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GEOTECHNICAL ENGINEERING REPORT
Delafield Street Apartments Development
Northwest Corner of Madison Street and Delafield Street
Waukesha, Wisconsin

April 30, 2024
File No. 20.0158728.00

PREPARED FOR:
Mandel Group, Inc.
Milwaukee, Wisconsin

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April 30, 2024
File No. 20.0158728.00

Mr. Daniel Romnek
Mandel Group, Inc.
330 East Kilbourn Avenue, Suite 600 South
Milwaukee, Wisconsin 53202-3144

Re: Geotechnical Engineering Report
Delafield Street Apartments Development
Northwest Corner of Madison Street and Delafield Street
Waukesha, Wisconsin

Dear Mr. Romnek:

GZA GeoEnvironmental, Inc. (GZA) is pleased to present the attached Geotechnical Engineering Report ("Report") for the Delafield Street Apartments Development located at the northwest corner of Madison Street and Delafield Street in Waukesha, Wisconsin ("Site"). The Report provides findings, conclusions, and recommendations that GZA derived from our geotechnical evaluation and are based on our current understanding of the project.

We appreciate the opportunity to provide services for this project. Please feel free to contact us with questions.

Very truly yours,

GZA GeoEnvironmental, Inc.

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Jesse D. Graham, P.E.
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Attachments

FIGURES

APPENDICES

1.0 INTRODUCTION

At the request of Mandel Group, Inc. ("Client"), GZA GeoEnvironmental, Inc. (GZA) conducted a geotechnical engineering evaluation for the potential development of three previously developed parcels located at 130 Delafield Street, 201 Delafield Street, and 318 Delafield Street, in Waukesha, Wisconsin ("Site"). A Site Location Plan is provided as **Figure 1**. GZA's services were conducted in general accordance with our January 19, 2024 Proposal for Geotechnical Exploration Services, GZA File No. 20.P000566.24. The findings, conclusions, and recommendations that GZA derived from the geotechnical evaluation are provided in this Geotechnical Engineering Report ("Report") and are subject to the Limitations provided in **Appendix A**. Boring elevations, when provided, are in reference to the City of Waukesha Vertical Datum (COW) and are based on elevation contours provided in an electronic drawing file titled "1773.00 ALTA," provided to GZA by the Client on January 8, 2024. Elevations are assumed to be accurate to the nearest +/- 1 foot unless specified otherwise.

1.1 SUMMARY

Geotechnical findings and recommendations for the potential development are summarized below. The summary is provided for the convenience of the non-technical reader and must be read in complete context with the remaining Report.

1. GZA field staff oversaw and logged 19 soil test borings at the Site. The 19 borings were drilled to depths of approximately 3.5 to 28.5 feet below ground surface (bgs) to evaluate the subsurface conditions for the potential development. The borings were advanced on the existing vacant parcel at the approximate locations shown on **Figure 2**.
2. Based on the subsurface conditions and estimated structural loads/foundations sizes for the future development, it is our opinion that shallow foundation systems will be feasible for building support at the Site. However, due to the existing fill and somewhat variable soils present at the Site, overexcavation and replacement will be necessary. Other methods of soil improvement, such as rammed aggregate piers, could also be considered.
3. Isolated areas of organic and soft soils should be removed from areas below structural footings and replaced with approved, compacted, engineered fill materials or lean-mix concrete slurry. Additional overexcavation may be required in areas of previously placed thick fill deposits. A maximum, net, allowable bearing capacities of **2,500 and 3,000 pounds per square foot (psf), for the north and south buildings, respectively,** may be used for foundation design, depending on final grades and location on-Site. Strip footings should be at least 24 inches wide and a maximum of 6 feet wide. Isolated column footings should be at least 30 inches wide and a maximum of 12 feet wide.
4. We recommend that perimeter foundations in unheated areas extend at least 48 inches below the lowest adjacent grade, or deeper if required by local Building Code.
5. A vertical modulus of subgrade reaction (k_v) of 90 pounds per cubic inch (pci) is recommended for concrete slab-on-grade design assuming the recommendations within this Report are followed. If encountered at footing grade, organic soils and deleterious fill materials should be removed prior to proof rolling and slab-on-grade placement. Backfilling of overexcavated soils with approved backfill materials will likely increase the k_v value in these locations.
6. Subgrade soils exposed during excavation and grading may be sensitive to moisture changes and disturbance due to construction traffic. Therefore, the exposed subgrade soils should be protected from moisture changes and monitored for disturbance from construction equipment. We recommend that a layer of compacted, well-graded, aggregate fill be placed over exposed construction traffic routes and laydown areas (minimum of 9 inches thick) to reduce disturbance potential. Due to the fine-grained nature of subgrade soils, a separation geotextile may also be

required along construction traffic routes and laydown areas. Excavation into the silt and/or clay soils should be done with smooth-edged equipment to reduce disturbance. Concrete mud slabs should be considered for construction taking place during periods of seasonal moisture increases.

7. Groundwater was observed in 14 soil borings at depths ranging from about 3.7 to 23 feet bgs, after allowing the groundwater to stabilize for times ranging from 5 minutes to 2.5 hours. Temporary dewatering should be expected when performing excavations for the foundations unless Site grades are raised. It is expected that conventional sumps/pumps placed in the excavation should be sufficient for dewatering the expected groundwater infiltration.

1.2 PURPOSE AND SCOPE OF SERVICES

GZA's objective for this project was to develop geotechnical engineering recommendations for design and construction of foundations, slabs-on-grade, fill placement, conditions regarding the existing structures, and construction considerations for the potential development. To achieve our objective, GZA:

- Reviewed previous work in the area completed by GZA and other publicly available information;
- Coordinated a geotechnical subsurface exploration program that consisted of 19 soil borings;
- Classified soil samples recovered from the borings based on field observations and prepared boring logs using our visual classifications;
- Conducted field and laboratory tests on a select number of soil samples to aid in the evaluation of the engineering properties of the subsurface soils;
- Performed geotechnical engineering analyses and developed geotechnical engineering recommendations; and
- Prepared this Report, which summarizes GZA's findings from the geotechnical evaluation and provides geotechnical recommendations for the potential project.

2.0 BACKGROUND

2.1 EXISTING CONDITIONS AND HISTORIC DEVELOPMENT

2.1.1 Existing Conditions

The Site is located at the northwest corner of Madison Street and Delafield Street in Waukesha, Wisconsin in the northeast quarter of Section 3, Township 6 North, Range 19 East of the 4th Principal Meridian. The Site is approximately 3.95 acres and is bounded by Delafield Street on the north and east, Madison Street on the south, and private property on the west. Site surface elevations range from about Elevation (El.) 41 to El. 74, COW Vertical Datum. The Site is currently occupied by the previous City of Waukesha municipal building and three asphalt parking lots separated by two concrete retaining walls.

Existing underground utilities, including overhead electric lines, storm sewer, sanitary sewer, electrical, gas, and communications, are present on and adjacent to the Site. Public utilities were marked in the field by utility locating companies as part of our services.

2.1.2 Historic Development

Based on the review of select historic aerial photographs, topographic maps, and other publicly available information, an abbreviated history of the Site can be interpreted. Individual interpreted parcel development histories are provided below. The summary presented below is not intended to be exhaustive.

- As shown on the original plat map of southeastern Wisconsin (1837) and a United States Geological Survey (USGS) topographic map (1906), there is evidence of a river or stream that previously ran through the center of the Site from northwest to southeast until approximately the 1950s. The stream was likely filled in during construction activities that occurred on the parcels included within the Site boundaries during and prior to the 1960s.
- 130 Delafield Street - A vacated City of Waukesha municipal building with underground parking and an at-grade asphalt parking lot were constructed between 1963 and 1970, and remain today.
- 201 Delafield Street - A shopping center and asphalt parking lot appear to have been constructed between 1950 and 1963. A dry cleaner was located on the north end of the shopping center and has documented evidence of contamination (Wisconsin Department of Natural Resources [WDNR] Bureau for Remediation and Redevelopment Tracking System [BRRTS] #02-68-494990). The Site is listed as "closed" on the Wisconsin Remediation and Redevelopment Database (WRRD). The shopping center was demolished in 2018, but the asphalt parking lot remains.
- 318 Delafield Street - A gas station and asphalt parking lot appear to have been constructed between 1950 and 1963. Eight underground storage tanks (USTs) were utilized by the gas station during operation. At least seven of the eight USTs were removed. There is documented evidence of a gasoline leak on the parcel. Overexcavation and removal of the contaminated material were performed in 1989. The Site is listed as "closed" on the WRRD. The gas station was demolished between 2017 and 2020, but the asphalt parking lot remains.

2.2 POTENTIAL DEVELOPMENT

The potential development will likely consist of two mixed-use residential and retail structures with underground parking. Foundation details were not provided to GZA at the time of writing this Report. However, based on work we have performed for other residential and retail developments, we anticipate that the typical (dead plus live) structural loads will range between about 400 and 600 kips for column loads and between 2 and 6 kips per foot for bearing walls. The finished first floor elevation for the north and south buildings are currently planned at approximately 61.5 feet and 46 feet (COW vertical datum), respectively. Updated floor plans and structural loading information should be provided to GZA for review prior to finalization of this Report.

3.0 SUBSURFACE EXPLORATION PROGRAM

GZA's subsurface exploration consisted of 19 soil test borings, as described below. The approximate locations of the soil borings are presented on **Figure 2** and detailed soil boring logs are provided in **Appendix B.** Three subsurface profile diagrams (fence diagrams) are provided in **Appendix C**, one for the north building, one for the south building, and one Site-wide fence diagram.

3.1 SOIL TEST BORINGS

GZA's drilling subcontractor, GESTRA of Milwaukee, Wisconsin, drilled 19 soil test borings (B-01 through B-14, B-02A, B-04A, B-04B, B-05A, and B-06A) at selected locations across the Site. The approximate locations of the borings are presented on **Figure 2**. The borings were drilled in two mobilizations with the first from January 30 to February 1, and the

second on February 22, 2024. The borings were drilled to depths between 3.5 and 28.5 feet bgs (from approximate ground surface El. 44 to El. 70 [+/- 2 feet], COW Vertical Datum). The actual termination depths are noted on the boring logs in **Appendix B**.

GESTRA used a Diedrich D-50 track-mounted drill rig; a CME-75 truck-mounted drill rig; and hollow-stem auger drilling techniques to advance the borings to the termination depths. Split-spoon soil samples were obtained in accordance with ASTM D1586, *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils*. The SPT consists of driving a 1⅜-inch inside-diameter (ID) sampler for at least 18 inches with a 140-pound hammer falling 30 inches. The number of blows required for each 6 inches of penetration was recorded, and the number of blows required to drive the sampler from 6 to 18 inches of penetration is the SPT N-value, a commonly used indicator of soil density and consistency. Pocket penetrometer testing was also performed on fine-grained soil to aid in the soil's in-situ consistency estimation. Undisturbed Shelby tube samples were also attempted within four of the test borings, and we were able to retrieve one relatively undisturbed sample. Refer to the boring logs in **Appendix B** for more information. Soil samples were collected in the split-spoon sampler and were stored in sealed, labeled, glass jars. Samples were classified in general accordance with ASTM D2488, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*.

4.0 FIELD AND LABORATORY TESTING PROGRAM

Soil samples were classified in the field to determine approximate plasticity (for cohesive soils) and grain-size distribution (for granular soils). SPT N-values and/or pocket penetrometer testing results were utilized to evaluate relative density/consistency of the soils encountered and are recorded on the boring logs.

Laboratory tests were performed on select soil samples to aid in soil classification. The testing included natural moisture content, fines content (the percent of material passing the U.S. No. 200 Sieve, by weight), plasticity characterization (Atterberg Limits), grain size distribution, unit weight (density testing), moisture-density (Proctor) tests, and consolidation testing. Results of the laboratory tests are summarized on the boring logs in **Appendix B** and laboratory summary report in **Appendix D**.

5.0 GENERALIZED SUBSURFACE CONDITIONS

A generalized description of the subsurface conditions encountered at the soil boring locations are summarized in this section. Refer to the boring logs in **Appendix B** and the fence diagrams in **Appendix C** for more specific information. A summary of subsurface conditions is provided in the table below.

Boring No.	Surface Elev. (+/- 1 foot)	Boring Depth (feet bgs)	Approximate Thickness of Fill/Topsoil (feet)	Approximate Depth to Groundwater (feet bgs)	Approximate Bedrock Depth [Elevation] (+/- 1 foot)
B-01	44	25	7	21	25 [19]
B-02	46	19	4.5	15.3	19 [27]
B-02A	47	17	2	8.2	17 [30]
B-03	50	21	4.5	15.2	21 [29]
B-04	52	3.5	3.5	DRY	NE
B-04A	52	16.5	7	DRY	16.5 [35.5]
B-04B	52	15	NM	DRY	15 [37]
B-05	58	22	12	DRY	22 [36]

Boring No.	Surface Elev. (+/- 1 foot)	Boring Depth (feet bgs)	Approximate Thickness of Fill/Topsoil (feet)	Approximate Depth to Groundwater (feet bgs)	Approximate Bedrock Depth [Elevation] (+/- 1 foot)
B-05A	58	16	9.5	DRY	NE
B-06	59	6	6	NM	NE
B-06A	60	21.5	12	NM	21.5 [38.5]
B-07	61	25	13	15.9	25 [36]
B-08	61	24	8.5	DRY	24 [37]
B-09	61	20	12	11.5	NE
B-10	62	22	6	7.5	22 [40]
B-11	64	10	0.3	6.5	NE
B-12	64	21	7	5.9	NE
B-13	70	28.5	14.5	23	28.5 [41.5]
B-14	61	10	3.5	3.7	NE

Notes:
1. NM = not measured.
2. NE = not encountered.

5.1 SURFACE AND SUBSURFACE SOIL CONDITIONS

5.1.1 Fill and Topsoil

Surface conditions at the boring locations consisted of asphalt, topsoil, or fill underlain with native soils. Where encountered, the surficial asphalt layer was typically 4 inches thick and underlain with 6 to 12 inches of gravel base. Where measured, the surficial topsoil layer was approximately 3 to 5 inches thick. Topsoil generally consisted of sandy, lean clay with trace to little organics, and was generally distinguished by dark brown to black coloring. Fill soils were encountered in 17 borings at depths ranging from 2 to 14.5 feet bgs, and generally consisted of silty to clayey sand with trace to little gravel and sandy, lean clay. Moisture contents on tested samples within the fill ranged from about 7% to 38%, by weight. The granular fill soils had an average SPT N-value of 11 blows per foot (bpf), indicating medium-dense soil conditions. The fine-grained fill soils had consistencies ranging from very soft to very stiff and pocket penetrometer-measured unconfined compressive strengths ranging from 0.25 to 3.5 tons per square foot (tsf), with an average of 1.7 tsf, indicating an average stiff consistency. Gravel and cobbles were encountered in the fill layer at many of the locations explored.

5.1.2 Native Soils

Native soils were present under the surficial fill/topsoil layer and continued to bedrock. The native soils varied from silty and clayey sand (SM/SC), silt (ML), lean clay (CL) with trace to little sand to poorly-graded gravel (GP). The native soil generally was brown to tan, with isolated samples exhibiting orange mottling. Most of the clayey soils encountered in the native soil layer had stiff to hard consistencies and pocket penetrometer-measured unconfined compressive strengths ranged from 0.5 to 4.5+ tsf, with most tests being greater than 2.5 tsf. The granular soils had SPT N-values ranging from 1 to 50+, indicating loose to very dense soil conditions, and averaged approximately 29 bpf, indicating medium-dense soil conditions. Gravel and cobbles were generally encountered in the native soil layer, near the bedrock.

Moisture contents on tested samples ranged from about 6% to 31%, by weight. Atterberg limit tests were performed on selected samples to determine plasticity characteristics of the plastic, fine-grained soils. Plastic indices on tested samples ranged from about 0 to 33, indicating non-plastic to high plasticity soils. The average plasticity index was 12, and the median was 8 to 11.

A one-dimensional consolidation test was also performed on a Shelby tube sample of silty, lean clay from boring B-09 collected at a depth of 16 to 18 feet. Results of the consolidation test indicated normally consolidated to slightly over-consolidated soil conditions with a compression index (C_C) of 0.120, a Recompression Index (C_R) of 0.023, preconsolidation stresses (P_C) of 2,000 psf, and an estimated overconsolidation ratio of approximately 1.2.

5.2 BEDROCK

Based on auger refusal, bedrock is believed to have been encountered in 12 borings (B-01, B-02, B-02A, B-03, B-04A, B-04B, B-05, B-06A, B-07, B-08, B-10, B-13). Depth to bedrock varied across the Site and ranged from 15 to 28.5 feet bgs. The bedrock surface generally dipped down from north to south and bedrock elevations ranged from 41.5 feet to 19 feet (COW Vertical Datum), respectively.

5.3 GROUNDWATER

Groundwater was encountered and measured in 11 borings at depths ranging from 3.7 to 23.0 feet bgs (El. 23 to El. 58). Groundwater was measured in the borings after drilling. Groundwater was variable across the Site, but, on average, was encountered around 12 to 15 feet bgs. Fluctuations of the groundwater table will likely occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the soil borings were performed. Therefore, groundwater levels during construction or at other times over the life of the structures may be different than the levels indicated on the boring logs.

6.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Geotechnical design and related construction recommendations for the Site are provided in the following sections. The recommendations are based on subsurface conditions encountered in the borings, results of laboratory testing, and the results of GZA's geotechnical engineering analyses. As the project design continues to develop, these recommendations should be reviewed so that more structure-specific geotechnical design criteria can be developed.

6.1 GENERAL GEOTECHNICAL CONSIDERATIONS

The fill encountered on-Site was likely imported for historic construction activities that took place at the Site. The fill has variable composition, consistency, moisture content, and strength characteristics. GZA understands that structures are planned to be constructed where fill is present. The existing fill soils are not suitable for foundation support without some overexcavation and replacement or ground improvement methods. Additionally, the presence of the former stream at the Site may lead to ongoing groundwater control costs during construction and in areas of the proposed structures constructed below the groundwater table.

Based on the subsurface conditions in the soil borings and estimated structural loads, it is our opinion that shallow foundation systems consisting of strip footings with isolated column pads are feasible for building support at the Site. Areas of soil removal and replacement will be required where unsuitable bearing strength soils and fill soils are present below designed structural footing elevations. Alternatively, ground improvement methods, such as rammed aggregate piers (RAPs), could be considered in areas where overexcavation may no longer be considered economically viable.

It is likely that remnants of former structure(s) are present below grade and will require removal during excavation and prior to construction of new foundations. **Possible buried concrete slabs and/or footings were encountered at boring B-04.** Additionally, the existing structure on-Site will have subgrade foundations and basement walls that will also need to be removed prior to construction of new foundations. Remnants of previous foundations, existing foundations, buried

utilities, and other structural elements should be removed in their entirety prior to placement of new fill or foundation elements.

6.2 NORTH BUILDING FOUNDATIONS

The planned north building is underlain by relatively horizontal bedrock varying from about El. 36 to 42. However, the existing fill present in the northern borings varied in relative thickness below the basement slab, as well as general consistency with SPT N-values varying from 0 to 50+ bpf. The highly variable existing fill soils will require improvement prior to foundation and/or lower level slab placement.

Fill located below foundations for the north building should be overexcavated to native soils or at least 6 feet if native soils are not encountered. Subgrade bearing soils should be evaluated by a representative of the geotechnical engineer to document bearing capacity of the soil and compaction of the structural backfill. If overexcavations do not encounter native soils, the bottom of the overexcavation should be checked to determine that either a correlated unconfined compressive strength of not less than 2 tsf or correlated blow count N-value of not less than 11 is determined using appropriate testing methods. Overexcavations should extend laterally beyond the edge of footing at least 2 feet or equal to depth of the overexcavation, whichever is greater. Sloping overexcavations and/or shoring will likely be required to allow for testing of soils at the base of the overexcavation.

After testing and approval, the overexcavated subgrade should be compacted prior to placing backfill. Overexcavations should be backfilled with structural backfill placed in 12-inch loose lifts and compacted to a minimum of 95% of the modified proctor compaction test (ASTM D1557, *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort*). Alternatively, use of a lean-mix cement slurry (1,500 pounds per square inch [psi] minimum compressive strength) can be used to backfill overexcavations. If lean-mix is utilized, the width of the excavation only needs to be as wide as the planned footing width, provided the excavation sidewalls are stable.

It is our opinion that the north building foundation can be supported on shallow foundation systems consisting of strip footings and isolated column pads, provided the recommendations above are adhered to. Based on subsurface conditions and laboratory testing, **a maximum, net, allowable bearing capacity of 2,500 psf is recommended for the north building foundation design**. Strip footings should be at least 24 inches wide and a maximum of 6 feet wide. Isolated column footings should be at least 30 inches wide and a maximum of 12 feet wide.

We recommend that shallow spread footings in unheated areas that will be subject to freezing conditions bear at least 48 inches below the lowest adjacent exterior grade for frost protection.

Foundation settlement will depend on variations within the subsurface soil profile, the actual structural loading conditions, the embedment depth of the footings, and the quality of the earthwork operations. Based on the subsurface conditions and planned construction described herein, we estimate that post-construction total settlements of footings designed and constructed in accordance with the recommendations in this Report will be about 1 to 1.5 inches. Differential settlement across a distance of 25 feet within the building area is estimated to be ½-inch. These settlement estimates assume that footings will be supported on suitable existing soils or a prepared structural compacted fill soil subgrade.

6.3 SOUTH BUILDING FOUNDATIONS

The planned south building is underlain by relatively horizontal bedrock on its north half, and then the bedrock surface dips down to the south. The apparent bedrock surface within the south building varies from about El. 27.5 to El. 36. Also, the existing fill present in the southern borings is anticipated to be removed in full below the basement slab and foundation elements.

The variable depth to bedrock could result in differential settlement of foundation elements, especially between borings B-04A and B-03 where the bedrock appears to drop in elevation by about 5 feet in a relatively short distance. If possible, structural breaks should be considered in this area to allow for additional differential settlements between the northern and southern sections of the south building.

It is our opinion that the south building foundation can be supported on shallow foundation systems consisting of strip footings and isolated column pads founded on native soils with a minimum correlated unconfined compressive strength of not less than 2.5 tsf or correlated N-value of not less than 15, as determined by applicable testing methods. Based on subsurface conditions and laboratory testing, **a maximum, net, allowable bearing capacity of 3,000 psf is recommended for the south building foundation design.** Strip footings should be at least 24 inches wide and a maximum of 6 feet wide. Isolated column footings should be at least 30 inches wide and a maximum of 12 feet wide.

We recommend that shallow spread footings in unheated areas that will be subject to freezing conditions bear at least 48 inches below the lowest adjacent exterior grade for frost protection.

Foundation settlement will depend on variations within the subsurface soil profile, the actual structural loading conditions, the embedment depth of the footings, and the quality of the earthwork operations. Based on the subsurface conditions and planned construction described herein, we estimate that post-construction total settlements of footings designed and constructed in accordance with the recommendations in this Report will be about 1.5 inches. Differential settlement across a distance of 25 feet within the building area is estimated to be ½-inch, with the exception of the areas between B-03 and B-04 where increased differential settlements of up to 1 inch may be encountered. These settlement estimates assume that footings will be supported on suitable existing soils.

6.4 GROUND IMPROVEMENT OPTION

To increase allowable bearing capacities for the building foundations, ground improvement, such as RAPs are recommended for foundation design. RAPs are densified columns of crushed stone over which shallow footings and slabs-on-grade can be constructed. RAPs are installed using a bottom-feed pipe fitted with a specially shaped tamper at the tip of the mandrel. The piers are typically installed by hammering a 10- to 12-inch hollow mandrel through the soft/loose soils. As the mandrel is removed, well-graded aggregate is fed through the mandrel and densified in lifts by hammering down at the bottom of the hole, creating columns of dense, crushed stone. At the bottom of the pier is a bulb of "clean stone," which is typically located within a competent bearing stratum, such as the naturally deposited, very stiff to hard till soils or bedrock underlying the fill soils. The hammering both densifies the aggregate and forces the aggregate laterally into the sidewalls of the hole. This action increases the lateral stresses in the surrounding soil, thereby further stiffening the stabilized composite soil mass. Since the RAP elements act as soil reinforcement versus a structural section, there are no connections to be made from the foundation to the slab. Therefore, construction of the foundation can be completed "on-grade" using the RAP option. The above process of reinforcing soils with aggregate piers provides for a more uniform and consistent subgrade with less risk for differential settlement.

Based on initial conversations with a RAP design engineer, if RAPs are utilized for ground improvement, it is anticipated that the foundation systems can be designed to allow for a maximum footing bearing pressure of 5,500 psf. The actual bearing pressure will be determined by the RAP design engineer.

The RAPs should be designed by the specialty foundation contractor and installed so that the tips of the stone columns are embedded in the top 2 feet of the competent, very stiff to hard, till deposits or bedrock (approximate Elev. 42 to 50 for the north building and Elev. 20 to 41 for the south building). Footings should be centered on top of the piers or pier clusters. Following installation of the aggregate piers, the building footprint should be regraded to a level surface and heavily proof compacted. Structural fill, as defined in **Appendix E**, should then be placed in lifts not exceeding 12 inches and compacted in accordance with the recommendations provided below to achieve the required final subgrade

elevations. Based on the results of the test borings, aggregate piers below the slab-on-grade do not appear to be necessary. Preparation of the footing and slab subgrade should be done in accordance with the recommendations below.

