP	POORLY GRADED GRAVELS AND GRAVEL–SAND MIXTURES, LITTLE OR NO FINES		NOT MEETING BOTH CRITERIA FOR GW
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL–SAND–SILT MIXTURES		ATTERBERG LIMITS PLOT BELOW "A" LINE OR PLASTICITY INDEX LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL–SAND–CLAY MIXTURES		ATTERBERG LIMITS PLOT ABOVE "A" LINE AND PLASTICITY INDEX GREATER THAN 7
	SANDS MORE THAN 50% OF COARSE FRACTION PASSES 4.75 mm (NO. 4) SIEVE	CLEAN SANDS	SW	WELL–GRADED SAND AND GRAVELLY SANDS, LITTLE OR NO FINES		$C_U = D_{60}/D_{10}$ GREATER THAN 6 $C_Z = \frac{(D_{30})^2}{D_{10} * D_{60}}$ BETWEEN 1 AND 3
			SP	POORLY GRADED SANDS AND GRAVELLY SANDS, LITTLE OR NO FINES		NOT MEETING BOTH CRITERIA FOR SW
		SANDS WITH FINES	SM	SILTY SANDS, SAND–SILT MIXTURES		ATTERBERG LIMITS PLOT BELOW "A" LINE OR PLASTICITY INDEX LESS THAN 4
			SC	CLAYEY SANDS, SAND–CLAY MIXTURES		ATTERBERG LIMITS PLOT ABOVE "A" LINE AND PLASTICITY INDEX GREATER THAN 7

MAJOR DIVISION		GROUP SYMBOLS	TYPICAL NAMES	CLASSIFICATION CRITERIA
FINE–GRAINED SOILS 50% OR MORE PASSES 75 µm (NO. 200) SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS	ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	(see plasticity chart below)
		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
		OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	
		CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
HIGHLY ORGANIC SOILS		PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOILS	FIBROUS ORGANIC MATTER; WILL CHAR, BURN, OR GLOW



PLASTICITY CHART FOR THE CLASSIFICATION OF FINE–GRAINED SOILS

Appendix III

BORING LOGS:

B-1 through B-6

BORING LOGS

Definitions of Abbreviations

AS	=	Auger sample
HP	=	Unconfined compressive strength as determined by a hand penetrometer (tons per square foot)
LOI	=	Percent organic content (by weight) as determined by ASTM D2974 (loss on ignition test)
PID	=	Photo-ionization detector reading (parts per million)
QR	=	Unconfined compressive strength of intact rock core sample as determined by ASTM D2938 (pounds per square inch)
QU	=	Unconfined compressive strength of soil sample as determined by ASTM D2166 (pounds per square foot)
RC	=	Rock core sample
REC	=	Ratio of total length of recovered soil or rock to the total sample length, expressed as a percentage
RQD	=	Rock quality designation – estimate of the degree of jointing or fracture in a rock mass, expressed as a percentage:

$$\frac{\sum \text{segments equal to or longer than 4.0 inches}}{\text{core run length}} \times 100$$

S	=	Sulfate content (parts per million)
SPT	=	Standard penetration test blow counts, per ASTM D1586. Driving resistance recorded in terms of blows per 6-inch interval while letting a 140-pound hammer free fall 30 inches to drive a 2-inch outer diameter (O.D.) split spoon sampler a total of 18 inches. The second and third intervals are added to obtain the number of blows per foot (N_m).
N_{60}	=	Measured blow counts corrected to an equivalent (60 percent) energy ratio (ER) by the following equation: $N_{60} = N_m*(ER/60)$
SS	=	Split spoon sample
2S	=	For instances of no recovery from standard SS interval, a 2.5 inch O.D. split spoon is driven the full length of the standard SS interval plus an additional 6.0 inches to obtain a representative sample. Only the final 6.0 inches of sample is retained. Blow counts from 2S sampling are not correlated with N_{60} values.
3S	=	Same as 2S, but using a 3.0 inch O.D. split spoon sampler.
TR	=	Top of rock
USCS	=	Unified Soil Classification System per ASTM D2487
W	=	Initial water level measured during drilling
▼	=	Water level measured at completion of drilling

Classification Test Data

Gradation (as defined on Description of Soil Terms):

GR	=	% Gravel
SA	=	% Sand
SI	=	% Silt
CL	=	% Clay

Atterberg Limits:

LL	=	Liquid limit
PL	=	Plastic limit
PI	=	Plasticity Index

WC	=	Water content (%)

RESOURCE INTERNATIONAL, INC.

PROJECT: W-22-057 NAME: Harrison Central High School Outdoor Classroom CLIENT: The Thrasher Group, Inc. START: 5-25-22 END: 5-25-22	DRILLING FIRM / OPERATOR: RII / SB SAMPLING FIRM / LOGGER: RII / J.K. DRILLING METHOD: 3.25" HSA SAMPLING METHOD: SPT	DRILL RIG: CME 750X (310218) HAMMER: Automatic CALIBRATION DATE: 3/31/22 ENERGY RATIO (%): 84.2	NORTHING 220790.482 EASTING: 2389172.215 ELEVATION: 1220.3 ft. COMPLETION DEPTH: 47.0 ft.

