ADDENDUM NO. 1

ARCANUM BUTLER LOCAL SCHOOLS
DARKE COUNTY, OHIO
BOOSTER STADIUM PEDESTRIAN BRIDGE
December 2, 2024

To: Planholders

From: Mote & Associates, Inc.
214 West Fourth Street
Greenville, Ohio 45331
Phone: (937) 548-7511
Fax: (937) 548-7484

Re: Arcanum Butler Local Schools
Booster Stadium Pedestrian Bridge

This addendum forms a part of the Contract Documents and modifies the original Contract Documents dated November 2024. Acknowledge receipt of this Addendum in the space provided on the Bid Proposal form. Failure to do so may subject the Bidder to disqualification.

CHANGES/CLARIFICATIONS TO THE CONSTRUCTION PLANS:

1. Statement of qualifications received for substitution of prefabricated bridge manufacturer from Bridge Brothers was reviewed - Rejected by Consulting Engineer.

End of Addendum

Attached: Pre-Bid Meeting Minutes
Pre-Bid Meeting Sign-in Sheet
Geotechnical Engineering Investigation Report

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ARCANUM H.S. BOOSTERS
PEDESTRIAN BRIDGE REPLACEMENT
PRE-BID MEETING

Monday, November 25, 2024, 2:00 P.M.

Meeting Minutes

1. Bids are due:
   a. Bids will be received until 2 PM on December 5, 2024
   b. Delivered to: Arcanum Butler Local School District Superintendent's Office
      2011 Trojan Way
      Arcanum, Ohio, 45304

2. The construction documents including plans and specifications may be examined or purchased from the Issuing Office of the Consulting Engineer, Mote & Associates, Inc., 214 West Fourth Street, Greenville, Ohio 45331 (937.548.7511).

3. A non-refundable charge for the Contract Documents will be required in the amount of $25.00, payable to Mote & Associates, Inc. An additional non-refundable handling charge of $15.00 will be required if documents are to be shipped.

4. An electronic version of the Contract Documents is also available for a non-refundable charge of $25.00.

5. The Owner and/or Engineer will not be responsible for full or partial sets of Bidding Documents, including Addenda if any, obtained from sources other than the Engineer.

6. Proposals will only be accepted from bidders who have purchased the Contract Documents from Mote & Associates, Inc. and are registered as a planholder.

7. The purchase of the plans will place the purchaser on the registered planholder list.

8. The Contract Documents including Specifications may be examined at the superintendent's office located at 2011 Trojan Way, Arcanum, Ohio.

9. The Arcanum Butler Local Schools reserves the right to accept or reject any or all bids, to waive any informalities in the bidding, and to enter into a contract with the bidder(s) whom in their consideration offered the lowest and best proposal(s).

10. The bid shall be submitted in a sealed envelope with the name of the project you are bidding on and the company name submitting the bid clearly marked on the front of the envelope.

11. No bidder may withdraw their bid for a period of (60) days after the bid opening.

12. Bids will be opened by the owner and read aloud @ 2:00 PM on December 5, 2024 at the Superintendent's Office, 2011 Trojan Way, Arcanum, Ohio 45304.

13. Awards: Bids will be reviewed for award by the Arcanum Butler Local Schools Board of Education at their scheduled board meeting on December 12, 2024.

14. The selected bid must be awarded or all bids will be rejected on or before February 3, 2025.

15. Work will be permitted to commence after a pre-construction conference is held; all work must be completed no later than August 1, 2025. The first regular scheduled home football game of the season will be held on August 22, 2025. Scrimmages are scheduled earlier beginning on August 15, 2025. Demolition of the existing bridge cannot occur until the construction of the new bridge is substantially completed and accessible. Some leniency may be offered with the demolition timing dependent upon the school's needs for access at that time.

16. Questions concerning bid bonds, insurance, etc. are directed to Ashley Rose at 937-548-7511.

17. The project consists of three contracts: Contract A – Pedestrian Bridge, Contract B – Demolition of Existing Pedestrian Bridge, and Contract C – Combination Bid of A and B. Bidders may bid on any or all contracts.

18. Sub-contractors must be listed with the bids in the allotted space on the bid form.

19. Substitutions: All requests to approve equivalent products must be submitted to the engineer no later than November 26, 2024, as stated in the specifications. All approvals will be released via addendum.

20. Last addendum will be no later than 72 hours before bid date which will be 2:00 P.M. on December 2, 2024. All questions must be emailed to jmcclannan@moteassociates.com before 9:00 AM on December 2, 2024. No information altering the plans and specifications will be issued verbally or outside the written addendum.

21. The contractor shall investigate the existing site conditions to satisfy themselves of the existing conditions and complexity of the work prior to bidding. No additional compensation will be considered due to lack of investigation on the contractor's part.

22. The existing 15" sanitary sewer running parallel to the south bank of Painter Creek will be relocated away from the southwest abutment to the location shown on these plans as a part of Phase III of the Arcanum Booster Stadium project prior to the construction of the southwest abutment.

23. Testing will be paid for by the owner and performed at the owner's discretion.

24. Review:

    a. The school is tax exempt.
    b. This project is exempt of the prevailing wage rates for Ohio.
    c. Insurance requirements can be found in the construction documents.
    d. Liquidated damages of $500/day.
    e. Each day weather prevents work, the contract shall be extended one day. Time extensions should be requested by the contractor in writing the day of the event.

25. Discussion and questions:

    a. Moveable bollards shall be placed at each end of the bridge, but positioned to allow golf cart accessibility at all times.
    b. A geotechnical report was performed by KBJW Engineers. A copy of the report will be included with Addendum #1.
    c. The rebar quantity listed on the bid form includes all rebar in the abutments and footings. Deck rebar are not included there. Deck rebar will be considered a part of the bridge package. A detail for the deck rebar will be included with the bridge submittal.
    d. E5 concrete admixtures were discussed. They may be considered as an option after the bids are received, but should not be included with the bid.
    e. Work on this project during the spring may need to be coordinated with track events. All track events are now taking place on the stadium side of Painter Creek.
    f. The school will adhere to Ohio Revised Code requirements when awarding bids. No bid can exceed the Engineer's estimate by more than 20%.

End of Notes

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ARCANUM H.S. BOOSTERS
PEDESTRIAN BRIDGE REPLACEMENT
PRE-BID MEETING

Monday, November 25, 2024, 2:00 P.M.

SIGN-IN SHEET

Representative's Name	Name of Company	Phone Number	Email
Jerry McClannan	Mote & Associates	937-548-7511	jmcclannan@moteassociates.com
JOHN KANZLEMAR	CONTECH	513-320-0268	john.kanzlemar@ CONTECHES .COM
Gavin Bixler	Brumbaugh Construction	937-692-5107	gavin@brumbaughconstruction.com
JEFF BLEVINS	SUNESIS CONSTRUCTION	513-256-6813	jblevins@sunesiscc.com
John Stephens	Arcanum-Butler LSD	937-692-5174	john_stephens@arcanum-butler.k12.oh
Matt Huffman	Arcanum-Butler LSD	937-692-5174	matt_huffman@arcanum-butler.k12.oh.us

KOONTZ BRYANT
JOHNSON WILLIAMS

June 25, 2024

Arcanum-Butler Local Schools-Arcanum Boosters
2011 Trojan Avenue
Arcanum, Ohio 45304

Attn.: Mr. John Stephens
Superintendent

Re: Geotechnical Engineering Investigation for the Proposed Pedestrian Bridge, Pavilion and Concession Stand to be Constructed at the Arcanum Boosters Stadium, Arcanum, Ohio; KBJW Report No. 24-30510-001-01-0624

Gentlemen:

Koontz Bryant Johnson Williams, Inc. (KBJW, formerly CBC Engineers and Associates, Ltd.) is pleased to submit our report of the geotechnical engineering investigation for the above-referenced project. The purpose of this project is to provide a geotechnical evaluation of the physical characteristics of the soil strata for the proposed pedestrian bridge, pavilion and concession stand to be constructed at the Arcanum Boosters Stadium, Arcanum, Ohio. Also noted are other conditions that might affect the design and/or construction of the proposed project based on the results of the testing.

For your convenience, the samples collected that were not used to perform the laboratory tests will be kept in our office for a period of three months. If you have any questions, or if we can be of further service, please call us.

Respectfully submitted,

Koontz Bryant Johnson Williams, Inc.

Deepa Nair, M.S., P.E.
Project Engineer

STATE OF OHIO
MITCHELL
T.
HARDERT
E-67613
REGISTERED
PROFESSIONAL ENGINEER

Mitchell T. Hardert, P.E.
Chief Engineer

DN/MTH/mt
ec: Client (john_stephens@arcanum-butler.k12.oh.us)
ec: Jerry McClannan (jmcclannan@moteassociates.com)
1-File

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SECTION I

TEXT

1.0 INTRODUCTION

Authorization to proceed with this project was given by John Stephens of Arcanum Butler Local Schools. Work was to proceed in accordance with KBJW Quotation No. 24-30510-001, Revision No. 1 dated June 4, 2024, and the terms and conditions of the executed agreement dated June 4, 2024.

The proposed new construction is to be located at the Arcanum Boosters Stadium, Arcanum, Ohio. A Vicinity Map is presented in Figure 1 in Section III of this document.

2.0 WORK PERFORMED

2.1 FIELD WORK

Four (4) borings were made in the relative positions shown on the Boring Location Plan (Figure 2) in Section III. The boring logs and resulting data are also included in Section III. The borings were made with an ATV-mounted drilling rig using hollow-stem augers and employing standard penetration resistance methods (ASTM D-1586, which includes 140-pound hammer, 30-inch drop, and two-inch-O.D. split-spoon sampler) at maximum 2.5 foot intervals for 10 feet below the ground surface and at 5 foot intervals to the bottom of the borings The disturbed split-spoon samples were visually classified, logged, sealed in moisture-proof jars, and taken to the KBJW laboratory for study. The depths where these "A"-type split-spoon samples were collected are noted on the boring logs.