6.5 FLOOR SLAB

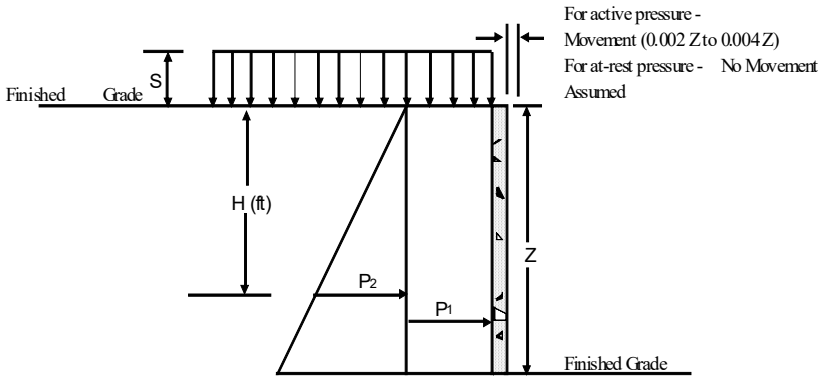
Concrete slab-on-grade or possibly basement floors will likely be proposed for the bottom floor of the structures. Based on the subsurface information, at-grade floor may be designed using a vertical modulus of subgrade reaction (k_v) of 90 pci, provided the slab, subgrade, and base are prepared in accordance with this Report. The floor slab should be isolated from walls and columns to allow for independent movement. Joints should be constructed at regular intervals, as recommended by the American Concrete Institute (ACI). The structural engineer should specify actual details of the floor slab, including thickness, reinforcing, and joint details.

Floor slabs should generally be underlain by a minimum 6-inch-thick, coarse aggregate base course. The coarse aggregate base course should consist of material meeting the requirements for Wisconsin Department of Transportation (WisDOT) Standard Specifications for Highway and Structure Construction. Base course materials should be placed and compacted in accordance with Section 6.7.2. An experienced geotechnical engineer should test and approve base course material prior to placement.

Depending on location and elevation, a water-resistant layer (waterproofing membrane) may be required.

6.6 LATERAL EARTH PRESSURES

Below grade walls and/or retaining walls are planned for the Site. Unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction, and the strength of the materials being restrained. Three wall restraint conditions are shown. Active earth pressure is commonly used for design of freestanding cantilever retaining walls that are unrestrained at the tops and free to move. The "at-rest" condition should be used for walls restrained from movement and rotation and would be appropriate for the basement walls proposed. Passive earth pressures represent movement of the retaining wall into the retained earth. Significant movement of the wall may be required to fully develop passive earth pressures. The recommended design lateral earth pressures are for cast-in-place concrete walls only and do not include a factor of safety or any provision for possible hydrostatic pressure on the walls.



Earth Pressure Coefficients

	Coefficient for Backfill Types	Equivalent Fluid Pressure (pcf)	Surcharge Pressure, P_1 (psf)	Earth Pressure, P_2 (psf)
Active (Ka)	Granular - 0.33 Lean Clay - 0.42	36 54	(0.33)S (0.42)S	(36)H (54)H
At-Rest (Ko)	Granular - 0.46 Lean Clay - 0.58	51 75	(0.46)S (0.58)S	(51)H (75)H
Passive (Kp)	Granular - 3.0 Lean Clay - 2.4	330 312	---	---

Conditions applicable to the above conditions include:

- For active earth pressure, the wall must rotate about base, with top lateral movements 0.002 Z to 0.004 Z, where Z is wall height;
- For passive earth pressure, the wall must move horizontally to mobilize resistance;
- Uniform surcharge, where S is the surcharge pressure;
- A maximum in-situ soil backfill weight of 110 pounds per cubic foot (pcf) should be used for granular backfill and 130 pcf for cohesive materials;
- Horizontal backfill, compacted to at least 90% of the ASTM D1557 maximum dry density;
- Loading from heavy compaction equipment is not included;
- No groundwater is acting on wall;
- No safety factor is included; and
- Ignore passive pressure in frost zone.

Under no circumstances should high-plasticity, clayey soils (those soils with liquid limits greater than 40 and/or plastic indices greater than 18) be used as backfill in retaining wall systems. Backfill placed against walls should consist of granular soils. For the granular values to be valid, the granular backfill should extend out from the base of the wall at an angle of at least 45° and 60° from vertical for the active and passive cases, respectively. Additional design considerations are required where these conditions are not met. To calculate the resistance to sliding, a value of 0.35 could be used as the allowable coefficient of friction between the footing and the underlying soil. To control the water level behind the wall, we recommend that perimeter drain tiles be utilized with outlet to storm sewers.

6.7 UTILITIES

Existing utilities, including water, electrical, gas, and communications, are present on the Site near the existing structure and along Delafield Street. If below grade utilities will remain for use with the new development, those utilities should be evaluated and rerouted prior to beginning construction, as necessary. Additionally, existing utilities adjacent to the proposed structure should be protected by crane mats or other bridging devices during construction. Abandoned utility pipes/conduit should be properly abandoned, removed, or plugged so it does not serve as conduits for water inflow and subsequent soil wetting and/or subsurface erosion, which could adversely affect the new foundation.

New underground pipes and utilities should be placed on bedding in accordance with the manufacturer's recommendations. Trench backfill should be placed in loose lifts not to exceed 6 inches thick and should be compacted in accordance with the specifications provided in this Report. Due to potential shallow groundwater conditions, buoyancy forces should be considered in the design of subsurface utility structures.

6.8 SEISMIC PARAMETERS

Based on the subsurface conditions encountered in the borings, the Site Class is considered to be "C" based on the 2015 International Building Code (IBC). The following seismic design parameters presented below are calculated using the California Office of Statewide Health Planning and Development (OSHPD) and Structural Engineers Association of California (SEAOC) *U.S. Seismic Design Maps* calculator using Site Class "C" and Risk Category II parameters per the IBC.

Parameter	Value (unit)
S_s = Short Period Mapped Spectral Acceleration	0.089 (g)
S_1=1-second Period Mapped Spectral Acceleration	0.047 (g)
Fa = Short Period Site Coefficient	1.2 (unitless)
Fv = 1-sec. Period Site Coefficient	1.7 (unitless)
$SM_s = S_s \times Fa$	0.106(g)
$SM_1 = S_1 \times Fv$	0.090(g)
$SD_s = 0.667 \times SM_s$	0.071 (g)
$SD_1 = 0.667 \times SM_1$	0.053 (g)
Seismic Design Category	A

6.9 SITE PREPARATION AND CONSTRUCTION

6.9.1 Subgrade Preparation

Topsoil, surface vegetation, and unsuitable subgrade soils should be removed from areas planned for development. Based on the soil borings, the topsoil was approximately 3 to 5 inches thick and asphalt was approximately 4 to 5 inches thick. Greater topsoil and asphalt thicknesses may be encountered in other areas. After stripping to the design subgrade elevations, the exposed subgrade should either be proof rolled with a fully loaded, quad-axle dump truck with a minimum 10-cubic yard capacity to detect unstable soil; or, if space constraints do not allow proof roll, other appropriate testing methods (such as Static Cone Penetrometer testing) can be used. Overexcavation may be required due to the possible shallow groundwater, presence of fill soils, and variable strength of the near surface soils encountered.

A GZA geotechnical engineer should observe the exposed subgrade conditions and proof roll or subgrade acceptance operations. High-plasticity soils, if encountered, should not be used as fill or backfill under pavements, structures, or slabs. Additionally, unsuitable bearing soil detected during proof rolling should be scarified and compacted in-place, replaced with fill material, or stabilized, as recommended by the geotechnical engineer. After the subgrade is determined to be stable, Site grades may be raised, where needed, by placing and compacting General Fill material. Recommendations regarding fill placement and compaction of fill materials are provided in Section 6.8.2.

The upper soils encountered at the soil boring locations may be susceptible to disturbance by construction activity, especially if exposed to precipitation and/or surface water. The contractor should expect that soft and potentially unstable subgrades will likely be encountered or developed during construction. It is our experience that even if the near surface soils exhibit a relatively firm or stable surface when initially exposed, repetitive construction traffic and/or wetting will reduce the strength and stability of these soils. We recommend that repetitive traffic on subgrade soils be minimized. Traffic/work mats and/or clear stone gravel layers are recommended for this Site.

6.9.2 Placement and Compaction of Fill

Fill material should be placed on a properly prepared subgrade, as noted in Section 6.8.1. Also, the subgrade or fill soil should not be frozen. Fill soil should be placed and compacted in uniform, loose lifts that are between 6 and 12 inches thick. A GZA geotechnical engineer should determine the actual fill thickness based on characteristics of the fill materials and the type of compaction equipment that is used.

Fill, base course, and backfill materials should be compacted to at least the minimum degree of compaction relative to the maximum dry density determined by the modified Proctor test (ASTM D1557), as noted in the following table. Vibratory compaction methods should be used with caution for fill placed on wet, native soils or near the water table.

During placement, fill soil should have uniform water content within about 2% of the optimum water content determined by the modified Proctor compaction test.

Fill Area	Percent of Maximum Dry Density Determined by ASTM D1557
Below Slabs-on-Grade and Slab-on-Grade Base Course	95
Between Exterior Retaining Walls and Earth Retention Systems	90
Pavement Base Course and Within 2 Feet of Surface Pavement Base Course	95
More Than 2 Feet Below Pavement Base Course	92
Below Landscape Areas	90

We recommend that a GZA geotechnical engineer test each layer of fill to measure in-place dry density and water content. A subsequent layer of fill should not be placed until the density and water content of the prior lift are in accordance with our recommendations. In-place fill should be protected from moisture increases and construction traffic disturbance. Disturbed fill material may be scarified, moisture conditioned, and re-compacted, or it may be replaced with suitable fill material. Properly placed and compacted fill should be protected from freezing. General Fill, as defined in **Appendix E**, can be used to raise Site grades.

6.9.3 On-Site Fill Borrow Material

Based on the boring logs and results of laboratory testing, a majority of the lean clay and fill material present on-Site are suitable for use as General Fill to raise grades below pavements, slabs, or foundations. The on-Site fill is anticipated to be heterogeneous and sections of the fill may not be suitable for use as General Fill. A geotechnical engineer should be on-Site to evaluate the on-Site fill and collect samples for plasticity characterization (Atterberg testing). Soils should be checked and tested to ensure that only granular and/or fine-grained soils with plastic indices less than 18 are used for fill under structural slabs or foundations.

Although not generally encountered at the Site, soils exhibiting high plastic indices are generally harder to moisture condition, harder to adequately compact, and may have some shrink/swell potential after compaction. Soils with liquid limits greater than about 40 and plastic indices greater than 18 should only be used in landscaping areas and not used under slabs, pavements, foundations, or other structural elements. Additionally, relatively high-plasticity clays could be treated and/or blended to reduce the plasticity and allow for more general fill applicability.

6.9.4 Foundations

We recommend that a GZA geotechnical engineer monitor foundation excavation on an on-call basis to confirm that the foundation soil strength is consistent with the design parameters. The geotechnical engineer should perform hand-auger probes and in-situ strength tests at the foundation bearing grade to confirm that the soil within the foundation influence zone can support the design bearing capacity.

Foundation footings should be constructed immediately after excavation and soil testing to protect the soil bearing surface. In addition, footing excavations should be backfilled as soon as possible after foundation construction. Excavations along foundation walls should be filled such that the fill at the interior and exterior sides of the walls are at about the same height as much as practical for lateral pressure considerations. Backfill along foundation walls may consist of General Fill.

6.9.5 Excavation Slopes and Shoring

Based on the Site location and current state of the Site, we understand that space limitations and excavation depths will not likely require an earth retention system for foundation construction. Open-sloped excavations should be feasible for the construction of subsurface grade structures.

Excavations should be in accordance with current United States Department of Labor, Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. Excavations must be shored, sloped, or benched, as required by OSHA. Per OSHA Standard 29 CFR 1926 Subpart P, the soils present at Site should be classified as Type "C" soils. Excavations should also be in accordance with local, State, and Federal safety regulations. Due to shallow groundwater excavations are expected to slough where groundwater seeps into the excavations. Exposed excavation slope faces should be protected. The geotechnical engineer should evaluate the stability of proposed slopes.

6.10 SHORT- AND LONG-TERM DEWATERING RECOMMENDATIONS

Groundwater was encountered at depths from 3.7 to 21 feet bgs at the Site during drilling. Due to the varied depths of groundwater encountered, additional soil borings and/or groundwater monitoring wells could be considered when building plans are developed to better determine localized groundwater conditions. The presence of a historical stream in the area may lead to increased dewatering demand both during construction and for basements. It is expected that conventional sumps/pumps placed in the excavation may be sufficient for dewatering the expected groundwater infiltration; however, pumping tests should be considered to better estimate groundwater control parameters.

6.11 PAVEMENT RECOMMENDATIONS

We understand that areas of pavement outside of the anticipated structures are planned. Based on the soil and groundwater conditions in the borings, we assume that the subgrade in these areas will generally consist of lean clay and sandy, lean clay soil. Based on our experience within these materials, a CBR value of about 4 was used by GZA to determine the recommended pavement thickness. Similarly, a modulus of subgrade reaction value equal to 90 pci could be used for design of rigid concrete pavement sections placed on compacted subgrade. Prior to placement of base course, subgrade soils should be prepared in accordance with this Report.

Typical pavement thickness recommendations are provided in the following table for asphalt and concrete pavements. The recommended pavement sections are based on an assumed moderate volume of passenger vehicle traffic and low volume of traffic from delivery or garbage trucks, and also should be considered minimum design thicknesses. Thickness recommendations for Passenger Vehicle Parking sections are based on light passenger vehicle traffic (gross weight less than 4 tons) and only occasional truck traffic such as fire trucks and snow removal trucks (2001 Wisconsin Asphalt Paving Association [WAPA] Traffic Class II). The Driveways sections are based on occasional garbage truck, buses, and delivery truck traffic (WAPA Traffic Class III).

MINIMUM PAVEMENT SECTIONS (CBR 4)

Pavement	Passenger Vehicle Parking	Driveways
Portland Cement Concrete (PCC)	5 inches	6 inches
Granular Base Course	6 inches	6 inches
Flexible Pavement Section		
Asphalt Cement Concrete (ACC)	4 inches	6 inches
Granular Base Course	8 inches	10 inches

1. All materials should meet the current WisDOT Standard Specifications for Highway and Structure Construction.
2. In areas of anticipated heavy traffic, delivery trucks, or concentrated loads (e.g. dumpster pads), a minimum concrete thickness of 7 inches is recommended, but should be evaluated further when loading conditions are known.
3. A minimum 6-inch granular base should be used below PCC pavements.
4. A minimum 1.5-inch surface course should be used on ACC pavements.

The estimated pavement sections provided in this Report are minimums for the assumed design criteria and, as such, periodic maintenance should be expected. Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections and may benefit from a geotextile separation layer between the subgrade and granular base course. Final design sections should consider details such as traffic loadings, traffic volumes, the desired design life and any applicable local or City requirements. If you wish, we would be pleased to perform a detailed pavement section design using traffic volumes and American Association of State Highway and Transportation Officials (AASHTO) or ACI procedures when this information is available.

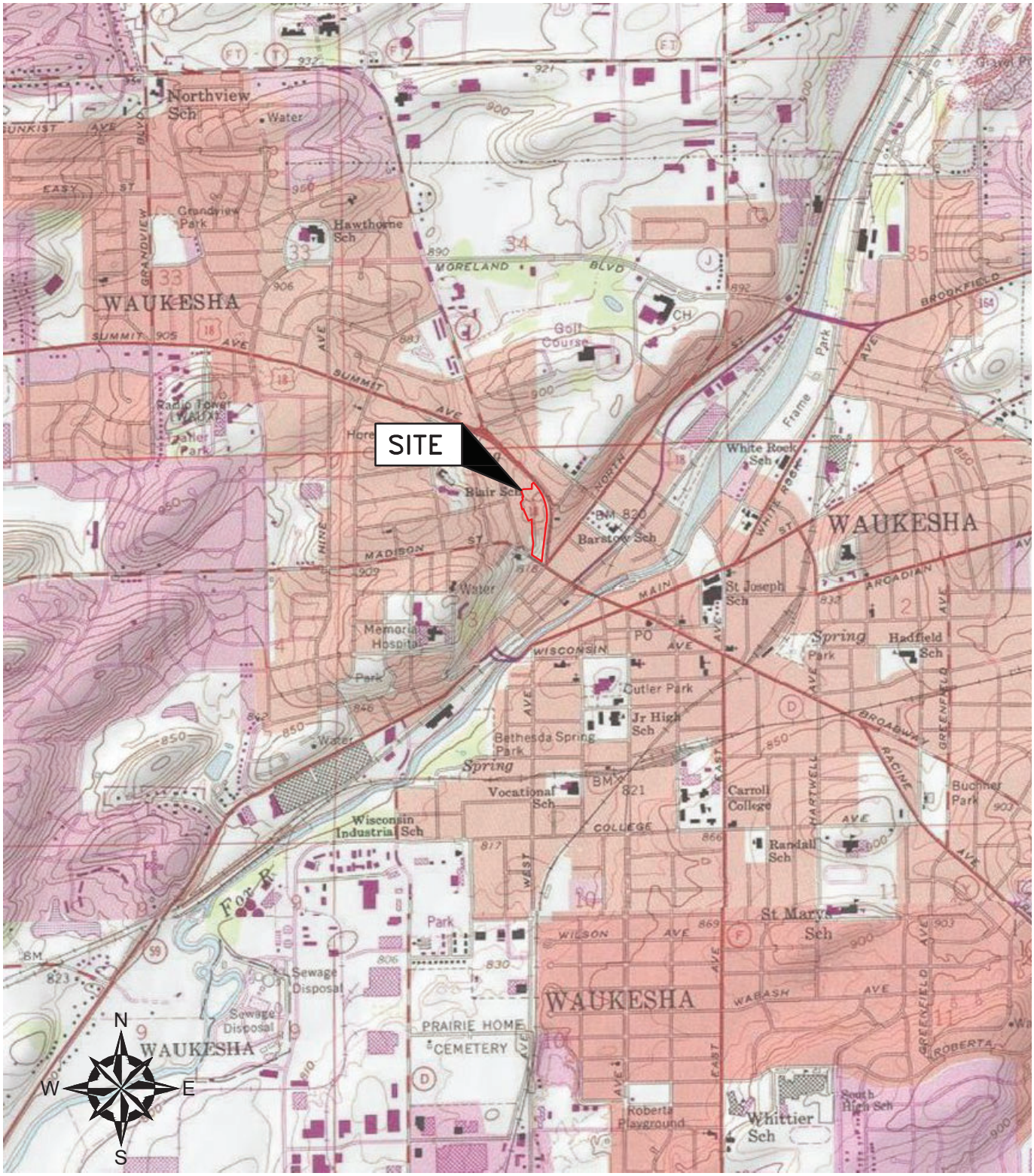
A maintenance program that includes surface sealing, joint cleaning and sealing, and timely repair of cracks and deteriorated areas will increase the pavement's service life. As an option, thicker sections and/or the use of a geotextile separation layer could be constructed to decrease future maintenance.

The pavement base course is recommended to meet the gradation requirement of Structural Fill in **Appendix E**. We recommend that the pavement subgrade be sloped to discharge water to the perimeter edges of the pavement or to a catch basin/drain pipe system.

7.0 FINAL DESIGN AND CONSTRUCTION PHASE SERVICES

After building plans are available, additional geotechnical exploration may need to be conducted for the Site prior to commencement of construction. During construction, we recommend that GZA be retained to observe earthwork activities and geotechnical-related construction for compliance with our recommendations. These activities would include confirming that subsurface conditions encountered during construction are consistent with those anticipated, observation of general excavation work, subgrade preparation for foundations, for slab and pavement base course, foundation construction, slab and pavement base course placement and general fill placement.

FIGURES



NO.	ISSUE/DESCRIPTION	BY	DATE

NORTHWEST CORNER OF MADISON STREET AND DELAFIELD STREET
WAUKESHA, WISCONSIN

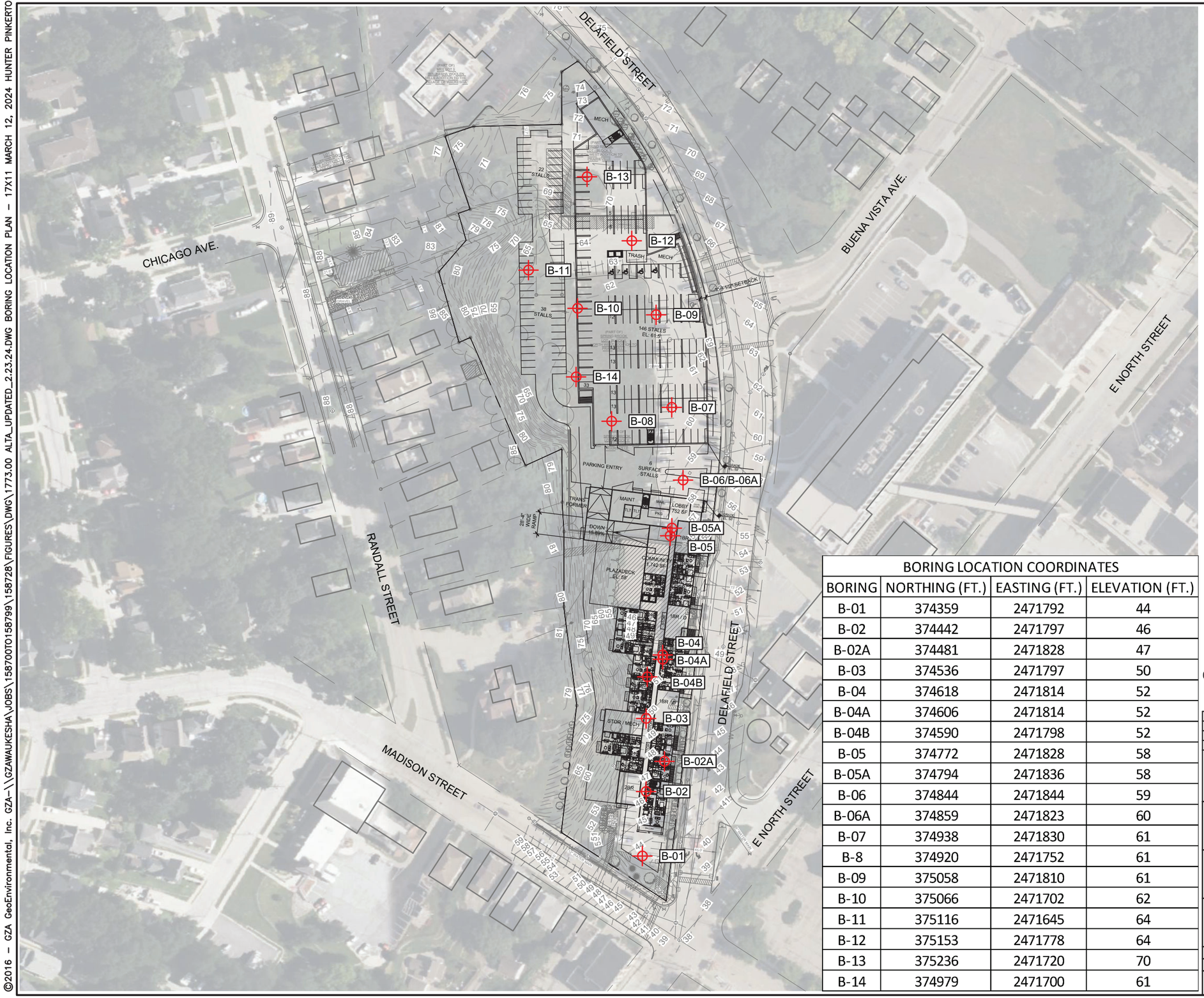
SITE LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
MANDEL GROUP, INC.
330 EAST KILBOURN AVENUE, SUITE 600
SOUTH MILWAUKEE, WISCONSIN 53202 3144

PROJ MGR:	JDG	REVIEWED BY:	IJM	CHECKED BY:	ERH
DESIGNED BY:	JDG	DRAWN BY:	HKP	SCALE:	AS NOTED
DATE: MARCH, 2024		PROJECT NO. 20.0158728.00		REVISION NO. 0	

FIGURE 1
SHEET NO.



GENERAL NOTES

1. AERIAL MAP UNDERLAY DEVELOPED FROM INTEGRATED BING MAP SERVICE PROVIDED IN AUTOCAD SOFTWARE.
2. AERIAL MAP UNDERLAY DEVELOPED FROM ESRI MAPPING SERVICE PROVIDED IN AUTOCAD SOFTWARE.
3. THE USE OF AERIAL PHOTOGRAPHY CAN OFTEN MAKE BUILDINGS AND OTHER SITE FEATURES APPEAR TO BE OVERLAPPING AND DISTORTED WHEN OVERLAID WITH ACTUAL SITE FEATURES.
4. THE PURPOSE OF THIS DRAWING IS TO LOCATE, DESCRIBE, AND REPRESENT THE POSITIONS OF GZA SOIL BORING LOCATIONS IN RELATION TO THE SUBJECT SITE. THIS DRAWING IS NOT CONSIDERED A LAND SURVEY. THE LOCATIONS SHOWN SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
5. HORIZONTAL DATUM REFERENCED TO THE NORTH AMERICAN DATUM OF 1927 (NAD27), WISCONSIN STATE PLANE, SOUTH ZONE, US FOOT.
6. VERTICAL DATUM REFERENCED TO THE CITY OF WAUKESHA DATUM.

LEGEND

- GZA SOIL BORING
- EXISTING MAJOR TOPOGRAPHIC CONTOUR LINE
- EXISTING MINOR TOPOGRAPHIC CONTOUR LINE

BORING LOCATION COORDINATES			
BORING	NORTHING (FT.)	EASTING (FT.)	ELEVATION (FT.)
B-01	374359	2471792	44
B-02	374442	2471797	46
B-02A	374481	2471828	47
B-03	374536	2471797	50
B-04	374618	2471814	52
B-04A	374606	2471814	52
B-04B	374590	2471798	52
B-05	374772	2471828	58
B-05A	374794	2471836	58
B-06	374844	2471844	59
B-06A	374859	2471823	60
B-07	374938	2471830	61
B-8	374920	2471752	61
B-09	375058	2471810	61
B-10	375066	2471702	62
B-11	375116	2471645	64
B-12	375153	2471778	64
B-13	375236	2471720	70
B-14	374979	2471700	61

DRAFT COPY

N
W E
S

0 63' 125' 250'
SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

NORTHWEST CORNER OF MADISON STREET AND DELAFIELD STREET
WAUKESHA, WISCONSIN

BORING LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
www.gza.com

PREPARED FOR:
MANDEL GROUP, INC.
330 EAST KILBOURN AVENUE, SUITE 600 SOUTH
MILWAUKEE, WISCONSIN 53202□ 3144

PROJ MGR: JDG	REVIEWED BY: IJM	CHECKED BY: ERH	FIGURE 2
DESIGNED BY: JDG	DRAWN BY: HKP/CJB	SCALE: AS NOTED	
DATE: MARCH, 2024	PROJECT NO. 20.0158728.00	REVISION NO. 0	

APPENDIX A

LIMITATIONS

GEOTECHNICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this Report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this Report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this Report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the Report, as appropriate, to reflect the unanticipated changed conditions.