EXPLORATION ID
B-1
PAGE
1 OF 2

ELEV. 1220.3	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	GR	SA	SI	CL	LL	PL	PI	WC	USCS CLASS	BACK FILL
								GRADATION (%)				ATTERBERG					
1220.0							0.3'- Topsoil (4.0")										
	1, 2	SS-1	6-5-6	15	92	4.0	**FILL**: Very stiff, gray to brownish gray **SANDY LEAN CLAY**, damp to moist.									CL (V)	
	3, 4, 5	SS-2	5-5-6	15	33	3.5	-Fragments of shale, limestone and cinders in SS-1 and SS-2									CL (V)	
	6, 7	SS-3	10-11-28	55	69	4.0	-Root fibers in SS-2 and SS-3	12.6	33.9	21.4	32.2	39	20	19	18	CL	
1212.3	8, 9, 10	SS-4	8-8-14	31	78	4.5+	**FILL**: Hard, gray **SANDY LEAN CLAY**, damp.									CL (V)	
	11, 12	SS-5	7-8-10	25	0												
	13	2S-5A	12	-	100	4.5+	-Limestone fragments in 2S-5A and SS-6									CL (V)	
	14, 15, 16	SS-6	7-8-6	20	64	4.5+									13	CL (V)	
1203.3	17, 18, 19, 20, 21	SS-7	7-18-9	38	44		**FILL**: Dense, gray **POORLY GRADED GRAVEL**, moist. -Limestone fragments throughout									GP (V)	
1198.3	22, 23, 24, 25	SS-8	8-5-14	27	56	2.25	**FILL**: Very stiff to hard, brownish gray to gray **SANDY LEAN CLAY**, dry to damp.									CL (V)	
	26, 27, 28, 29	SS-9	6-6-8	20	89	4.25	-Limestone, sandstone, and coal fragments present throughout									CL (V)	

NAME: Harrison Central High School Outdoor Classroom	PROJECT NO.: W-22-057	ELEVATION: 1220.3 ft.	START: 5/25/22	END: 5/25/22	PG 2 OF 2	B-1

ELEV. 1190.3	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	GR	SA	SI	CL	LL	PL	PI	WC	USCS CLASS	BACK FILL
	31–33						**FILL**: Very stiff to hard, brownish gray to gray **SANDY LEAN CLAY**, dry to damp. *(same as above)*										
	34–35	SS-10	8 12 13	35	81	3.5									7	CL (V)	
1183.3	35.5 ∇, 36–37																
	38–41	SS-11	5 9 9	25	67		**FILL**: Medium dense to very dense, dark gray **POORLY GRADED GRAVEL**, wet. -Limestone and shale fragments present throughout									GP (V)	
1178.3	42	SS-12	50/2"	-	100												
1173.3	42–47 EOB	RC-1	51		75		**LIMESTONE** : gray, slightly weathered, strong, medium bedded, carbonaceous, fossiliferous, narrow, very rough, very blocky, good. -QU @ 42.0' = 4,582 psi									CORE	

NOTES: Groundwater initially encountered @ 35.5'; Cave-in depth @ 16.2'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: Compacted with the auger 75 lbs bentonite chips and soil cuttings

RESOURCE INTERNATIONAL, INC.

PROJECT: W-22-057	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING 220818.462	EXPLORATION ID
NAME: Harrison Central High School Outdoor Classroom	SAMPLING FIRM / LOGGER: RII / J.K.	HAMMER: Automatic	EASTING: 2389167.823	**B-2**
CLIENT: The Thrasher Group, Inc.	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/31/22	ELEVATION: 1220.4 ft.	PAGE
START: 5-25-22 END: 5-25-22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84.2	COMPLETION DEPTH: 33.4 ft.	1 OF 2

ELEV. 1220.4	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	***MATERIAL DESCRIPTION AND NOTES***	GRADATION (%) GR	SA	SI	CL	ATTERBERG LL	PL	PI	WC	USCS CLASS	BACK FILL
1219.9							0.5'- Topsoil (6.0")										
	1 – 2	SS-1	6 9 7	22	94	3.5	**FILL**: Very stiff to hard, gray to brownish gray **SANDY LEAN CLAY**, damp to moist. -Root fibers in SS-1									CL (V)	
	3.5 – 5	SS-2	3 4 8	17	53	4.5+										CL (V)	
	6 – 7.5	SS-3	6 7 6	18	72	4.25										CL (V)	
	8.5 – 10	SS-4	3 4 5	13	81	3.0	-Shale, limestone and coal fragments present throughout								19	CL (V)	
	11 – 12.5	SS-5	4 7 5	17	61	3.0										CL (V)	
	13.5 – 15	SS-6	6 5 6	15	53	3.0		12.9	30.6	24.0	32.5	40	20	20	16	CL	
1203.4	17						**FILL**: Medium dense to very dense, gray and dark gray to gray **SILTY GRAVEL WITH SAND**, moist.										
	18.5 – 20	SS-7	12 13 11	34	89											GM (V)	
	23.5 – 24	SS-8	21 50/5"	-	27		-Cobbles @ 23.5'									GM (V)	
	28.5 – 30	SS-9	13 9 10	27	56		-Shale, limestone, and coal fragments present throughout									GM (V)	