2.2 LABORATORY WORK

Twenty-five (25) natural moisture content tests were performed on the "A" type split-spoon samples in accordance with ASTM D-4643. The results of these tests are tabulated in Table 1 as follows, and are also included in Section III of this report:

TABLE 1

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
KBJW-1	1.0 – 2.5	17.1
KBJW-1	3.5 – 5.0	19.7
KBJW-1	6.0 – 7.5	17.8
KBJW-1	8.5 – 10.0	17.5
KBJW-1	13.5 – 15.0	11.3
KBJW-1	18.5 – 20.0	8.9
KBJW-2	1.0 – 2.5	17.4
KBJW-2	3.5 – 5.0	16.2
KBJW-2	6.0 – 7.5	17.1
KBJW-2	8.5 – 10.0	18.7
KBJW-2	13.5 – 15.0	13.7
KBJW-2	18.5 – 20.0	11.0
KBJW-2	23.5 – 25.0	11.5
KBJW-3	1.0 – 2.5	15.8
KBJW-3	3.5 – 5.0	13.5
KBJW-3	6.0 – 7.5	19.9
KBJW-3	13.5 – 15.0	11.1
KBJW-3	18.5 – 20.0	8.6
KBJW-4	1.0 – 2.5	16.0
KBJW 4	3.5 – 5.0	7.0
KBJW-4	6.0 – 7.5	9.0
KBJW-4	8.5 – 10.0	10.6
KBJW-4	13.5 – 15.0	8.5
KBJW-4	18.5 – 20.0	11.0
KBJW-4	23.5 – 25.0	11.0

3.0 SOIL CONDITIONS AND GROUNDWATER LEVELS

Four (4) borings were made at the proposed construction site at the locations shown on the Boring Location Plan (Figure 2) in Section III of this report. Borings KBJW-1 and KBJW-2 were made at the proposed pedestrian bridge location, boring KBJW-3 was made at the proposed pavilion location, and boring KBJW-4 was made at the proposed concession stand location. The borings showed the presence of approximately 1 to 2 inches of topsoil overlying the project site. The topsoil was generally underlain in all the borings by existing silty clay fill extending to an approximate depth of 2.5 feet below the existing site grade. Native, very soft, silty clay was encountered underneath the existing fill in borings KBJW-1 and KBJW-2 (proposed pedestrian bridge location) extending to an approximate depth of 8.5 feet below the existing site grade. SPT blow counts in this stratum varied from 3 to 6. Medium dense sand with varying amounts of gravel was encountered underneath the native soft clay layer extending to an approximate depth of 13.5 below the existing site grade in these borings. SPT blow counts in this stratum varied from 22 to 31. Native stiff, gray, silty clay was encountered underneath the sand and gravel layer extending to the bottom of these borings with SPT blow counts varying from 14 to 34. Native, very soft, silty clay was encountered underneath the existing fill in boring KBJW-3 (proposed pavilion location) extending to an approximate depth of 8.5 feet below the existing site grade. SPT blow counts in this stratum varied from 2 to 4. Medium dense sand with varying amounts of gravel was encountered underneath the native soft clay layer extending to an approximate depth of 13.5 below the existing site grade in this boring with SPT blow counts of 36. Native stiff, gray, silty clay was encountered underneath the sand and gravel layer extending to the bottom of this boring with SPT blow counts varying from 11 to 28. Native, medium dense sand and gravel was encountered underneath the existing fill in boring KBJW-4 (proposed concession stand location) extending to an approximate depth of 6.0 feet below the existing site grade with SPT blow counts of 22. Stiff silty clay was encountered underneath the native sand and gravel zone extending to an approximate depth of 8.5 below the existing site grade in this boring with SPT blow counts of 30. Medium dense sand with varying amounts of gravel was encountered underneath this native clay layer extending to an approximate depth of 13.5 below the existing site grade in this boring with SPT blow counts of 23. Native stiff, gray silty clay was encountered underneath the sand and gravel layer extending to the bottom of the boring with SPT blow counts varying from 17 to 33.

Groundwater observations were made during the drilling operations (by noting the depth of water on the drilling tools) and in the open boreholes following withdrawal of the drilling augers. Free groundwater was encountered at the time of drilling activities at the depths tabulated in Table 2 as follows at the time of drilling activities:

TABLE 2

DEPTH TO FREE GROUNDWATER AT THE TIME OF DRILLING ACTIVITIES
(AS MEASURED BENEATH THE EXISTING SITE GRADE)

BORING NO.	DEPTH TO GROUNDWATER DURING DRILLING ACTIVITIES (FT)	DEPTH TO GROUNDWATER AT THE COMPLETION OF DRILLING ACTIVITIES (FT)
KBJW-1	9.0	9.0
KBJW-2	9.0	12.0
KBJW-3	8.5	18.0
KBJW-4	8.5	13.5

Based on the encountered soil conditions at the project site, the site classification was determined to be "Site Class D" per the Ohio Building Code. In addition, a S_{DS} coefficient of 0.168g was calculated, and a S_{D1} coefficient of 0.116g was also calculated for design based on the aforementioned building code. A "Site Class D" suggests that the soil materials are stiff with standard penetration test "N-values" between 15 and 50.

4.0 DISCUSSION AND RECOMMENDATIONS

4.1 PROJECT DESCRIPTION

Arcanum-Butler Local Schools is currently developing information regarding the proposed pedestrian bridge, pavilion and concession stand to be constructed at the Arcanum Boosters Stadium, Arcanum, Ohio. The existing creek bed at the proposed pedestrian bridge location was estimated to be approximately 8.0 to 9.0 feet below the top of the boring elevations performed at the bridge location. No other details of the proposed project including the detailed spacial geometry of the facility and structural loads from the project have been provided to us at this time. The following recommendations are based on the assumption that no unusual loading conditions or special settlement restrictions apply to the proposed project and the foundations for the future construction are proposed to be shallow foundations. Consequently, if the above information is incorrect or if changes are made, KBJW should be notified so that the new data can be reviewed.

4.2 PROPOSED BRIDGE, PAVILION AND CONCESSION STAND

The existing fill and upper layers of softer silty clay soils encountered at the proposed construction are not suitable for foundation support due to their potential for producing excessive total and/or differential settlement. The footings for the proposed construction would need to bear on the native stiffer silty clay/sand and gravel soils encountered at the approximate depths shown in Table 3 below. The footings for the proposed construction should be extended to bear on such proper bearing soil, or the upper softer silty clay soils encountered should be excavated until such proper soil is reached and the undercut excavations backfilled to the bottom of the proposed footings with lean concrete or compacted engineered fill compacted to at least 95% of the maximum dry unit weight with a moisture content within 2% of the optimum moisture content as determined by the modified Proctor test. It is recommended that the exposed sub-grade found at the bottom of the foundation excavations be compacted to at least 95% of the modified Proctor maximum dry unit weight within 2% of the optimum moisture content as determined by modified Proctor test prior to the addition of lean concrete or compacted fill. This compacted bearing surface should be observed and tested by a representative of this office. Once the bearing surface is deemed to be acceptable based on the field testing and observation, the undercut excavation should be backfilled to the bottom of the footings with lean concrete or compacted engineered fill. Table 3 shows the estimated approximate minimum depth below the existing grade in each boring to reach the suitable bearing soils.

TABLE 3

APPROXIMATE DEPTH TO BEARING SOILS
(AS MEASURED BENEATH THE EXISTING GRADE)

BORING NO.	APPROXIMATE DEPTH TO BEARING SOILS (FT.)	LOCATION
KBJW-1	8.5	PROPOSED BRIDGE
KBJW-2	8.5	PROPOSED BRIDGE
KBJW-3	8.5	PROPOSED PAVILION
KBJW-4	3.5	PROPOSED CONCESSION STAND

Any engineered fill placed should be compacted to at least 95% of the maximum dry unit weight with moisture content within 2% of the optimum moisture content as determined by the modified Proctor test. Excavated material that is free of organic or objectionable materials can be reused as fill outside the pad areas. In general, any non-organic naturally-occurring soils can be used for structural fill. Cohesive soils with a Liquid Limit (LL) greater than 50, a Plasticity Index (PI) of greater than 25, or an organic content greater than 7 percent as determined by Loss-on-Ignition (ASTM D2974) should not be used for engineered fill. The fill should contain no fragments whose greatest dimension is larger than half the thickness of the lift being placed. Based on the soil conditions encountered in our borings, the on-site soils appear to be suitable for reuse as engineered fill but would require moisture adjustments. The fill should be compacted in accordance with the Specifications for Engineered Fill contained in this report. The spread footing elements founded on such native stiffer silty clay/sand and gravel /compacted engineered fill at the recommended bearing depths can be designed with a net allowable bearing pressure of 2,000 lbs./sq. ft. This net allowable bearing pressure can be increased by a factor of one-third when designing for transient loadings such as wind or earthquake ground motions. All exterior foundations should bear at a depth of at least 32 inches below the final grade for frost considerations, or deeper if required to protect the footings from scour (scour evaluation by others than KBJW). Interior footings (within permanently heated areas) can be located at nominal depths below the finished floor provided the undesirable materials are removed and replaced with engineered fill. Square and continuous footings should be designed at least 2.5 feet and 1.5 feet wide, respectively, even if the anticipated structural loadings would allow for smaller foundation element sizes. These recommendations are provided based on the assumption that suitable native bearing soils are available at the bottom of the foundation excavations. As mentioned earlier the existing fill/upper layers of softer native silty clay encountered in the borings are not suitable for foundation support, and KBJW should be retained to confirm the acceptability of the bearing soil at the bottom of the proposed foundation excavations and verify the recommended bearing capacity once the excavation is completed before the lean concrete/compacted fill is placed.

All soil bearing foundations settle as the result of the externally applied loads. Settlement of the proposed building should be anticipated, although such movements are estimated (based upon our experience in similar soils) to be well within the tolerable limits for the structure (i.e., the total settlement will be less than about 1 inch, while differential settlement will be limited to about one half of this value).

Backfill for utility trenches, foundation excavations, etc., within structures, driveways, or parking lot areas should be placed in successive, horizontal layers. Each layer should be compacted to at least 95% of the maximum modified Proctor dry unit weight within 2% of the optimum moisture content before the next layer is added. In no instance should puddling or jetting the backfill material be allowed as a compaction method. Any silty or clayey soils at foundation depth will soften and the bearing capacity will be reduced if water ponds in the excavation. Soils exposed in the bases of all satisfactory foundation excavations should be protected against any detrimental change in condition such as from disturbance, rain and freezing. Surface run-off water should be drained away from the excavation and not allowed to pond. If possible, all foundation concrete should be placed the same day the excavation is made. If this is not practical, the foundation excavations should be adequately protected. Also, for this reason, proper drainage should be maintained after construction.

All foundations should be located so that the least lateral clear distance between any two foundations will be at least equal to the difference in their bearing elevations (see Figure 3 in Section III of this document). If this distance cannot be maintained, the lower foundation should be designed to account for the load imparted by the upper foundation. If this condition occurs adjacent to a below-grade wall, the wall should be designed for the additional lateral earth pressure due to the upper foundation.

4.2.1 LATERAL AND UPLIFT FORCES ON SHALLOW FOOTINGS

Lateral forces on the foundation elements can be resisted by passive lateral earth pressures against the opposite vertical face of the foundation and by friction along the soil/foundation interface. An allowable resisting passive earth pressure of 200 lbs./sq. ft., and coefficient of friction of 0.30, respectively, can be used for design purposes. The passive resistance should only be used for that portion of the foundation located at a depth greater than 2.5 feet beneath the final grade (Please see Figure 4 in Section III of this text). A factor of safety of 1.5 relative to the lateral capacity should be used in design. It should be noted that lateral movements, on the order of up to 0.5 inch, may occur to mobilize this lateral resisting force.

It is further recommended that only the weight of the footing and the total weight of the soil above and within the periphery of the footing be used for resisting uplift forces. A total soil unit weight of 120 lbs./cu. ft. should be used for these computations for backfill material compacted as recommended in Section 4.2 (Please see Figure 5 in Section III of this document). It is also recommended that a factor of safety of at least 1.5 be used in calculating uplift resistance due to the weight of the footing and the backfill soil.

4.2.2 LATERAL EARTH PRESSURES ON BELOW GRADE WALLS

The magnitude of lateral earth pressure against subsurface walls (such as abutments walls, designed by others) is dependent on the method of backfill placement, the type of backfill soil, drainage provisions and whether or not the wall is permitted to yield during and/or after placement of the backfill. When a wall is held rigidly against horizontal movement, the lateral pressure against the wall is greater than the "active" earth pressure that is typically used in the design of free-standing retaining walls. Therefore, rigid walls should be designed for higher, "at-rest" pressures (using an at-rest lateral earth pressure coefficient, K_o), while yielding walls can be designed for active pressures (using an active lateral earth pressure coefficient, K_a).