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this Report.

6. In preparing this Report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

Compliance with Codes and Regulations

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

Additional Services

11. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

BORING LOGS

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
Brookfield, WI 53045
(262) 754-2560

KEY TO SYMBOLS

CLIENT Mandel Development, Inc. **PROJECT NAME** Delafield Street Apartments

PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188

LITHOLOGIC SYMBOLS (Unified Soil Classification System)


ASPHALT: Asphalt


BD: Blind drilled footage


CL: USCS Low Plasticity Clay


CL-ML: USCS Low Plasticity Silty Clay


CLS: USCS Low Plasticity Sandy Clay


COBBLES: Cobbles


FILL: Fill (made ground)


GC: USCS Clayey Gravel


GM: USCS Silty Gravel


GP: USCS Poorly-graded Gravel


GW: USCS Well-graded Gravel


ML: USCS Silt


SC: USCS Clayey Sand


SM: USCS Silty Sand


SP: USCS Poorly-graded Sand


SP-SM: USCS Poorly-graded Sand with Silt

RELATIVE DENSITY/ CONSISTENCY

Granular Soils (Sands, Gravels)

N-Value	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

Cohesive Soils (Clays, Some Silts)

PP-Value (tsf)	Consistency
< 0.25	Very Soft
0.25 - 0.5	Soft
0.5 - 1.0	Medium Stiff
1.0 - 2.0	Stiff
2.0 - 4.0	Very Stiff
> 4.0	Hard

MINOR COMPONENTS

Percentage	Descriptor
1 - 5	Trace
5 - 15	Little
15 - 30	Some
30 - 50	With

SOIL MOISTURE

DRY	No Free Moisture
MOIST	Wet to Touch, No Free Moisture
WET	Free Moisure

DRILLING STATISTICS

Number of Boreholes:	19
Total Length of Drilling:	343
Total Number of Samples:	149

TESTING:

Water Content:	48
Dry Density:	0
Atterberg Limits:	10
Sieve Analysis:	28
Unconfined:	0
Direct Shear:	0
Pocket Pen:	53

ABBREVIATIONS

LL	LIQUID LIMIT (%)
PI	PLASTIC INDEX (%)
W	MOISTURE CONTENT (%)
NP	NON PLASTIC
P#200	PERCENT PASSING NO. 200 SIEVE (FINES)
PP	POCKET PENETROMETER (TSF)
NE	NOT ENCOUNTERED
NM	NOT MEASURED
TV	TORVANE
PID	PHOTOIONIZATION DETECTOR
UC	UNCONFINED COMPRESSION
ppm	PARTS PER MILLION
ETR	ENERGY TRANSFER RATIO
DD	DURING DRILLING
AD	AFTER DRILLING

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
Brookfield, WI 53045
(262) 754-2560

BORING NUMBER B-01

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/30/24 **COMPLETED** 1/30/24
GROUND ELEVATION 44 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/30/24	AD	21.0	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	40		**Surface**: 4" thick asphalt parking lot **S-1**: FILL: Loose, Silty SAND (SM), fine to medium-grained; trace Gravel, fine-grained; black, moist		S-1 (0.5-2)	6	2-3-3 (6)							
			S-2: No Recovery		S-2 (2-3.5)	0	3-1-2 (3)							
5	35		**S-3**: FILL: Very stiff, Lean CLAY (CL), medium plasticity; little Sand, fine-grained; dark brown, moist		S-3 (4.5-6)	14	2-2-3 (5)	2.0-2.25		23.7 38.0	38	17	21	80
			S-4: Soft, SILT with SAND (ML), low to no plasticity; tan, moist to wet		S-4 (7-8.5)	12	2-2-1 (3)	0.5		18.4				73
10	30		**S-5**: Stiff, Sandy SILT (ML), low to no plasticity; little Gravel, fine-grained; tan, moist to wet		S-5 (9.5-11)	14	1-4-8 (12)	1.5						
			S-6: Low recovery - rock chips in sampler.	1	S-6 (12-13.5)	4	39-11-4 (15)							
15	25		**S-7**: Very loose, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown, moist to wet		S-7 (14.5-16)	6	1-1-1 (3)							
			S-8: Loose, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown, moist to wet		S-8 (17-18.5)	3	3-4-4 (8)			9.9				41
20	20		**S-9**: Medium dense, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown, moist to wet		S-9 (19.5-21)	2	6-6-6 (12)							
25			**S-10**: Very dense, Well-graded GRAVEL with SAND (GW-GM), fine to coarse-grained; tan, wet		S-10 (23.5-24)	5	50/5"-- (50+)							
			End of boring at 25' bgs due to auger refusal on bedrock. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Rig chatter from 11.5' to 13.5' bgs.

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
Brookfield, WI 53045
(262) 754-2560

BORING NUMBER B-02

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/31/24 **COMPLETED** 1/31/24
GROUND ELEVATION 46 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/31/24	AD	15.3	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	45		**Surface**: 4" thick asphalt parking lot **S-1**: FILL: Medium dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; tan, moist		S-1 (0.5-2)	14	8-14-16 (30)							
			S-2: No Recovery	1	S-2 (2-3.5)	0	7-9-8 (17)							
5	40		**S-3**: Loose, Silty SAND (SM), fine-grained; tan, wet		S-3 (4.5-6)	12	3-4-5 (9)			19.8				36
			S-4: Stiff, Sandy SILT (ML), non-plastic; tan, wet, slightly dilatant		S-4 (7-8.5)	12	3-4-8 (12)	2						
10	35		**S-5**: Top 7": Hard, Sandy SILT (ML), non-plastic; tan, wet Bottom 9": Stiff, lean CLAY (CL), low plasticity; little Sand, fine-grained; gray, moist		S-5 (9.5-11)	16	3-9-11 (20)	2.5-4						
			S-6: Hard, Lean CLAY (CL), low-plasticity; trace Sand, fine-grained; gray, moist	2	S-6 (12-13.5)	18	3-7-17 (24)	4.5+		20.3	30	13	17	99
15	30		**S-7**: Top 8": Hard, Sandy lean CLAY (CL), low plasticity; gray, moist Bottom 7": Medium dense, Silty SAND (SM), fine-grained; gray, moist	2	S-7 (14.5-16)	15	4-12-13 (25)	4.5+						
			S-8: Very dense, Clayey SAND (SC), fine to medium-grained; light brown, moist	3	S-8 (17-18.3)	15	30-47-50 (50+)							
			S-9: Very dense, Silty SAND with GRAVEL (SM), fine to medium-grained; tan, moist		S-9 (18.5-19)	5	50/5"-- (50+)							
			End of boring at 19' bgs due to obstruction or bedrock. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Gravel stuck in tip of sampler
2. Sand seam at 13.1' bgs.
2. Rig chatter from 15' to 17' bgs.
3. Difficult drilling from 17-19' bgs.

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
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BORING NUMBER B-02A

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/22/24 **COMPLETED** 2/22/24
GROUND ELEVATION 47 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG Diedrich D-50

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/22/24	AD	8.2	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	45		**Surface**: 4" thick asphalt parking lot **S-1**: FILL: Medium dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black to tan, moist		S-1 (0.5-2)	8	2-9-10 (19)							
			S-2: Medium dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; tan, moist		S-2 (2-3.5)	10	6-15-10 (25)							
5			**S-3**: Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; tan, wet		S-3 (3.5-5)	16	2-2-2 (4)			9.6				32
	40		**S-4**: Medium dense, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; tan, wet	1 2	S-4 (6-7.5)	10	2-4-7 (11)			18.6				
10			**S-5**: Very stiff, Sandy SILT (ML), non-plastic to low-plasticity; tan, wet, slightly dilatant		S-5 (8.5-10)	18	3-6-6 (12)	3.0		22.2				
	35		**S-6**: Hard, lean CLAY (CL), low-plasticity; little Sand, fine-grained; gray, moist		S-6 (11-12.5)	18	3-7-9 (16)	4.5+		13.5	25	13	12	
15			**S-7**: Hard, lean CLAY (CL), low-plasticity; little Sand, fine-grained; gray, moist		S-7 (13.5-15)	18	5-13-21 (34)	4.5+		15.6				100
	30		**S-8**: Hard, lean CLAY (CL), low-plasticity; little Sand, fine-grained; gray, moist	3	S-8 (16-16.2)	2	50/2"-- (50+)	4.5+						
			End of boring at 17' bgs due to refusal on bedrock. Boring backfilled with cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Rig chatter at 5.5' bgs.
2. 2" silt seam at 6.25' bgs
3. Rig chatter at 16' bgs.

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BORING NUMBER B-03

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/31/24 **COMPLETED** 1/31/24
GROUND ELEVATION 50 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/31/24	AD	15.2	N/A	20 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	50		**Surface**: 4" thick asphalt parking lot **S-1**: FILL: 1-1/4" Traffic bond (road base)		S-1 (0.5-2)	12	12-11-9 (20)							
			S-2: FILL: Medium dense, Silty SAND (SM), fine to medium-grained; tan, moist		S-2 (2-3.5)	16	5-8-8 (16)							
5	45		**S-3**: Hard, Sandy SILT (ML), non-plastic; tan with orange mottling, moist	1	S-3 (4.5-6)	18	9-16-21 (37)	4.5+						
			S-4: Top 3": Sandy SILT (ML), non-plastic; tan with orange mottling, moist Bottom 15": Medium dense, Poorly-graded SAND (SP), fine to medium-grained; trace Silt, non-plastic; tan with orange staining, wet	2	S-4 (7-8.5)	18	4-10-10 (20)			21.6				4
10	40		**S-5**: Hard, Sandy SILT (ML), non-plastic; tan, moist to wet		S-5 (9.5-11)	18	5-13-14 (27)	4.5+						
			S-6: Medium dense, Silty SAND (SM), fine to medium-grained; gray, moist		S-6 (12-13.5)	18	5-9-14 (23)							
15	35		**S-7**: Hard, Lean CLAY (CL), low plasticity; trace Gravel, fine-grained; gray, moist		S-7 (14.5-16)	18	4-13-17 (30)	4.5+		12.7				91
			S-8: Hard, Sandy lean CLAY (CL), low plasticity; little Gravel, fine-grained; gray, moist 1" sand seam at 17.9' bgs.		S-8 (17-18.5)	18	7-22-28 (40)	4.5+						
20	30		**S-9**: Very dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; gray, moist	2	S-9 (19.5-19.9)	4	50/5"-- (50+)							
			End of boring at 21' bgs. due to obstruction or bedrock. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Sand seam at 5.3' bgs.
2. Silt sample too small for pocket pen measurement
2. Rock chips in sampler.

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BORING NUMBER B-04

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/31/24 **COMPLETED** 1/31/24
GROUND ELEVATION 52 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/31/24	AD	DRY	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0			4" thick asphalt parking lot											
	50		**S-1**: FILL: Medium stiff, sandy, clayey topsoil		S-1 (0.5-2)	8	2-2-2 (4)	1.5						
			S-2: FILL: Soft, Sandy lean CLAY (CL), low plasticity; trace Gravel, fine-grained; tan, moist	1	S-2 (2-3.5)	10	1-22-14 (36)	0.5						

End of boring at 3.5' bgs due to obstruction. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.

REMARKS

1. Rig chatter at 2' bgs.

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BORING NUMBER B-04A

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/31/24 **COMPLETED** 1/31/24
GROUND ELEVATION 52 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/31/24	AD	DRY	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	50		B-4A offset 5' southeast from B-4. Blind drill from 0 to 4.5' bgs.											
5	45		**S-3**: FILL: Very loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; tan, moist to wet		S-3 (4.5-6)	18	3-2-2 (4)			8.0				30
			S-4: Hard, Sandy lean CLAY (CL), low plasticity; light brown, moist		S-4 (7-8.5)	16	3-7-10 (17)	4.0						
10	40		**S-5**: Hard, Silty CLAY (CL-ML), low plasticity; trace Gravel, fine-grained; gray, moist		S-5 (9.5-11)	12	2-6-7 (13)	4.0		16.9				99
			S-6: Rock chips		S-6 (12-13.5)	12	9-45-26 (50+)							
15			**S-7**: Very dense, Clayey SAND with GRAVEL (SC), fine to coarse-grained; brown, moist		S-7 (14.5-15.3)	4	40-50/3"- (50+)							

End of boring at 16.5' bgs due to refusal. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.

REMARKS

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BORING NUMBER B-04B

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/22/24 **COMPLETED** 2/22/24
GROUND ELEVATION 52 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG Diedrich D-50

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/22/24	AD	DRY	N/A	5 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	50		Blind drill to bedrock											
5	45													
10	40													
15			End of boring at 15' bgs. due to refusal on bedrock. Boring backfilled with cuttings, bentonite chips, and asphalt patch.											

REMARKS

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BORING NUMBER B-05

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/31/24 **COMPLETED** 1/31/24
GROUND ELEVATION 58 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/31/24	AD	DRY	N/A	10 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0			**Surface**: 4-5" thick asphalt parking lot											
			S-1: Road base and asphalt chips plugged in sampler.		S-1 (0.5-2)	6	6-2-2 (4)							
	55		**S-2**: FILL: Very loose, Clayey SAND (SC), fine to medium-grained; dark brown, moist to wet		S-2 (2-3.5)	12	WOH-1-1 (2)			14.0				
5			**S-3**: No Recovery		S-3 (4.5-6)	0	6-4-2 (6)							
	50		**S-4**: No Recovery	1	S-4 (7-8.5)	0	4-4-6 (10)							
10			**S-5**: FILL: Loose, Clayey SAND (SC), fine to medium-grained; dark brown, moist to wet, little glass	2	S-5 (9.5-11)	8	2-4-4 (8)			12.2				41
	45		**S-6**: Dense, Clayey SAND (SC), fine to medium-grained; dark brown, moist to wet	3	S-6 (12-13.5)	4	9-31-7 (38)							
15			**S-7**: Lean CLAY (CL), low plasticity; trace Gravel, fine-grained; tan with orange staining, moist to wet	4	S-7 (14.5-16)	3	5-6-3 (9)	Disturbed						
	40		**S-8**: Very dense, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; light brown, moist to wet	5	S-8 (17-18.5)	8	6-5-46 (50+)							
20			**S-9**: Very dense, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; light brown, moist to wet	6 7	S-9 (19.5-20.3)	4	10-50/4"- (50+)			11.8				32

End of boring at 22' bgs due to refusal or bedrock. Boring backfilled with soil cuttings, bentonite chips, and asphalt patch.

REMARKS

1. Split spoon sampler stuck on obstruction during middle blow count.
2. Gravel stuck in tip of sampler. Rig chatter from 9' to 13' bgs.
3. Gravel stuck in tip of sampler.
4. Sample was disturbed due to gravel in sampler.
5. Attempted shelby tube at 16' to 18' bgs, failed due to gravel/cobbles.
6. Low recovery, gravel stuck in tip of sampler.
7. Drilled to bedrock after S-9.

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BORING NUMBER B-05A

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/1/24 **COMPLETED** 2/1/24
GROUND ELEVATION 58 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/1/24	AD	DRY	N/A	10 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0			**Surface**: 4" thick asphalt parking lot											
			S-1: Top 10": Traffic bond (road base) Bottom 5": FILL: Stiff, Sandy lean CLAY (CL), low plasticity; black, moist		S-1 (0.5-2)	15	12-8-11 (19)	2.0						
	55		**S-2**: FILL: Medium dense, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown, moist	1	S-2 (2-3.5)	10	2-10-5 (15)							
5			**S-3**: FILL: Very loose, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown, moist	2	S-3 (4.5-6)	7	2-1-2 (3)							
	50		**S-4**: FILL: Medium dense, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown, moist	2 3	S-4 (7-8.5)	1	3-5-6 (11)							
10			**S-5**: Medium dense, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; tan, moist	4 2	S-5 (9.5-11)	10	2-6-7 (13)							
	45		**S-6**: Top 6": Loose, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; tan, moist Bottom 4": Loose, Silty SAND (SM), fine to medium-grained; black, moist	5	S-6 (12-13.5)	8	3-1-9 (10)							
15			**S-7**: Medium stiff, Sandy lean CLAY (CL), low plasticity; little Gravel, fine-grained; brown, moist to wet	2	S-7 (14.5-16)	14	4-5-5 (10)	0.75						
			End of boring at 16' bgs. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.	6										

REMARKS

1. Obstruction encountered during 2nd blow count.
2. Rig chatter from 4' to 6' bgs, at 7' bgs, at 10' bgs, and from 15' to 16' bgs.
3. Low recovery due to gravel stuck in tip of sampler.
4. Gravel stuck in tip of sampler.
5. Sampler dropped during 2nd blow count.
6. Shelby tube attempted at 16' bgs, failed due to gravel/cobble

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BORING NUMBER B-06

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/30/24 **COMPLETED** 1/30/24
GROUND ELEVATION 59 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/30/24	N.M.	N.M.	N.M.	N.M.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0			**Surface**: 4" thick asphalt parking lot											
			S-1: FILL: Loose, Silty SAND (SM), fine to medium-grained; trace Gravel, fine-grained; black, moist		S-1 (0.5-2)	12	2-4-3 (7)							
			S-2: FILL: Loose, Silty SAND (SM), fine to medium-grained; trace Gravel, fine-grained; black, moist to wet		S-2 (2-3.5)	6	2-2-2 (4)			30.7				
	55													
5			**S-3**: FILL: Very loose, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; trace organics, wood; dark brown, moist		S-3 (4.5-6)	3	2-2-1 (3)							

End of boring at 6.5' bgs due to obstruction. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.

REMARKS

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BORING NUMBER B-06A

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/30/24 **COMPLETED** 1/30/24
GROUND ELEVATION 60 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/30/24	N.M.	N.M.	N.M.	N.M.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		B-06A offset 11' north of B-06. Blind drill to 7' bgs.											
			S-4: FILL: Very loose, Clayey GRAVEL (GC), fine to coarse-grained; little Sand, fine to medium-grained; black to brown, moist		S-4 (7-8.5)	1	2-1-3 (4)							
10	50		**S-5**: POSSIBLE BURIED TOPSOIL: Soft, Lean CLAY (CL), medium plasticity; trace organics, rootlets; black, moist to wet	1	S-5 (9.5-11)	15	1-0-1 (1)	0.5						
			S-6: Soft, Sandy lean CLAY (CL), low plasticity; trace Gravel, fine-grained; reddish brown, moist		S-6 (12-13.5)	12	6-3-4 (7)	0.5						
15	45		**S-7**: Loose, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; brown, moist		S-7 (14.5-16)	8	6-3-6 (9)							
			S-8: Dense, Clayey GRAVEL (GC), fine-grained; brown, moist to wet	2	S-8 (17-18.5)	12	18-25-15 (40)							
20	40		**S-9**: Very dense, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; little Gravel, fine-grained; brown, moist		S-9 (19.5-21)	5	15-19-34 (50+)							
			End of boring at 21.5' bgs due to refusal on bedrock. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Split spoon was wet when recovered.
2. Rig chatter from 16.5' to 18' bgs.

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
Brookfield, WI 53045
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BORING NUMBER B-07

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/1/24 **COMPLETED** 2/1/24
GROUND ELEVATION 61 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/1/24	AD	15.9	N/A	20 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		**Surface**: 4" thick, asphalt parking lot **S-1**: FILL: Medium dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist		S-1 (0.5-2)	12	5-6-5 (11)							
			S-2: FILL: Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist Interbedded with tan, poorly-graded sand seams		S-2 (2-3.5)	16	3-4-2 (6)							
5	55		**S-3**: FILL: Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist Interbedded with tan, poorly-graded sand seams	1	S-3 (4.5-6)	12	2-4-3 (7)							
			S-4: FILL: Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist	1	S-4 (7-8.5)	12	2-2-3 (5)							
10	50		**S-5**: FILL: Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist	2 3	S-5 (9.5-11)	1	1-0-0 (0)							
			S-6: FILL: Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist	4 5	S-6 (12-13.5)	14	1-1-7 (8)							
15	45		**S-7**: Medium stiff, Sandy lean CLAY (CL), low plasticity; trace Gravel, fine-grained; greenish-brown, wet	4 6	S-7 (14.5-16)	5	3-5-8 (13)	1.0		12.2	25	14	11	
			S-8: Medium dense, Silty SAND with GRAVEL (SM), fine to coarse-grained; tan, wet		S-8 (17-18.5)	12	4-5-7 (12)							
20	40		**S-9**: Dense, Well-graded SAND with GRAVEL (SW), fine to coarse-grained; tan to dark brown, wet		S-9 (19.5-21)	16	6-15-23 (38)			6.9				15
25			**S-10**: Very dense, Well-graded SAND with GRAVEL (SW), fine to coarse-grained; tan to dark brown, wet		S-10 (23.5-25)		16-34-37 (50+)							
			End of boring at 25' bgs due to refusal on bedrock. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Interbedded with tan, poorly-graded sand seams present in sample.
2. Split spoon sampler was wet.
3. Potential void space encountered.
4. Gravel stuck in tip of sampler.
5. Distinct change in blow counts observed at 13' bgs.
6. Rig chatter from 15' to 18.5' bgs.

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BORING NUMBER B-08

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/22/24 **COMPLETED** 2/22/24
GROUND ELEVATION 61 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG Diedrich D-50

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/22/24	AD	DRY	N/A	20 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		**Surface**: Grass with 3" Topsoil	1	S-1 (0-2)	20	3-10-7 (13)	1.0						
			S-1: FILL: Medium dense, Clayey SAND (SC), fine to coarse-grained; little Gravel, fine-grained; dark brown, moist, asphalt chunks in sample.											
			S-2: FILL: Loose, Clayey SAND (SC), fine to coarse-grained; little Gravel, fine-grained; dark brown, moist		S-2 (2-3.5)	8	3-2-5 (7)			7.5				
5			**S-3**: FILL: Medium dense, Clayey SAND (SC), fine to coarse-grained; little Gravel, fine-grained; dark brown, moist		S-3 (3.5-5)	8	3-5-22 (27)							
	55		**S-4**: FILL: Very loose, Clayey SAND (SC), fine to medium-grained; trace Gravel, fine-grained; dark brown to black, moist	2	S-4 (6-7.5)	12	3-1-2 (3)							
			S-5: Medium stiff, Sandy lean CLAY (CL), medium plasticity; trace Gravel, fine-grained; dark brown to black, moist		S-5 (8.5-10)	8	10-11-5 (16)	0.5-1.0		17.2				
10				3										
	50		**S-6**: Medium stiff, Sandy lean CLAY (CL), high plasticity; trace Gravel, fine-grained; dark brown to black, moist		S-6 (11-12.5)	15	3-3-3 (6)	0.5-1.0		30.5	49	16	33	
			ST-7: Top 8": Sandy lean CLAY (CL), low plasticity; trace Gravel, fine-grained; dark brown to black, moist		ST-7 (13.5-14.5)	11								
15			Bottom 3": Well-graded SAND (SW), fine to coarse-grained; little Gravel, fine-grained; tan, moist	4										
	45		**S-8**: Dense, Well-graded SAND (SW), fine to coarse-grained; little Gravel, fine-grained; tan, moist		S-8 (16-17.5)	18	9-17-15 (32)			5.5				15
			S-9: Medium dense, Clayey SAND (SC), fine to coarse-grained; little Gravel, fine-grained; light brown, moist to wet, gravel chips in sampler		S-9 (18.5-20)	18	24-11-15 (26)			8.9				23
20	40													
			End of boring at 24' bgs due to refusal on bedrock. Boring backfilled with cuttings and bentonite chips.											

REMARKS

1. Rig chatter at 1' bgs.
2. Rig chatter at 6' bgs.
3. Rig chatter at 10' bgs.
4. Rig chatter at 15' bgs.

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BORING NUMBER B-09

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/1/24 **COMPLETED** 2/1/24
GROUND ELEVATION 61 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/1/24	AD	11.5	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		**Surface**: 4" thick asphalt parking lot **S-1**: FILL: Medium dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist		S-1 (0.5-2)	10	3-6-6 (12)							
			S-2: FILL: Loose, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; little Gravel, fine-grained; tan, moist		S-2 (2-3.5)	8	3-3-3 (9)							
5	55		**S-3**: FILL: Very loose, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; little Gravel, fine-grained; tan, moist		S-3 (4.5-6)	9	1-2-2 (4)			6.7				8
			S-4: FILL: Top 2": Loose, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; little Gravel, fine-grained; tan, moist FILL: Bottom 9": Loose, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; black, moist		S-4 (7-8.5)	11	2-4-3 (7)							
10	50		**S-5**: FILL: Medium dense, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; black, moist to wet, petroleum odor	1 2	S-5 (9.5-11)	10	2-2-12 (14)	0.75						
			S-6: Medium stiff, Sandy silty CLAY (CL-ML), low-plasticity; trace Gravel, fine-grained; tan, moist, petroleum odor		S-6 (12-13.5)	10	9-2-3 (5)	0.75		13.2				
15	45		**S-7**: Medium stiff, Sandy silty CLAY (CL-ML), low-plasticity; trace Gravel, fine-grained; tan, moist to wet, petroleum odor		S-7 (14.5-16)	14	2-3-5 (8)	0.5						
			ST-8: Stiff, Sandy silty CLAY (CL-ML), low-plasticity; trace Gravel, fine-grained; tan, moist to wet	3	ST-8 (16-18)	24		1.5		11.8	19	12	7	57
20			**S-9**: Stiff, Sandy lean CLAY (CL), low-plasticity; trace Gravel, fine-grained; gray, wet		S-9 (18-20)		3-7-14 (21)	1.5		10.0	19	11	8	

End of boring at 20' bgs. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.

REMARKS

1. Distinct change in blow counts observed at 10.5' bgs. Gravel/cobbles encountered.
2. Rig chatter from 11' to 16' bgs.
3. Shelby tube collected from 16' to 18' bgs.

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BORING NUMBER B-10

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/22/24 **COMPLETED** 2/22/24
GROUND ELEVATION 62 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG Diedrich D-50

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/22/24	AD	7.5	N/A	2.5 Hr.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		**Surface**: Grass with 4" Topsoil **S-1**: FILL: Medium dense, Clayey SAND with GRAVEL (SC), fine to medium-grained; light brown, moist	1	S-1 (0-2)	23	5-16-12 (22)							
			S-2: FILL: Very stiff, Sandy lean CLAY (CL), low-plasticity; little Gravel, fine-grained; light brown, moist		S-2 (2-3.5)	18	3-6-11 (17)	3.5		8.4				
5			**S-3**: FILL: Very stiff, Sandy lean CLAY (CL), low-plasticity; little Gravel, fine-grained; light brown, moist		S-3 (3.5-3.75)	3	50/3"-- (50+)	3.25		7.4				
	55		**S-4**: Very dense, Clayey SAND (SC), fine to coarse-grained; little Gravel, fine-grained; light brown, moist	2 3	S-4 (6-7.5)	15	11-35-35 (50+)	2.0						
10			**S-5**: Medium dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; light brown, moist	4	S-5 (8.5-10)	15	7-13-13 (26)			10.0	NP	NP	NP	
	50		**S-6**: Very stiff, sandy SILT (SM), low plasticity; little Gravel, fine-grained; light brown, moist	5	S-6 (11-12.5)	18	4-9-20 (29)	3.5		10.0	15	12	3	
15			**S-7**: Dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; light brown, moist	6	S-7 (13.5-15)	18	6-16-20 (36)			15.5 12.7				20
	45		**S-8**: Top 6": Very dense, Poorly-graded SAND (SP), fine to medium-grained; light brown, wet Middle 4": Hard, Sandy SILT (ML), non-plastic; tan, wet Bottom 6": Hard, Sandy lean CLAY (CL), low-plasticity; trace Gravel, fine-grained; grayish brown, moist		S-8 (16-17.5)	16	9-28-37 (50+)	4.5+		15.1				
20			**S-9**: Hard, Sandy lean CLAY (CL), low-plasticity; little Gravel, fine-grained; light brown, wet		S-9 (18.5-20)	18	10-27-37 (50+)	4.5+		10.6				
	40		End of boring at 22' bgs due to refusal on bedrock. Boring backfilled with cuttings and bentonite chips.											

REMARKS

1. Rig chatter from 1' to 3' bgs.
2. Rig chatter from 5.5' to 6.5' bgs
3. Gravel chips in sampler
4. 1" sand seam at 9' bgs
5. 1" sand seam at 9' bgs
6. 4" sand seam at 14.25' bgs

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BORING NUMBER B-11

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/22/24 **COMPLETED** 2/22/24
GROUND ELEVATION 64 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG Diedrich D-50

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/22/24	AD	6.5	N/A	2 Hr.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0			**Surface**: Grass with Topsoil **S-1**: Clayey TOPSOIL		S-1 (0-2)	2	2-2-6 (22)							
			S-2: Dense, Silty SAND (SM), fine to medium-grained; little Gravel, fine-grained; grayish brown, moist		S-2 (2-3.5)	18	9-18-15 (33)	4.5+		7.9				47
	60		**S-3**: Very dense, Silty SAND with GRAVEL (SM), fine to medium-grained; little Gravel, fine-grained; tannish brown, moist		S-3 (3.5-5)	10	25-50/4"-(50+)			6.2				36
5			**S-4**: Hard, Sandy silty CLAY (CL-ML), low-plasticity; little Gravel, fine-grained; light brown, moist	1	S-4 (6-7.5)	18	6-35-21 (50+)	4.5+			16	11	5	
	55		**S-5**: Hard, Sandy silty CLAY (CL-ML), low-plasticity; little Gravel, fine-grained; light brown, moist		S-5 (8.5-10)	18	13-24-32 (50+)	4.5+						
10			End of boring at 10' bgs. Boring backfilled with cuttings and bentonite chips.	2										

REMARKS

1. Rig chatter from 5.0' to 6.0' bgs.
2. 2" Sand seam at 9.75' bgs.

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BORING NUMBER B-12

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/1/24 **COMPLETED** 2/1/24
GROUND ELEVATION 64 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/1/24	AD	5.9	N/A	15 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		**Surface**: 4" thick asphalt parking lot **S-1**: FILL: Hard Sandy lean CLAY (CL), low-plasticity; trace Gravel, fine-grained; gray, moist	1	S-1 (0.5-2)	14	12-7-9 (16)	4.0						
			S-2: FILL: Medium Dense, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; black to dark brown, moist to wet		S-2 (2-3.5)	7	4-5-6 (11)							
5			**S-3**: No Recovery	2	S-3 (4.5-6)	0	5-3-1 (4)							
	55		**S-4**: Medium dense, Silty SAND (SM), fine to medium-grained; black, moist to wet, petroleum odor		S-4 (7-8.5)	12	4-7-6 (13)			20.9				
10			**S-5**: Very stiff, Sandy lean CLAY (CL), low-plasticity; little Gravel, fine-grained; gray, moist to wet	3	S-5 (9.5-11)	10	2-9-50/4" (50+)	3.5						
	50		**S-6**: Medium dense, Silty SAND (SM), fine to medium-grained; trace Gravel, fine-grained; gray, wet	4	S-6 (12-13.5)	15	4-8-10 (18)	4.0		11.4				44
15			**S-7**: Hard, Sandy lean CLAY (CL), low-plasticity; trace Gravel, fine-grained; gray, moist	5	S-7 (14.5-16)	18	4-8-15 (23)	4.5		11.8				
	45		**S-8**: Top 8": Medium dense, Silty SAND (SM), fine-grained; tan, wet Bottom 8": Hard, lean CLAY (CL), low-plasticity; little Sand, fine-grained; reddish brown, moist		S-8 (17-18.5)	16	8-12-14 (26)	2.0-4.5+						
20			**S-9**: Top 10": Hard, lean CLAY (CL), low-plasticity; little Sand, fine-grained; reddish brown, moist Bottom 8": Very dense, Well-graded SAND with GRAVEL (SW), fine to coarse-grained; tan, wet		S-9 (19.5-21)	10	6-15-40 (50+)	4.5+						
			End of boring at 21' bgs. Boring backfilled with soil cuttings, bentonite chips and asphalt patch.											

REMARKS

1. Rig chatter from 1' to 6' bgs.
2. Significant drop in blow counts at 5.3' bgs. Cobble/boulder at 5' bgs caused augers to kick.
3. Obstruction hit with sampler at 10.1' bgs. Rig chatter from 10' to 13' bgs.
4. Interbedded layers of Clayey SAND (SC).
5. Interbedded layers of Poorly-graded SAND (SP).

GZA GeoEnvironmental, Inc.
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BORING NUMBER B-13

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 1/30/24 **COMPLETED** 1/30/24
GROUND ELEVATION 70 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG CME-75

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
1/30/24	AD	23.0	N/A	20 Min.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	70		**Surface**: 4" thick, asphalt parking lot **S-1**: FILL: 1-1/4" Traffic bond (road base)		S-1 (0.5-2)	11	11-7-5 (12)							
			S-2: FILL: Traffic bond (road base)		S-2 (2-3.5)	7	4-5-6 (11)							
5	65		**S-3**: FILL: Loose, Well-graded GRAVEL with SAND (GP-GM), fine to coarse-grained; trace Silt, non-plastic; gray, moist	1	S-3 (4.5-6)	8	3-3-3 (6)							
			S-4: No Recovery		S-4 (7-8.5)	0	2-1-2 (3)							
10	60		**S-5**: FILL: Top 5": Very soft, Sandy lean CLAY (CL), low plasticity; trace Gravel, fine-grained; greenish brown, moist Bottom 2": Very loose, Silty SAND (SM), little Gravel, fine-grained; black, moist, petroleum odor		S-5 (9.5-11)	7	1-0-2 (2)	0.25		20.0				
			S-6: FILL: Very soft, Sandy lean CLAY (CL), low plasticity; trace Gravel, fine-grained; black, moist, petroleum odor		S-6 (12-13.5)	5	3-7-6 (13)	0.25						
15	55		**S-7**: Medium dense, Silty GRAVEL with SAND (GM), fine to coarse-grained; little Sand, fine-grained; dark gray, wet	2	S-7 (14.5-16)	12	4-7-5 (12)			13.6				21
			S-8: Dense, Well-graded SAND with GRAVEL (SW), fine to coarse-grained; gray, tan, wet		S-8 (17-18.5)	18	9-15-21 (36)							
20	50		**S-9**: Very dense, Poorly-graded GRAVEL with SAND (GP), fine-grained; tan, wet (gravel chips)		S-9 (19.5-21)	18	13-25-29 (50+)							
25	45		**S-10**: Top 3": Very stiff, SILTY CLAY (CL-ML), low-plasticity; little Sand, fine-grained; brown, moist Bottom 9": Medium dense, Silty SAND (SM), fine to medium-grained; light brown, wet		S-10 (23.5-25)	12	10-12-14 (26)	3.25						23
			End of boring at 28.5' bgs due to refusal on bedrock. Boring backfilled with spoils and bentonite chips.											

REMARKS

1. Rig chatter from 4' to 6' bgs.
2. Rig chatter from 16' to 17' bgs.

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
Brookfield, WI 53045
(262) 754-2560

BORING NUMBER B-14

CLIENT Mandel Development, Inc.
PROJECT NAME Delafield Street Apartments
PROJECT NUMBER 20.0158728.00
PROJECT LOCATION Delafield Street, Waukesha, WI 53188
DATE STARTED 2/22/24 **COMPLETED** 2/22/24
GROUND ELEVATION 61 feet, C.O.W. **HOLE SIZE** 7-1/4 inches
DRILLING CONTRACTOR GESTRA
DRILLING METHOD HSA - 3-1/4" Inner Dia.
LOGGED BY CJB **CHECKED BY** JDG
DRILL RIG Diedrich D-50

GROUND WATER LEVELS (ft, bgs):

DATE	TIME	DEPTH	CASING	STAB
2/22/24	AD	3.7	N/A	1 Hr.

DEPTH (ft)	Elevation (ft, C.O.W.)	GRAPHIC LOG	MATERIAL DESCRIPTION	REMARKS	SAMPLE TYPE NUMBER (Depth Interval)	RECOVERY (inches)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0	60		**Surface**: Grass with 4" Topsoil **S-1**: Medium dense, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; light brown, moist	1	S-1 (0-2)	16	4-9-10 (20)							
			S-2: Dense, Clayey SAND (SC), fine to medium-grained; little Gravel, fine-grained; light brown, moist, gravel chips in sampler	2	S-2 (2-3.5)	18	6-28-13 (41)			7.1				
5			**S-3**: Medium dense, Poorly-graded SAND with SILT (SP-SM), fine to medium-grained; tan, wet		S-3 (3.5-5)	11	26-9-10 (19)			15.3				9
	55		**S-4**: Hard, Sandy CLAY (CL), low plasticity; grayish brown, moist	3	S-4 (6-7.5)	17	8-14-15 (29)	4.5+		10.3				69
10			**S-5**: Top 6": Very stiff, Sandy SILT (ML), non-plastic; tan, moist Bottom 12": Hard, Sandy lean CLAY (CL), low-plasticity; light brown, moist		S-5 (8.5-10)	18	10-19-22 (41)	2.5-4.5+						
			End of boring at 10' bgs. Boring backfilled with cuttings and bentonite chips.											

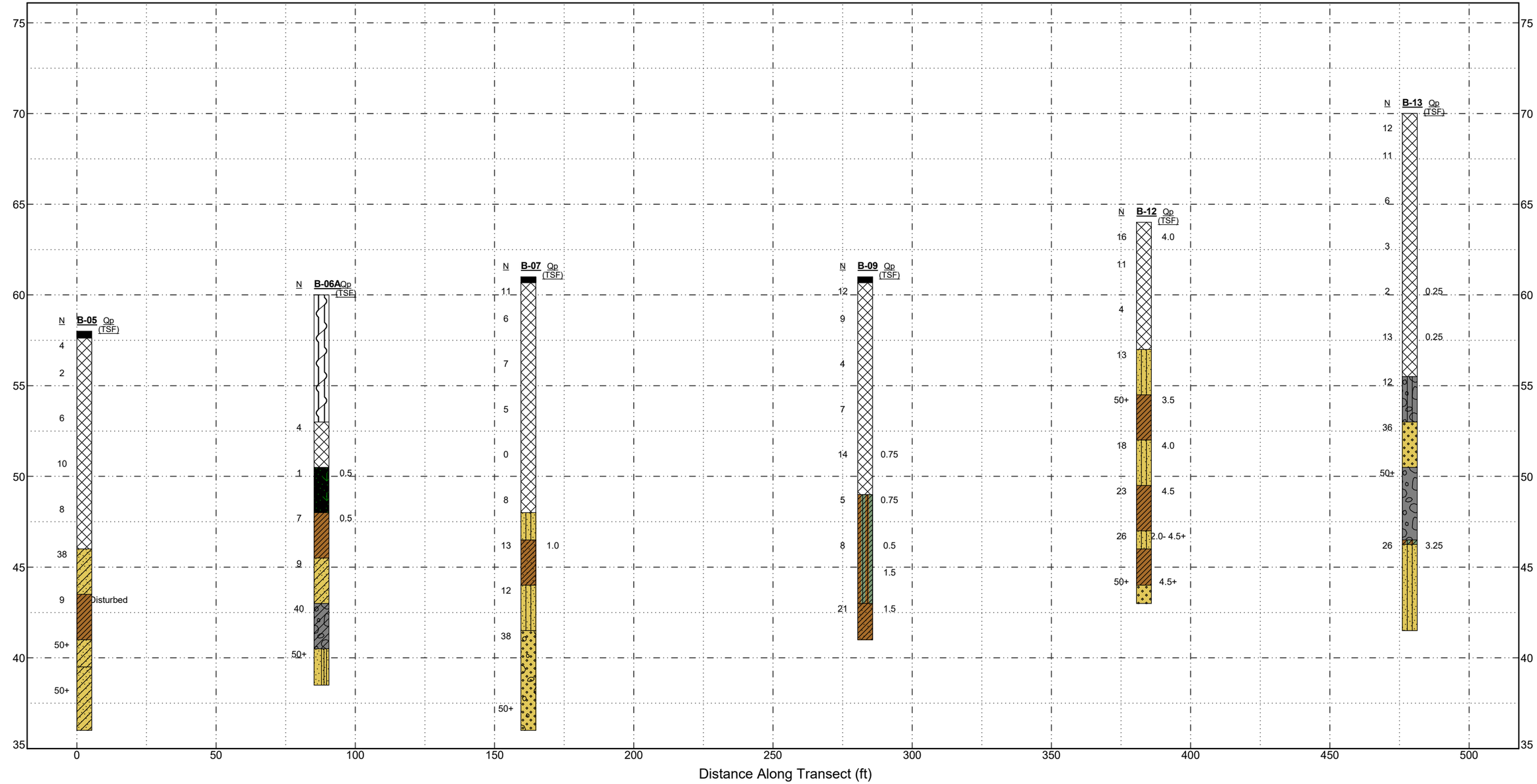
REMARKS

1. Rig chatter at 1' bgs.
2. Rig chatter at 3' bgs.
3. 2" sand seam in sample at 7.25' bgs.

APPENDIX C

FENCE DIAGRAMS

NOTES:
1) Soil boundaries are estimates;
2) Groundwater observations made at time of exploration and are subject to change.



Borehole	Northing	Easting	Elevation	Depth	GW Depth
B-05	374772	2471828	58.0	22.0	DRY
B-06A	374859	2471823	60.0	21.5	N.M.
B-07	374938	2471830	61.0	25.0	15.9
B-09	375058	2471810	61.0	20.0	11.5
B-12	375153	2471778	64.0	21.0	5.9
B-13	375236	2471720	70.0	28.5	23.0

GZA GeoEnvironmental, Inc.
Engineers and Scientists

- ASPHALT: Asphalt
- CL: USCS Low Plasticity Clay
- GC: USCS Clayey Gravel
- CLS: USCS Low Plasticity Sandy Clay
- SW: USCS Well-graded Sand
- FILL: Fill (made ground)
- BD: Blind drilled footage
- SP-SM: USCS Poorly-graded Sand with Silt
- SWG: USCS Well-graded Gravelly Sand
- GM: USCS Silty Gravel
- SC: USCS Clayey Sand
- TOPSOIL: Topsoil
- SM: USCS Silty Sand
- CL-ML: USCS Low Plasticity Silty Clay
- GP: USCS Poorly-graded Gravel

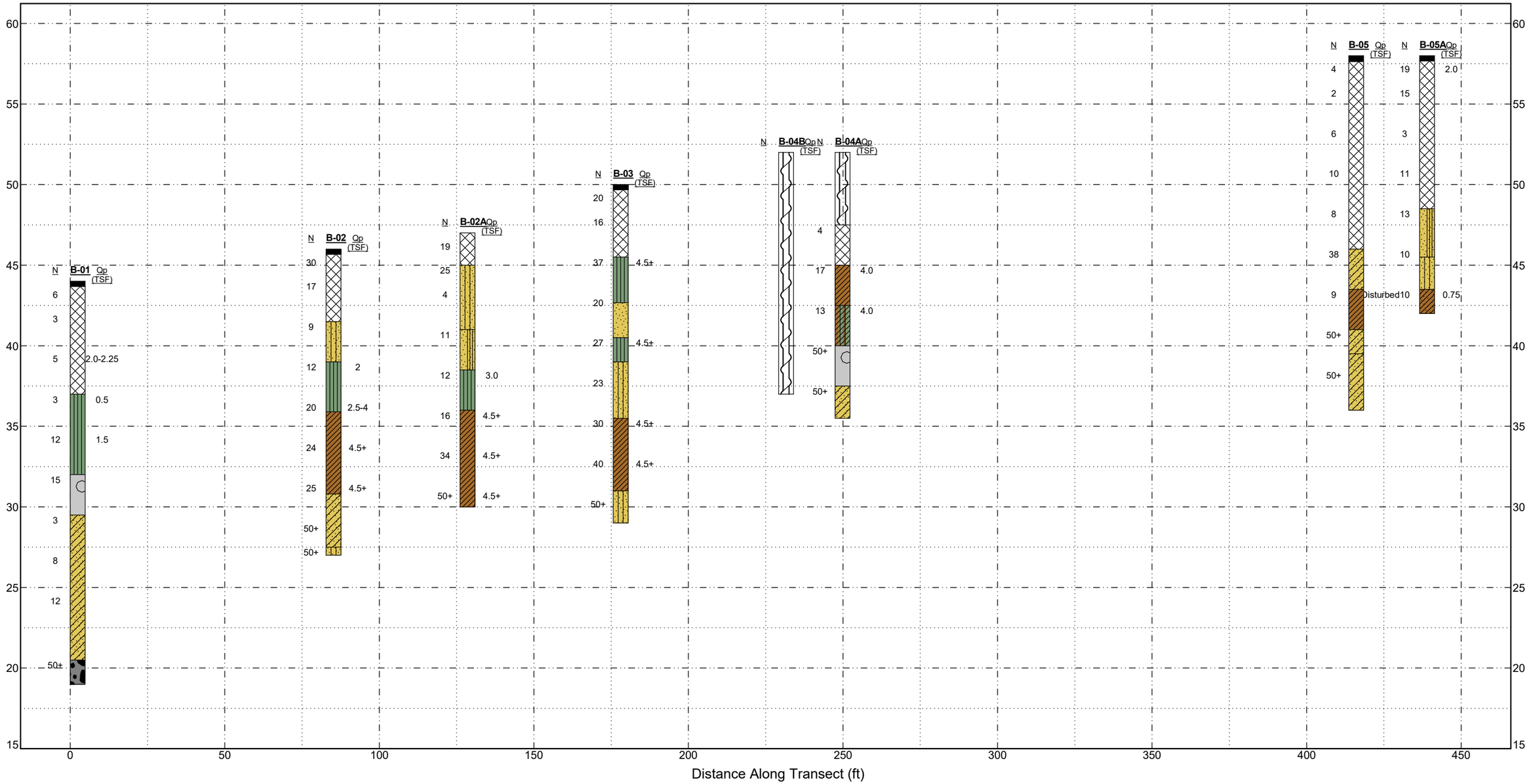
NORTH BUILDING FENCE DIAGRAM

Refer to Boring Logs in Appendix B for detailed description

Delafield Street Apartments
Delafield Street, Waukesha, WI 53188

PROJECT #	DATE	FIGURE
20.0158728.00	Mar 2024	3

NOTES:
1) Soil boundaries are estimates;
2) Groundwater observations made at time of exploration and are subject to change.



Borehole	Northing	Easting	Elevation	Depth	GW Depth
B-01	374359	2471792	44.0	25.0	21.0
B-02	374442	2471797	46.0	19.0	15.3
B-02A	374481	2471828	47.0	17.0	8.2
B-03	374536	2471797	50.0	21.0	15.2
B-04A	374606	2471814	52.0	16.5	DRY
B-04B	374590	2471798	52.0	15.0	DRY
B-05	374772	2471828	58.0	22.0	DRY
B-05A	374794	2471836	58.0	16.0	DRY

GZA GeoEnvironmental, Inc.
Engineers and Scientists

- ASPHALT: Asphalt
- COBBLES: Cobbles
- SM: USCS Silty Sand
- SP: USCS Poorly-graded Sand
- CLS: USCS Low Plasticity Sandy Clay
- FILL: Fill (made ground)
- SC: USCS Clayey Sand
- CL: USCS Low Plasticity Clay
- BD: Blind drilled footage
- ML: USCS Silt
- GW: USCS Well-graded Gravel
- SP-SM: USCS Poorly-graded Sand with Silt
- CL-ML: USCS Low Plasticity Silty Clay

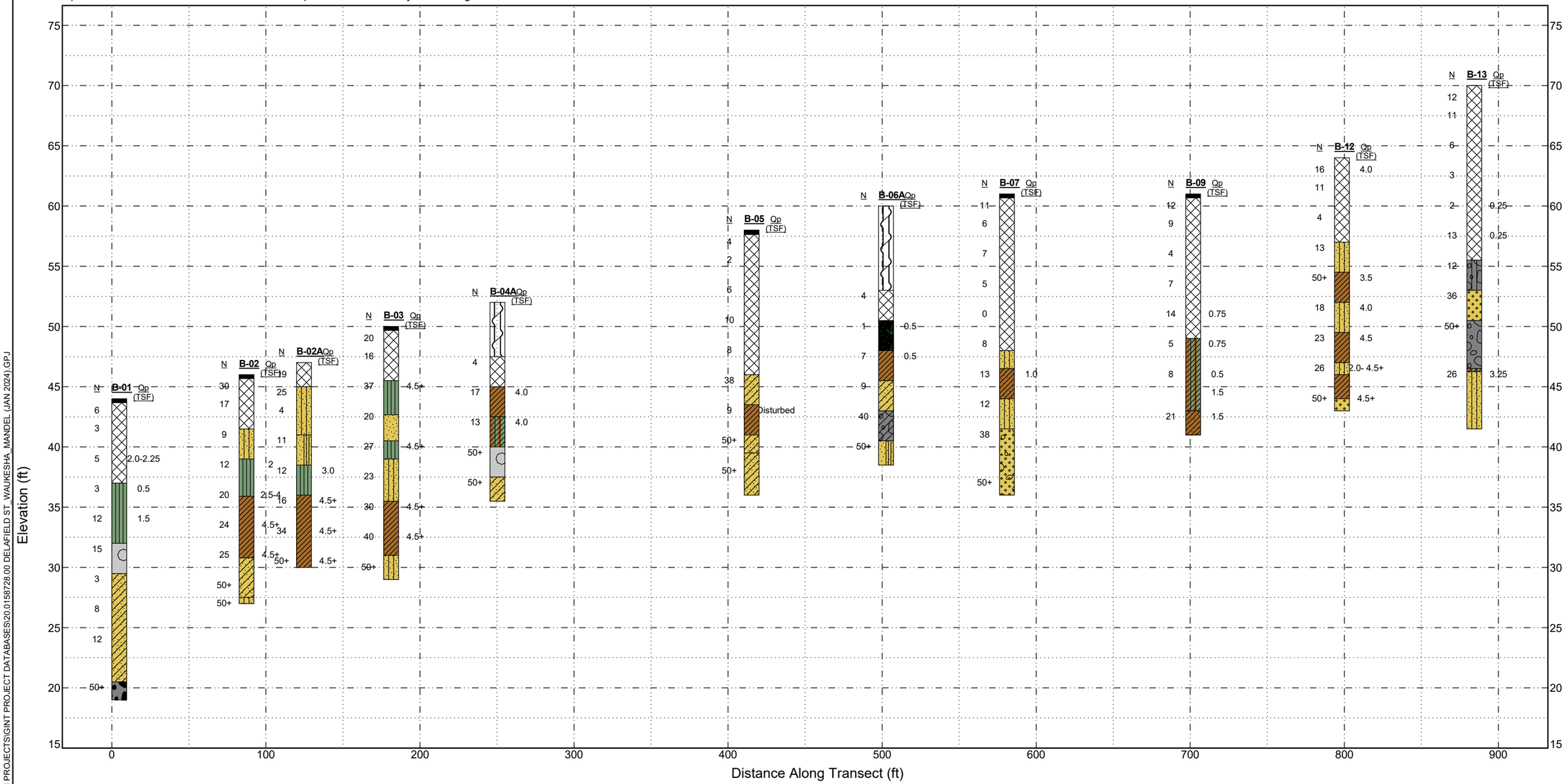
SOUTH BUILDING FENCE DIAGRAM

Refer to Boring Logs in Appendix B for detailed description

Delafield Street Apartments
Delafield Street, Waukesha, WI 53188

PROJECT #	DATE	FIGURE
20.0158728.00	Mar 2024	4

NOTES:
1) Soil boundaries are estimates;
2) Groundwater observations made at time of exploration and are subject to change.



Borehole	Northing	Easting	Elevation	Depth	GW Depth
B-01	374359	2471792	44.0	25.0	21.0
B-02	374442	2471797	46.0	19.0	15.3
B-02A	374481	2471828	47.0	17.0	8.2
B-03	374536	2471797	50.0	21.0	15.2
B-04A	374606	2471814	52.0	16.5	DRY
B-05	374772	2471828	58.0	22.0	DRY
B-06A	374859	2471823	60.0	21.5	N.M.
B-07	374938	2471830	61.0	25.0	15.9
B-09	375058	2471810	61.0	20.0	11.5
B-12	375153	2471778	64.0	21.0	5.9
B-13	375236	2471720	70.0	28.5	23.0

GZA GeoEnvironmental, Inc.
Engineers and Scientists

- ASPHALT: Asphalt
- COBBLES: Cobbles
- SM: USCS Silty Sand
- SP: USCS Poorly-graded Sand
- TOPSOIL: Topsoil
- SWG: USCS Well-graded Gravelly Sand
- FILL: Fill (made ground)
- SC: USCS Clayey Sand
- CL: USCS Low Plasticity Clay
- BD: Blind drilled footage
- GC: USCS Clayey Gravel
- SW: USCS Well-graded Sand
- ML: USCS Silt
- GW: USCS Well-graded Gravel
- SP-SM: USCS Poorly-graded Sand with Silt
- CL-ML: USCS Low Plasticity Silty Clay
- CLS: USCS Low Plasticity Sandy Clay
- GM: USCS Silty Gravel

SUBSURFACE FENCE DIAGRAM

Refer to Boring Logs in Appendix B for detailed description

Delafield Street Apartments
Delafield Street, Waukesha, WI 53188

PROJECT #	DATE	FIGURE
20.0158728.00	Mar 2024	

STRATUM N & QP - - 3/21/24 15:55 - J:\GEOTECH PROJECTS\GINT PROJECT DATABASES\20.0158728.00 DELAFIELD ST_WAUKESHA_MANDEL (JAN 2024).GPJ

APPENDIX D

LABORATORY TESTING RESULTS

GZA GeoEnvironmental, Inc.
17975 West Sarah Lane, #100
Brookfield, WI 53045
(262) 754-2560

TABULATION OF LABORATORY DATA

CLIENT Mandel Development, Inc.

PROJECT NAME Delafield Street Apartments

PROJECT NUMBER 20.0158728.00

PROJECT LOCATION Delafield Street, Waukesha, WI 53188

Boring Number	Sample Number	Depth ft, bgs	Natural Moisture %	Dry Unit Weight (pcf)	Sieve Data: Percent Passing By Weight					Atterberg Limits			USCS Class.	UC. Strength (psf)	Date Tested | Technician
					3/4"	No. 4	No. 10	*No. 40	No. 200	LL	PL	PI			
B-01	S-3	4.5	23.7						80						2/15/2024 | GZA
B-01		5	38.0							38	17	21			2/27/2024 | GESTRA
B-01	S-4	7	18.4			100	100	99	73						2/15/2024 | GZA
B-01	S-8	17	9.9			83	79	69	41						2/15/2024 | GZA
B-02	S-3	4.5	19.8				100	100	36						2/15/2024 | GZA
B-02	S-6	12	20.3						99	30	13	17	CL		2/15/2024 | GZA
B-02A	S-3	3.5	9.6						32						2/26/2024 | GZA
B-02A	S-4	6	18.6												2/26/2024 | GZA
B-02A	S-5	8.5	22.2												2/26/2024 | GZA
B-02A	S-6	11	13.5							25	13	12			3/4/2024 | GESTRA
B-02A	S-7	13.5	15.6						100						2/26/2024 | GZA
B-03	S-4	7	21.6			100	100	100	4				SP		2/15/2024 | GZA
B-03	S-7	14.5	12.7						91						2/15/2024 | GZA
B-04A	S-3	4.5	8.0		100	77	71	58	30						2/15/2024 | GZA
B-04A	S-5	9.5	16.9						99						2/15/2024 | GZA
B-05	S-2	2	14.0												2/14/2024 | GZA
B-05	S-5	9.5	12.2						41						2/15/2024 | GZA
B-05	S-9	19.5	11.8						32						2/15/2024 | GZA
B-06	S-2	2	30.7												2/14/2024 | GZA
B-07	S-7	14.5	12.2							25	14	11			2/14/2024 | GZA
B-07	S-9	19.5	6.9		100	72	58	36	15						2/15/2024 | GZA
B-08	S-2	2	7.5												2/26/2024 | GZA
B-08	S-5	8.5	17.2												2/26/2024 | GZA
B-08	S-6	11	30.5							49	16	33			3/4/2024 | GESTRA
B-08	S-8	16	5.5		92	51	38	25	15						2/26/2024 | GZA
B-08	S-9	18.5	8.9						23						2/26/2024 | GZA

GZA GeoEnvironmental, Inc.
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TABULATION OF LABORATORY DATA

CLIENT Mandel Development, Inc.

PROJECT NAME Delafield Street Apartments

PROJECT NUMBER 20.0158728.00

PROJECT LOCATION Delafield Street, Waukesha, WI 53188

Boring Number	Sample Number	Depth ft, bgs	Natural Moisture %	Dry Unit Weight (pcf)	Sieve Data: Percent Passing By Weight					Atterberg Limits			USCS Class.	UC. Strength (psf)	Date Tested | Technician
					3/4"	No. 4	No. 10	*No. 40	No. 200	LL	PL	PI			
B-09	S-3	4.5	6.7		100	90	84	54	8						2/15/2024 | GZA
B-09	S-6	12	13.2												2/14/2024 | GZA
B-09	ST-8	16	11.8		100	94	91	83	57	19	12	7	CL-ML		2/23/2024 | GESTRA
B-09	S-9	18	10.0							19	11	8			2/14/2024 | GZA
B-10	S-2	2	8.4												2/26/2024 | GZA
B-10	S-3	3.5	7.4												2/26/2024 | GZA
B-10	S-5	8.5	10.0							NP	NP	NP			2/26/2024 | GZA
B-10	S-6	11	10.0							15	12	3			3/4/2024 | GESTRA
B-10	S-7	13.5	15.5						20						2/26/2024 | GZA
B-10		14.5	12.7												2/27/2024 | GESTRA
B-10	S-8	16	15.1												2/26/2024 | GZA
B-10	S-9	18.5	10.6												2/26/2024 | GZA
B-11	S-2	2	7.9						47						2/27/2024 | GZA
B-11	S-3	3.5	6.2		91	77	71	59	36						2/27/2024 | GZA
B-11	S-4	6								16	11	5			3/4/2024 | GESTRA
B-12	S-4	7	20.9												2/14/2024 | GZA
B-12	S-6	12	11.4			95	91	82	44						2/15/2024 | GZA
B-12	S-7	14.5	11.8												2/14/2024 | GZA
B-13	S-5	9.5	20.0												2/14/2024 | GZA
B-13	S-7	14.5	13.6		86	54	47	35	21						2/15/2024 | GZA
B-13	S-10	23.5				97	82	66	23						2/15/2024 | GZA
B-14	S-2	2	7.1												2/27/2024 | GZA
B-14	S-3	3.5	15.3						9						2/27/2024 | GZA
B-14	S-4	6	10.3						69						2/27/2024 | GZA
Maximum Values:			38.0		100	100	100	100	100	49	17	33			
Minimum Values:			5.5		86	51	38	25	4	0	0	3			
Average Value:			14.2		96	82	78	67	44	24	12	13			
Number of Tests Performed:			48	0	7	12	13	13	26	10	10	10		0	

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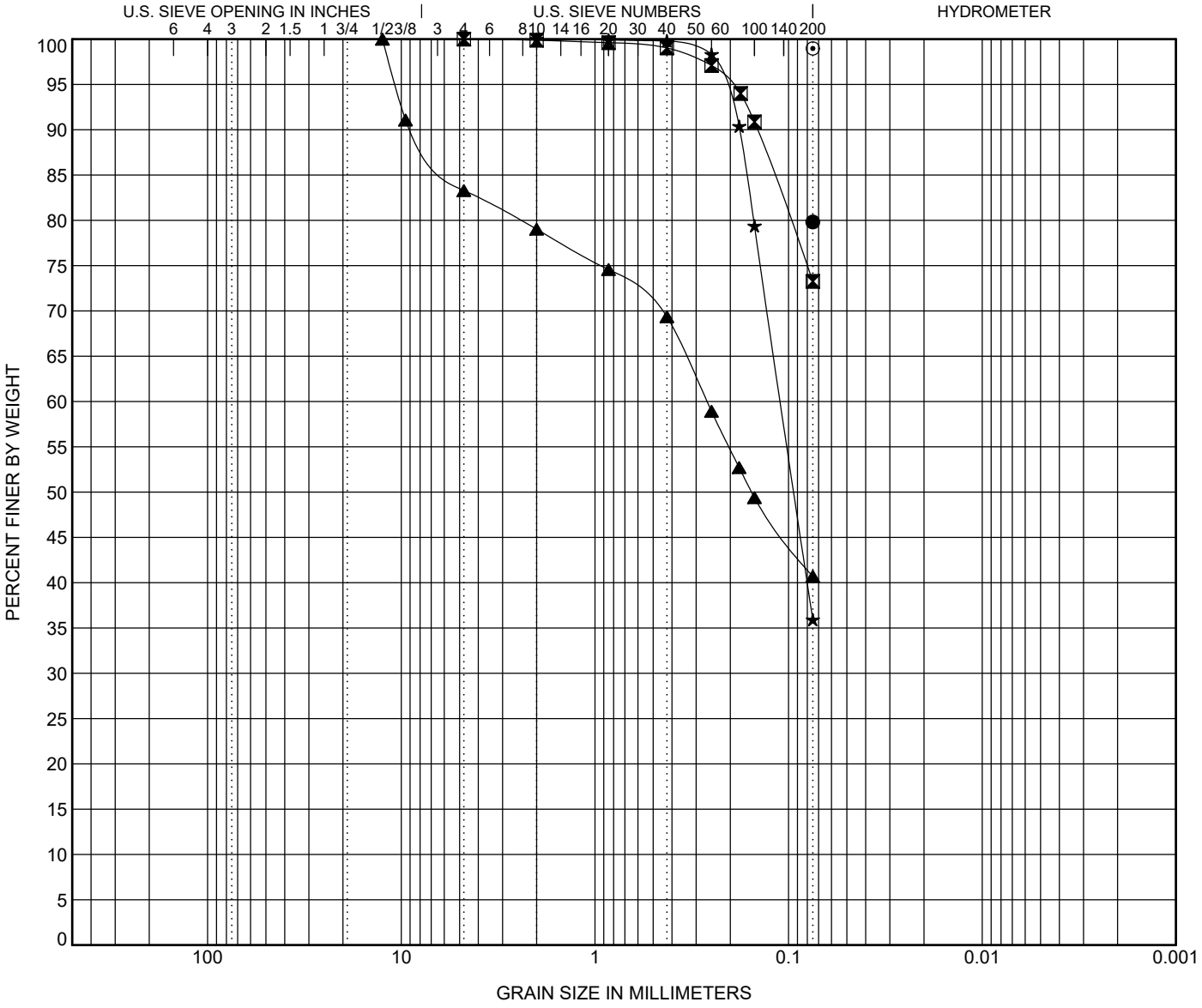
GRAIN SIZE DISTRIBUTION

CLIENT Mandel Development, Inc. **PROJECT NAME** Delafield Street Apartments

PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	B-01	4-6.5						
⊠	B-01	7-8.5						
▲	B-01	17-18.5						
★	B-02	4.5-6						
⊙	B-02	12-13.5	**LEAN CLAY(CL)**	**30**	**13**	**17**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-01	4-6.5	0.075						79.8	
⊠	B-01	7-8.5	4.75				0.0	26.7	73.3	
▲	B-01	17-18.5	12.5	0.264			16.7	42.6	40.7	
★	B-02	4.5-6	2	0.11			0.0	64.1	35.9	
⊙	B-02	12-13.5	0.075						99.0	

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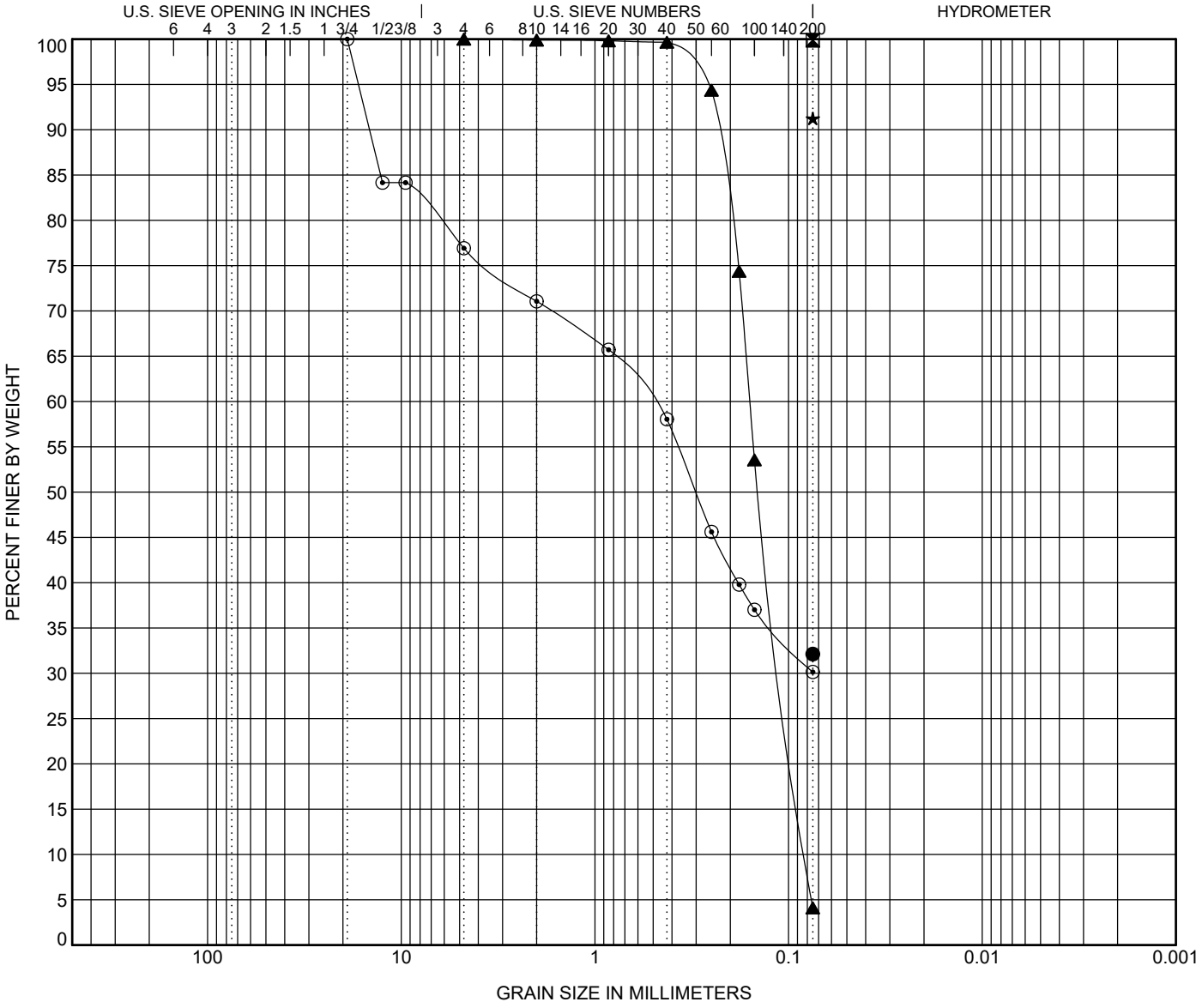
PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-02A**	**3.5-5**						
⊠	**B-02A**	**13.5-15**						
▲	**B-03**	**7-8.5**	**POORLY GRADED SAND(SP)**				**0.90**	**1.95**
★	**B-03**	**14.5-16**						
⊙	**B-04A**	**4.5-6**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-02A**	**3.5-5**	**0.075**						**32.1**	
⊠	**B-02A**	**13.5-15**	**0.075**						**99.9**	
▲	**B-03**	**7-8.5**	**4.75**	**0.159**	**0.108**	**0.081**	**0.0**	**95.9**	**4.1**	
★	**B-03**	**14.5-16**	**0.075**						**91.2**	
⊙	**B-04A**	**4.5-6**	**19**	**0.507**			**23.1**	**46.8**	**30.1**	

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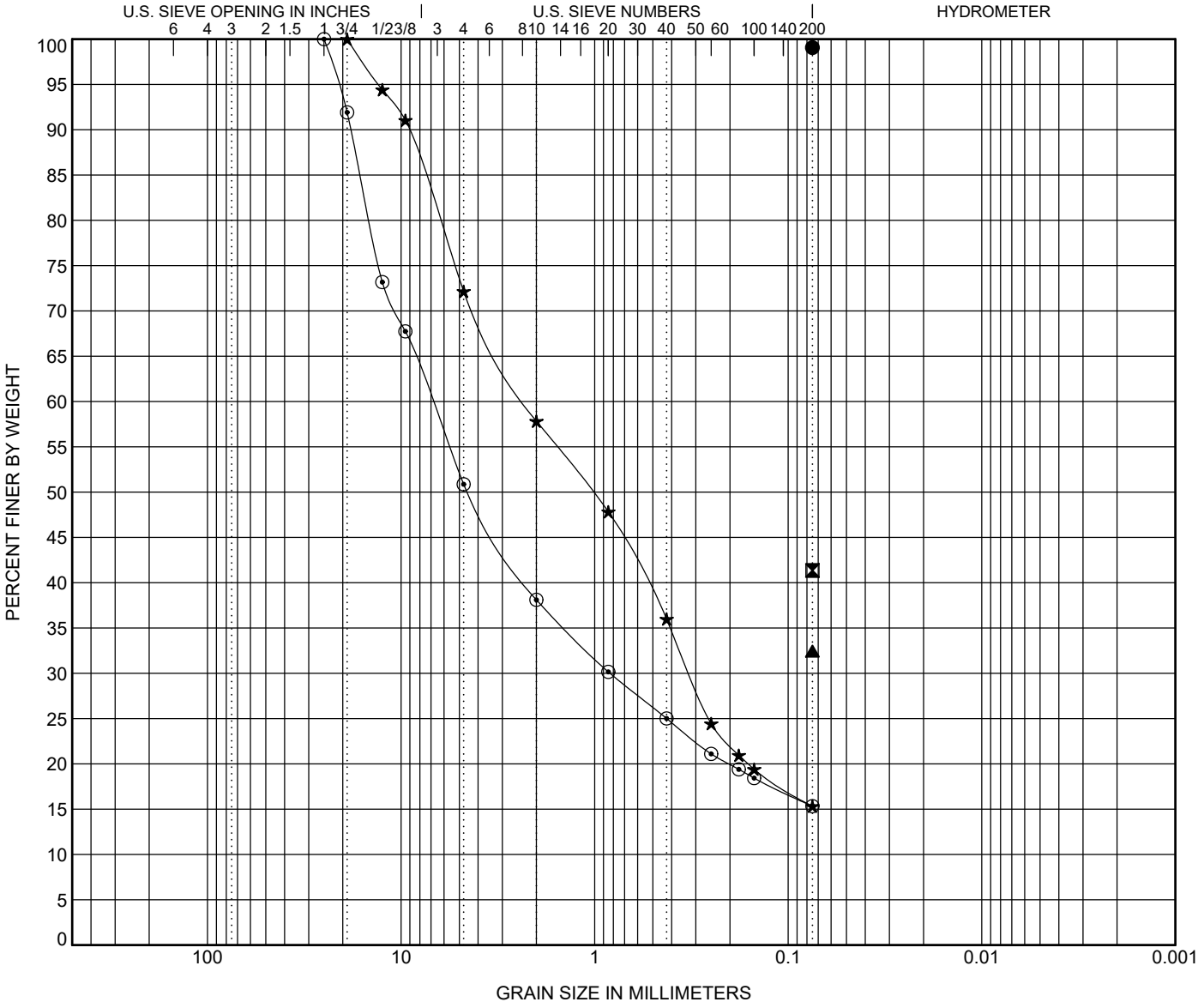
PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-04A**	**9.5-11**						
⊠	**B-05**	**9.5-11**						
▲	**B-05**	**19.5-20.3**						
★	**B-07**	**19.5-21**						
⊙	**B-08**	**16-17.5**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-04A**	**9.5-11**	**0.075**						**99.1**	
⊠	**B-05**	**9.5-11**	**0.075**						**41.3**	
▲	**B-05**	**19.5-20.3**	**0.075**						**32.5**	
★	**B-07**	**19.5-21**	**19**	**2.28**	**0.323**		**27.8**	**56.8**	**15.3**	
⊙	**B-08**	**16-17.5**	**25**	**6.913**	**0.832**		**49.1**	**35.5**	**15.3**	

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GRAIN SIZE DISTRIBUTION

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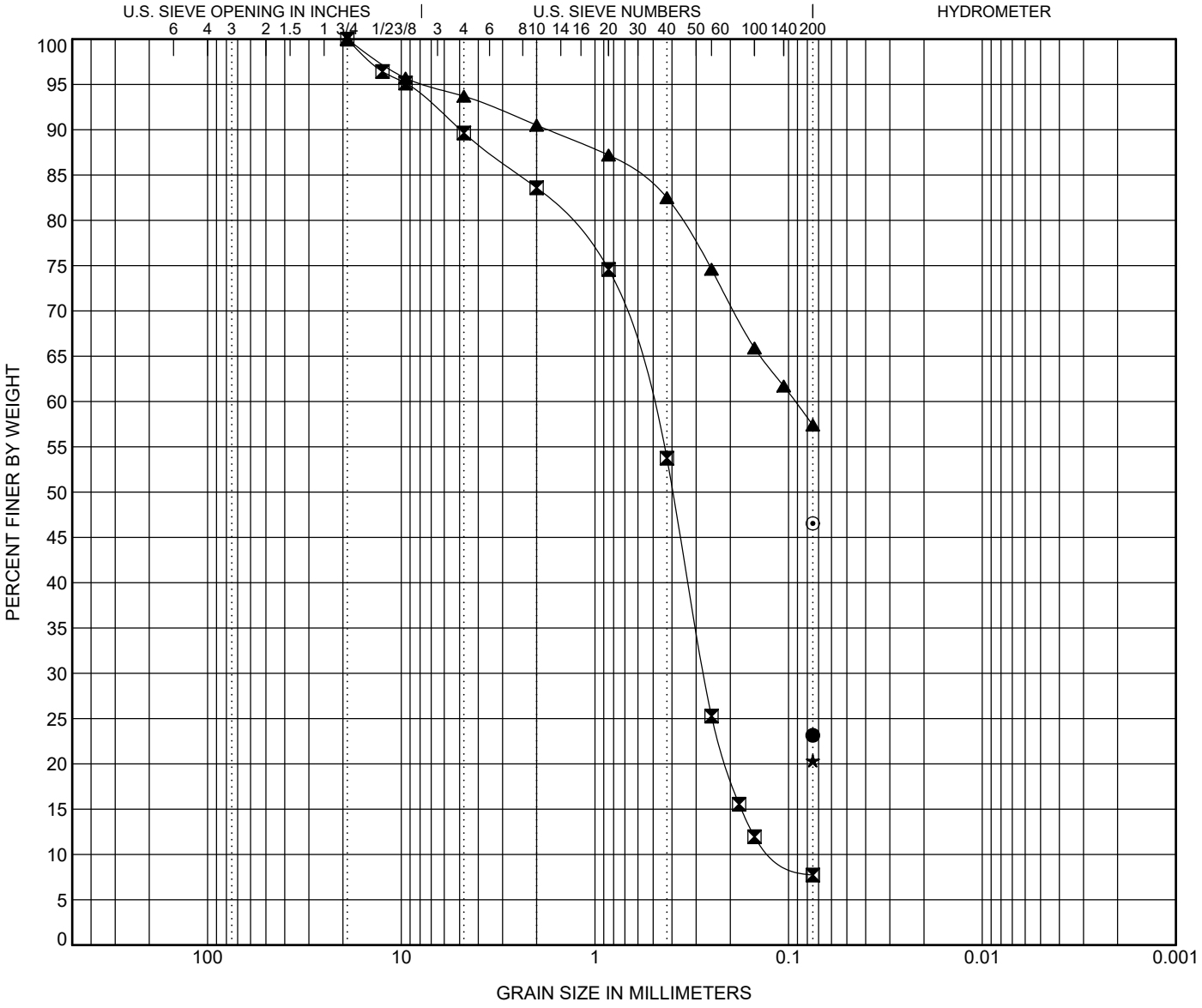
PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-08**	**18.5-20**						
⊠	**B-09**	**4.5-6**					**1.31**	**4.80**
▲	**B-09**	**16-18**	**SANDY SILTY CLAY(CL-ML)**	**19**	**12**	**7**		
★	**B-10**	**13.5-15**						
⊙	**B-11**	**2-3.5**						

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-08**	**18.5-20**	**0.075**						**23.1**	
⊠	**B-09**	**4.5-6**	**19**	**0.523**	**0.273**	**0.109**	**10.4**	**81.9**	**7.7**	
▲	**B-09**	**16-18**	**19**	**0.092**			**6.3**	**36.3**	**57.4**	
★	**B-10**	**13.5-15**	**0.075**						**20.3**	
⊙	**B-11**	**2-3.5**	**0.075**						**46.5**	

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GRAIN SIZE DISTRIBUTION

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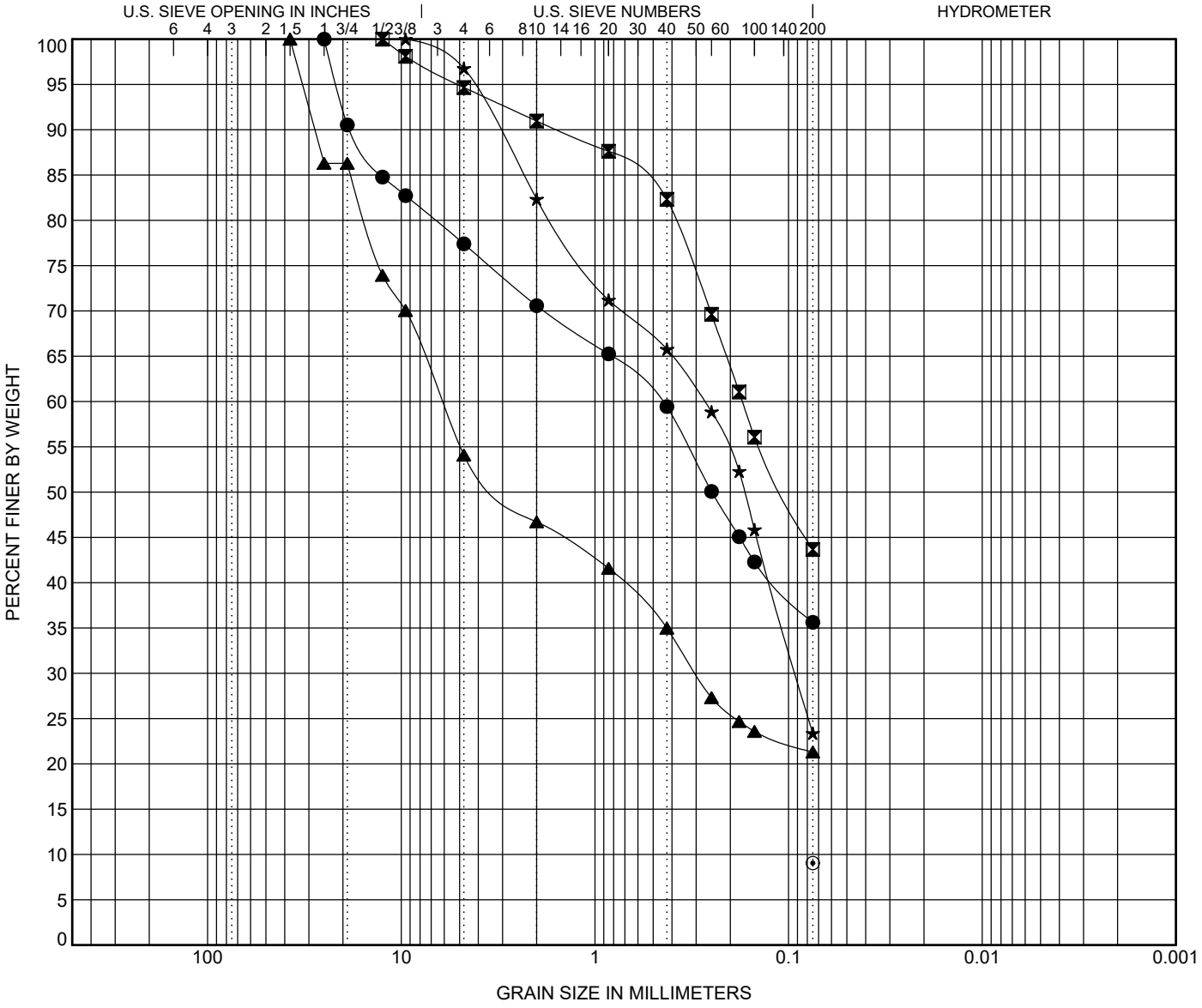
PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-11**	**3.5-5**						
⊠	**B-12**	**12-13.5**						
▲	**B-13**	**14.5-16**	**SILTY GRAVEL with SAND(GM)**	**NP**	**NP**	**NP**		
★	**B-13**	**23.5-25**	**SILTY SAND(SM)**	**NP**	**NP**	**NP**		
⊙	**B-14**	**3.5-5**		**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-11**	**3.5-5**	**25**	**0.454**			**22.6**	**41.8**	**35.6**	
⊠	**B-12**	**12-13.5**	**12.5**	**0.173**			**5.3**	**51.0**	**43.7**	
▲	**B-13**	**14.5-16**	**37.5**	**6.141**	**0.301**		**45.9**	**32.8**	**21.3**	
★	**B-13**	**23.5-25**	**9.5**	**0.273**	**0.092**		**3.2**	**73.4**	**23.4**	
⊙	**B-14**	**3.5-5**	**0.075**						**9.1**	

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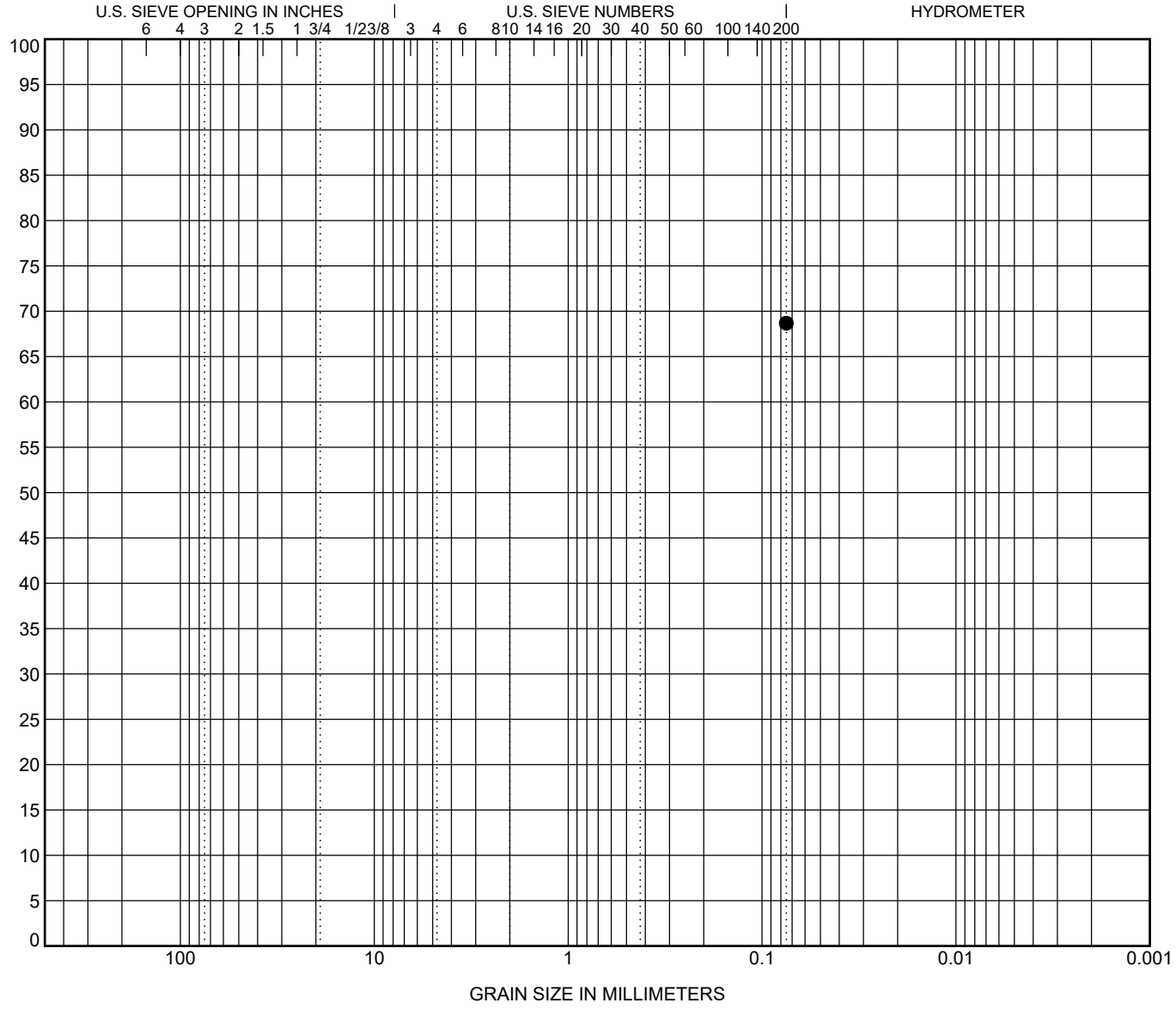
(262) 754-2560

GRAIN SIZE DISTRIBUTION

CLIENT Mandel Development, Inc. **PROJECT NAME** Delafield Street Apartments

PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BOREHOLE	DEPTH	Classification	LL	PL	PI	Cc	Cu
●	**B-14**	**6-7.5**	**SANDY SILT(ML)**	**NP**	**NP**	**NP**		

	BOREHOLE	DEPTH	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-14**	**6-7.5**	**0.075**						**68.7**	

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Report On: Test Report Attachment

Lab No: 24-09956
Report No: 24-09956

Project No: 24057-10 **Cust No:** 0109

Client: GZA GeoEnvironmental
Jesse Gra am
17975 West Sara Lane
Suite 100
Broo field, WI 53045

Project: GZA - 20.0158728.00 Wau es a

Location: Wau es a, WI

Report Date: 02/28/2024
Sample Date: 02/14/2024
Sampled By: Client

Test Met od Various
Remar s: Please see attatc ed files for test results.

Orig: GZA GeoEnvironmental Attn: Jesse Gra am
(1-ec co)
1-cc La orator

Res ectfull Su mitted,

Thomas Stevens, Lab Manager

191 W. Edgerton Ave
Milwaukee, WI 53207
(414)933-7444

Report On: Test Report Attachment

Lab No: 24-09996
Report No: 24-09996

Project No: 24057-10 **Cust No:** 0109

Client: GZA GeoEnvironmental
Mr. Jesse Gra am
17975 West Sara Lane
Suite 100
Broo field, WI 53045

Project: GZA - 20.0158728.00 Wau es a

Location:

Report Date: 03/05/2024
Sample Date: 03/05/2024
Sampled By: Client

Test Met od Various
Remar s: Please see attatc ed PDF's for test results.

Orig: GZA GeoEnvironmental Attn: Mr. Jesse Gra am
(1-ec co)
1-cc La orator

Res ectfull Su mitted,

Thomas Stevens, Lab Manager

GESTRA Engineering, Inc
191 W. Edgerton Ave
Milwaukee, WI 53207
Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Moisture Content, Organic Content, and Density of Soil

Project Name:	GZA Waukesha	Date:	February 22, 2024
Project Number:	24057-40	Report To:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D2216, D2974 (Method A), D7263**		

Boring Number	B-1		B-2		B-3		B-9		B-10	
Sample Number	SS-3		SS-6		SS-7		SS-9		SS-7	
Cup Number										
Weight of Cup (g)	24.12		24.59		25.32		23.84		23.97	
Weight of Wet Soil and Cup (g)	47.64		45.20		45.67		48.84		46.76	
Weight of Dry Soil and Cup (g)	43.64		41.72		43.46		46.20		44.19	
Weight of Soil and Cup After Burn (g)										
Weight of Sample for Density (lbs)										
Diameter (in)										
Length(in)										
Moisture Content (%)	20.5		20.3		12.2		11.8		12.7	
Organic Content (%)										
Wet Density (pcf)										
Dry Density (pcf)										

Boring Number										
Sample Number										
Cup Number										
Weight of Cup (g)										
Weight of Wet Soil and Cup (g)										
Weight of Dry Soil and Cup (g)										
Weight of Soil and Cup After Burn (g)										
Weight of Sample for Density (lbs)										
Diameter (in)										
Length(in)										
Moisture Content (%)										
Organic Content (%)										
Wet Density (pcf)										
Dry Density (pcf)										

Performed by T Stevens

Reviewed by Nicole Merkes

T Stevens 02-12-24

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Phone: (414) 933-7444; Fax: (414) 933-7844

Laboratory Test Results of
Moisture Content, Organic Content, and Density of Soil

Project Name:	GZA Waukesha	Date:	February 22, 2024
Project Number:	24057-40	Report To:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D2216, D2974 (Method A), D7263**		

Boring Number	B-2A	B-2A		B-8		B-10	B-10		B-11	
Sample Number	6	7		6		5	6		4	
Cup Number										
Weight of Cup (g)	27.75	24.31		23.39		24.58	24.02		24.04	
Weight of Wet Soil and Cup (g)	49.72	54.12		43.77		46.23	44.11		44.95	
Weight of Dry Soil and Cup (g)	47.11	50.38		39.01		44.35	42.28		43.36	
Weight of Soil and Cup After Burn (g)										
Weight of Sample for Density (lbs)										
Diameter (in)										
Length(in)										
Moisture Content (%)	13.5	14.3		30.5		9.5	10.0		8.2	
Organic Content (%)										
Wet Density (pcf)										
Dry Density (pcf)										

Boring Number										
Sample Number										
Cup Number										
Weight of Cup (g)										
Weight of Wet Soil and Cup (g)										
Weight of Dry Soil and Cup (g)										
Weight of Soil and Cup After Burn (g)										
Weight of Sample for Density (lbs)										
Diameter (in)										
Length(in)										
Moisture Content (%)										
Organic Content (%)										
Wet Density (pcf)										
Dry Density (pcf)										

Performed by T Stevens

Reviewed by Nicole Merkes

T Stevens 02-12-24

GZA GeoEnvironmental, Inc.
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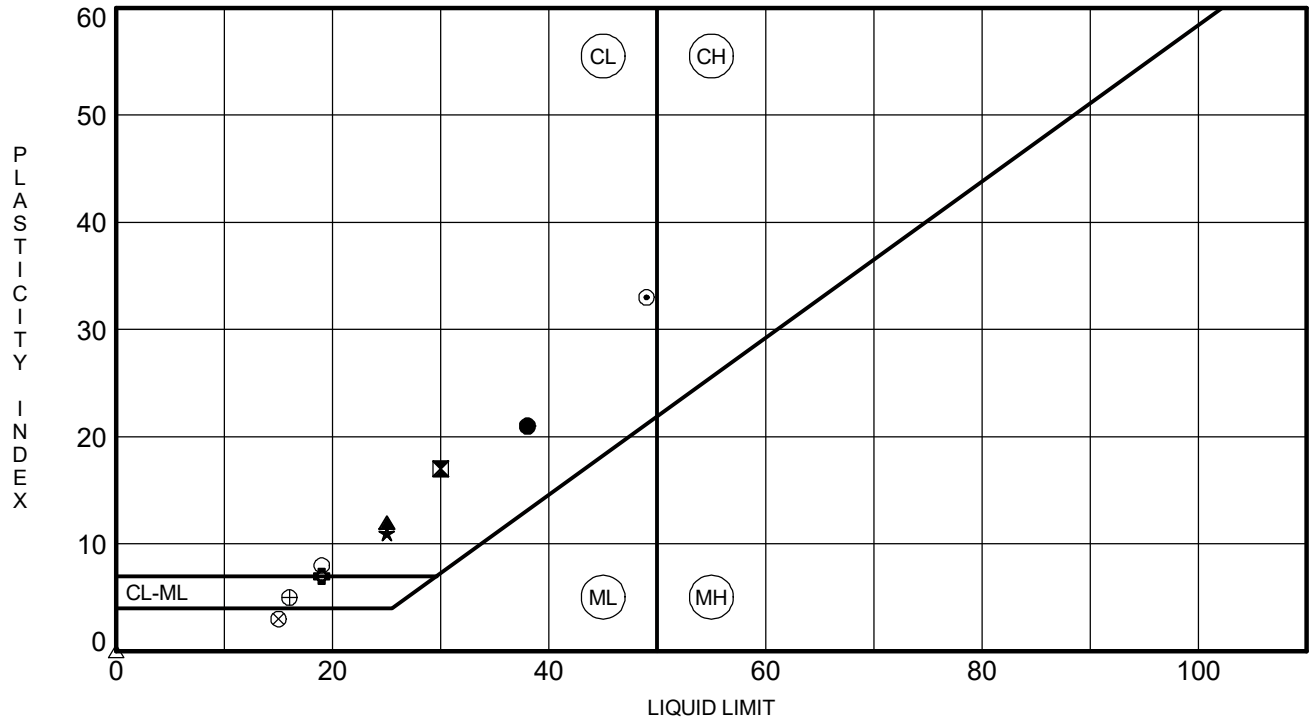
ATTERBERG LIMITS' RESULTS

CLIENT Mandel Development, Inc. **PROJECT NAME** Delafield Street Apartments

PROJECT NUMBER 20.0158728.00 **PROJECT LOCATION** Delafield Street, Waukesha, WI 53188



	BOREHOLE	DEPTH	LL	PL	PI	Fines	Classification
●	**B-01**	**5.0**	**38**	**17**	**21**		
⊠	**B-02**	**12.0**	**30**	**13**	**17**	**99**	**LEAN CLAY(CL)**
▲	**B-02A**	**11.0**	**25**	**13**	**12**		
★	**B-07**	**14.5**	**25**	**14**	**11**		
⊙	**B-08**	**11.0**	**49**	**16**	**33**		
✿	**B-09**	**16.0**	**19**	**12**	**7**	**57**	**SANDY SILTY CLAY(CL-ML)**
○	**B-09**	**18.0**	**19**	**11**	**8**		
△	**B-10**	**8.5**	**NP**	**NP**	**NP**		
⊗	**B-10**	**11.0**	**15**	**12**	**3**		
⊕	**B-11**	**6.0**	**16**	**11**	**5**		

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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	February 27, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method B)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-1
Sample Number	SS-3
Depth of Sample	4'-5.5'

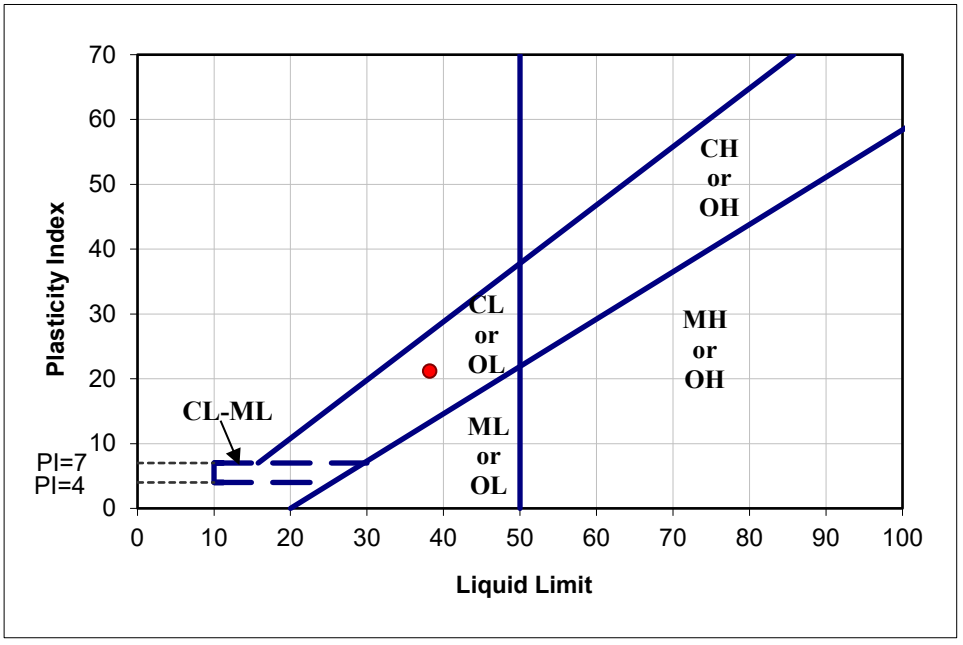
Determination of Liquid Limit

Cup Number	69
Weight of Cup (g)	18.91
Weight of Wet Soil and Cup (g)	35.54
Weight of Dry Soil and Cup (g)	30.96
Moisture Content (%)	38.0
Blow Counts	26

Determination of Plastic Limit

Cup Number	D6	33
Weight of Cup (g)	7.23	6.91
Weight of Wet Soil and Cup (g)	13.31	13.15
Weight of Dry Soil and Cup (g)	12.40	12.25
Moisture Content (%)	17.6	16.9

Compilation of Test Results



Liquid Limit	38
Plastic Limit	17
Plasticity Index	21
USCS Symbol	**CL**

Performed by: BJB

Reviewed By: Nicole Merkes
GESTRA Engineering, Inc.

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Milwaukee, WI 53207
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	February 27, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method B)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-2
Sample Number	SS-6
Depth of Sample	12'-13.5'

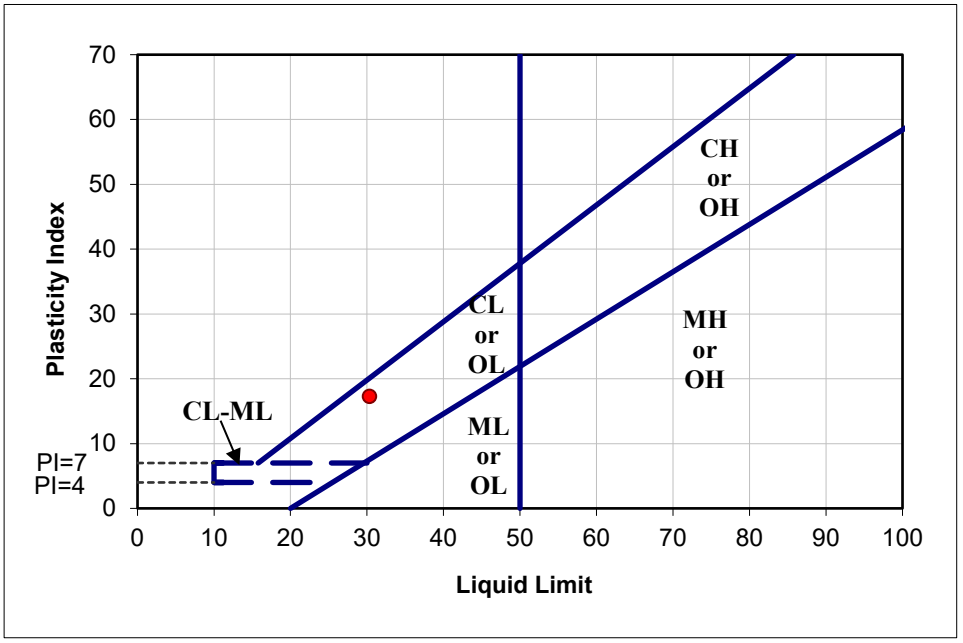
Determination of Liquid Limit

Cup Number	Q5
Weight of Cup (g)	24.36
Weight of Wet Soil and Cup (g)	40.17
Weight of Dry Soil and Cup (g)	36.45
Moisture Content (%)	30.8
Blow Counts	22

Determination of Plastic Limit

Cup Number	Z1	D16
Weight of Cup (g)	7.16	7.33
Weight of Wet Soil and Cup (g)	12.22	12.29
Weight of Dry Soil and Cup (g)	11.63	11.71
Moisture Content (%)	13.2	13.2

Compilation of Test Results



Liquid Limit	30
Plastic Limit	13
Plasticity Index	17
USCS Symbol	**CL**

Performed by: T. Stevens

Reviewed By: Nicole Merkes
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	February 27, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method B)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-3
Sample Number	SS-7
Depth of Sample	14.5'-16'

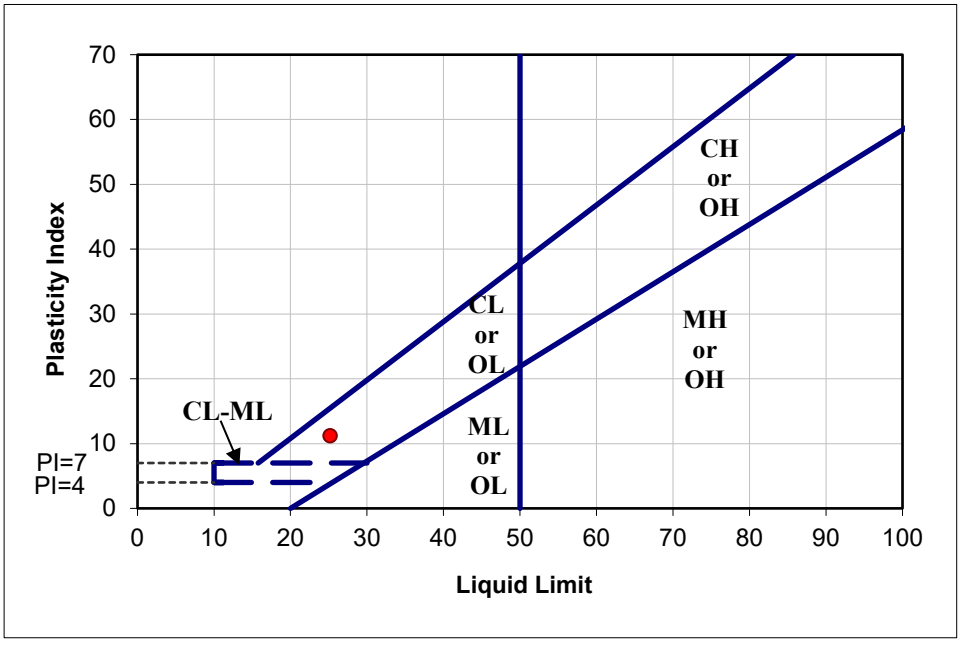
Determination of Liquid Limit

Cup Number	B6
Weight of Cup (g)	23.33
Weight of Wet Soil and Cup (g)	38.13
Weight of Dry Soil and Cup (g)	35.14
Moisture Content (%)	25.3
Blow Counts	24

Determination of Plastic Limit

Cup Number	B4	D6
Weight of Cup (g)	7.17	7.22
Weight of Wet Soil and Cup (g)	12.10	12.54
Weight of Dry Soil and Cup (g)	11.51	11.89
Moisture Content (%)	13.6	13.9

Compilation of Test Results



Liquid Limit	25
Plastic Limit	14
Plasticity Index	11
USCS Symbol	**CL**

Performed by: T. Stevens

Reviewed By: Nicole Merkes
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Milwaukee, WI 53207
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	February 23, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Shelby Tube
Boring Number	B-9
Sample Number	8
Depth of Sample	16' - 18'