00-2021-USCS BORING LOG - OH DOT.GDT - 7/7/22 10:41 - U:\GI8\PROJECTS\2022\W-22-057.GPJ

NAME: Harrison Central High School Outdoor Classroom	PROJECT NO.: W-22-057	ELEVATION: 1220.4 ft.	START: 5/25/22	END: 5/25/22	PG 2 OF 2	B-2

ELEV. 1190.4	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	GRADATION (%) GR	SA	SI	CL	ATTERBERG LL	PL	PI	WC	USCS CLASS	BACK FILL
	31 32						**FILL**: Medium dense to very dense, gray and dark gray to gray **SILTY GRAVEL WITH SAND**, moist. *(same as above)*										
1187.0	EOB 33	SS-10	50/4"	-	0		Auger refusal @ 33.4'										

NOTES: Groundwater not encountered duting drilling; Cave-in depth @ 23.4'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: Compacted with the auger 100 lbs bentonite chips and soil cuttings

RESOURCE INTERNATIONAL, INC.

PROJECT: W-22-057 NAME: Harrison Central High School Outdoor Classroom CLIENT: The Thrasher Group, Inc. START: 5-26-22 END: 5-26-22	DRILLING FIRM / OPERATOR: RII / SB SAMPLING FIRM / LOGGER: RII / J.K. DRILLING METHOD: 3.25" HSA SAMPLING METHOD: SPT	DRILL RIG: CME 750X (310218) HAMMER: Automatic CALIBRATION DATE: 3/31/22 ENERGY RATIO (%): 84.2	NORTHING 220798.727 EASTING: 2389143.321 ELEVATION: 1220.3 ft. COMPLETION DEPTH: 40.0 ft.	EXPLORATION ID **B-3** PAGE 1 OF 2

ELEV. 1220.3	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	*MATERIAL DESCRIPTION AND NOTES*	GR	SA	SI	CL	LL	PL	PI	WC	USCS CLASS
1220.0	0-1						0.3'- Topsoil (4.0")									
	1-2.5	SS-1	19 11 7	25	92	4.5+	**FILL**: Very stiff to hard, gray to brownish gray **SANDY LEAN CLAY WITH GRAVEL**, moist.									CL (V)
	3.5-5	SS-2	4 5 8	18	33	4.5+		19.7	27.5	22.0	30.8	39	19	20	17	CL
	6-7.5	SS-3	4 4 5	13	19	4.5+										CL (V)
	7.5-8	2S-3A	8	-	100	2.5										CL (V)
	8.5-10	SS-4	3 4 5	13	83	3.0									18	CL (V)
1208.3	12						**FILL**: Very stiff to hard, gray to brownish gray **SANDY LEAN CLAY WITH GRAVEL**, moist to very moist.									
	13.5-15	SS-5	5 7 8	21	83	4.5+										CL (V)
	18.5-20	SS-6	3 8 6	20	89	4.5+	-Limestone, shale and coal fragments present throughout									CL (V)
	23.5-25	SS-7	5 4 7	15	100	4.5+	-Water added to augers @ 25.0'								23	CL (V)
	28.5-30	SS-8	4 6 9	21	56	3.0										CL (V)

GRADATION (%): GR, SA, SI, CL; ATTERBERG: LL, PL, PI; BACK FILL

NAME: Harrison Central High School Outdoor Classroom	PROJECT NO.: W-22-057	ELEVATION: 1220.3 ft.	START: 5/26/22	END: 5/26/22	PG 2 OF 2	B-3

ELEV. 1190.3	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	GR	SA	SI	CL	LL	PL	PI	WC	USCS CLASS	BACK FILL
	31–33						**FILL**: Very stiff to hard, gray to brownish gray **SANDY LEAN CLAY WITH GRAVEL**, moist to very moist. *(same as above)*										
	34–35	SS-9	7 5 5	14	50	3.0										CL (V)	
1183.3	36–37																
	37–38						**FILL**: Very dense, gray **SILTY SAND WITH GRAVEL**, very moist.										
	39	SS-10	8 50/3"	-	89		-Limestone and shale fragments in SS-10									SM (V)	
1180.3	EOB 40						Auger Refusal @ 40.0'										

00-2021-USCS BORING LOG - OH DOT.GDT - 7/7/22 10:41 - U:\GI8\PROJECTS\2022\W-22-057.GPJ

NOTES: Groundwater not encountered duting drilling; Cave-in depth @ 14.6'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: Compacted with the auger 50 lbs bentonite chips and soil cuttings

RESOURCE INTERNATIONAL, INC.

PROJECT: W-22-057 NAME: Harrison Central High School Outdoor Classroom CLIENT: The Thrasher Group, Inc. START: 5-25-22 END: 5-25-22	DRILLING FIRM / OPERATOR: RII / SB SAMPLING FIRM / LOGGER: RII / J.K. DRILLING METHOD: 4.5" CFA SAMPLING METHOD: SPT	DRILL RIG: CME 750X (310218) HAMMER: Automatic CALIBRATION DATE: 3/31/22 ENERGY RATIO (%): 84.2	NORTHING 220759.609 EASTING: 2389198.988 ELEVATION: 1220.7 ft. COMPLETION DEPTH: 20.0 ft.