For use in these computations, a total soil unit weight of 130 lbs/cu. ft. should be used. For below-grade walls, a coefficient of earth pressure at-rest (K_o) of 0.5 and a coefficient of "active" earth pressure of 0.33 are recommended, provided a well-graded granular material is used for backfill (Please see Figure 6 in Section III of this document). The granular backfill material should extend upward and outward from the base of the wall on a slope not steeper than about 1 (horizontal) to 1 (vertical). This method of computation presumes that there will be no hydrostatic pressure due to water build-up.

It is recommended that the static weight per axle of equipment utilized for the compaction of the backfill materials not exceed 2 tons per axle for non-vibratory equipment and 1 ton per axle for vibratory equipment. All heavy equipment, including compaction equipment heavier than recommended abovc, should not be allowcd closer to the wall (horizontal distance) than the vertical distance from the backfill surface to the bottom of the wall. If it is desired to use heavier compaction equipment adjacent to the below grade wall, it is recommended that this office be contacted to determine the resulting earth pressures.

4.2.3 SLABS-ON-GRADE

Any existing topsoil/existing fill and other deleterious soft material encountered below the proposed slab-on-grade for the pavilion and concession stand should be excavated to a minimum depth of 36 inches below the bottom of the proposed slab or until all deleterious existing fill/softer material is completely removed, whichever is shallower, the base of the excavation properly stabilized, and the excavation backfilled to the bottom of the slab with compacted engineered fill compacted to at least 95% of the maximum modified Proctor dry unit weight. Slabs-on-grade can then be supported on new compacted structural fill.

It is recommended that all slabs-on-grade be "floating", that is, fully ground supported and not structurally connected to walls or foundations. This is to minimize the possibility of cracking and displacement of the slabs-on-grade because of differential movements between the slab and the foundation. Although the movements are estimated to be within the tolerable limits for structural safety, such movements could be detrimental to the slabs if they were rigidly connected to the foundations.

It is furthermore recommended that the slabs-on-grade be supported on a 4 to 6-inch layer of relatively clean granular material such as sand and gravel or crushed stone. This is to help distribute concentrated loads and equalize moisture conditions beneath the slab. Proper drainage must be incorporated into this granular layer to preclude future wet areas in the finished slab-on-grade. Provided that a minimum of 4 inches of granular material is placed below the new slab-on-grade (and the native soil is prepared as recommended), a modulus of subgrade reaction (k_{30}) of 100 lbs./cu. in. can be used for design of the slabs.

4.2.4 FOUNDATION EXCAVATIONS

Each foundation excavation should be inspected to insure that all loose, soft or otherwise undesirable material is removed and that the foundation will bear on satisfactory material.

If pockets of soft, loose or otherwise unsuitable material are encountered in the footing excavations and it is inconvenient to lower the footings, the proposed footing elevations may be re-established by backfilling after the undesirable material has been removed. The undercut excavation beneath each footing should extend to suitable bearing soils and the dimensions of the excavation base should be determined by imaginary planes extending outward and down on a 1 (vertical) to 1 (horizontal) slope from the base perimeter of the footing as illustrated in Figure 7 in Section III. The entire excavation should then be refilled with a well-compacted engineered fill, or lean concrete (please note that the width of the lean concrete zone should be at least 1-foot wider than the width of the overlying footing element on all sides). Special care should be exercised to remove any sloughed, loose or soft materials near the base of the excavation slopes. Proper shoring techniques must be adopted during the excavation of the proposed footings below the bearing elevations of any nearby existing footings. All Federal, State, and Local regulations should be strictly adhered to relative to excavation side-slope geometry and any required shoring.

5.0 SLOPE CONSIDERATIONS

A detailed slope stability analysis is beyond the scope of this study. However, it is, recommended that fill slopes less than 10 feet in height be designed for slopes not steeper than 2.5 (horizontal) to 1 (vertical). For any fill greater than 10 feet in height, it is recommended that slopes be not steeper than 3 (horizontal) to 1 (vertical).

In general, temporary cut slopes of 2 (horizontal) to 1 (vertical) should remain stable during a reasonable construction period provided they are not higher than about 10 feet and are not subjected to excessive vibration from construction equipment and are protected from surface erosion. The need for temporary bracing of utility trenches should be anticipated. In general, any permanent cut slopes should be no steeper than about 3 (horizontal) to 1 (vertical).

6.0 CONSTRUCTION DEWATERING

At the time of our investigation, the free groundwater level was noted to be generally around the anticipated excavation depths. Therefore, significant quantities of groundwater should be anticipated in the proposed foundation/slab excavations due to the presence of sand and gravel zones. In order to maintain proper bearing support for the foundations/slabs, the entire foundation/slab excavation area must be dewatered (groundwater level lowered) to at least 2 feet below the deepest excavation elevation prior to the placement of the backfill/foundations/slabs, and the dewatering of the area maintained until the backfill/foundations/slabs are fully constructed. Sump pumping is generally a suitable method of dewatering in such areas where the required depth of groundwater to be lowered is generally less. Extra care must be exercised when pumping from sumps that extend into silts and other granular soils as observed at this site, as a general deterioration of the bearing soils and a localized "quick" condition could result. Extra care must also be exercised during pumping to ensure that the loss of fines does not occur and filter fabric should be used as necessary to maintain a soil-tight system. It is imperative that the dewatering of the foundations and subgrade soils be continually maintained until the foundations/slabs are fully constructed, and they are providing confinement of the underlying soils. If the groundwater level is allowed to rise to the surface of the excavation areas without the surface being confined, detrimental softening and degradation of the foundation and subgrade soils should be expected that will require remedial measures in order to provide adequate support for the structure. The evaluation and design of any required temporary or permanent dewatering measures to facilitate proper construction and proper in-service conditions is the responsibility of others than KBJW.

7.0 SITE PREPARATION

All areas that will support slabs-on-grade should be properly prepared. After rough grade has been established in cut areas and prior to placement of fill in all fill areas, the exposed subgrade should be carefully inspected by probing and testing as needed. Any topsoil or other deleterious/soft material still in place, frozen, wet, soft or loose soil, and other undesirable materials should be removed and replaced with engineered fill. Based on the test results presented in Table 1 of this document, aeration of the near-surface in-situ soils should be anticipated prior to their placement as engineered fill (or chemical stabilization can also be used). The exposed subgrade should furthermore be inspected by proofrolling with a loaded tandem axle dump truck or other suitable equipment to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed should be removed and replaced with well-compacted, engineered fill as outlined in the specifications of this document. However, it may also become necessary (due to the presence of soft exposed soil materials) to employ chemical stabilization or to locally incorporate ODOT No. 2 aggregate into the subgrade to increase its stiffness.

Care should be exercised during the grading operations at the site. Due to the nature of the near surface soils, the traffic of heavy equipment, including heavy compaction equipment, may create pumping and general deterioration of the shallower soils, especially if excess surface water is present. If this occurs, it may be necessary to utilize a biaxial/triaxial geogrid, chemical stabilization, or other methodology (such as the incorporation of ODOT No. 2 aggregate into the subgrade) to stabilize the disturbed subgrade. The grading, therefore, should be done during a dry season, if at all possible.

In addition, it must be emphasized that once engineered fill is properly placed on the project site, that these materials can also degrade significantly due to the effects of heavy construction traffic and wet weather. This degradation may in some cases require the excavation and replacement of the engineered fill with aerated, chemically-stabilized fill materials; hence, caution should be exercised to avoid such degradation of these soil materials.

It should be noted that when vibratory rollers are utilized on certain soils types (such as fine grain sands or silts), that shear induced pore water pressures may be developed within these materials which will result in significant "pumping" of these materials (even though these soils may be stiff and pass moisture density tests on engineered fills). Therefore (in these types of soils), it is imperative that the vibrator not be utilized and that these soils be statically rolled in order to preclude the development of such shear induced pore water pressures. These shear induced pore water pressures dissipate over a number of days (depending on the permeability of the soil materials); however in the short term, significant "pumping" of these materials can be witnessed in the field.

8.0 SOIL SWELLING POTENTIAL

Based upon the laboratory tests performed for this study and the mineralogy of typical soils from the general vicinity of the project site, no significant soil swelling is anticipated. To our knowledge, there are no instances of problems associated with soil swelling in the project vicinity.

9.0 LIQUEFACTION

When certain soils (generally only granular soils) below the groundwater table are subjected to dynamic loads, such as those produced by earthquakes, a sudden increase in pore water pressure occurs as the result of shearing of the soil particles past one another. In extreme cases, when these shear induced pore water pressures exceed the strength of the soil, the soil strength can reduce to zero thereby resulting in a phenomenon known as "liquefaction." Conditions at this site have been examined to determine the likelihood for liquefaction of the natural soils during earthquake ground motions.

Soil type, relative density, initial confining pressure (i.e., the depth of the potentially liquefiable soil below the ground surface) and the magnitude of potential ground motions are the most important factors in determining the liquefaction potential of a soil mass. It is generally agreed that saturated, relatively loose (with blow counts or "N" values typically less than about 13) in the upper 50 feet or so are most susceptible to liquefaction.

Clayey soils are generally considered to be non-vulnerable to liquefaction. It is, therefore, concluded that liquefaction (or any significant loss of strength) of the soils underlying the project site during earthquake ground motions is extremely unlikely. To our knowledge, there are no recorded cases of liquefaction of subsurface materials similar to those at this project site. Therefore, no special design measures relative to soil liquefaction appear to be warranted.

10.0 BURIED UTILITY PIPES

Excavations for buried utility pipelines should follow the guidelines set forth previously in this report. Depending on the pipeline material, a minimum thickness of at least 0.5 foot of select fine-grained granular bedding material should be used beneath all below-grade pipes, with a minimum cover thickness of at least 3 feet to afford an "arching" effect and reduce stresses on the pipe. The cover thickness may be reduced if the external loading condition on the pipe is relatively light or if the pipe is designed to withstand the external loading condition. It is not recommended that "pea-gravel" or other "open-work" aggregates be used for trench backfill since these materials are nearly impossible to compact and have a tendency to pond water within their interstices.

11.0 DRAINAGE

Adequate drainage should be provided at the site to minimize any increase in moisture content of the foundation soils. The exterior grade (including all parking areas) should be sloped away from all facility structures to prevent ponding of water.

12.0 CLOSURE

12.1 BASIS OF RECOMMENDATIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project and our experience with similar sites and subsurface conditions. Data used during this exploration included, but were not necessarily limited to:

- four (4) exploratory borings performed during this study,
- observations of the project site by our staff,
- results of the laboratory soil tests,
- site plans and drawings furnished by the client,
- supportive interaction with the client; and
- published soil or geologic data of this area.

In the event that changes in the project characteristics are planned, or if additional information or differences from the conditions anticipated in this report become apparent, KBJW should be notified so that the conclusions and recommendations contained in this report can be reviewed and, if necessary, modified or verified in writing.

12.2 LIMITATIONS OF STUDY/RECOMMENDED ADDITIONAL SERVICES

The subsurface conditions discussed in this report and those shown on the boring logs represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Regardless of the thoroughness of a subsurface exploration, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by designers, or that the construction process has altered the soil conditions. As variations in the soil profile are encountered, additional subsurface sampling and testing may be necessary to provide data required to re-evaluate the recommendations of this report. Consequently, after submission of this report it is recommended that KBJW be authorized to perform additional services to work with the designer(s) to minimize errors and omissions regarding the interpretation and implementation of this report.