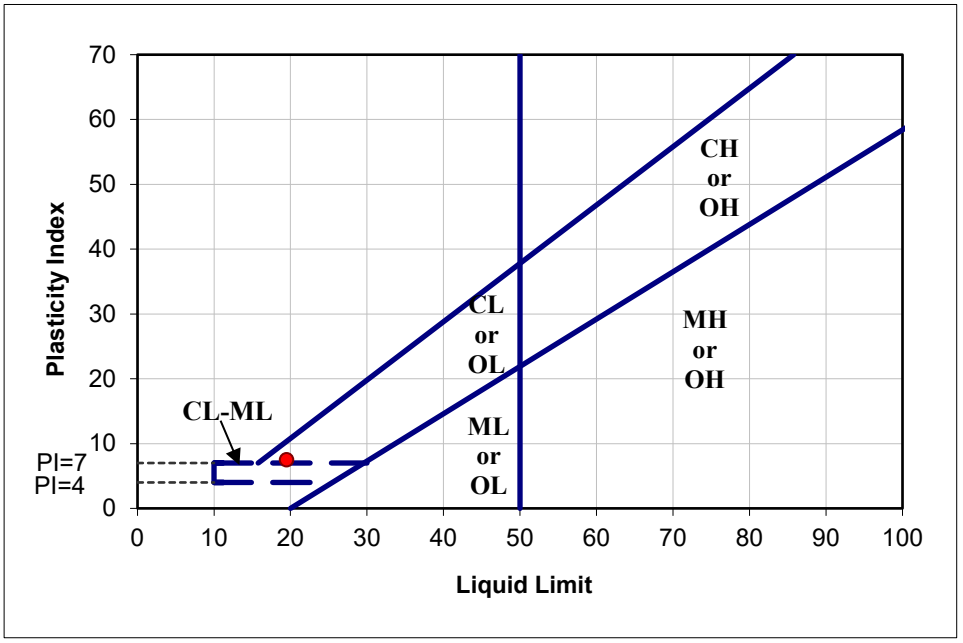
Determination of Liquid Limit

Cup Number	2	718	J4
Weight of Cup (g)	19.29	19.42	20.75
Weight of Wet Soil and Cup (g)	38.23	40.11	45.64
Weight of Dry Soil and Cup (g)	35.27	36.74	41.45
Moisture Content (%)	18.5	19.5	20.2
Blow Counts	32	26	19

Determination of Plastic Limit

Cup Number	L20	T2
Weight of Cup (g)	7.25	7.20
Weight of Wet Soil and Cup (g)	13.94	13.51
Weight of Dry Soil and Cup (g)	13.20	12.81
Moisture Content (%)	12.4	12.5

Compilation of Test Results



Liquid Limit	19
Plastic Limit	12
Plasticity Index	7
USCS Symbol	**CL-ML**

Performed by: BJB

Reviewed By: Nicole Merkes
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	February 27, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-9
Sample Number	SS-9
Depth of Sample	18.5'-21'

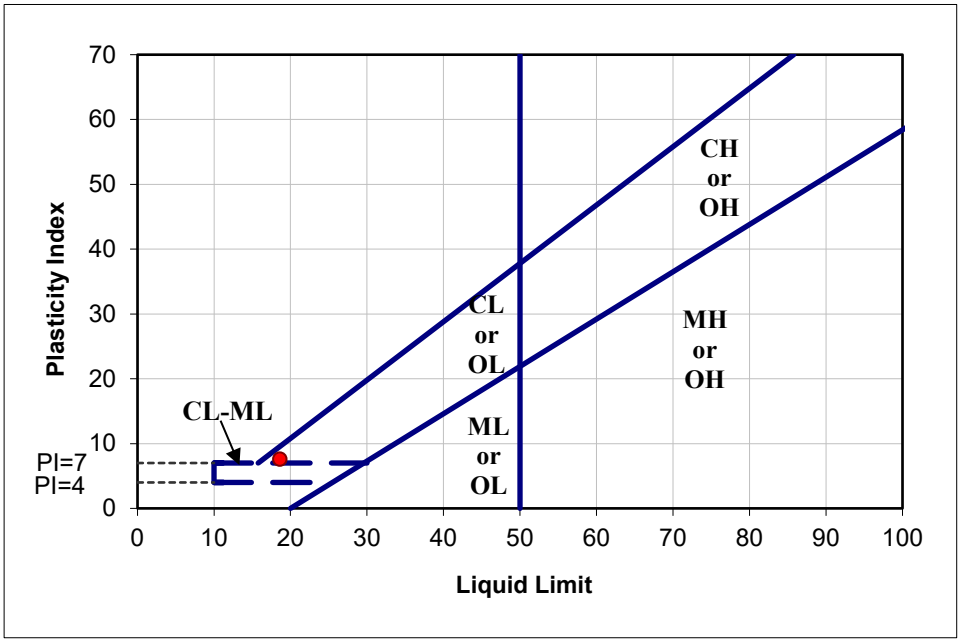
Determination of Liquid Limit

Cup Number	45	Y1	Y10
Weight of Cup (g)	20.52	23.85	24.88
Weight of Wet Soil and Cup (g)	32.26	35.86	37.03
Weight of Dry Soil and Cup (g)	30.43	33.96	35.08
Moisture Content (%)	18.5	18.8	19.1
Blow Counts	27	21	18

Determination of Plastic Limit

Cup Number	L2	L18
Weight of Cup (g)	7.36	7.30
Weight of Wet Soil and Cup (g)	13.75	14.73
Weight of Dry Soil and Cup (g)	13.13	13.99
Moisture Content (%)	10.7	11.1

Compilation of Test Results



Liquid Limit	19
Plastic Limit	11
Plasticity Index	8
USCS Symbol	**CL**

Performed by: T Stevens

Reviewed By: Nicole Merkes

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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	February 27, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-10
Sample Number	SS-7
Depth of Sample	14.5'-16'

NON-PLASTIC, Silty Sand

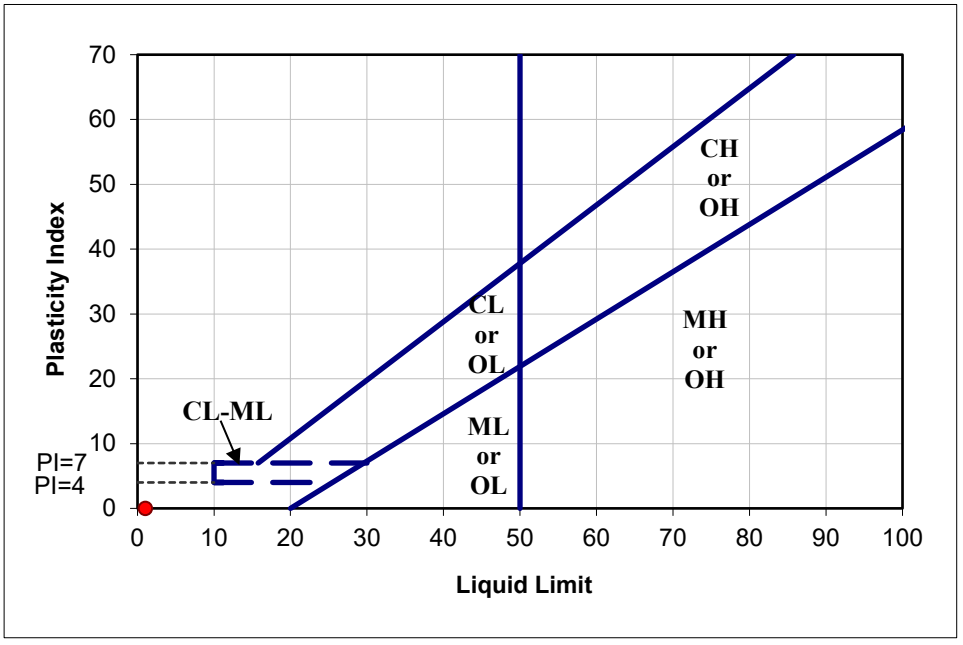
Determination of Liquid Limit

Cup Number			
Weight of Cup (g)			
Weight of Wet Soil and Cup (g)			
Weight of Dry Soil and Cup (g)			
Moisture Content (%)	#DIV/0!	#DIV/0!	#DIV/0!
Blow Counts			

Determination of Plastic Limit

Cup Number		
Weight of Cup (g)		
Weight of Wet Soil and Cup (g)		
Weight of Dry Soil and Cup (g)		
Moisture Content (%)	#DIV/0!	#DIV/0!

Compilation of Test Results



Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP
USCS Symbol	

Performed by: T Stevens

Reviewed By: Nicole Merkes
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	Delafield Street Apartments	Date:	March 4, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-2A
Sample Number	6
Depth of Sample	11'-12.5'

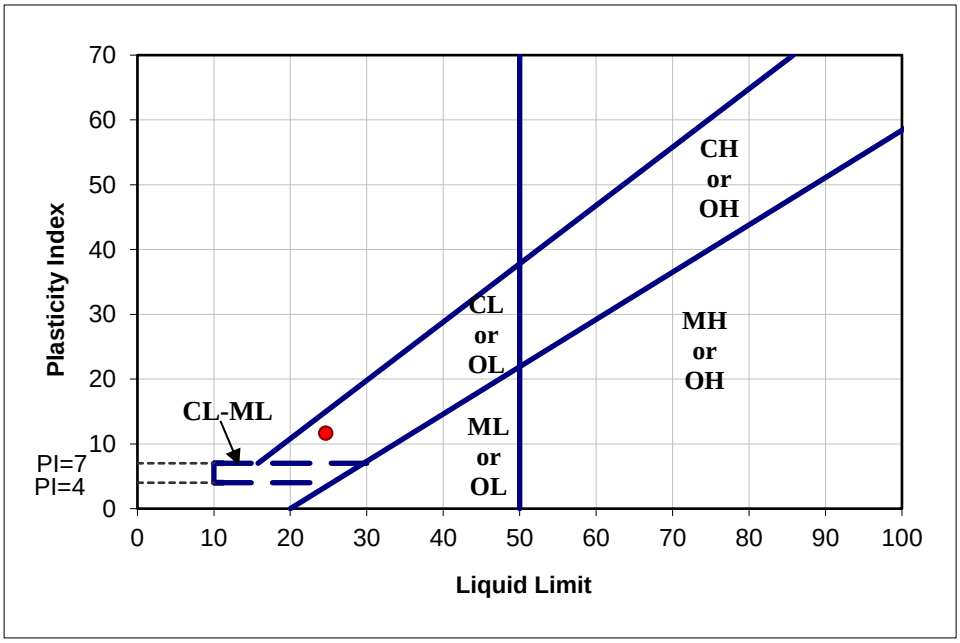
Determination of Liquid Limit

Cup Number			
Weight of Cup (g)	26.43	26.00	25.91
Weight of Wet Soil and Cup (g)	43.45	44.70	47.05
Weight of Dry Soil and Cup (g)	40.22	41.00	42.69
Moisture Content (%)	23.4	24.7	26.0
Blow Counts	34	25	15

Determination of Plastic Limit

Cup Number		
Weight of Cup (g)	7.16	6.96
Weight of Wet Soil and Cup (g)	15.08	13.95
Weight of Dry Soil and Cup (g)	14.17	13.17
Moisture Content (%)	13.0	12.6

Compilation of Test Results



Liquid Limit	25
Plastic Limit	13
Plasticity Index	12
USCS Symbol	**CL**

Performed by: T Stevens

Reviewed By: Nicole Merkes

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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	March 4, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-8
Sample Number	6
Depth of Sample	11'-12.5'

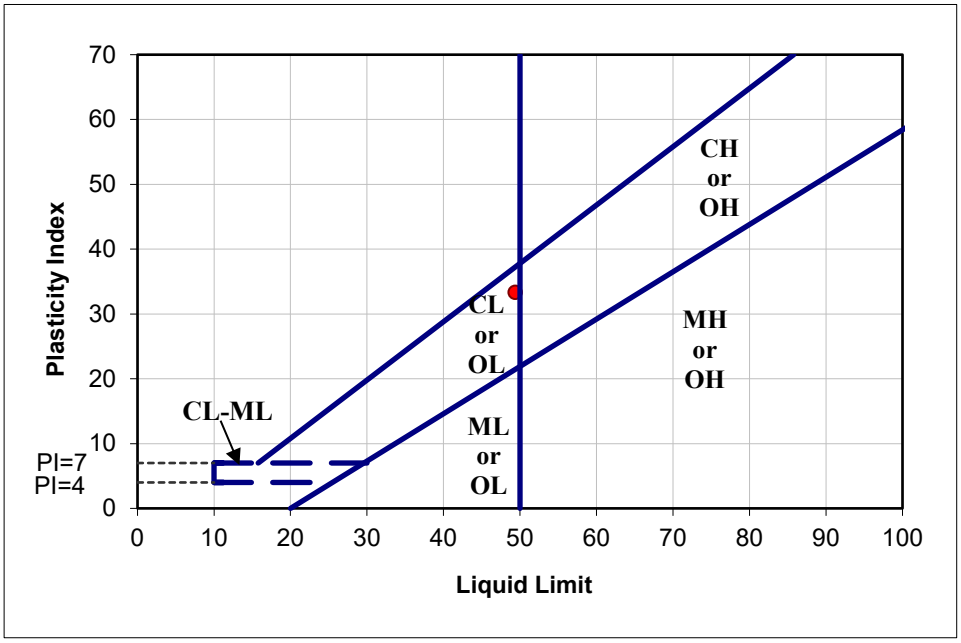
Determination of Liquid Limit

Cup Number			
Weight of Cup (g)	23.32	26.21	25.13
Weight of Wet Soil and Cup (g)	37.99	43.90	39.93
Weight of Dry Soil and Cup (g)	33.27	38.07	34.90
Moisture Content (%)	47.4	49.2	51.5
Blow Counts	33	25	17

Determination of Plastic Limit

Cup Number		
Weight of Cup (g)	7.24	7.29
Weight of Wet Soil and Cup (g)	12.21	12.35
Weight of Dry Soil and Cup (g)	11.54	11.67
Moisture Content (%)	15.6	15.5

Compilation of Test Results



Liquid Limit	49
Plastic Limit	16
Plasticity Index	33
USCS Symbol	**CL**

Performed by: T Stevens

Reviewed By: Nicole Merkes
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	Delafield Street Apartments	Date:	March 4, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-10
Sample Number	5
Depth of Sample	8.5'-10'

Non Plastic: Sand

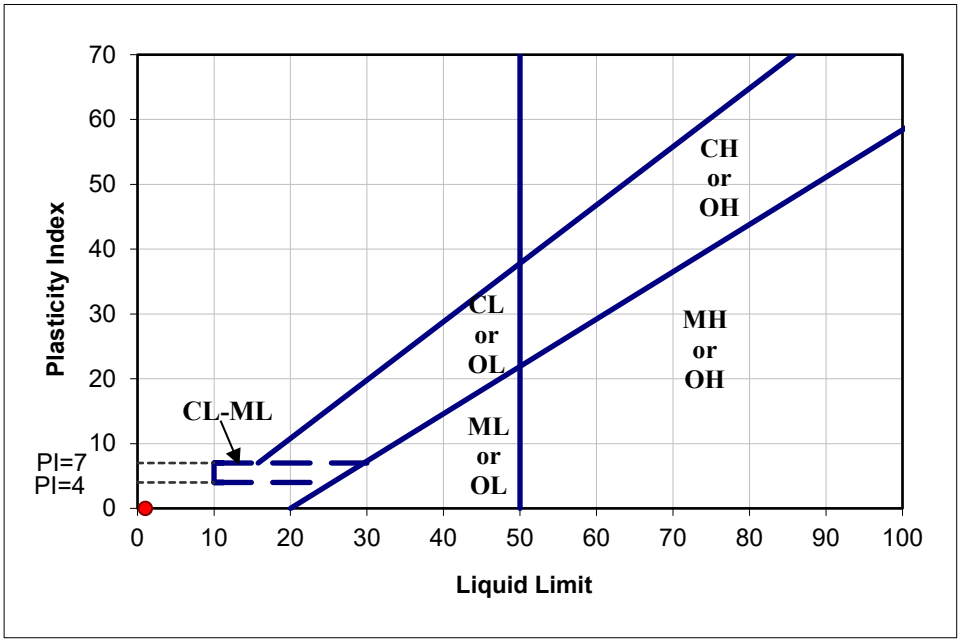
Determination of Liquid Limit

Cup Number			
Weight of Cup (g)			
Weight of Wet Soil and Cup (g)			
Weight of Dry Soil and Cup (g)			
Moisture Content (%)	#DIV/0!	#DIV/0!	#DIV/0!
Blow Counts			

Determination of Plastic Limit

Cup Number		
Weight of Cup (g)		
Weight of Wet Soil and Cup (g)		
Weight of Dry Soil and Cup (g)		
Moisture Content (%)	#DIV/0!	#DIV/0!

Compilation of Test Results



Liquid Limit	NP
Plastic Limit	NP
Plasticity Index	NP
USCS Symbol	########

Performed by: TS

Reviewed By: Nicole Merkes
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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	March 4, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-10
Sample Number	6
Depth of Sample	11'-12.5'

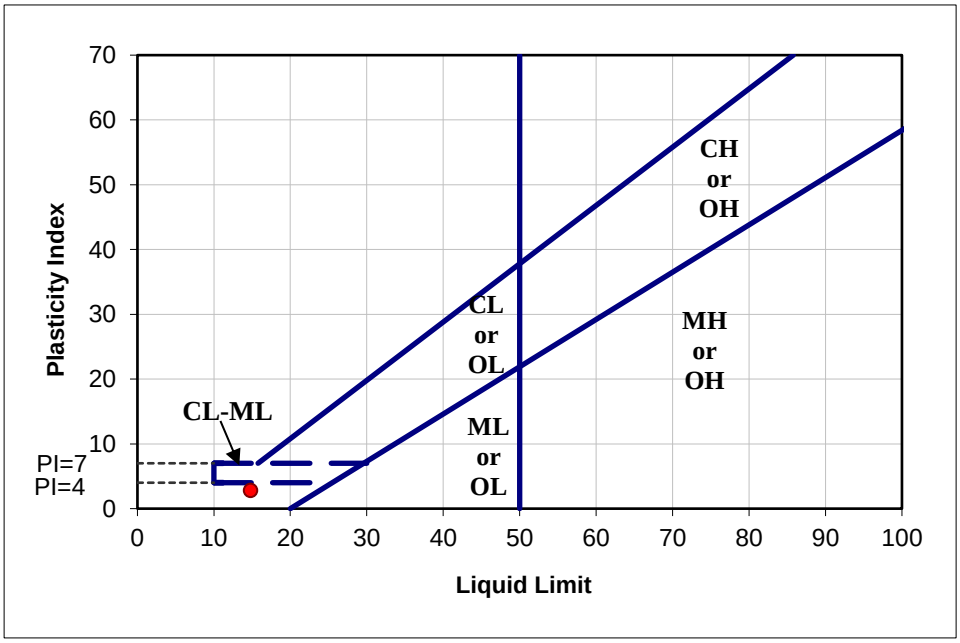
Determination of Liquid Limit

Cup Number			
Weight of Cup (g)	26.90	26.65	23.83
Weight of Wet Soil and Cup (g)	41.64	40.69	39.62
Weight of Dry Soil and Cup (g)	39.79	38.87	37.49
Moisture Content (%)	14.4	14.9	15.6
Blow Counts	31	26	10

Determination of Plastic Limit

Cup Number		
Weight of Cup (g)	7.19	7.16
Weight of Wet Soil and Cup (g)	14.32	13.43
Weight of Dry Soil and Cup (g)	13.57	12.77
Moisture Content (%)	11.8	11.8

Compilation of Test Results



Liquid Limit	15
Plastic Limit	12
Plasticity Index	3
USCS Symbol	**ML**

Performed by: T Stevens

Reviewed By: Nicole Merkes

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Laboratory Test Results of Atterberg Limits of Soil

Project Name:	GZA Waukesha	Date:	March 4, 2024
Project Number:	24057-40	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D4318 (Method A)**		

Sample Information

Type of Sample	Split Spoon
Boring Number	B-11
Sample Number	4
Depth of Sample	6'-7.5'

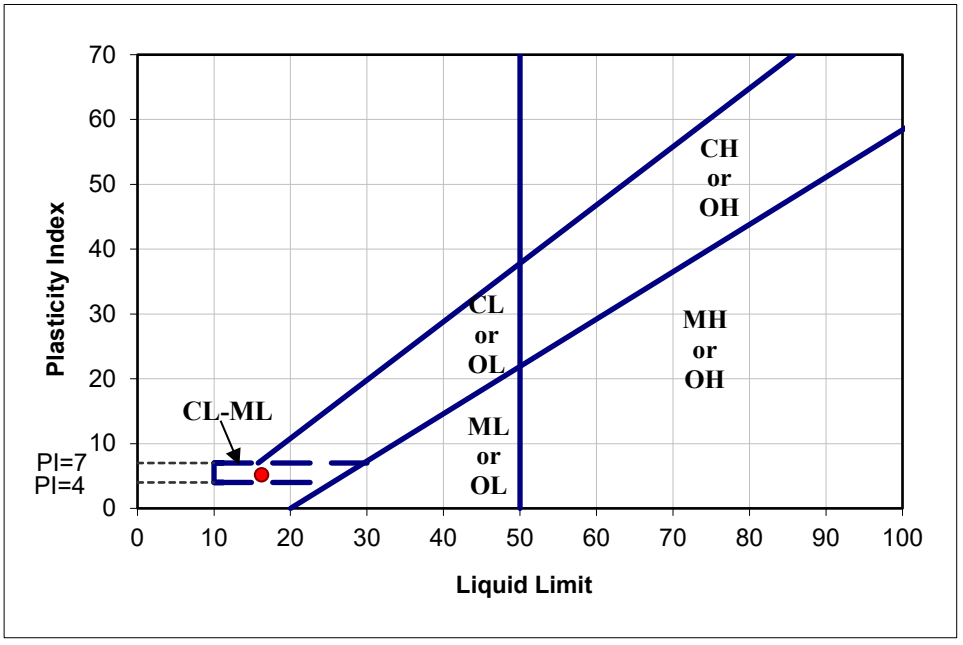
Determination of Liquid Limit

Cup Number			
Weight of Cup (g)	27.77	24.32	25.48
Weight of Wet Soil and Cup (g)	43.34	44.28	43.65
Weight of Dry Soil and Cup (g)	41.18	41.46	41.06
Moisture Content (%)	16.1	16.5	16.6
Blow Counts	27	20	17

Determination of Plastic Limit

Cup Number		
Weight of Cup (g)	7.30	7.23
Weight of Wet Soil and Cup (g)	13.32	13.99
Weight of Dry Soil and Cup (g)	12.73	13.30
Moisture Content (%)	10.9	11.4

Compilation of Test Results



Liquid Limit	16
Plastic Limit	11
Plasticity Index	5
USCS Symbol	**CL-ML**

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Reviewed By: Nicole Merkes

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Laboratory Test Results of Mechanical Analysis of Soil or Aggregate

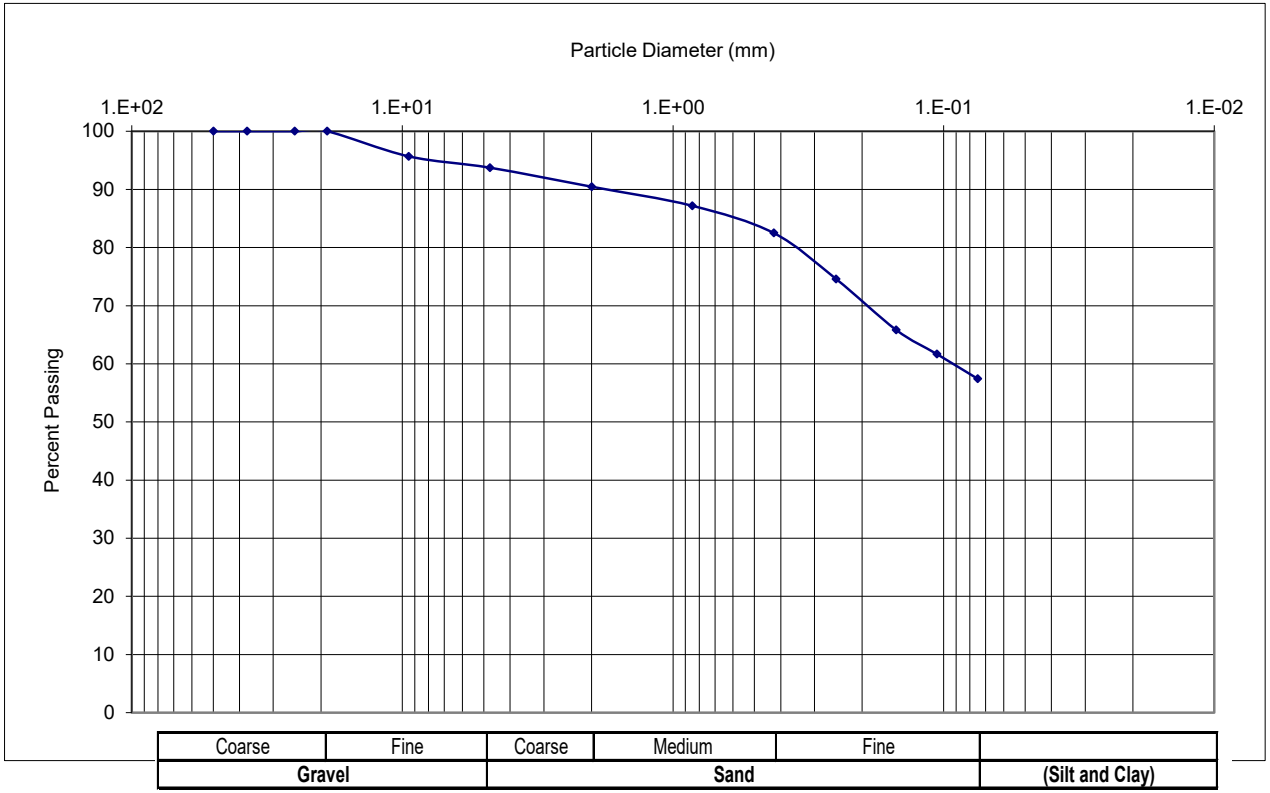
Project Name:	GZA Waukesha	Date:	February 19, 2024
Project Number:	24057-40	Reported To:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D6913**	**Method**	**A**

Sample Information

Type of Sample:	Shelby Tube	Sample Number:	ST-8
Boring Number:	B-9	Depth of Sample:	16'-18'

Mechanical Analysis Data

Sieve	Sieve Opening (mm)	Percent Passing (%)
2	50	100.0
1 1/2	37.5	100.0
1	25.0	100.0
3/4	19.0	100.0
3/8	9.5	95.7
#4	4.75	93.7
#10	2.000	90.5
#20	0.850	87.2
#40	0.425	82.5
#60	0.250	74.6
#100	0.150	65.9
#140	0.106	61.7
#200	0.075	57.4
Pan		56.4



Moisture Content 14.2 %

Remarks: Gravel 6.3 % Sand 36.3 %
Passing #200 Sieve (Silt & Clay) 57.4 %

Performed by: Christina Schneider

Reviewed by: Nicole Merkes
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Shelby Tube Extraction Form

Project Name:	GZA Waukesha	Date:	February 19, 2024
Project Number:	24057-10	Client:	GZA
Projection Location:	Waukesha, WI	GZA #	20.0158728.00
ASTM Designation:	**D2488**		

Sample Information

Boring Number	B-9	
Sample Number	ST-8	qp: 1.25
Depth of Sample	16'-18'	

Recovery:	23"
Soil Description	Brown, sily lean clay, moist, trace sand and gravel, grey mottling.