EXPLORATION ID
B-4
PAGE
1 OF 1

ELEV. 1220.7	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	***MATERIAL DESCRIPTION AND NOTES***	GRADATION (%) GR	SA	SI	CL	ATTERBERG LL	PL	PI	WC	USCS CLASS	BACK FILL
1220.4	0.3						0.3'- Topsoil (4.0")										
	1.0 - 2.5	SS-1	6 5 7	17	78	4.5+	**FILL**: Very stiff to hard, brownish gray **SANDY LEAN CLAY**, damp.									CL (V)	
	3.5 - 5.0	SS-2	3 4 7	15	81	4.0	-Shale and coal fragments present throughout								16	CL (V)	
1212.7	6.0 - 7.5	SS-3	5 5 8	18	100	3.0										CL (V)	
	8.5 - 8.8	SS-4	50/3"	-	100		**FILL**: Very dense, brownish gray **POORLY GRADED GRAVEL**, moist. -Cobbles @ 8.5' -Limestone fragments present throughout									GP (V)	
1208.7	12.0						**FILL**: Hard, gray to brownish gray **SANDY LEAN CLAY WITH GRAVEL**, damp.										
	13.5 - 15.0	SS-5	11 12 14	36	78	4.5+										CL (V)	
1200.7	18.5 - 20.0 EOB	SS-6	10 10 11	29	50	4.25	-Shale fragments in SS-6									CL (V)	

NOTES: Groundwater not encountered duting drilling

ABANDONMENT METHODS, MATERIALS, QUANTITIES: Compacted with the auger 75 lbs bentonite chips and soil cuttings

RESOURCE INTERNATIONAL, INC.

PROJECT: W-22-057 NAME: Harrison Central High School Outdoor Classroom CLIENT: The Thrasher Group, Inc. START: 5-26-22 END: 5-26-22	DRILLING FIRM / OPERATOR: RII / SB SAMPLING FIRM / LOGGER: RII / J.K. DRILLING METHOD: 3.25" HSA SAMPLING METHOD: SPT	DRILL RIG: CME 750X (310218) HAMMER: Automatic CALIBRATION DATE: 3/31/22 ENERGY RATIO (%): 84.2	NORTHING 220814.294 EASTING: 2389221.769 ELEVATION: 1219.5 ft. COMPLETION DEPTH: 23.2 ft.	EXPLORATION ID **B-5** PAGE 1 OF 1

ELEV. 1219.5	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	MATERIAL DESCRIPTION AND NOTES	GR	SA	SI	CL	LL	PL	PI	WC	USCS CLASS
1219.0							0.5'- Topsoil (6.0")									
	1–2	SS-1	9 8 6	20	100	3.5	**FILL**: Very stiff, brownish gray to gray **SANDY LEAN CLAY**, damp. -Coal and shale fragments present throughout									CL (V)
1215.0	4	SS-2A	14 8 17	35	53	3.5	-Root fibers in SS-2								12	CL (V)
	4.5	SS-2B					**FILL**: Medium dense, brownish gray **POORLY GRADED GRAVEL**, moist.									GP (V)
1212.0	6–7	SS-3	11 9 10	27	28		-Cobbles @ 6.0'									GP (V)
	8	2S-3A	12	-	100	4.5+	**FILL**: Hard, dark gray to gray and brownish gray **SANDY LEAN CLAY**, damp.	6.4	25.3	26.6	41.7	43	21	22	18	CL
	9	SS-4	7 9 11	28	92	4.5										CL (V)
	12						-Coal, shale and limestone fragments present throughout									
	14	SS-5	11 9 7	22	56	4.5+										CL (V)
	19	SS-6	6 6 8	20	89	4.5+										CL (V)
1196.3	EOB 23	SS-7	50/2"	-	0		Auger refusal @ 23.2'									

NOTES: Groundwater not encountered duting drilling; Cave-in depth @ 18.9'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: Compacted with the auger 75 lbs bentonite chips and soil cuttings

RESOURCE INTERNATIONAL, INC.

PROJECT: W-22-057	DRILLING FIRM / OPERATOR: RII / SB	DRILL RIG: CME 750X (310218)	NORTHING 220857.334
NAME: Harrison Central High School Outdoor Classroom	SAMPLING FIRM / LOGGER: RII / J.K.	HAMMER: Automatic	EASTING: 2389182.225
CLIENT: The Thrasher Group, Inc.	DRILLING METHOD: 3.25" HSA	CALIBRATION DATE: 3/31/22	ELEVATION: 1220.3 ft.
START: 5-26-22 END: 5-26-22	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84.2	COMPLETION DEPTH: 15.0 ft.