Prior to construction, we recommend that KBJW:

- work with the designers to implement the recommended geotechnical design parameters into plans and specifications,
- consult with the design team regarding interpretation of this report,
- establish criteria for the construction observation and testing for the soil conditions encountered at this site; and
- review final plans and specifications pertaining to geotechnical aspects of design.

During construction, we recommend that KBJW:

- observe the construction, particularly the site preparation, fill placement, and foundation excavation or installation,
- perform in-place density testing of all compacted fill,
- perform materials testing of soil and other materials as required; and
- consult with the design team to make design changes in the event that differing subsurface conditions are encountered.

If KBJW is not retained for these services, we shall assume no responsibility for construction compliance with the design concepts, specifications or recommendations.

12.3 WARRANTY

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, express or implied, is made.

While the services of KBJW are a valuable and integral part of the design and construction teams, we do not warrant, guarantee, or insure the quality or completeness of services provided by other members of those teams, the quality, completeness, or satisfactory performance of construction plans and specifications which we have not prepared, nor the ultimate performance of building site materials.

12.3.1 SUBSURFACE EXPLORATION

Subsurface exploration is normally accomplished by test borings, although test pits are sometimes employed. The method of determining the boring location and the surface elevation at the boring is noted in the report, and is presented on the Boring Location Plan or on the boring log. The location and elevation of the boring should be considered accurate only to the degree inherent with the method used.

The boring log includes sampling information, description of the materials recovered, approximate depth of boundaries between soil and rock strata and groundwater data. The boring log represents conditions specifically at the location and time the boring was made. The boundaries between different soil strata are indicated at specific depths; however, these depths are in fact approximate and are somewhat dependent upon the frequency of sampling (The transition between soil strata is often gradual). Free groundwater level readings are made at the times and under conditions stated on the boring logs (Groundwater levels change with time and season). The borehole does not always remain open sufficiently long enough for the measured water level to coincide with the groundwater table.

12.3.2 LABORATORY AND FIELD TESTS

Laboratory and field tests are performed in accordance with specific ASTM standards unless otherwise indicated. All determinations included in a given ASTM standard are not always required and performed. Each test report indicates the measurements and determinations actually made.

12.3.3 ANALYSIS AND RECOMMENDATIONS

The geotechnical report is prepared primarily to aid in the engineering design of site work and structural foundations. Although the information in the report is expected to be sufficient for these purposes, it is not intended to determine the cost of construction or to stand alone as a construction specification.

Our engineering report recommendations are based primarily on data from test borings made at the locations shown on a boring location plan included in this report. Soil variations may exist between borings and these variations may not become evident until construction. If significant variations are then noted, the geotechnical engineer should be contacted so that field conditions can be examined and recommendations revised if necessary.

The geotechnical engineering report states our understanding as to the location, dimensions and structural features proposed for the site. Any significant changes in the nature, design, or location of the site improvements MUST be communicated to the geotechnical engineer such that the geotechnical analysis, conclusions, and recommendations can be appropriately adjusted. The geotechnical engineer should be given the opportunity to review all drawings that have been prepared based on their recommendations.

12.3.4 CONSTRUCTION MONITORING

Construction monitoring is a vital element of complete geotechnical services. The field engineer/inspector is the owner's "representative" observing the work of the contractor, performing tests as required in the specifications, and reporting data developed from such tests and observations. The field engineer or inspector does not direct the contractor's construction means, methods, operations or personnel. The field inspector/engineer does not interfere with the relationship between the owner and the contractor and, except as an observer, does not become a substitute owner on site. The field inspector/engineer is responsible for his own safety but has no responsibility for the safety of other personnel at the site. The field inspector/engineer is an important member of a team whose responsibility is to watch and test the work being done and report to the owner whether that work is being carried out in general conformance with the plans and specifications.

12.3.5 GENERAL

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

To evaluate the site for possible environmental liabilities, we recommend an environmental assessment, consisting of a detailed site reconnaissance, a record review, and report of findings. Additional subsurface drilling and samplings, including groundwater sampling, may be required. KBJW can provide this service and would be pleased to provide a cost proposal to perform such a study, if requested.

This report has been prepared for the exclusive use of the Arcanum-Butler Local Schools and its project team, for specific application to the proposed construction at the Arcanum Boosters Stadium, Arcanum, Ohio (see Figure 1 in Section III of this report). Specific design and construction recommendations have been provided in the various sections of the report. The report shall, therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. KBJW is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploratory and laboratory test data presented in this report.

SECTION II

SPECIFICATIONS

I - ENGINEERED FILL BENEATH STRUCTURES

CLEARING AND GRADING SPECIFICATIONS

1.0 GENERAL CONDITIONS

The Contractor shall furnish all labor, materials, and equipment, and perform all work and services necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction and grading as shown on the plans and as described therein.

This work shall consist of all clearing and grading, removal of existing structures unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes, and specifications.

This work is to be accomplished under the constant and continuous supervision of the Owner or his designated representative.

In these specifications the terms "approved" and "as directed" shall refer to directions to the Contractor from the Owner or his designated representative.

2.0 SUBSURFACE CONDITIONS

Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work. Borings and/or soil investigations shall have been made. Results of these borings and studies will be made available by the Owner to the Contractor upon his request, but the Owner is not responsible for any interpretations or conclusions with respect thereto made by the Contractor on the basis of such information, and the Owner further has no responsibility for the accuracy of the borings and the soil investigations.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the Owner can investigate the condition.

3.0 SITE PREPARATION

Within the specified areas, all trees, brush, stumps, logs, tree roots, and structures scheduled for demolition shall be removed and disposed of.

All cut and fill areas shall be properly stripped. Topsoil will be removed to its full depth and stockpiled for use in finish grading. Any rubbish, organic and other objectionable soils, and other deleterious material shall be disposed of off the site, or as directed by the Owner or his designated representative if on site disposal is provided. In no case shall such objectionable material be allowed in or under the fill unless specifically authorized in writing.

Prior to the addition of fill, the original ground shall be compacted to job specifications as outlined below. Special notice shall be given to the proposed fill area at this time. If wet spots, spongy conditions, or groundwater seepage is found, corrective measures must be taken before the placement of fill.

4.0 FORMATION OF FILL AREAS

Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross-section. The depth of lift may be increased if the Contractor can demonstrate the ability to compact a larger lift. If compaction is accomplished using hand-tamping equipment, lifts will be limited to 4-inch loose lifts. Engineered fill placed shall be compacted to at least 95% of the maximum dry unit weight with a moisture content within 2% of the optimum moisture content as determined by the modified Proctor test.

All material entering the fill shall be free of organic matter such as leaves, grass, roots, and other objectionable material.

The operations on earth work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions. The Contractor shall keep the work areas graded to provide the drainage at all times.

The fill material shall be of the proper moisture content before compaction efforts are started. Wetting or drying of the material and manipulation to secure a uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work thus affected shall be delayed until the material has dried to the required moisture content. The moisture content of the fill material should be no more than two (2) percentage points higher or lower than optimum unless otherwise authorized. Sprinkling shall be done with equipment that will satisfactorily distribute the water over the disced area. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that hardpan, cemented gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer. The fill shall contain no fragments whose greatest dimension is larger than 1/2 of the thickness of the lift being placed.

In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. Original slopes shall be continuously, vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal and the back of the bench is vertical. As many benches as are necessary to bring the site to final grade shall be constructed. Filling operations shall begin on the lowest bench, with the fill being placed in horizontal eight (8) inch thick loose lifts unless otherwise authorized. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper drainage shall be maintained at all times during benching and filling of the benches, to insure that all water is drained away from the fill area.

Frozen material shall not be placed in the fill nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all fills made under the contract, and shall replace any portion, which in the opinion of the Owner or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damaged by inclement weather shall be repaired at the Contractor's expense.

5.0 SLOPE RATIO AND STORM WATER RUN-OFF

Slopes shall not be greater than 2 (horizontal) to 1 (vertical) in both cut and fill, or as illustrated on the construction drawings. Excavations shall be constructed in accordance with all Federal, State and local codes relative to slope geometry.

6.0 GRADING

The Contractor shall furnish, operate, and maintain such equipment as is necessary to construct uniform layers, and control smoothness of grade for maximum compaction and drainage.

7.0 COMPACTING

The compaction equipment shall be approved equipment of such design, weight, and quantity to obtain the required density in accordance with these specifications.

8.0 TESTING AND INSPECTION SERVICES

Testing and inspection services will be provided by the Owner.

SECTION III

BORING LOGS, LAB TESTING RESULTS, & FIGURES

BORING LOG TERMINOLOGY

STRATUM DEPTH

Distance in feet and/or inches below ground surface.

STRATUM ELEVATION

Elevation in feet below ground surface elevation.

DESCRIPTION OF MATERIALS

Major types of soil material existing at boring location. Soil classification based on one of the following systems: Unified Soil Classification System, Ohio State Highway Classification System, Highway Research Board Classification System, Federal Aviation Authority Classification System, Visual Classification.

SAMPLE NO.

Sample numbers are designated consecutively, increasing with depth for each boring.

SAMPLE TYPE

"A" Split spoon, 2" O.D., 1-3/8" I.D., 18" in length.

"B" One of the following:

- Power Auger Sample
- Piston Sample
- Diamond Bit NX: BX: AX:
- Housel Sample
- Wash Sample
- Denison Sample

"C" Shelby Tube 3" O.D. except where noted.

SAMPLE DEPTH

Depth below top of ground at which appropriate sample was taken.

BLOWS PER 6" ON SAMPLER

The number of blows required to drive a 2" O.D., 1-3/8" I.D., split spoon sampler, using a 140 pound hammer with a 30 inch free fall, is recorded for 6" drive increments. (Example: 3/8/9)

"N" BLOWS/FT.

Standard penetration resistance. This value is based on the total number of blows required for the last 12" of penetration. (Example: 3/8/9 $\therefore$ N = 8 + 9 = 17)

WATER OBSERVATIONS

Depth of water recorded in test boring is measured from top of ground to top of water level. Initial depth indicates water level during boring, completion depth indicates water level immediately after boring, and depth of "X" number hours indicates water level after letting water rise or fall over a time period. Water observations in pervious soil are considered reliable ground water levels for that date. Water observations in impervious soils can not be considered accurate ground water measurements for that date unless records are made over several days' time. Factors such as weather, soil porosity, etc., will cause the ground water level to fluctuate for both pervious and impervious soils.

SOIL DESCRIPTION

COLOR

When the color of the soil is uniform throughout, the color recorded will be such as brown, gray, black and may be modified by adjectives such as light and dark. If the soil's predominant color is shaded by a secondary color, the secondary color precedes the primary color, such as: gray-brown, yellow-brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled, such as: mottled brown and gray.

PARTICLE SIZE	VISUAL	SOIL COMPONENTS	
Boulders	Larger than 8"	**Major Component**	**Minor Component Term**
Cobbles	8" to 3"	Gravel	Trace 1-10%
Gravel—Coarse	3" to ¾"	Sand	Some 11-35%
Fine	2 mm. To ¾"	Silt	And 36-50%
Sand —Coarse	2 mm.-0.6 mm. (Pencil lead size)	Clay	
—Medium	0.6 mm.-0.2 mm.	**Moisture Content**	
	(Table sugar and salt size)	**Term**	**Relative Moisture**
—Fine	0.2 mm.-0.06 mm.	Dry	Powdery
	(Powdered sugar and human hair size)	Damp	Moisture content below plastic limit
Silt	0.06 mm.-0.002 mm.	Moist	Moisture content
Clay	0.002 and smaller (Particle size of both Silt and Clay not visible		above plastic limit but below liquid limit
	to naked eye)	Wet	Moisture content above liquid limit

Condition of Soil Relative to Compactness Granular Material		**Condition of Soil Relative to Consistency Cohesive Material**	
Very Loose	5 blows/ft. or less	Very Soft	3 blows/ft. or less
Loose	6 to 10 blows/ft.	Soft	4 to 5 blows/ft.
Medium Dense	11 to 30 blows/ft.	Medium Stiff	6 to 10 blows/ft.
Dense	31 to 50 blows/ft.	Stiff	11 to 15 blows/ft.
Very Dense	51 blows/ft. or more	Very Stiff	16 to 30 blows/ft.
		Hard	31 blows/ft. or more

STANDARD PENETRATION RESISTANCE (ASTM D1586)

The purpose of this test is to determine the relative consistency of the soils in a boring, or from boring to boring over the site. This method consists of making a hole in the ground and driving a 2 inch O.D. split spoon sampler into the soil with a 140 pound hammer dropped from a height of 30 inches. The sampler is driven 18 inches and the number of blows recorded for each 6 inches of penetration. Values of standard penetration (N) are determined in blows per foot, summarizing the blows required for the last two 6 inch increments of penetration. (Example: 2-6-8; N = 14)

THIN-WALLED SAMPLER (ASTM D1587)

The purpose of the thin-walled sampler is to recover a relatively undisturbed soil sample for laboratory tests. The sampler is a thin-walled seamless tube with a 3 inch outside diameter, which is hydraulically pressed into the ground, at a constant rate. The ends are then sealed to prevent moisture loss, and the tube is returned to the laboratory for tests.

UNCONFINED COMPRESSION OR TRIAXIAL TESTS (ASTM D2166)

The unconfined compression test and the triaxial tests are performed to determine the shearing strength of the soil, to use in establishing its safe bearing capacity. In order to perform the unconfined compression tests, it is necessary that the soil exhibit sufficient cohesion to stand in an unsupported cylinder. These tests are normally performed on samples which are 6.0 inches in height and 2.85 inches in diameter. In the triaxial test, various lateral stresses can be applied to more closely simulate the actual field conditions. There are several different types of triaxial tests. These are, however, normally performed on constant strain apparatus with a deformation rate of 0.05 inches per minute.

CONSOLIDATION TEST (ASTM D2435)

The purpose of this test is to determine the compressibility of the soil. This test is performed on a sample of soil which is 2.5 inches in diameter and 1.0 inch in height, and has been trimmed from relatively "undisturbed" samples. The test is performed with a level system or an air activated piston for applying load. The loads are applied in increments and allowed to remain on the sample for a period of 24 hours. The consolidation of the sample under each individual load is measured and a curve of void ratio vs. Pressure is obtained. From the information obtained in this manner and the column loads of the structure, it is possible to calculate the settlement of each individual building column. This information, together with the shearing strength of the soil, is used to determine the safe bearing capacity for a particular structure.

REVISED TO ASTM D4318
ATTERBERG LIMITS (ASTM D423 AND D424)

These tests determine the liquid and plastic limits of soils having a predominant percentage of fine particle (silt and clay) sizes. The liquid limit of a soil is the moisture content expressed as a percent at which the soil changes from a liquid to a plastic state, and the plastic limit is the moisture content at which the soil changes from a plastic to a semi-solid state. Their difference is defined as the plasticity index (P.I. = L.L. - P.L.), which is the change in moisture content required to change the soil from a "semi-solid" to a liquid. These tests furnish information about the soil properties which is important in determining their relative swelling potential and their classifications.

MECHANICAL ANALYSIS (ASTM D422)

This test determines the percent of each particle size of a soil. A sieve analysis is conducted on particle sizes greater than a No. 20 sieve (0.074 mm), and a hydrometer test on particles smaller than the No. 200 sieve. The gradation curve is drawn through the points of cumulative per cent of particle size, and plotted on semi-logarithmic paper for the combined sieve and hydrometer analysis. This test, together with the Atterberg Limits tests, is used to classify a soil.

NATURAL MOISTURE CONTENT (ASTM D2216)

The purpose of this test is to indicate the range of moisture contents present in the soil. A wet sample is weighed, placed in the constant temperature oven at 105° for 24 hours, and re-weighed. The moisture content is the change in weight divided by the dry weight.

PROCTOR TESTS

The purpose of these tests is to determine the maximum density and optimum moisture content of a soil. The Modified Proctor test is performed in accordance with ASTM D1557-70. The test is performed by dropping a 10 pound hammer 25 times from an 18 inch height on each of 5 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 56,250 foot pounds per cubic foot. The moisture content is then raised, and this procedure is repeated. A moisture density curve is then plotted, with the density on the ordinate axis and the moisture content on the abscissa axis. The moisture content at which the maximum density requirement can be achieved with a minimum compactive effort is designated as the optimum moisture content (O.M.C.). The Standard Proctor test is performed in accordance with ASTM D698-70. This test is similar to the Modified Proctor test and is performed by dropping a 5.5 pound hammer 25 times from a height of 12 inches on 3 equal layers of soil in a 1/30 cubic foot mold, which represents a compaction effort of 12,375 foot pounds per cubic foot. This test gives proportionately lower results than the Modified Proctor test.

FIELD CLASSIFICATION SYSTEM FOR ROCK EXPLORATION

Saprolite A transitional material between soil and rock retains the relic structure of the parent rock and exhibits penetration resistance between 60 blows per foot and 100 blows/2 inches of penetration.

R.Q.D. Rock Quality Designation; Ratio of the core lengths greater than four inches to the total length of the core run.

Description	Percentage Core Recovered	RQD Rock Quality Description	Description of Rock Quality
Incompetent	Less than 40	0 - 25	very poor
Competent	40 - 70	25 - 50	poor
Fairly Competent	70 - 80	50 - 75	fair
Fairly Continuous	80 - 90	75 - 90	good
Continuous	90 - 100	90 - 100	excellent

FIELD HARDNESS: (A measure of resistance to scratching or abrasion)

Very Hard	Cannot be scratched with knife or sharp pick, breaking of hand specimens requires several hard blows of geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow of a hammer required to detach hand specimen.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to ¼ inch deep can be excavated by hard blow of point of a geologist's pick. Hand specimens can be detached by moderate blow.
Medium	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips to pieces about 1 inch maximum size by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips and pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.
Very soft	Can be carved with knife. Can be excavated with point of pick. Pieces 1 inch or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.

WEATHERING: (The action of the elements in altering the color, texture, and composition of the rock)

Very slightly	Rock generally fresh, joints stained, some joints may contain thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slightly	Rock generally fresh, joins stained, and discoloration extends into rock up to 1 inch. Joints may contain clay. In granitoid rocks some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderately	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some may be decomposed to clay. Rock as dull sound under hammer and has a significant loss of strength compared with fresh rock.
Severely	All rock except quartz discolored or stained. Rock "fabric" clear and evident but reduced in strength to strong soil. In granitoid rocks all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severely	All rock except quartz discolored of stained. Rock "fabric" discernible, but mass effectively reduces to "soil" with only fragments of strong rock usually left.
Completely	All rock completely altered to soil-like material.

ROCK FRACTURE FREQUENCY: (Any break in a rock whether or not it has undergone relative displacement.)

Description	Spacing Between Fractures
Extremely fractured	Less than 1 inch
Moderately fractured	1 inch to 4 inches
Slightly fractured	4 inches to 8 inches
Sound	More than 8 inches

Note: Fracture frequency terms are generalized to described the average condition of the rock obtained from the core run. Portions of the rock within the run described may vary from the generalized descriptions. Where a core break appears to be due to drilling and not to natural causes, it has not been considered as a break for accessing fracture frequency. Frequency shown on Record of Soil Exploration represents condition of core as removed form the core barrel.

JOINTS BEDDING, AND FOLIATION:

Joints	Bedding & Foliation	Spacing
Very close	Very thin	Less than 2 inches
Close	Thin	2 inches - 1 foot
Moderately close	Medium	1 foot - 3 feet
Wide	Thick	3 feet - 10 feet
Very wide	Very Thick	More than 10 feet

Notes: Refers to perpendicular distance between discontinuities

Attitude	Angle (degrees)
Horizontal	0 to 5
Shallow to low angle	5 to 35
Moderately dipping	35 to 55
Steep or high angle	55 to 85
Vertical	85 to 90

Koontz Bryant Johnson Williams, Inc.
3171 Research Boulevard
Dayton, OH 45420
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BORING LOG

CLIENT: Arcanum-Butler Local Schools
PROJECT: Pedestrian Bridge, Pavilion and Concession Stand
LOCATION: Arcanum Boosters Stadium, Arcanum, Ohio

REPORT NO.: 24-30510-001
DATE STD.: 6/24/24
DRILLERS: EnviroCore, Inc.
METHOD: HSA

BORING NO.: KBJW-1
DATE FINISHED: 6/24/24
GROUND ELEV.: --

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	DEPTH OF SAMPLE, FT. TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL					
	2"	FILL, soft, brown, silty CLAY, trace sand and gravel (moist)	1A	1.0	2.5	4-3-3	6
2.0							
	2.5	ORIGINAL, very soft, brown/gray, silty CLAY, trace sand and gravel (moist)	2A	3.5	5.0	1-2-1	3
4.0							
6.0			3A	6.0	7.5	2-1-3	4
8.0							
	8.5	Medium dense, brown, silty SAND, some gravel (wet)	4A	8.5	10.0	4-10-21	31
10.0							
12.0							
	13.5	Stiff, gray, silty CLAY, trace sand and gravel (wet)	5A	13.5	15.0	7-8-9	17
14.0							
16.0							
18.0							
			6A	18.5	20.0	10-13-21	34
20.0		BOTTOM OF BORING AT 20.0 ft.					
22.0							
24.0							
26.0							
28.0							
30.0							
32.0							
34.0							
36.0							
38.0							

WATER LEVEL OBSERVATIONS
Noted on rods 9.0 ft.
At completion 9.0 ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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(P) (937) 428-6150

BORING LOG

CLIENT:	Arcanum-Butler Local Schools	REPORT NO.:	24-30510-001	BORING NO.:	KBJW-2
		DATE STD.:	6/24/24	DATE FINISHED:	6/24/24
PROJECT:	Pedestrian Bridge, Pavilion and Concession Stand	DRILLERS:	EnviroCore, Inc.	GROUND ELEV.:	--
LOCATION:	Arcanum Boosters Stadium, Arcanum, Ohio	METHOD:	HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	DEPTH OF SAMPLE, FT. TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL					
	2"	FILL, soft, brown, silty CLAY, trace sand and gravel (moist)	1A	1.0	2.5	3-3-5	8
2.0							
	2.5	ORIGINAL, soft, brown/gray, silty CLAY, some sand and gravel (moist)	2A	3.5	5.0	2-1-4	5
4.0							
6.0			3A	6.0	7.5	3-3-3	6
8.0							
	8.5	Medium dense, brown, silty SAND, some gravel (wet)	4A	8.5	10.0	6-11-11	22
10.0							
12.0							
	13.5	Stiff, gray, silty CLAY, some sand and gravel (wet)	5A	13.5	15.0	6-6-8	14
14.0							
16.0							
18.0							
			6A	18.5	20.0	6-7-7	14
20.0							
22.0							
			7A	23.5	25.0	5-6-10	16
24.0							
		BOTTOM OF BORING AT 25.0 FEET					
26.0							
28.0							
30.0							
32.0							
34.0							
36.0							
38.0							

WATER LEVEL OBSERVATIONS
Noted on rods 9.0 ft.
At completion 12.0 ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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3171 Research Boulevard
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(P) (937) 428-6150

BORING LOG

CLIENT: Arcanum-Butler Local Schools	REPORT NO.: 24-30510-001	BORING NO.: KBJW-3	
	DATE STD.: 6/24/24	DATE FINISHED: 6/24/24	
PROJECT: Pedestrian Bridge, Pavilion and Concession Stand	DRILLERS: EnviroCore, Inc.	GROUND ELEV.: --	
LOCATION: Arcanum Boosters Stadium, Arcanum, Ohio	METHOD: HSA		

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Silt, Sand, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL					
	1"	FILL, soft, brown, silty CLAY, trace sand and gravel (moist)	1A	1.0	2.5	3-2-2	4
2.0							
	2.5	ORIGINAL, very soft, brown/gray, silty CLAY, some sand and gravel (moist)	2A	3.5	5.0	1-1-1	2
4.0							
6.0			3A	6.0	7.5	WOH-WOH-2	2
8.0							
	8.5	Medium dense, brown, silty SAND, some gravel (wet)	4A	8.5	10.0	16-26-10	36
10.0							
12.0							
	13.5	Stiff, gray, silty CLAY, some sand and gravel (wet)	5A	13.5	15.0	4-5-6	11
14.0							
16.0							
18.0							
			6A	18.5	20.0	7-9-10	19
20.0							
22.0							
			7A	23.5	25.0	10-13-15	28
24.0							
		BOTTOM OF BORING AT 25.0 FEET					
26.0							
28.0							
30.0							
32.0							
34.0							
36.0							
38.0							

<u>WATER LEVEL OBSERVATIONS</u>
Noted on rods 8.5 ft.
At completion 18.0 ft.
After -- hours -- ft.

<u>BORING METHOD</u>
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

<u>TYPE SAMPLE</u>
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

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BORING LOG

CLIENT: Arcanum-Butler Local Schools
REPORT NO.: 24-30510-001
BORING NO.: KBJW-4
DATE STD.: 6/24/24
DATE FINISHED: 6/24/24
PROJECT: Pedestrian Bridge, Pavilion and Concession Stand
DRILLERS: EnviroCore, Inc.
GROUND ELEV.: --
LOCATION: Arcanum Boosters Stadium, Arcanum, Ohio
METHOD: HSA

SCALE, FT.	STRATUM DEPTH, FT.	CLASSIFICATION OF MATERIAL Major Soil Components: Gravel, Sand, Silt, Clay Minor Component Term: Trace 1-10%, Some 11-35%, And 36-50%	SAMPLE NUMBER & SAMPLE TYPE	DEPTH OF SAMPLE, FT. FROM	TO	BLOWS ON SAMPLER PER SPT (6" INTER-VAL)	SPT "N", OR RECOVERY (IN. FOR SHELBY TUBES, % FOR ROCK CORE)
0.0	0.0	TOPSOIL					
	2"	FILL, soft, brown, silty CLAY, trace sand and gravel (moist)	1A	1.0	2.5	5-5-2	7
2.0							
	3.5	ORIGINAL, medium dense, brown, silty SAND, some gravel (wet)	2A	3.5	5.0	7-11-11	22
4.0							
6.0	6.0	Stiff, brown/gray, silty CLAY, some sand, gravel (moist)	3A	6.0	7.5	12-12-18	30
8.0							
	8.5	Medium dense, brown, silty/clayey SAND, some gravel (wet)	4A	8.5	10.0	14-15-8	23
10.0							
12.0							
	13.5	Stiff, gray, silty CLAY, some sand and gravel (wet)	5A	13.5	15.0	10-15-16	31
14.0							
16.0							
18.0							
			6A	18.5	20.0	7-7-10	17
20.0							
22.0							
			7A	23.5	25.0	5-15-18	33
24.0							
		BOTTOM OF BORING AT 25.0 FEET					
26.0							
28.0							
30.0							
32.0							
34.0							
36.0							
38.0							

WATER LEVEL OBSERVATIONS
Noted on rods 8.5 ft.
At completion 13.5 ft.
After -- hours -- ft.

BORING METHOD
HSA Hollow Stem Auger
CFA Continuous Flight Auger
DC Driven Casing
MD Mud Drilling
RC Rock Coring
CA Casing Advancer

TYPE SAMPLE
A - Split Spoon
B - Rock Core
C - Shelby Tube
D - Other

*These Shelby Tube Samples Obtained In An Auxiliary Boring Drilled A Few Feet From This Boring

TABLE 1

RESULTS OF NATURAL MOISTURE CONTENT TESTS (ASTM D-4643)

BORING NO.	DEPTH INCREMENT, (FT.)	NATURAL MOISTURE CONTENT, %
KBJW-1	1.0 – 2.5	17.1
KBJW-1	3.5 – 5.0	19.7
KBJW-1	6.0 – 7.5	17.8
KBJW-1	8.5 – 10.0	17.5
KBJW-1	13.5 – 15.0	11.3
KBJW-1	18.5 – 20.0	8.9
KBJW-2	1.0 – 2.5	17.4
KBJW-2	3.5 – 5.0	16.2
KBJW-2	6.0 – 7.5	17.1
KBJW-2	8.5 – 10.0	18.7
KBJW-2	13.5 – 15.0	13.7
KBJW-2	18.5 – 20.0	11.0
KBJW-2	23.5 – 25.0	11.5
KBJW-3	1.0 – 2.5	15.8
KBJW-3	3.5 – 5.0	13.5
KBJW-3	6.0 – 7.5	19.9
KBJW-3	13.5 – 15.0	11.1
KBJW-3	18.5 – 20.0	8.6
KBJW-4	1.0 – 2.5	16.0
KBJW 4	3.5 – 5.0	7.0
KBJW-4	6.0 – 7.5	9.0
KBJW-4	8.5 – 10.0	10.6
KBJW-4	13.5 – 15.0	8.5
KBJW-4	18.5 – 20.0	11.0
KBJW-4	23.5 – 25.0	11.0

VICINITY MAP

GEOTECHNICAL ENGINEERING INVESTIGATION
FOR THE PROPOSED PEDESTRIAN BRIDGE, PAVILION,
AND CONCESSION STAND TO BE CONSTRUCTED
AT THE ARCANUM BOOSTERS STADIUM,
ARCANUM, OHIO

Project No.	Scale	Date:
24-30510-001	1" = 800'	6/25/24

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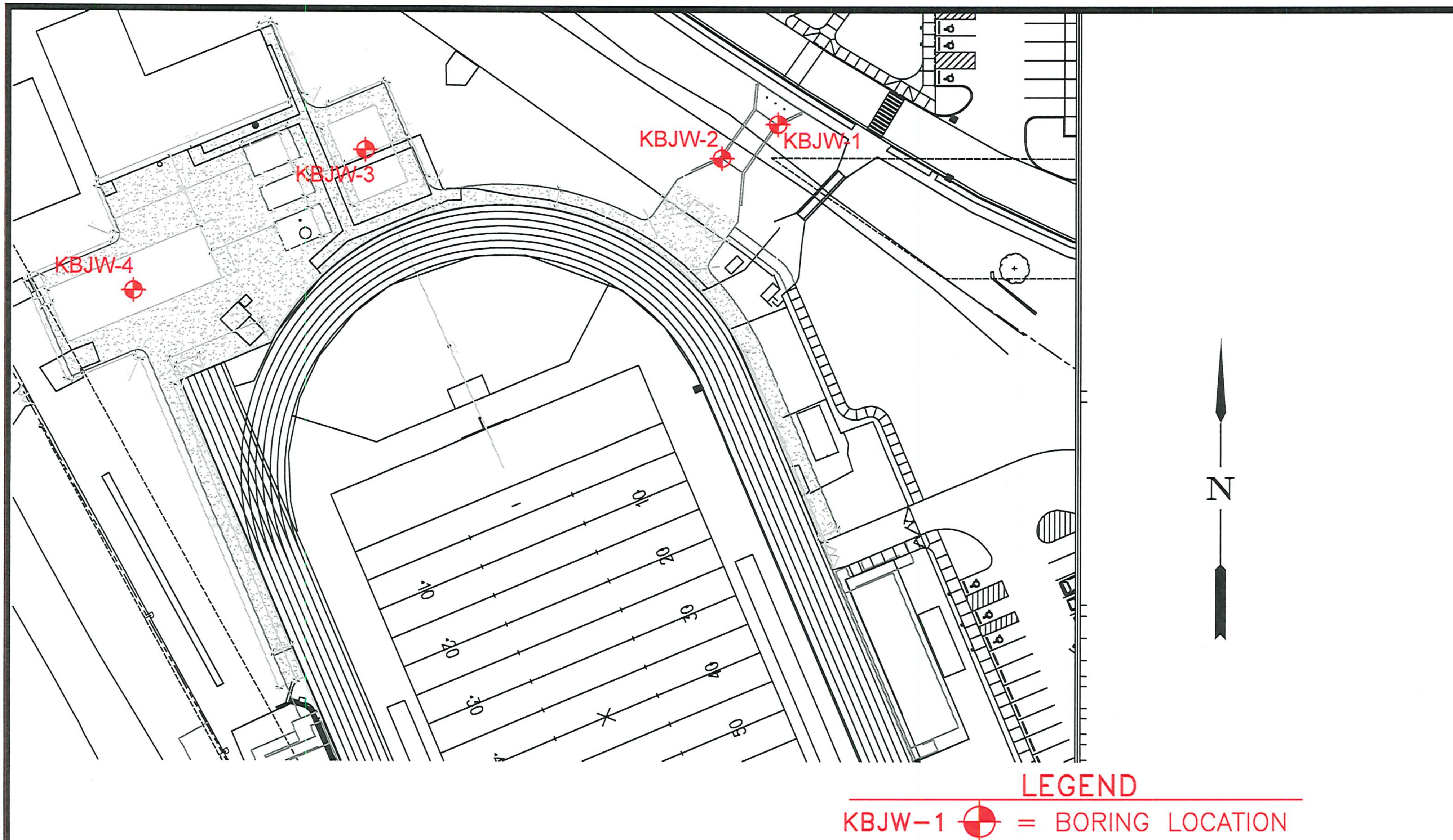
Figure No. 1



BORING LOCATION PLAN

GEOTECHNICAL ENGINEERING INVESTIGATION
FOR THE PROPOSED PEDESTRIAN BRIDGE, PAVILION,
AND CONCESSION STAND TO BE CONSTRUCTED
AT THE ARCANUM BOOSTERS STADIUM,
ARCANUM, OHIO

Project No.	24-30510-001
Scale	1" = 100'
Date:	6/25/24
Figure No.	2

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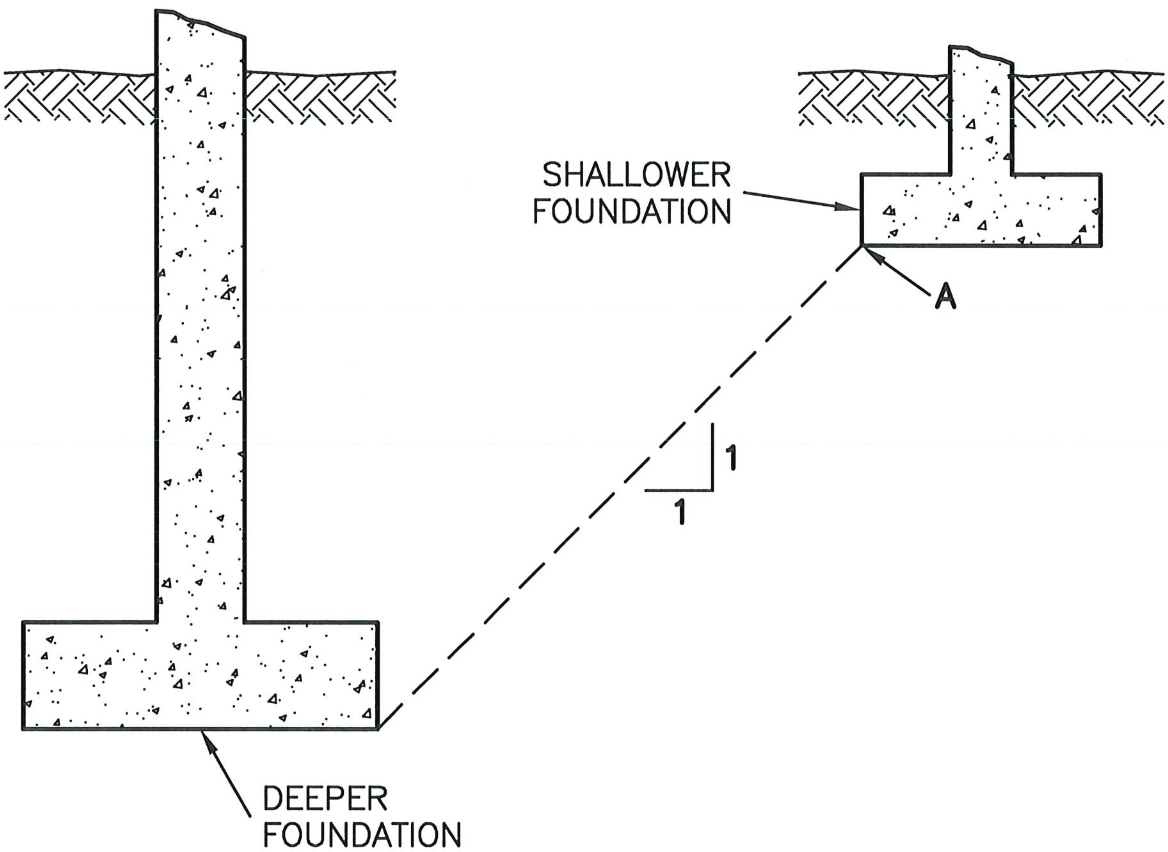


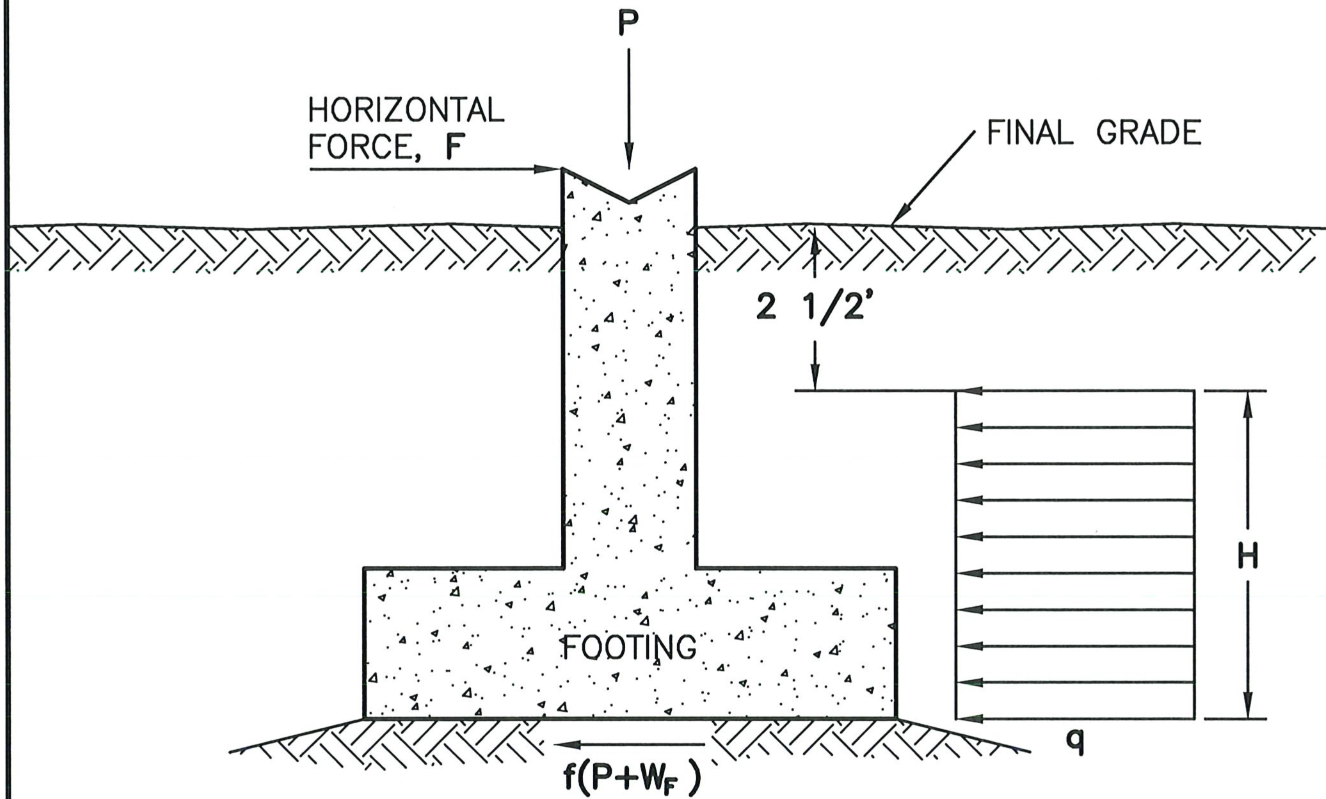
NOTE: POINT "A" OF SHALLOWER FOOTING MUST BE SITUATED BELOW THE DASHED LINE SHOWING THE FOOTING LOCATION LIMIT.

DESIGN ILLUSTRATION:

ADJACENT FOOTINGS

KOONTZ BRYANT JOHNSON WILLIAMS
Formerly CBC Engineers

PROJECT NO:	SCALE:	FIGURE NO.
.	NONE	3



LEGEND:

P = MINIMUM DOWNWARD LOAD

f = COEFFICIENT OF FRICTION AT CONCRETE/SOIL INTERFACE

F = MAXIMUM HORIZONTAL FORCE

W_F = WEIGHT OF FOOTING BELOW FINAL GRADE

q = RESISTING PASSIVE PRESSURE

DESIGN ILLUSTRATION:

RESISTING LATERAL FORCES FOR SHALLOW FOOTINGS

KOONTZ BRYANT JOHNSON WILLIAMS
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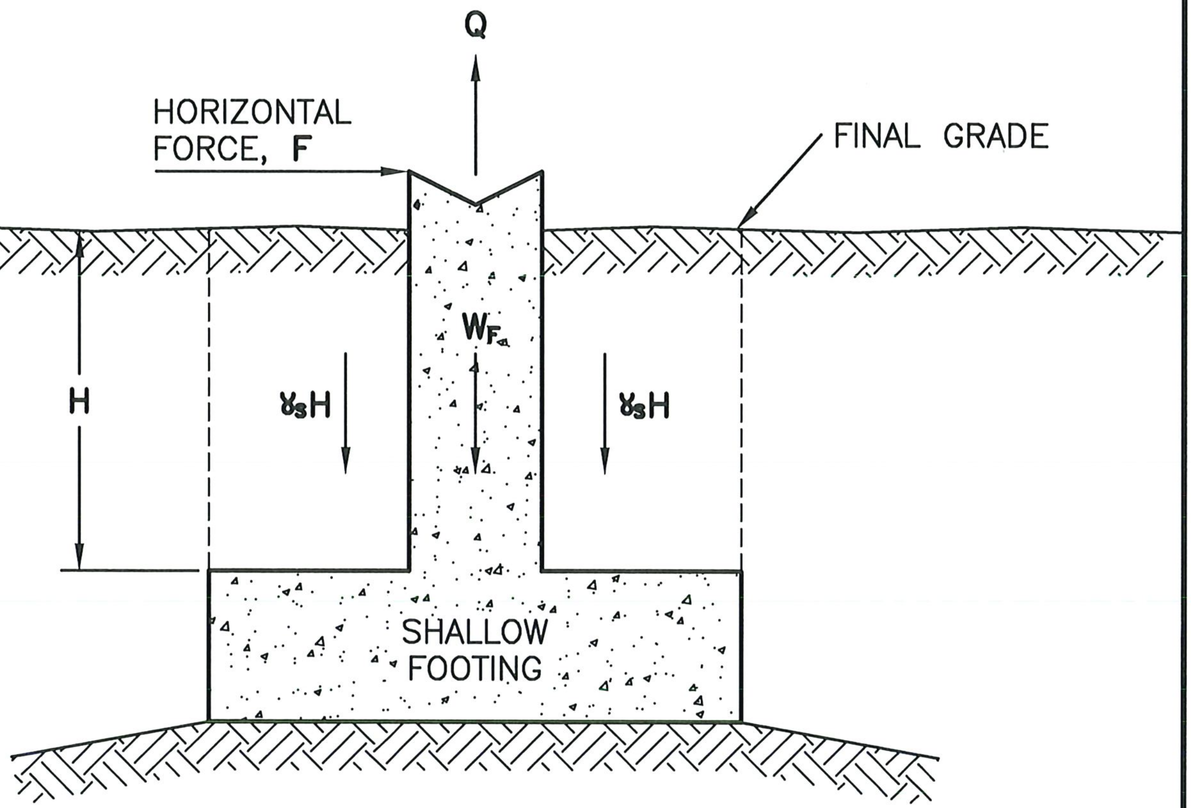
PROJECT NO:	SCALE:	FIGURE NO.
.	NONE	4



LEGEND:

Q = MAXIMUM UPLIFT LOAD

γ_s = TOTAL SOIL UNIT WEIGHT

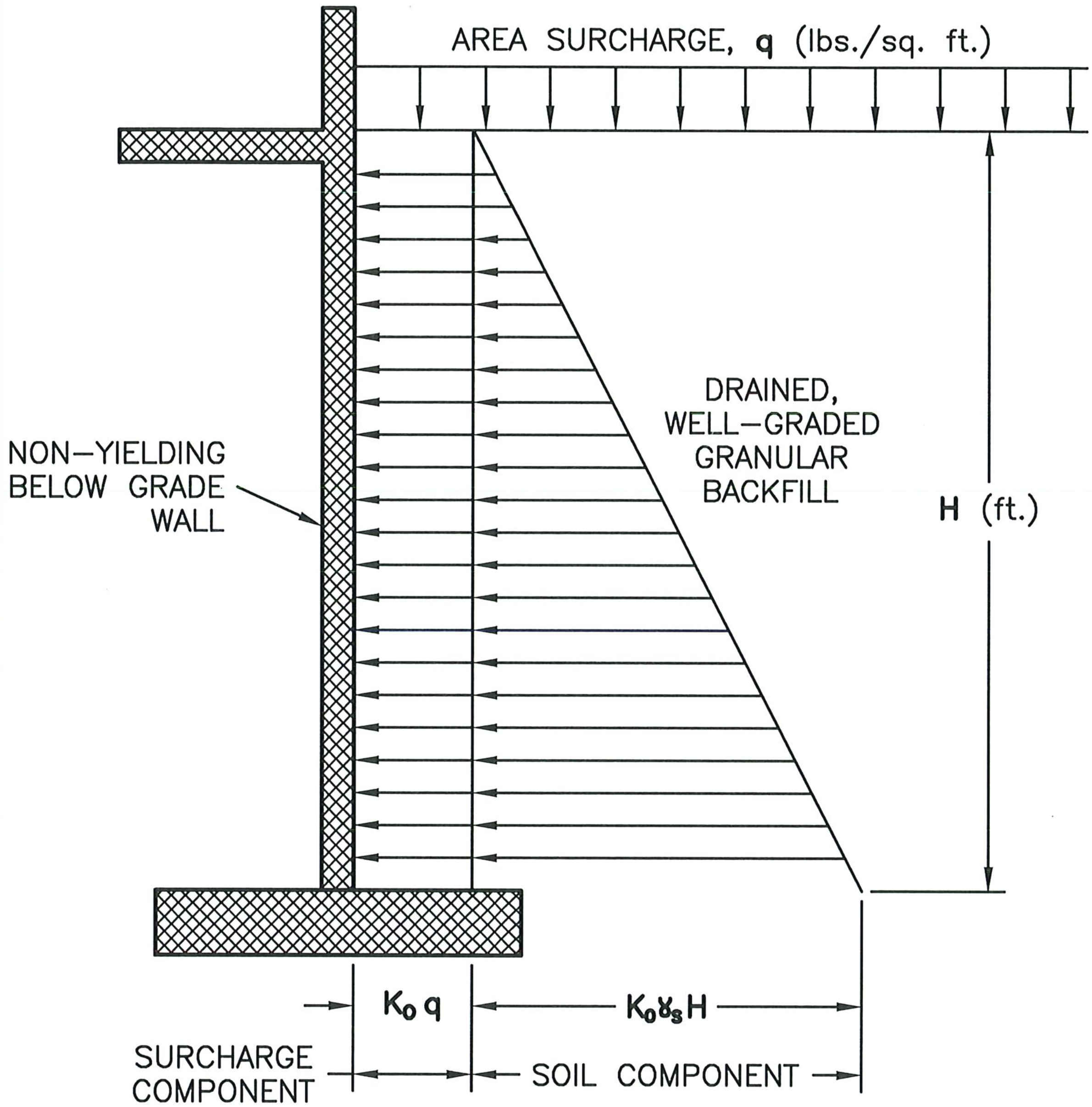
W_F = WEIGHT OF FOOTING BELOW FINAL GRADE

DESIGN ILLUSTRATION:

RESISTING UPLIFT FORCES FOR SHALLOW FOOTINGS

KOONTZ BRYANT JOHNSON WILLIAMS
Formerly CBC Engineers

PROJECT NO:	SCALE:	FIGURE NO.
.	NONE	5



LEGEND:

γ_s = TOTAL SOIL UNIT WEIGHT, (lbs./cu. ft.)

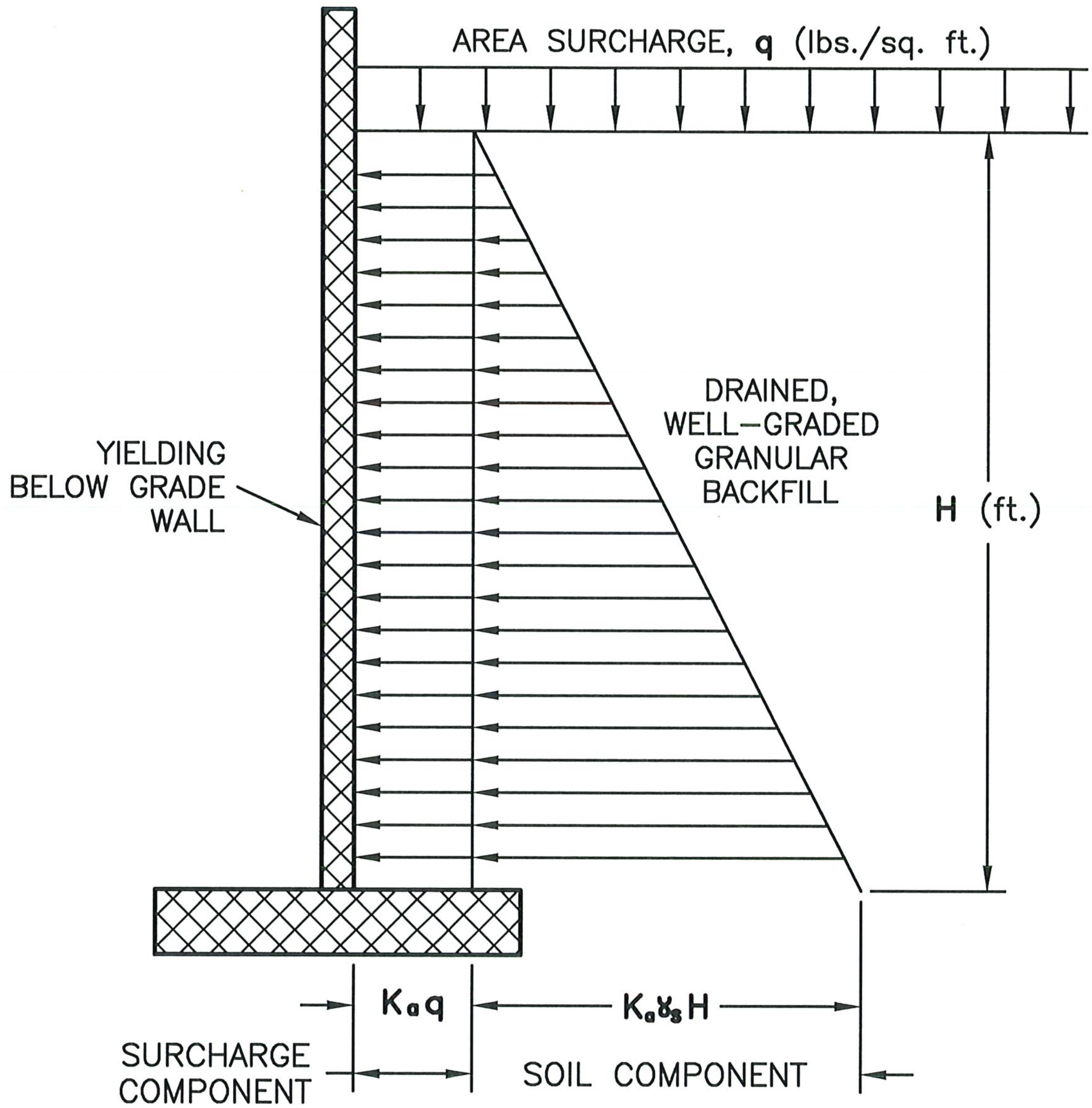
K_0 = AT REST EARTH PRESSURE COEFFICIENT

DESIGN ILLUSTRATION:

LATERAL EARTH PRESSURE AGAINST NON-YIELDING BELOW-GRADE WALL ASSUMING DRAINED BACKFILL WITH NON-HYDROSTATIC PRESSURE

KOONTZ BRYANT JOHNSON WILLIAMS
Formerly CBC Engineers

PROJECT NO:	SCALE:	FIGURE NO.
.	NONE	6



LEGEND:

K_a = ACTIVE EARTH PRESSURE COEFFICIENT

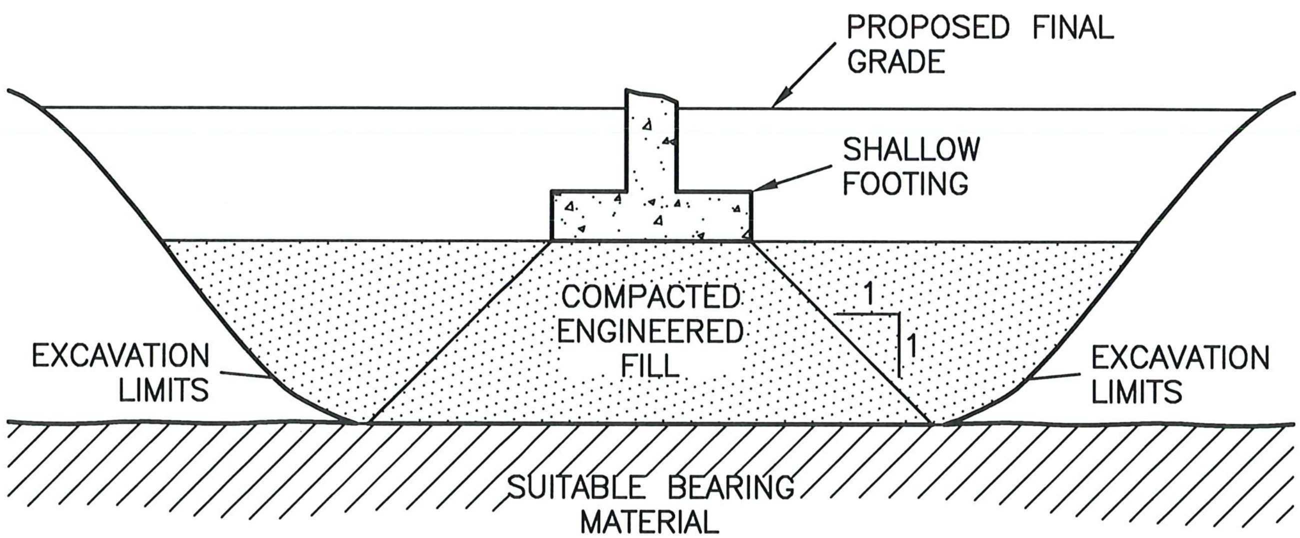
γ_s = TOTAL SOIL UNIT WEIGHT, (lbs./cu. ft.)

DESIGN ILLUSTRATION:

LATERAL EARTH PRESSURE AGAINST YIELDING BELOW-GRADE WALL ASSUMING DRAINED BACKFILL WITH NO HYDROSTATIC PRESSURE

KOONTZ BRYANT JOHNSON WILLIAMS
Formerly CBC Engineers

PROJECT NO:	SCALE:	FIGURE NO.
.	NONE	6A



DESIGN ILLUSTRATION:

SHALLOW FOOTINGS IN AN
UNDERCUT AREA

KOONTZ BRYANT JOHNSON WILLIAMS
Formerly CBC Engineers

PROJECT NO:	SCALE:	FIGURE NO.
.	NONE	7