BOTTOM **TOP**

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Laboratory Test Results of Mechanical Analysis of Soil or Aggregate

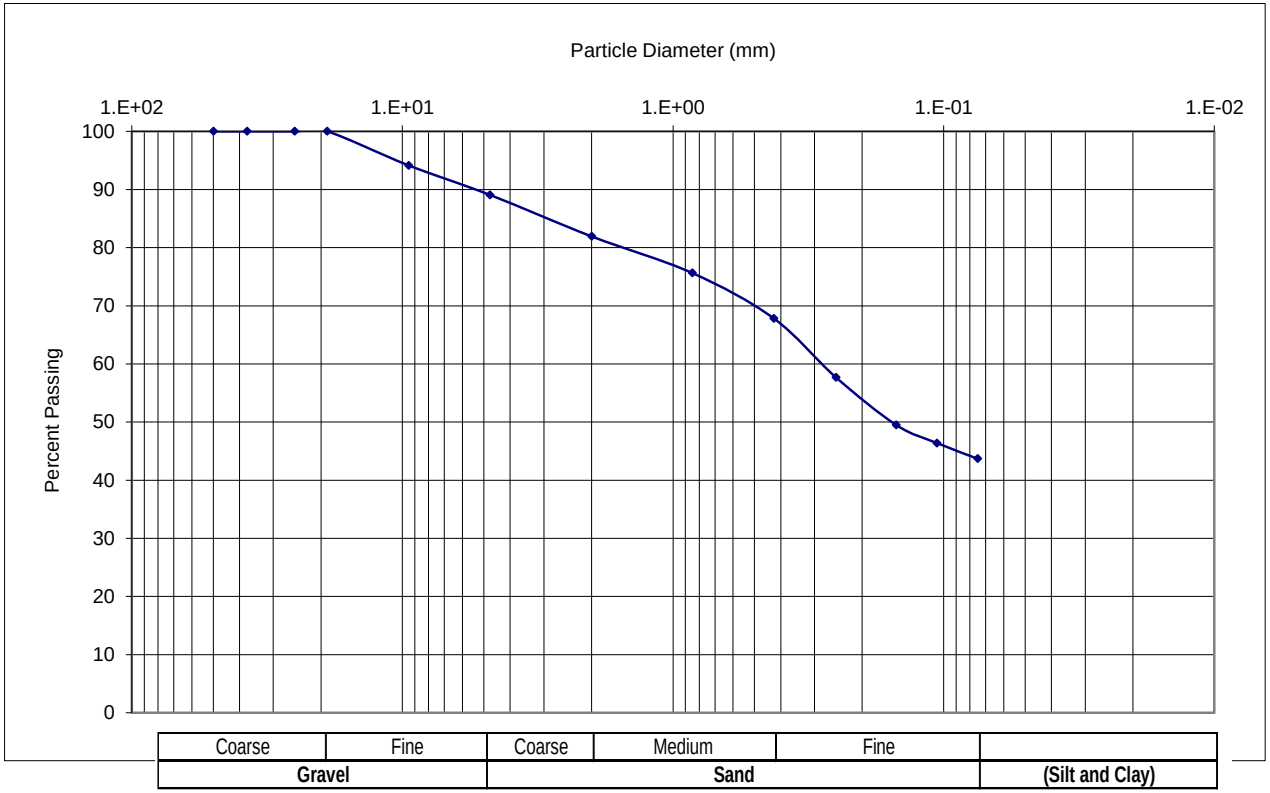
Project Name:	Delafield Street Apartments	Date:	February 26, 2024
Project Number:	24057-40	Reported To:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D6913** **Method A**		

Sample Information

Type of Sample:	Bag	Sample Number:	Cuttings
Boring Number:	B-8	Depth of Sample:	-

Mechanical Analysis Data

Sieve	Sieve Opening (mm)	Percent Passing (%)
2	50	100.0
1 1/2	37.5	100.0
1	25.0	100.0
3/4	19.0	100.0
3/8	9.5	94.2
#4	4.75	89.1
#10	2.000	81.9
#20	0.850	75.6
#40	0.425	67.8
#60	0.250	57.7
#100	0.150	49.5
#140	0.106	46.4
#200	0.075	43.7
Pan		42.8



Moisture Content 13.5 %

Remarks: Gravel 10.9 % Sand 45.4 %
Passing #200 Sieve (Silt & Clay) 43.7 %

Performed by: Christina Schneider

Reviewed by: Nicole Merkes
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Laboratory Test Results of Proctor Sample

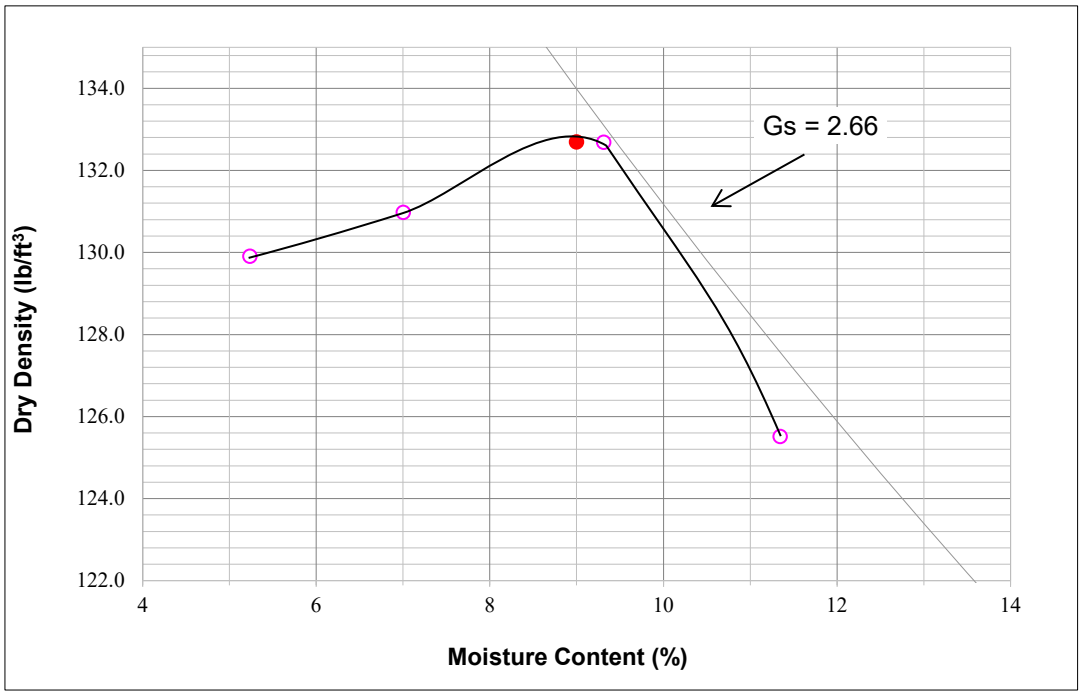
Project Name:	Delafield Street Apartments	Date:	February 29, 2024
Project Number:	24057-40	Client:	GZA
Projection Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D1557** Method: **B**	Rammer Type:	Manual

Sample Information

Type of Material	Clay with Gravel
Sample Location	On Site
Sample Number	B-8
Sample Date	2/26/2024

OPTIMUM MOISTURE 9.0 **%**

UNCORRECTED		**CORRECTED**	
Maximum Density:	132.7 **lb/ft^3**	**Maximum Dry Density**	135.9 **lb/ft^3**
Oversize Gravel Content	16 **%**	**Original Gravel Content**	29 **%**
		Corrected Optimum Moisture	7.6 **%**



Notes: [1]The solid dot indicates uncorrected maximum density at test gravel content.
[2]Field density tests should be compared to the corrected maximum dry density, listed above, which uses insitu gravel content

Performed by: CS

Reviewed By: Nicole Merkes
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Laboratory Test Results of Mechanical Analysis of Soil or Aggregate

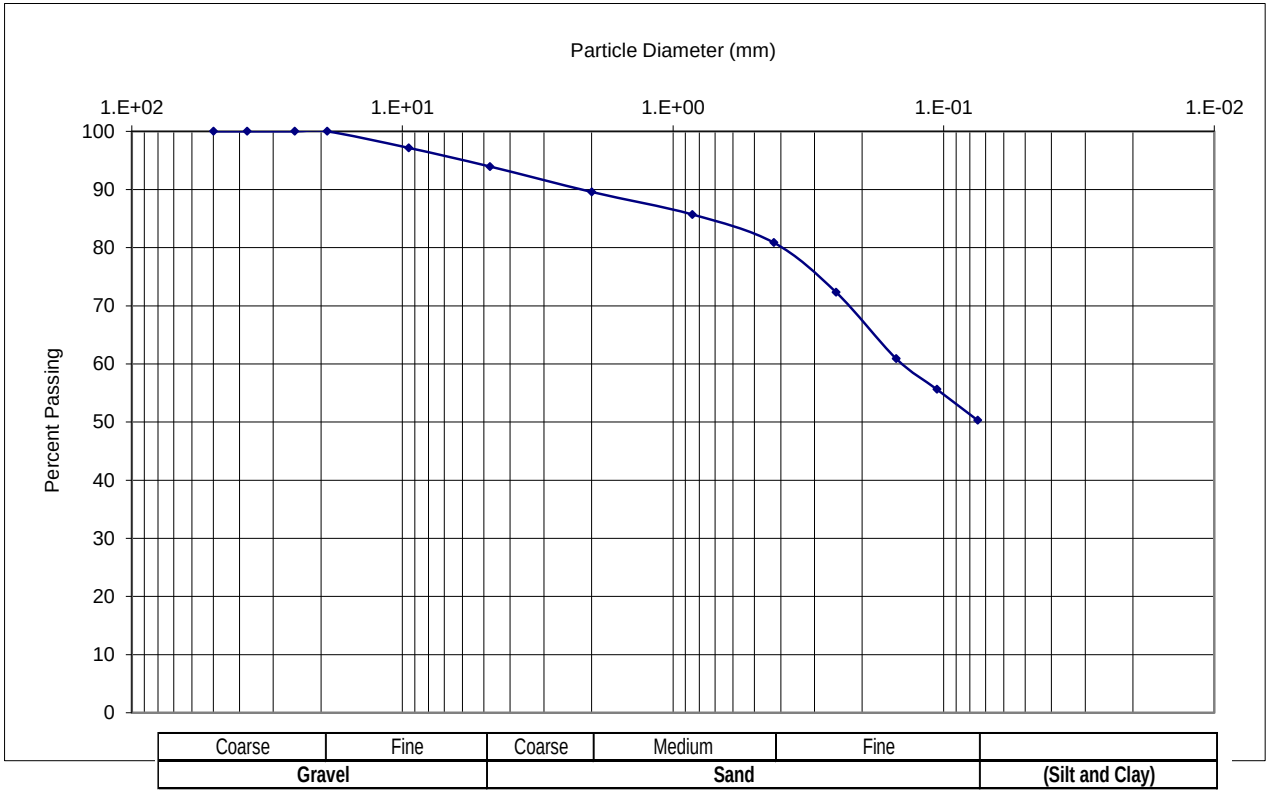
Project Name:	Delafield Street Apartments	Date:	February 26, 2024
Project Number:	24057-40	Reported To:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D6913** **Method A**		

Sample Information

Type of Sample:	Bag	Sample Number:	Cuttings
Boring Number:	B-10	Depth of Sample:	-

Mechanical Analysis Data

Sieve	Sieve Opening (mm)	Percent Passing (%)
2	50	100.0
1 1/2	37.5	100.0
1	25.0	100.0
3/4	19.0	100.0
3/8	9.5	97.2
#4	4.75	94.0
#10	2.000	89.6
#20	0.850	85.7
#40	0.425	80.9
#60	0.250	72.3
#100	0.150	60.9
#140	0.106	55.6
#200	0.075	50.3
Pan		48.4



Moisture Content 10.9 %

Remarks: Gravel 6.0 % Sand 43.6 %
Passing #200 Sieve (Silt & Clay) 50.3 %

Performed by: Christina Schneider

Reviewed by: Nicole Merkes
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Laboratory Test Results of Proctor Sample

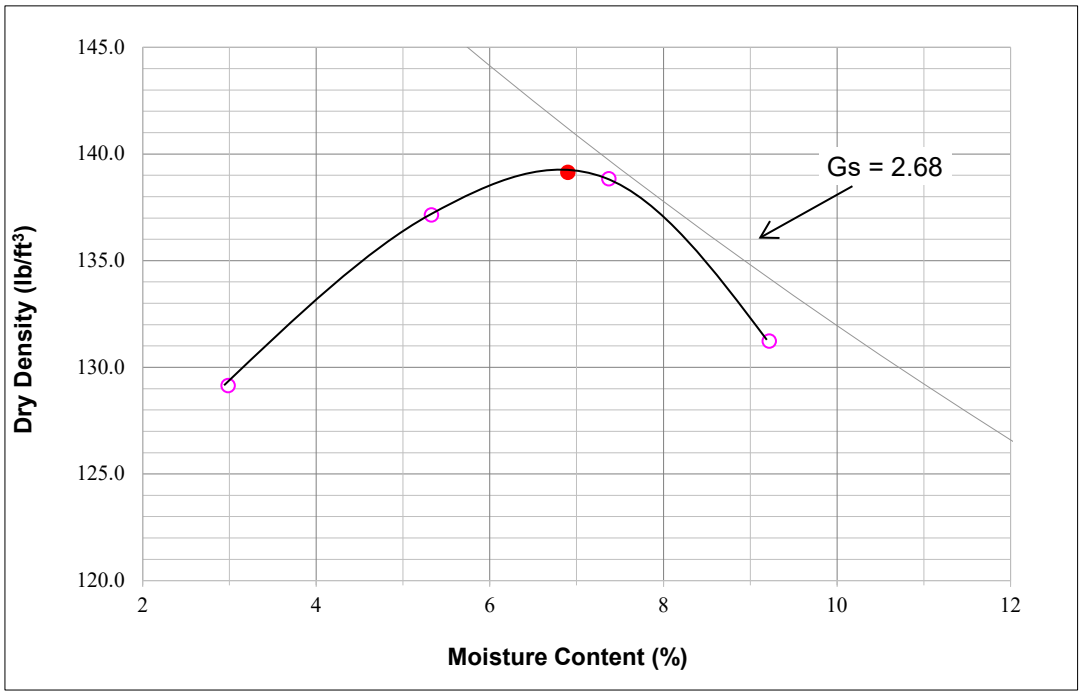
Project Name:	Delafield Street Apartments	Date:	February 29, 2024
Project Number:	24057-40	Client:	GZA
Projection Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D1557** Method: **A**	Rammer Type:	Manual

Sample Information

Type of Material	Clay with Gravel
Sample Location	On Site
Sample Number	B-10
Sample Date	2/26/2024

OPTIMUM MOISTURE 6.9 **%**

UNCORRECTED		**CORRECTED**	
Maximum Density:	139.1 **lb/ft^3**	**Maximum Dry Density**	141.5 **lb/ft^3**
Oversize Gravel Content	22 **%**	**Original Gravel Content**	22 **%**
		Corrected Optimum Moisture	5.6 **%**



Notes: [1]The solid dot indicates uncorrected maximum density at test gravel content.
[2]Field density tests should be compared to the corrected maximum dry density, listed above, which uses insitu gravel content

Performed by: CS

Reviewed By: Nicole Merkes
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One Dimensional Consolidation Test Report

Project Name:	GZA - Waukesha	Client:	GZA
Project Location:	Waukesha, WI	GZA #:	20.0158728.00
Project Number:	24057-40	Report Date:	2/23/2024
Boring Number:	B-9	Test Method:	ASTM D2435 Test Method B
Sample Number:	ST-8	Tester Name:	Nicole Merkes
Depth of Sample:	16'-18'	Test Period:	2/19/2024-2/21/2024
Sample Description:	Silty lean clay, moist, trace sand and gravel	Sampling Date:	
Sample Preparation:	Using cutting shoe		
Condition of Test:	Natural moisture		
Test Method for Coefficient of Consolidation:	Sqrt of Time		
Atterberg Limit Results			

L.L. 19 P.L. 12 P.I. 7

NP = Non Plastic

	Before Test	After Test
Water Content (%):	14.48	12.31
Saturation (%):	4.81	118.06
Void Ratio:	0.46	0.28
Dry unit weight (pcf):	115.37	131.52

Summary Table of Loading Procedure and Test Results

Stage	Applied Stress (tsf)	Final Displ. (inch)	Void Ratio	Strain at End (%)	Sq.Rt.T_{90} (minute)	Coeff. of Consolidation (ft^2/sec)	Coeff. of Volume Compressibility (1/tsf)	Hydraulic Conductivity (ft/day)
1	0.024759	0.003209	0.456	0.32	0.0	0.00E+00	1.30E-01	0.00E+00
2	0.125	0.015733	0.438	1.58	60.7	3.92E-07	1.26E-01	1.33E-04
3	0.25	0.022919	0.427	2.30	28.4	8.21E-07	5.78E-02	1.28E-04
4	0.5	0.032093	0.414	3.23	24.7	9.30E-07	3.69E-02	9.25E-05
5	1	0.045419	0.394	4.56	0.0	0.00E+00	2.68E-02	0.00E+00
6	2	0.064117	0.367	6.44	25.2	8.59E-07	1.88E-02	4.36E-05
7	4	0.086600	0.334	8.70	14.0	1.48E-06	1.13E-02	4.52E-05
8	2	0.084245	0.337	8.47	0.0	0.00E+00	1.18E-03	0.00E+00
9	1	0.080756	0.342	8.12	0.0	0.00E+00	3.51E-03	0.00E+00
10	0.5	0.076326	0.349	7.67	75.2	2.74E-07	8.91E-03	6.58E-06
11	0.25	0.071425	0.356	7.18	37.1	5.61E-07	1.97E-02	2.98E-05
12	0.5	0.073640	0.353	7.40	0.0	0.00E+00	8.91E-03	0.00E+00
13	1	0.076989	0.348	7.74	3.1	6.79E-06	6.73E-03	1.23E-04
14	2	0.080512	0.343	8.09	14.5	1.42E-06	3.54E-03	1.35E-05
15	4	0.089582	0.329	9.00	22.8	8.92E-07	4.56E-03	1.10E-05
16	8	0.113060	0.295	11.36	28.0	7.01E-07	5.90E-03	1.12E-05
17	16	0.136940	0.260	13.76	17.6	1.06E-06	3.00E-03	8.56E-06
18	32	0.159980	0.226	16.08	14.2	1.24E-06	1.45E-03	4.83E-06
19	8	0.158840	0.228	15.96	0.0	0.00E+00	4.75E-05	0.00E+00
20	2	0.146790	0.245	14.75	24.6	7.06E-07	2.02E-03	3.85E-06
21	0.5	0.133680	0.265	13.44	73.7	2.43E-07	8.79E-03	5.76E-06
22	0.25	0.130050	0.270	13.07	82.2	2.22E-07	1.46E-02	8.74E-06
23	0.05	0.122220	0.282	12.28	158.4	1.17E-07	3.94E-02	1.24E-05

Remarks: ***100 psf was applied as a seating load**

Report Prepared by: Nicole Merkes

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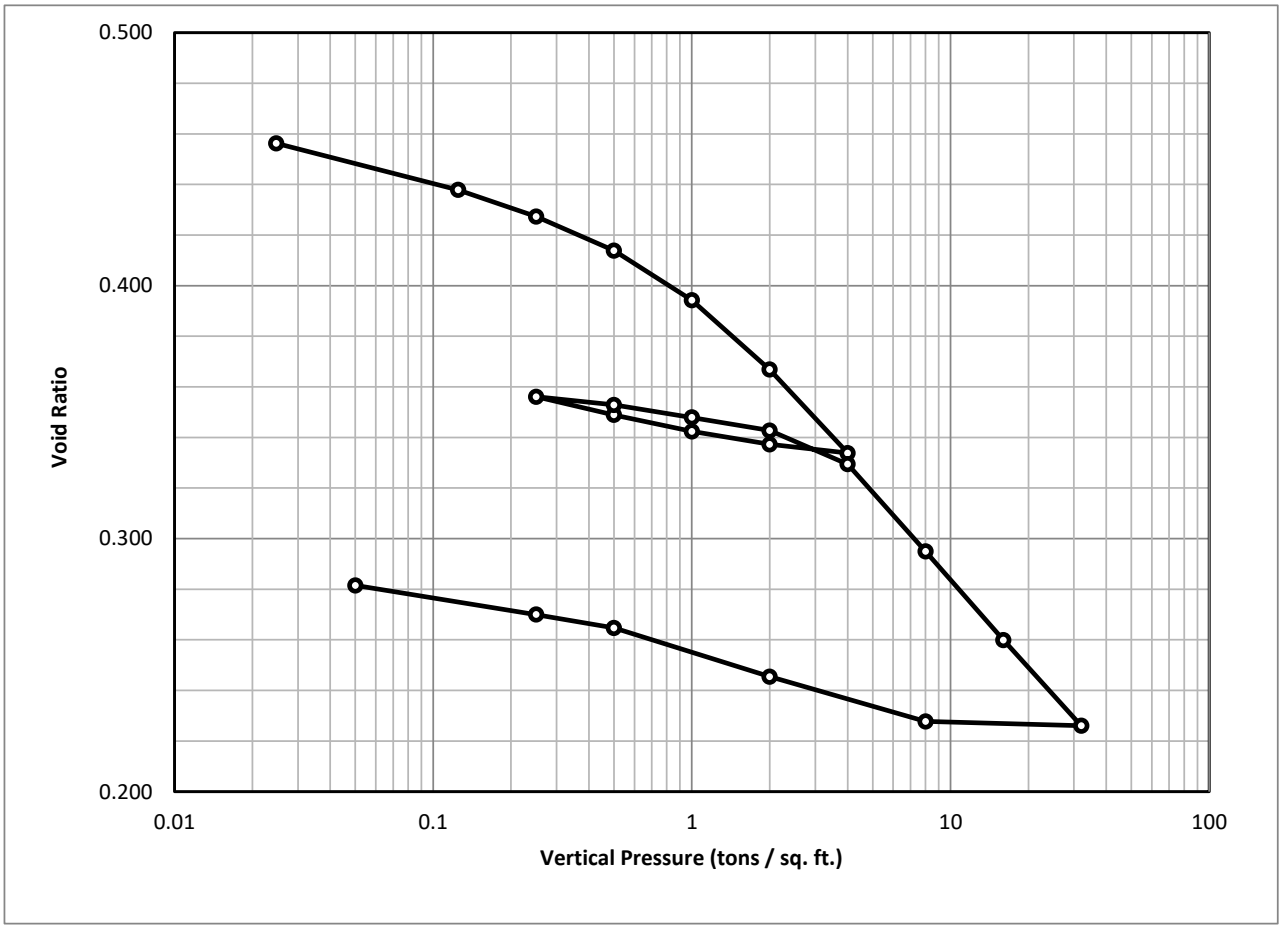
Laboratory Test Results of
One-Dimensional Consolidation Test

Project Name:	GZA Waukesha	Date:	February 23, 2024
Project Number:	24057-40	Client:	GZA
Projection Location:	Waukesha, WI	GZA #:	20.0158728.00
ASTM Designation:	**D2435**		

Sample Information

Type of Sample	Shelby Tube	OCR	
Boring Number	B-9	Cc	0.115
Sample Number	ST-8	Cs	0.017
Depth of Sample	16'-18'	e_o	



Performed by: Nicole Merkes

Reviewed By: Nicole Merkes
GESTRA Engineering, Inc.

APPENDIX E

RECOMMENDED USE AND GRADATION
REQUIREMENTS FOR FILL MATERIALS

APPENDIX E
RECOMMENDED USE AND GRADATION REQUIREMENTS
FOR FILL MATERIALS

Delafield Street Apartments Development
Waukesha, Wisconsin

USE OF FILL MATERIALS

Structural Fill: As pavement base course, raising Site grades.

Coarse Aggregate: As floor slab base course.

General Fill: Used to raise Site grades.

GRADATION REQUIREMENTS

Structural Fill shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. It shall be a crushed stone aggregate conforming to the requirements of the WisDOT Standard Specifications for Highway and Structure Construction and the following gradation requirements:

Sieve Size	Percent Finer By Weight
1 inch	100
⅜-inch	40-75
No. 4	25-60
No. 10	15-45
No. 200	3-12

Coarse Aggregate shall be free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. It shall conform to the requirements of the WisDOT Standard Specifications for Highway and Structure Construction, and the following gradation requirements:

Sieve Size	Percent Finer By Weight
1½ inches	100
1 inch	90-100
¾-inch	20-55
⅜-inch	0-15
No. 4	0-5

General Fill that are sufficient for use above the water table may be classified as GW, GP, GM, GC, SW, SP, SM, or CL in accordance with the Unified Soil Classification System (USCS) (ASTM D2487, *Standard Practice for Classification of Soils for Engineering Purposes [Unified Soil Classification System]*). Fill materials that are near the water table should consist of imported, well-graded, granular material that has minimal water sensitivity. Fill materials should be selected based on proximity to the water table and use. Fill materials are recommended to be natural soil free from ice and snow, roots, sod, rubbish and other deleterious or organic matter. The maximum particle size of fill is recommended to be $^{2}/_{3}$ of the loose lift thickness except in the top 12 inches of General Fill, which is recommended to have a maximum 3-inch particle size. An experienced geotechnical engineer should review and approve General Fill materials prior to use.