EXPLORATION ID B-6

PAGE 1 OF 1

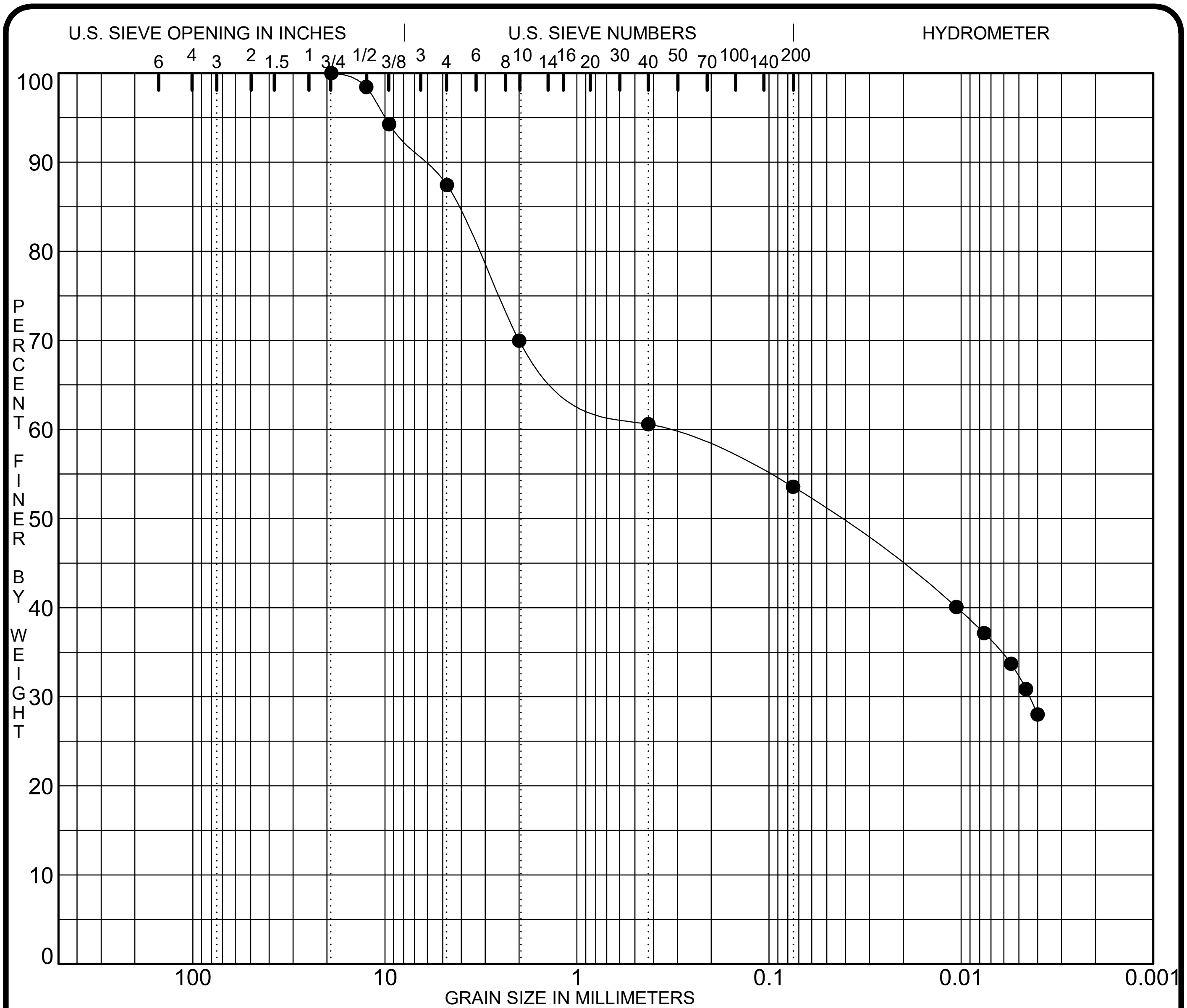
ELEV. 1220.3	DEPTHS	SAMPLE ID	SPT/ RQD	N_{60}	REC (%)	HP (tsf)	*MATERIAL DESCRIPTION AND NOTES*	GR	SA	SI	CL	LL	PL	PI	WC	USCS CLASS	BACK FILL
1219.9							0.4'- Topsoil (5.0")										
	1–2	SS-1	7 8 8	22	81	4.5+	**FILL**: Very stiff to hard, gray **SANDY LEAN CLAY WITH GRAVEL**, damp.									CL (V)	
	4–5	SS-2	4 5 50/5"	-	50	3.0										CL (V)	
	6–7	SS-3	5 8 12	28	50	4.0									13	CL (V)	
	9–10	SS-4	6 6 8	20	83	4.0	-Coal and shale fragments present throughout									CL (V)	
1205.3	14–15 EOB	SS-5	8 24 50/5"	-	79	4.5+										CL (V)	

NOTES: Groundwater not encountered duting drilling; Cave-in depth @ 9.1'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: Compacted with the auger 12.5 lbs bentonite chips and soil cuttings

Appendix IV

LABORATORY TEST RESULTS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

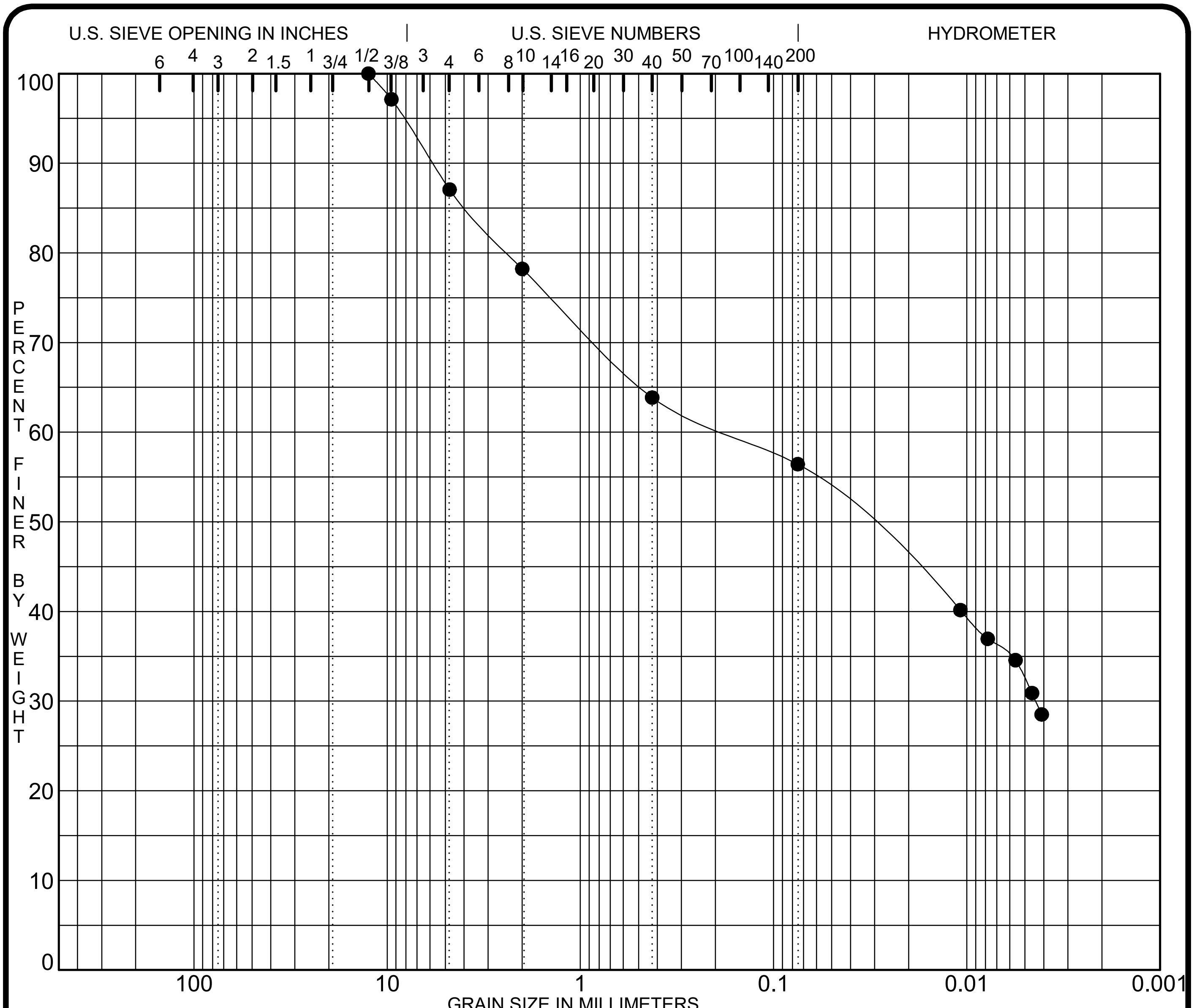
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-1**	**6.0**	**SANDY LEAN CLAY CL**	**18**	**39**	**20**	**19**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**B-1**	**6.0**	**19.00**	**0.37**	**0.004**		**0.0**	**12.6**	**17.5**	**9.4**	**7.0**	**21.4**	**32.2**

PROJECT **Harrison Central High School Outdoor Classroom** PROJECT NO. **W-22-057**

GRADATION CURVES

Resource International, Inc.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

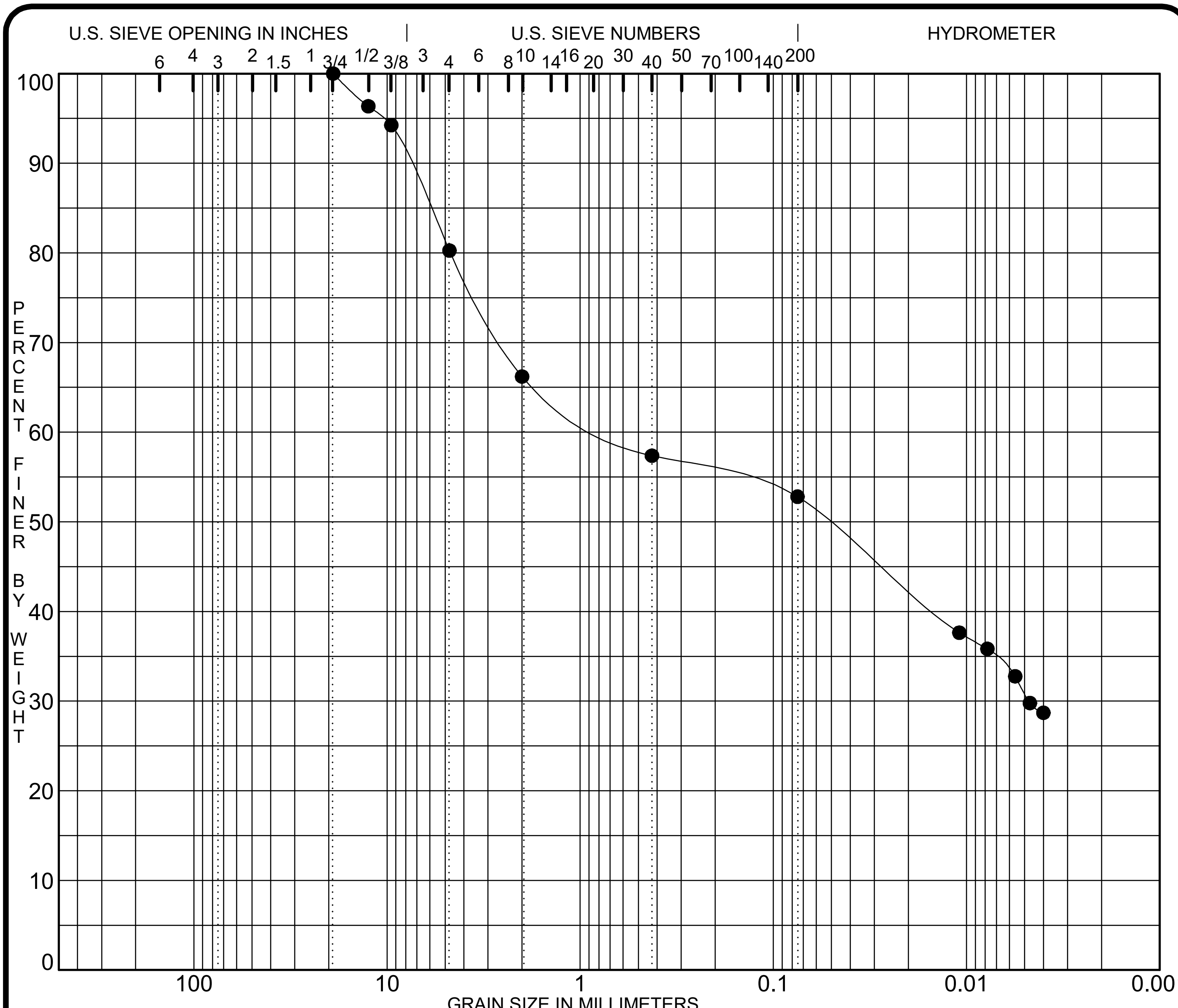
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-2**	**13.5**	**SANDY LEAN CLAY CL**	**16**	**40**	**20**	**20**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**B-2**	**13.5**	**12.50**	**0.17**	**0.004**		**0.0**	**12.9**	**8.8**	**14.4**	**7.4**	**24.0**	**32.5**

PROJECT **Harrison Central High School Outdoor Classroom** PROJECT NO. **W-22-057**

GRADATION CURVES

Resource International, Inc.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

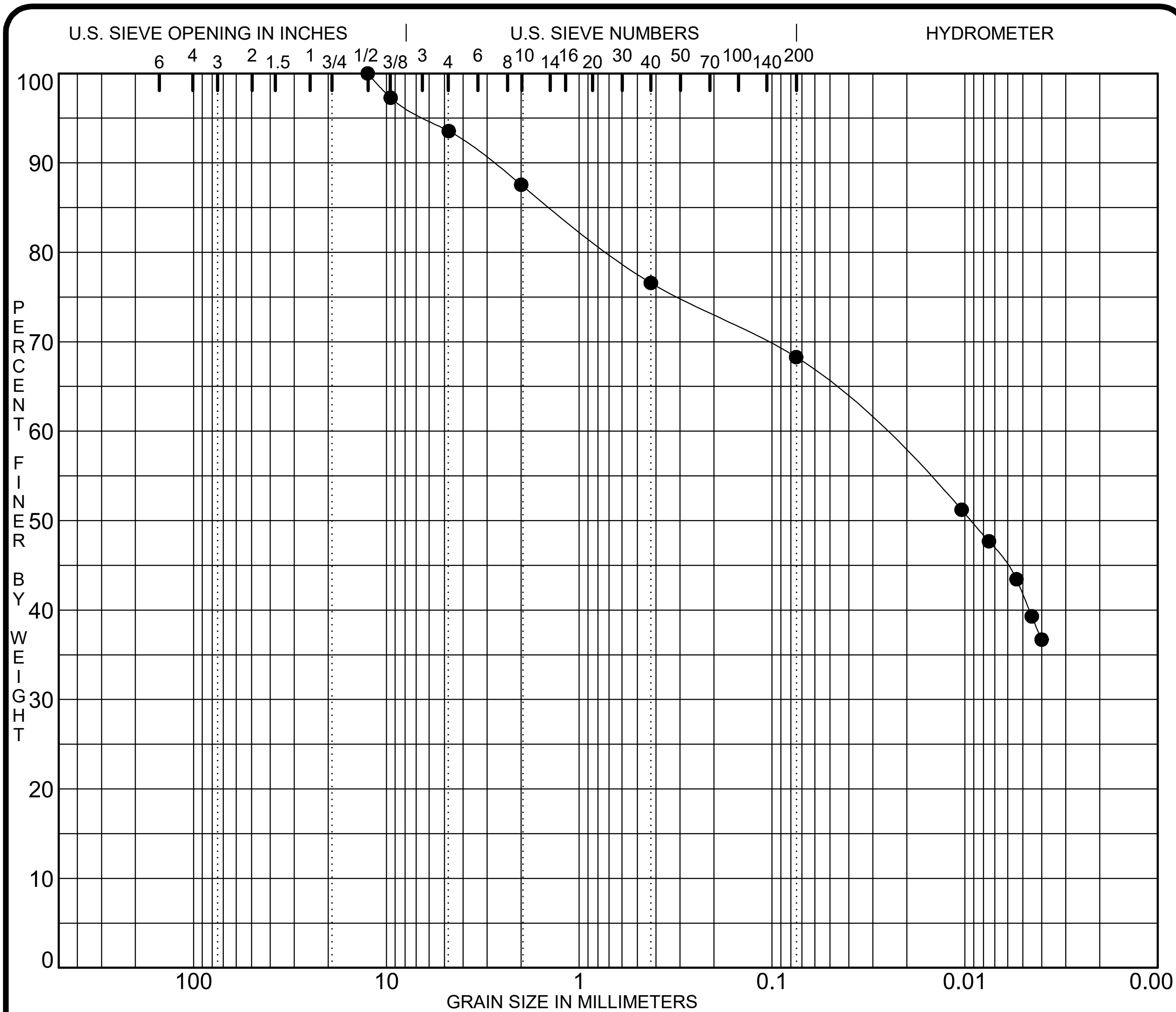
	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-3**	**3.5**	**SANDY LEAN CLAY with GRAVEL CL**	**17**	**39**	**19**	**20**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**B-3**	**3.5**	**19.00**	**0.67**	**0.005**		**0.0**	**19.7**	**14.1**	**8.8**	**4.6**	**22.0**	**30.8**

PROJECT **Harrison Central High School Outdoor Classroom** PROJECT NO. **W-22-057**

GRADATION CURVES

Resource International, Inc.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen ID	Depth	Classification	MC%	LL	PL	PI	Cc	Cu
●	**B-5**	**7.5**	**SANDY LEAN CLAY CL**	**18**	**43**	**21**	**22**		

	Specimen ID	Depth	D100	D60	D30	D10	%Gravel coarse	%Gravel fine	%Sand coarse	%Sand medium	%Sand fine	%Silt	%Clay
●	**B-5**	**7.5**	**12.50**	**0.03**			**0.0**	**6.4**	**6.0**	**11.0**	**8.3**	**26.6**	**41.7**

PROJECT **Harrison Central High School Outdoor Classroom** PROJECT NO. **W-22-057**

GRADATION CURVES

Resource International, Inc.

RESOURCE INTERNATIONAL, INC.
Engineering Consultants

6350 Presidential Gatew.	9885 Rockside Road	4480 Lake Forest Drive
Columbus, OH 43231	Cleveland, OH 44125	Cincinnati, Ohio 45242
Phone (614) 823-4949	Phone (216) 573-0955	Phone (513) 769-6998

Unconfined Compressive Strength of Intact Rock Core Specimens

(ASTM D 7012-14)

Project: Harrison Central HS Outdoor Classroom
Project No.: W-22-057
Date of Testing: 6/7/2022
Test Performed by: KL/EM

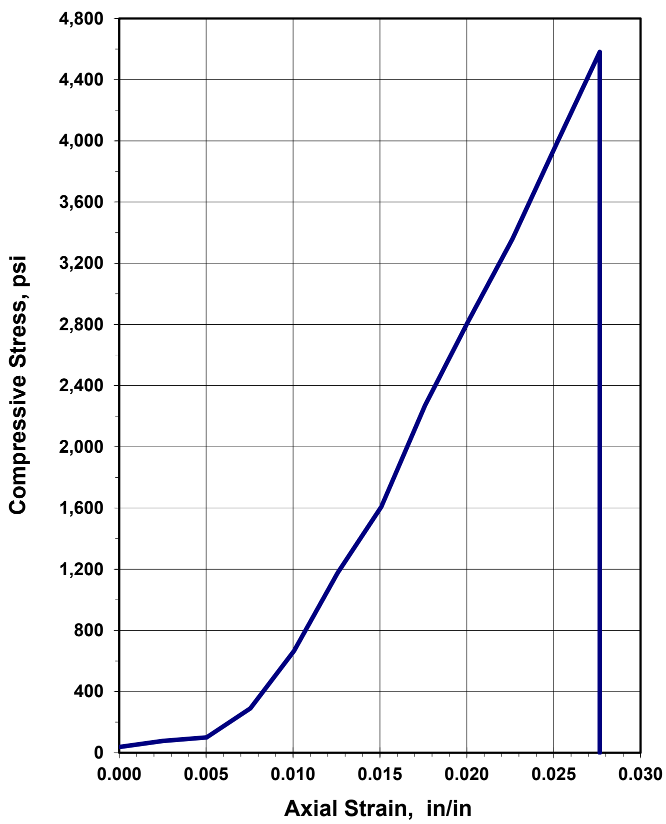
Rock Description: Gray Limestone
Rock Formation:

Boring No.:	B-1		Average Length:	3.978	in
Sample No:	RC_1		Average Diameter:	1.987	in
Depth (ft):	42.0	feet	Length to diameter ratio:	2.002	
Moisture condition:	As received		Cross Sectional Area:	3.101	in^2
Sample Mass:	518.52	grams	Volume:	0.0071	ft^3
Testing Temperature:	22	^oC	Unit Weight (sample specimen)*:	160.13	lbs/ft3
Rate of Loading:	46.1	lbs/sec	Failure Load:	14,207	lbs
Testing Time:	308	sec	Axial Strain at Failure:	0.0277	in/in
(Rate 2-15 min			Compressive Strength:	4,582	psi

Sample Preparation: Per ASTM D4543

**Actual test sample used for unit weight prior to testing.*

Unconfined Compression Test



Before Testing

After Failure

REMARKS: