LGCI
Lahlaf Geotechnical Consulting, Inc.

December 10, 2024

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Re: **Preliminary Geotechnical Report**
Proposed Wildwood Early Childhood Center
North Intermediate School – 320 Salem Street Site
Wilmington, MA
LGCI Project No. 2437

Dear Ms. Philip:

Lahlaf Geotechnical Consulting, Inc. (LGCI) has completed a preliminary geotechnical study for the proposed Wildwood Early Childhood Center in Wilmington, Massachusetts. We are submitting our preliminary geotechnical report electronically. Please notify us if you need a hard copy.

The soil samples from our explorations are currently stored at LGCI for further analysis, if requested. Unless notified otherwise, we will dispose of the soil samples after three (3) months.

Thank you for choosing LGCI as your geotechnical engineer.

Very truly yours,

Lahlaf Geotechnical Consulting, Inc.

Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

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PRELIMINARY GEOTECHNICAL REPORT
PROPOSED WILDWOOD EARLY CHILDHOOD CENTER
NORTH INTERMEDIATE SCHOOL – 320 SALEM STREET SITE
WILMINGTON, MASSACHUSETTS

LGCI Project No. 2437
December 10, 2024

Prepared for:

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Principal Engineer

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1. PROJECT INFORMATION

1.1 Project Authorization

This geotechnical report presents the results of the subsurface explorations and a geotechnical evaluation performed by Lahlaf Geotechnical Consulting, Inc. (LGCI) for the proposed Wildwood Early Childhood Center in Wilmington, Massachusetts. We performed our services in general accordance with our proposal No. 24084 dated August 9, 2024, and proposal No. 24107 dated October 15, 2024. Ms. Rani Philip of Dore and Whittier Architects, Inc. (Dore and Whittier) authorized our services by signing our proposals Nos. 24084 and 24107 on August 9, and October 15, 2024, respectively.

1.2 Purpose and Scope of Services

The purpose of our geotechnical services was to perform preliminary subsurface explorations at the site for the proposed Wildwood Early Childhood Center, and to provide preliminary foundation design and construction recommendations. LGCI performed the following services:

- Coordinated our exploration locations with Dore and Whittier and with school staff.
- Marked the exploration locations at the site and notified Dig Safe Systems Inc. (Dig Safe) and the Town of Wilmington for utility clearance.
- Engaged a drilling subcontractor for two (2) days to advance eight (8) soil borings at the site.
- Coordinated with Dore and Whittier who arranged with the Town of Wilmington's Department of Public Works (DPW) to perform five (5) test pits at the site, as requested by the civil engineer.
- Provided an LGCI geotechnical field representative at the site to coordinate and observe the borings and test pits, describe the soil samples, and prepare field logs. The LGCI representative performed four (4) double ring infiltrometer tests within test pits TP-1, TP-2, TP-3, and TP-4.
- Submitted six (6) soil samples for laboratory tests, including two (2) soil samples from the borings, and four (4) samples from the test pits where double ring infiltrometer tests were performed.
- Prepared this preliminary geotechnical report containing the results of our preliminary subsurface explorations and our preliminary recommendations for foundation design and construction.

Our scope does not include preparing specifications, reviewing contract documents, and providing construction services. LGCI would be pleased to perform these services when needed. Recommendations for stormwater management, erosion control, pavement design, slope stability analyses, site specific seismic and liquefaction analyses, pile analysis and design, FEMA 100-year flood elevation, historic uses of site, contaminated soil and groundwater treatment and disposal requirements and techniques, and cost or quantity estimates are not included in our scope of work.

LGCI's scope of services does not include an environmental assessment for the presence or absence of wetlands or analytical testing for hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site, or mold in the soil or in any structure at the site. Any statements regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

1.3 Site Description

Our understanding of the site is based on our field observations, our discussions with Dore and Wittier, and on the following document:

- Drawing EX-1 titled: "Existing Conditions Plan, 320 Salem Street, Wilmington, Massachusetts," (Existing Conditions Plan) prepared by Nitsch Engineering, dated October 24, 2024, and provided to LGCI by Dore and Whittier via e-mail on November 11, 2024.

The North Intermediate School site is located at 320 Salem Street in Wilmington, Massachusetts as shown in Figure 1. The site is bordered by private residential properties and Salem Street on the southern side, by Ballardvale Street on the eastern side, and by private properties on the western and northern sides. The site is occupied by the existing school building, a drop off loop, a paved parking lot, a playground, a basketball court and tennis courts, and athletic fields, including a baseball field and a soccer field.

Based on the Existing Conditions Plan, the grades at the site generally range between El. 90 feet and El. 108 feet, generally rising in the north to south direction.

1.4 Project Description

Our understanding of the proposed construction is based on our discussions with Dore and Whittier and on the following drawing:

- "Site Base Condition, Wilmington Schools, North Intermediate- Wilmington, MA," (Site Base Conditions) prepared by Dore and Whittier, undated, and provided to LGCI by Dore and Whittier on October 11, 2024.

We understand that at this time, the size, layout, and location of the proposed school are preliminary. Based on the Site Base Conditions, the proposed school will have an irregular shape

and will have a footprint of about 80,500 square feet. The proposed building will be located in the area of the existing athletic fields north of the existing building. We understand that the existing building will be demolished to allow for the construction of the proposed athletic fields.

Information about the proposed building finished floor elevation (FFE) and the proposed grading are not available at the time of this report.

1.5 Elevation Datum

We understand that the elevations provided in the Existing Conditions Plan are referenced with respect to the North American Vertical Datum of 1988 (NAVD 1988).

2. SITE AND SUBSURFACE CONDITIONS

2.1 Surficial Geology

LGCI reviewed a surficial geologic map titled: "Surficial Materials Map of Wilmington Quadrangle, Massachusetts," prepared by Byron D. Stone, J.R. and DiGiacomo-Cohen, M.L., Scientific Investigation Map 3402, Quadrangle 113 – Wilmington, 2018.

The surficial geologic map of the site indicates that the natural soils in the general vicinity of the site consist of coarse deposits.

The coarse deposits consist of sand, sand and gravel, and gravel deposits as described below.

Sand Deposits – The sand deposits are comprised mostly of fine to coarse sand. Coarser layers may contain up to 25 percent gravel. Finer layers may contain fine sand, silt, and clay.

Sand and Gravel Deposits – The sand and gravel deposits occur as a mixture of gravel and sand within individual layers and as alternating layers of sand and gravel. The sand and gravel layers range between 25 to 50 percent gravel and 50 to75 percent sand.

Gravel Deposits – The gravel deposits are comprised of at least 50 percent gravel, cobbles, and boulders. Sand occurs within gravel beds and as separate layers within the gravel.

The surficial geologic map also shows swamp deposits not far from the site.

Swamp Deposits – the swamp deposits consist of organic muck and peat that contain minor amounts of sand, silt, and clay, are stratified and poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas.

The Surficial Geologic Map is shown in Figure 2.

2.2 LGCI's Explorations

2.2.1 General

LGCI coordinated our exploration locations with Dore and Whittier and marked the exploration locations in the field. LGCI notified Dig Safe and the Town of Wilmington for utility clearance prior to starting our explorations at the site.

Unless notified otherwise, we will dispose of the soil samples obtained during our explorations after three (3) months.

2.2.2 LGCI's Soil Borings

LGCI engaged Soil X, Corp. (Soil X) of Leominster, Massachusetts to advance eight (8) soil borings (B-1 to B-8) at the site on October 28 and 29, 2024. The borings were advanced with a Diedrich D-70 Turbo ATV Drill Rig using hollow stem auger boring techniques with 4-1/4-inch inner diameter augers. The borings extended to depths ranging between 10.2 and 20.2 feet beneath the ground surface. Upon completion, the boreholes were backfilled with drill cuttings.

Soil X performed Standard Penetration Tests (SPT) and obtained split spoon samples with an automatic hammer at typical depth intervals of 2 feet or 5 feet as noted on the boring logs in general accordance with ASTM D-1586.

An LGCI geotechnical field representative observed and logged the borings in the field.

2.2.3 LGCI's Test Pits

Dore and Whittier coordinated with the Town of Wilmington DPW to perform five (5) test pits (TP-1, TP-2, TP-2A, TP-3, and TP-4) at the site on October 30 and 31, 2024. The purpose of the test pits was to perform double ring infiltrometer tests as described in Section 2.6. The test pits were excavated with a Volvo EWR150E excavator with a smooth-edge bucket. The test pits extended to depths ranging between 8.0 and 11.3 feet beneath the ground surface. Upon completion, the excavations were backfilled with excavated material in 12- to 18-inch lifts and tamped with the excavator bucket.

An LGCI geotechnical field representative observed and logged the test pits in the field.

2.2.4 Exploration Logs and Locations

The boring and test pit locations are shown in Figure 3A and Figure 3B. Appendices A and B contain LGCI's boring logs and test pits logs, respectively, and Tables 1 and 2 include summaries of LGCI's borings and test pits, respectively.

2.3 Subsurface Conditions

The subsurface description in this report is based on a limited number of explorations and is intended to highlight the major soil strata encountered during our explorations. The subsurface conditions are known only at the actual exploration locations. Variations may occur and should be expected between exploration locations. The exploration logs represent conditions that we observed at the time of our explorations and were edited, as appropriate, based on the results of the laboratory test data and inspection of the soil samples in the laboratory. Percentages of fines, sand, and gravel were estimated to the nearest 5 percent based on our field observations and laboratory inspection of the soil samples, except where a grain-size analysis was performed. The

strata boundaries shown in our exploration logs are based on our interpretations and the actual transitions may be gradual. Graphic soil symbols are for illustration only.

The soil strata encountered in LGCI's borings and test pits were as follows, starting at the ground surface.

Topsoil – A layer of surficial organic topsoil was encountered at the ground surface in borings B-1 to B-7, and in all test pits. The thickness of the topsoil ranged between 0.6 feet and 2.0 feet.

Fill – A layer of fill was encountered at the ground surface in boring B-8 and beneath the topsoil in all borings and test pits. The fill extended to depths ranging between 0.7 and 7.0 feet beneath the ground surface. The samples within this layer were mostly described as well graded sand, poorly graded sand, and silty sand. The fines content in the fill ranged between 0 and 30 percent, and the gravel content ranged between 0 and 25 percent. The fill contained traces of organic soil and roots. The fill contained 5 to 10 percent cobbles up to 12 inches in size in test pit TP-1.

The SPT N-values in this layer ranged between 7 blows per foot (bpf) and 54 bpf, with most values lower than 18 bpf, indicating mostly loose to medium dense material.

The excavation efforts within the fill layer ranged between easy, moderate, and difficult.

Buried Organic Soil – A layer of buried organic soil was encountered beneath the fill layer in borings B-2, B-5, and B-7 The buried organic soil extended to depths of 4.0, 4.4, and 8.0 feet beneath the ground surface in borings B-2, B-5, and B-7, respectively. The samples in this layer were described as silty sand. The fines content in the buried organic soil ranged between 25 and 45 percent. The buried organic soil contained traces of organic soil and roots.

The SPT N-values in this layer ranged between 16 bpf and 40 bpf, indicating medium dense to dense material.

Buried Subsoil – A layer of buried subsoil was encountered beneath the fill in boring B-8 and test pit TP-4. The subsoil extended to depths of 4.0 and 3.2 feet beneath the ground surface in boring B-8 and test pit TP-4, respectively. In boring B-8, the samples were described as silty sand. The fines content in the subsoil ranged between 15 and 35 percent, and the gravel content ranged between 0 and 15 percent. In test pit TP-4, the sample was described as poorly graded sand. The fines content ranged between 10 and 15 percent, and the gravel content ranged between 0 and 5 percent. The samples contained traces of organic soil and roots.

The SPT N-values in this layer ranged between 11 bpf and 14 bpf, indicating a medium dense material.

The excavation effort within the subsoil layer was easy, consistent with loose to medium dense material.

Silt – A layer of silt was encountered beneath the fill layer in boring B-1 and extended to a depth of 9.0 feet beneath the ground surface. The sample was described as silt and was slightly plastic. The sand content ranged between 5 and 10 percent.

The SPT N-value in this layer was 13 bpf, indicating stiff material.

Clay – A layer of clay was encountered beneath the layer of silt in boring B-1 between depths of 9.0 to 14.0 feet. The sample was described as lean clay and was slightly plastic. The sand content ranged between 15 and 20 percent.

The SPT N-value in this layer was 12 bpf, indicating stiff material.

Swamp Deposit – A layer of swamp deposits was encountered beneath the layer of fill in test pit TP-1 and extended to a depth of 10 feet beneath the ground surface. The sample was described as silty sand. The fines content ranged between 20 and 25 percent and the gravel content ranged between 10 and 15 percent. The swamp deposit had traces of organic soil, roots, and an organic odor.

The excavation effort within the swamp deposit layer was difficult possibly due to the presence of roots.

Sand – A layer of sand was encountered in test pit TP-1 and extended to a depth of 11.0 feet beneath the ground surface. The sand was described as poorly graded sand. The fines content ranged between 0 and 5 percent.

The excavation effort within the sand layer was difficult.

Sand and Gravel – A layer of sand and gravel was encountered in all borings and test pits, except in test pit TP-1, and extended to the termination depths of the borings and test pits, except for boring B-6 where the sand and gravel layer extended to the top of weathered rock. The samples in this layer were mostly described as well graded sand and silty sand. Five (5) samples were described as poorly graded sand. The fines content in this layer ranged between 0 and 25 percent, and the gravel content ranged between 0 and 40 percent.

The SPT N-values in this layer ranged between 15 bpf and refusal, with most values ranging between 20 bpf and 67 bpf, indicating dense to very dense material. Please note that the high SPT N-values in the sand and gravel may be due to obstructions such as cobbles and boulders in the sand and gravel and may not represent the true density of the sand and gravel.

Weathered Rock – A layer of weathered rock was encountered in boring B-6 and extended to the termination depth of 19.7 feet beneath the ground surface. The sample within this layer was described as silty sand. The fines content ranged between 15 and 20 percent, and the gravel content ranged between 35 and 40 percent.

2.4 Groundwater

Groundwater was encountered in all the borings, except for B-3, and in test pits TP-1 and TP-2A, at depths ranging between 9.0 and 14.0 feet beneath the ground surface, as shown in Tables 1 and 2, and in the boring and test pit logs.

The groundwater information reported herein is based on observations made during or shortly after the completion of drilling and excavation. The reported groundwater levels may not represent the actual groundwater conditions, as additional time may be required for the groundwater levels to stabilize. The groundwater information presented in this report only represents the conditions encountered at the time and location of the explorations. Seasonal fluctuation should be anticipated.

2.5 Laboratory Test Data

LGCI submitted six (6) soil samples collected from the borings for grain-size analysis. The results of the grain-size analyses are provided in the test data sheets included in Appendix C and are summarized in the table below.

Grain-Size Analysis Test Results

Exploration No.	Sample No.	Stratum	Sample Depth (ft.)	Percent Gravel	Percent Sand	Percent Fines
B-1	S2	Fill	2.0 – 4.0	36.5	43.5	20.0
B-4	S2	Sand and Gravel	2.0 – 4.0	36.9	42.6	20.5
TP-1	Infiltrometer	Fill	5.0	14.1	58.9	27.0
TP-2	Infiltrometer	Fill	4.0	6.8	77.3	15.9
TP-3	Infiltrometer	Sand and Gravel	4.0	31.4	67.1	1.5
TP-4	Infiltrometer	Sand and Gravel	4.6	30.4	58.6	11.0

2.6 Double Ring Infiltrometer Tests

LGCI provided a geotechnical field engineer to perform four (4) double ring infiltrometer tests in test pits TP-1 to TP-4 (one in each).

In each case, the excavation was first advanced to the test depth where the test pit bottom was leveled using the excavator bucket. After the infiltrometer rings were driven into the ground, the test was conducted by filling the rings with water. The test pit was advanced deeper after the completion of the test.

The test results are included in Appendix D and are summarized below.

The results include plots of the hydraulic conductivity for flow within the inner and outer rings. The stabilized portion of the plot for the inner ring indicates the permeability value. The results indicate the following approximate permeability, K, value:

Double Ring Infiltrometer Test Results

Test Pit	Stratum	Test Depth (ft.)	Permeability, K (cm/sec)
TP-1	Fill	5.0	1.00×10^{-3}
TP-2	Fill	4.0	4.06×10^{-3}
TP-3	Sand and Gravel	4.0	6.73×10^{-2}
TP-4	Sand and Gravel	4.5	8.95×10^{-2}

3. EVALUATION AND RECOMMENDATIONS

3.1 Foundation Recommendations

3.1.1 General

Based on the results of the borings and test pits, the subsurface conditions at the site are suitable to support the proposed building after the topsoil, existing fill, buried organic soil, buried subsoil, and swamp deposits are removed or improved as described below. There are a few issues that we would like to highlight for consideration and discussion.

3.1.2 Topsoil, , Existing Fill Buried Organic Soil, Buried Subsoil, and Swamp Deposits

- The topsoil should be removed from within the entire construction area, including the proposed building footprint and the proposed paved areas.

- The existing fill was observed to be variable in composition and density. The existing fill contained traces of organic soil and roots. In addition, the existing fill overlaid buried organic soil and buried subsoil. Existing fill that was not placed with strict moisture, density, and gradation control presents risk of unpredictable settlement that may result in poor performance of floor slabs and foundations. Due to these risks, the existing fill, the buried organic soil, and the buried subsoil should be entirely removed from within the proposed building's footprint and should be replaced with Structural Fill. We anticipate that the removal will extend up to depths ranging between 2 and 6 feet beneath the existing ground surface, and up to a depth of 8 feet beneath the ground surface near boring B-7. The removal may extend to greater depths at locations not explored by LGCI. Laterally, the removal should extend beyond the proposed building's footprint a distance equal to the distance between the bottom of the proposed footings and the top of the native sand and gravel, or 5 feet, whichever is greater.

- At test pit TP-1, performed outside of the proposed building footprint, swamp deposits were observed beneath the existing fill and extended to a depth of 10 feet beneath the ground surface. If encountered within the proposed building footprint, the swamp deposits should be removed and replaced with Structural Fill.

- After the topsoil, existing fill, buried organic soil, buried subsoil, and swamp deposits, if any, are removed from within the proposed building footprint and zone of influence of footings, as described above, the proposed building and other structures may be supported on shallow footings bearing in Structural Fill placed directly on top of the native sand and gravel or stiff silt and clay.

- As an alternative to the removing the existing fill, the buried organic soil, and the buried subsoil we considered the option of improving the ground using aggregate piers (APs) or

rigid inclusions (RIs). We dismissed this option due to the depth to the bottom of these layers being 6 feet or less in a few explorations. We will reconsider this option after additional explorations are performed at the site during future phases of the project.

- The subgrade of footings should be prepared in accordance with the recommendations in Section 4.1.

- The proposed slab may be designed as a slab-on-grade bearing on Structural Fill placed directly on top of the native sand and gravel or stiff silt and clay.

- Within paved areas, the existing fill and the buried organic soil and buried subsoil should be removed to the top of the native sand and gravel or stiff silt and clay or to a depth of 18 inches beneath the bottom of the proposed pavement, whichever occurs first. Where soft organic soil is exposed, the organic soil should be removed. The existing fill and buried organic soil and buried subsoil deeper than 18 inches beneath the bottom of the proposed pavement can remain in place provided that these materials are firm and unyielding following proofrolling as described in Section 4.1.

3.1.3 Additional Explorations

We recommend advancing additional explorations at the site during the schematic design (SD) phase and/or the design development (DD) phase. The additional explorations should include soil borings and test pits. We recommend installing at least one (1) groundwater observation well as part of the additional explorations.

3.2 Foundation Recommendations

We recommend supporting the proposed building on shallow footings placed on Structural Fill placed directly the native sand and gravel layer or the stiff silt and clay. Shallow foundations and slabs-on-grade should be placed on a subgrade that is prepared in accordance with the recommendations in this report. Recommendations for footing design and our settlement estimates are presented in Sections 3.2.1 and 3.2.2, respectively.

3.2.1 Footing Design

- Footings should be founded on Structural Fill placed directly on the native sand and gravel or on the stiff silt and clay. A representative of LGCI should observe the subgrade during construction to confirm that it is consistent with the materials encountered in our borings.

- For footing design, we recommend using a net allowable bearing pressure of 4 kips per square foot (ksf).

- The subgrade of footings should be prepared in accordance with the recommendations in Section 4.1.

- Foundations should be designed in accordance with The Commonwealth of Massachusetts State Building Code 780 CMR, Tenth Edition (MSBC 10th Edition).

- Exterior footings and footings in unheated areas should be placed at a minimum depth of 4.0 feet below the final exterior grade to provide adequate frost cover protection. Interior footings in heated areas may be designed and constructed at a minimum depth of 2 feet below finished floor grades.

- We recommend that wall footings have a minimum width of 2 feet, and that column footings have a minimum width of 3 feet. For foundations with a least lateral dimension smaller than 3 feet, the allowable bearing pressure should be reduced to 1/3 of the recommended allowable bearing pressure times the least dimension in feet.

- Wall footings should be designed and constructed with continuous, longitudinal steel reinforcement for greater bending strength to span across small areas of loose or soft soils that may go undetected during construction.

3.2.2 Settlement

Using the allowable bearing pressure of 4 ksf and the minimum footing sizes recommended above, we estimate for foundations constructed in accordance with the recommendations contained in this report that the total post-construction settlement will be less than about 1 inch and that the differential settlement will be 3/4 inch or less over a distance of 25 feet. Total and differential settlements of these magnitudes are usually considered tolerable for the anticipated construction. However, the tolerance of the proposed structure to the predicted total and differential settlements should be assessed by the structural engineer.

3.3 Concrete Slab Considerations

- The proposed floor slab can be constructed as a slab-on-grade bearing on a minimum of 12 inches of Structural Fill placed directly on top of the native sand and gravel.

- To reduce the potential for dampness in the proposed floor slab, the project architect may consider placing a vapor barrier beneath the floor slab. The vapor barrier should be protected from puncture during construction of the slab.

- For the design of the floor slab bearing on the materials described above, we recommend using a modulus of subgrade reaction, k_{s1}, of 100 tons per cubic foot (tcf). Please note that the values of k_{s1} are for a 1 x 1 square foot area. These values should be adjusted for larger areas using the following expression:

$$Modulus\ of\ Subgrade\ \text{Re}action\ (k_s) = k_{s1} * \left(\frac{B+1}{2B}\right)^2$$

where:

k_s = Coefficient of vertical subgrade reaction for loaded area,
k_{s1} = Coefficient of vertical subgrade reaction for 1 x 1 square foot area, and
B = Width of area loaded, in feet.

Please note that cracking of slabs-on-grade can occur as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the precautions listed below should be closely followed for construction of all slabs-on-grade:

- Construction joints should be provided between the floor slab and the walls and columns in accordance with the American Concrete Institute (ACI) requirements, or other applicable code.

- Backfill in interior and exterior utility trenches should be properly compacted.

- In order for the movement of exterior slabs not to be transmitted to the building foundation or superstructure, exterior slabs such as approach slabs and sidewalks, should be isolated from the building superstructure.

3.4 Under-slab Drainage

Based on the groundwater levels observed in our borings, we believe that an under-slab drainage system is not required beneath the slab.

3.5 Seismic Design Criteria

In accordance with Section 1613 of MSBC 10th Edition and based on the boring data, the seismic criteria are as follows:

- Site Class: D
- Spectral Response Acceleration at short period, S_s (Table 1604.11): 0.327g
- Spectral Response Acceleration at 1 sec., S_1 (Table 1604.11): 0.072g
- Site Coefficient, F_a (Table 1613.3.3(1)): 1.6
- Site Coefficient, F_v (Table 1613.3.3(2)): 2.4
- Adjusted spectral response S_{ms} (Equation 16-37): 0.523g
- Adjusted spectral responses S_{m1} (Equation 16-38): 0.173g

Based on the SPT data from the borings, we believe the site soils are not susceptible to liquefaction.

3.6 Lateral Pressures for Wall Design

3.6.1 Lateral Earth Pressures

Based on our understanding, the proposed construction will not include retaining walls or below-ground walls. Should the design change, the lateral earth pressures recommended shown below should be used to design proposed retaining walls.

Coefficient of Active Earth Pressure, K_A:	0.33
Coefficient of At-Rest Earth Pressure, K_o:	0.50
Coefficient of Passive Earth Pressure, K_p:	3.0
Total Unit Weight γ:	125 pcf

Note: The values in the table are based on a friction angle for the backfill of 30 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and a vertical wall face.

- Exterior walls of below-ground spaces and retaining walls braced at the top to restrain movement/rotation, should be designed using the "at-rest" pressure coefficient.

- We recommend placing free-draining material within the 3 feet immediately behind retaining walls. We recommend providing weep holes in site walls to promote drainage where possible; or a pipe should be placed at the base of the wall to collect the groundwater. Groundwater collected by the wall drains should be discharged in a lower area if gravity flow is possible.

- Passive earth pressures should only be used at the toe of the wall where special measures or provisions are taken to prevent disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key. In any case, the passive pressures should be neglected in the top 2 feet.

- Where a permanent vertical uniform load will be applied on the active side immediately adjacent to the wall, a horizontal surcharge load equal to half of the uniform vertical load should be applied over the height of the wall. At a minimum, a temporary construction surcharge of 100 psf should be applied uniformly over the height of the wall.

- We recommend using an ultimate friction factor of 0.5 between the native sand and gravel or Structural Fill and the bottom of the wall. Below-grade walls should be designed for minimum factors of safety of 1.5 for sliding and 2.0 for overturning. We recommend a factor of safety of 1.5 for global stability of walls.

3.6.2 Perimeter Drains

- Should the design change to include retaining walls, free-draining material should be placed within 3 feet of retaining walls and walls of below-grade spaces. To reduce the potential for dampness in below-ground spaces, if any, perimeter walls of the proposed below-ground spaces should be damp-proofed.

- We recommend that drains be provided behind the exterior of walls of below-ground spaces, if any, and behind site retaining walls, if any. The drains should consist of 6-inch perforated PVC pipes installed with the slots facing down. Perimeter drains should be installed at the bottom of the wall in 18 inches of crushed stone wrapped in a geotextile fabric for separation and filtration. Site retaining walls may be designed with weep holes discharging near the bottom of the face of the walls.

- Groundwater collected by the wall drains could be discharged in a lower area if gravity flow is possible. Alternatively, it should be discharged into the street drains. A permit would be required for discharge into street drains.

3.7 Pavement and Sidewalk Considerations

3.7.1 General

The subsurface conditions encountered at the site are generally suitable to support the proposed driveways, parking lots, and sidewalks after preparation of the subgrade as described in Section 4.1.

- We recommend entirely removing the topsoil and asphalt from within the footprint of the proposed driveways and parking lots.

- The existing fill should be improved within the proposed paved areas and under sidewalks in accordance with the recommendations in Sections 3.1.1 and 4.1.

Cobbles and boulders should be removed to at least 18 inches below the bottom of the pavement and sidewalks.

3.7.2 Pavement Sections

A typical, minimum, standard-duty pavement section that could be used for parking areas is as follows:

1.5" Asphalt "Top Course"
2.0" Asphalt "Base Course"
8" Processed Gravel for Sub-Base (MassDOT M1.03.1)

A typical, minimum, heavy-duty pavement section that could be used for areas of heavy truck traffic is as follows:

2.0" Asphalt "Top Course"
2.5" Asphalt "Base Course"
12" Processed Gravel for Sub-Base (MassDOT M1.03.1)

The pavement sections shown above represent minimum thicknesses representative of typical local construction practices for similar use. Periodic maintenance should be anticipated.

Pavement material types and construction procedures should conform to specifications of the "Standard Specifications for Highways and Bridges," prepared by the Commonwealth of Massachusetts Department of Transportation dated 2023.

Areas to receive relatively highly concentrated, sustained loads such as dumpsters, loading areas, and storage bins are typically installed over a rigid pavement section to distribute concentrated loads and reduce the possibility of high stress concentrations on the subgrade. Typical rigid pavement sections consist of 6 inches of concrete placed over a minimum of 12 inches of subbase material.

3.7.3 Sidewalks

- Sidewalks should be placed on a minimum of 12 inches of Structural Fill with less than 5 percent fines.

- To reduce the potential for heave caused by surface water penetrating under the sidewalk, the joints between sidewalk concrete sections should be sealed with a waterproof compound. The sidewalks should be sloped away from the building or other vertical surfaces to promote flow of water. To the extent possible, roof leaders should not discharge onto sidewalk surfaces.

3.8 Underground Utilities

Boulders at the bottom of utility trenches should be removed to at least 12 inches below the pipe invert and the resulting excavation should be backfilled with suitable backfill. Utilities should be placed on suitable bedding material in accordance with the manufacturer's recommendations. "Cushion" material should be placed, by hand, above the utility pipe in maximum 6-inch lifts. The lift should be compacted by hand to avoid damage to the utility. Where the bedding/cushion material consists of crushed stone, it should be wrapped in a geotextile fabric.

Before placing the bedding material, the bottom of utility trenches should be compacted to a firm and unyielding condition. Where soft or pumping material is encountered, it should be removed and replaced with Ordinary Fill.

Compaction of fill in utility trenches should be in accordance with our recommendations in Section 4.3. To reduce the potential for damage to utilities, placement and compaction of fill immediately above the utilities should be performed in accordance with the manufacturer's recommendations.

4. CONSTRUCTION CONSIDERATIONS

4.1 Subgrade Preparation

- Existing asphalt, topsoil, existing fill, buried organic soil, buried subsoil, swamp deposits, if any, organic materials, abandoned utilities, buried foundations, remnants of demolished buildings, and other below-ground structures should be entirely removed from within the footprint of the proposed building before the start of foundation work.

- Tree stumps, root balls, and roots larger than ½ inch in diameter should be removed and the cavities filled with suitable material and compacted per Section 4.3 of this report.

- Cobbles and boulders should be removed at least 6 inches from beneath footings and 18 inches beneath the bottom of slabs and paved areas. The resulting excavations should be backfilled with compacted Structural Fill under the building and with Ordinary Fill under the subbase of paved areas.

- We recommend removing the existing fill, buried organic soil, buried subsoil, and swamp deposits, if any, from within the proposed building footprint and within the zone of influence of footings. We recommend compacting the exposed subgrade in the native sand and gravel layer or in the deep existing fill to a firm and unyielding condition with at least six (6) passes of a heavy roller compactor imparting a minimum dynamic effort of 40 kips. Where organic soil is exposed or where the subgrade is soft during the compaction effort, the organic soil or soft material should be removed and replaced with Structural Fill. The subgrade in the stiff silt and clay should be cut with a smooth bladed bucket and compacted statically with no more than 2 passes of a roller compactor.

- After the surficial topsoil, buried organic soil, buried subsoil, and existing fill are removed to a depth of 18 inches below the bottom of the proposed pavement, the exposed existing fill, buried organic soil, and buried subsoil should be improved by compacting the exposed surface of the existing fill with at least six (6) passes of a vibratory roller compactor imparting a dynamic effort of at least 40 kips. Where soft organic soil or other soft materials of soil are observed, the organic soil or other soft material should be removed, and the grade should be restored using Ordinary Fill to the bottom of the proposed subbase layer. If pumping of the existing fill or buried subsoil deeper than 18 inches beneath the bottom of the proposed pavement is observed, the soft and/or pumping material should be removed and replaced.

- The base of footing excavations should be compacted with a dynamic vibratory compactor weighing at least 200 pounds and imparting a minimum of 4 kips of force to the subgrade, before placing concrete.

- The subgrade of the proposed slab should be compacted with a dynamic vibratory compactor imparting a minimum of 10 kips of force to the subgrade before placing Structural Fill.

- To reduce the potential for disturbance of the footing subgrade, excavations should be extended an additional 12 inches and restored with Structural Fill or crushed stone to serve as a working mat.

- Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill shown in Section 4.3.1.

- Fill placed under the subbase of paved areas should meet the gradation and compaction requirements of Ordinary Fill shown in Section 4.3.2.

- Fill placed in the top 12 inches beneath sidewalks should consist of Structural Fill with less than 5 percent fines.

- An LGCI geotechnical representative should observe the exposed subgrades prior to fill and concrete placement to verify that the exposed bearing materials are suitable for the design soil bearing pressure.

- If soft or loose pockets are encountered in the footing excavations, the soft or loose materials should be removed, and the bottom of the footing should be placed at a lower elevation on firm soil, or the resulting excavation should be backfilled with Structural Fill or crushed stone wrapped in a geotextile filter fabric.

4.2 Subgrade Protection

The onsite sand and gravel is frost susceptible. If construction takes place during freezing weather, special measures should be taken to prevent the subgrade from freezing. Such measures should include the use of heat blankets or excavating the final 6 inches of soil just before pouring concrete. Footings should be backfilled as soon as possible after footing construction. Soil used as backfill should be free of frozen material, as should the ground on which it is placed. Earthwork operations should be suspended during freezing weather.

Materials with high fines content are typically difficult to handle when wet as they are sensitive to moisture content variations. Subgrade support capacities may deteriorate when such soils become wet and/or disturbed. The contractor should keep exposed subgrades properly drained and free of ponded water. Subgrades should be protected from machine and foot traffic to reduce disturbance.

4.3 Fill Materials

Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill. Fill placed outside the building footprint beneath any pavement subbase should meet the gradation and compaction requirements of Ordinary Fill.

Structural Fill and Ordinary Fill should consist of inert, hard, durable sand and gravel, free from organic matter, clay, surface coatings, and deleterious materials.

4.3.1 Structural Fill

The Structural Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of optimum moisture content.

Sieve Size	Percent Passing by Weight
3 inches	100
1 ½ inch	80 - 100
½ inch	50 – 100
No. 4	30 – 85
No. 20	15 – 60
No. 60	5 – 35
No. 200*	0 – 10

* 0 – 5 Under sidewalks and exterior pads and slabs

4.3.2 Ordinary Fill

Ordinary Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of optimum moisture content.

Sieve Size	Percent Passing by Weight
6 inches	100
1 inch	50 - 100
No. 4	20 – 100
No. 20	10 - 70
No. 60	5 – 45
No. 200	0 – 20

4.4 Reuse of Onsite Materials

Based on the laboratory tests, the granular portion of the existing fill free of organic soil may be used as Ordinary Fill. The onsite materials are not suitable for reuse as Structural Fill.

Soils with high fines content (higher than about 20 percent) are generally very sensitive to moisture content variations and are susceptible to frost. These soils are difficult to compact at

moisture contents that are much higher or much lower than the optimum moisture content determined from the laboratory compaction test. Therefore, strict moisture control should be implemented during stockpiling, placement, and compaction of the existing fill.

All materials to be used as fill should first be tested for compliance with the applicable gradation specifications. During earthwork operations, the contractor should avoid mixing the reusable soils with fine-grained and/or organic soils.

4.5 Groundwater Control Procedures

Based on the groundwater levels encountered in our explorations, we anticipate the need for groundwater control procedures during footing and utility excavations. We anticipate that filtered sump pumps installed in pits located at least 3 feet below the bottom of the excavation may be sufficient to handle surface runoff that may enter the excavation. The contractor should be prepared to use multiple sump pumps as needed.

The contractor should be permitted to employ whatever commonly accepted means and practices are necessary, including well points, if necessary, to maintain the groundwater level below the excavation, and to maintain a dry excavation during wet weather. Placement of reinforcing steel or concrete in standing water should not be permitted.

Groundwater levels should be maintained at a minimum of 1-foot below the bottom of excavations during construction.

To reduce the potential for sinkholes developing over sump pump pits after the sump pumps are removed, the crushed stone placed in the sump pump pits should be wrapped in a geotextile fabric. Alternatively, the crushed stone should be entirely removed after the sump pumps are no longer in use and the sump pump pits should be restored with suitable backfill.

4.6 Temporary Excavations

All excavations to receive human traffic, including utility trenches, basement or footing excavations, or others (i.e. underground storage tanks, etc.), should be constructed in accordance with the OSHA guidelines.

The site soils should generally be considered Type “C” and should have a maximum allowable slope of 1.5 Horizontal to 1 Vertical (1.5H:1V) for excavations less than 20 feet deep. Deeper excavations, if needed, should have a shoring designed by a professional engineer.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of the excavation sides and bottom.

5. RECOMMENDATIONS FOR FUTURE WORK

We recommend engaging LGCI to perform the following services:

- Perform additional explorations at the site and update our geotechnical report.
- Prepare Earth Moving Specifications and review the geotechnical aspect of contract drawings.
- Review contractor submittals and Request for Information (RFIs);
- Provide a field representative during construction to observe the removal of the unsuitable soil, and to observe the subgrade of footings and slabs.

6. REPORT LIMITATIONS

Our analyses and recommendations are based on project information provided to us at the time of this report. If changes to the type, size, and location of the proposed structures or to the site grading are made, the recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions and recommendations modified in writing by LGCI. LGCI cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations, and whether our recommendations have been properly implemented in the design.

It is not part of our scope to perform a more detailed site history; therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Our scope did not include environmental services or services related to moisture, mold, or other biological contaminants in or around the site.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to 1) make site visits during construction to check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and 2) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our report has been prepared in accordance with generally accepted engineering practices and in accordance with the terms and conditions set forth in our agreement. No other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of Dore and Whittier Architects, Inc. for the proposed Wildwood Early Childhood Center at the North Intermediate School located at 320 Salem Street Site in Wilmington, Massachusetts as conceived at this time.

7. REFERENCES

In addition to the references included in the text of the report, we used the following references:

American Society of Civil Engineers, "Minimum Design Loads and Associated Criteria for Buildings and Other Structures," ASCE/SEI 7-16, 2017.

The Commonwealth of Massachusetts (2024), "The Massachusetts State Building Code, Ninth (10th) Edition."

The Department of Labor, Occupational Safety and Health Administration (1989), "Occupational Safety and Health Standards - Excavations; Final Rule," 20 CFR Part 1926, Subpart P.

USGS Wilmington, MA topographic map from http://mapserver.mytopo.com.

Table 1 - Summary of LGCI's Borings
Proposed Wildwood Early Childcare Center
Wilmington, MA
LGCI Project No. 2437

Boring No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / **El.** (ft.)	Bottom of Topsoil Depth / **El.** (ft.)	Bottom of Fill Depth / **El.** (ft.)	Bottom of Buried Organic Soil / **Buried Subsoil** Depth / **El.** (ft.)	Bottom of Sand and Gravel Depth / **El.** (ft.)	Bottom of Weathered Rock Depth / **El.** (ft.)	Bottom of Boring Depth / **El.** (ft.)
B-1	93.0	9.0 / **84.0**	0.6 / **92.4**	6.0 [3]/ **87.0**	- / **-**	19.0 [4]/ **74.0**	- / **-**	19.0 / **74.0**
B-2	94.0	9.0 / **85.0**	0.8 / **93.2**	2.8 / **91.2**	4.0 / **90.0**	19.0 [4]/ **75.0**	- / **-**	19.0 / **75.0**
B-3	95.0	- / **-**	0.7 / **94.3**	2.0 / **93.0**	- / **-**	10.2 [4]/ **84.8**	- / **-**	10.2 / **84.8**
B-4	93.0	9.0 / **84.0**	0.6 / **92.4**	2.0 / **91.0**	- / **-**	11.0 [4]/ **82.0**	- / **-**	11.0 / **82.0**
B-5	94.0	9.0 / **85.0**	0.7 / **93.3**	4.0 / **90.0**	4.4 / **89.6**	10.5 [4]/ **83.5**	- / **-**	10.5 / **83.5**
B-6	94.0	14.0 / **80.0**	2.0 / **92.0**	6.0 / **88.0**	- / **-**	19.0 / **75.0**	19.7 [5]/ **74.3**	19.7 / **74.3**
B-7	92.0	10.0 / **82.0**	0.9 / **91.1**	6.0 / **86.0**	8.0 / **84.0**	20.2 [6]/ **71.8**	- / **-**	20.2 / **71.8**
B-8	94.0	9.0 / **85.0**	- / **-**	0.7 / **93.3**	**4.0** / **90.0**	19.8 [6]/ **74.2**	- / **-**	19.8 / **74.2**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled: “Existing Conditions Plan, 320 Salem Street, Wilmington, Massachusetts,” prepared by Nitsch Engineering, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 8, 2024.
2. Groundwater was measured during drilling, at the end of drilling, after drilling, or based on sample moisture whichever is shallower.
3. A layer of silt was encountered beneath the fill in boring B-1, between depths of 6 to 9 feet, and a layer of clay was encountered beneath the silt between depths of 9 and 14 feet.
4. Boring terminated due to split spoon / auger refusal on possible boulder or rock in the sand and gravel layer.
5. Boring terminated in the weathered rock layer.
6. Boring terminated in the sand and gravel layer.
7. "-" means the groundwater or layer was not encountered.

Table 1 - Summary of LGCI's Test Pits
Proposed Wildwood Early Childcare Center
Wilmington, MA
LGCI Project No. 2437

Test Pit No.	Ground Surface Elevation (ft.)[1]	Groundwater[2] Depth / **El.** (ft.)	Bottom of Topsoil Depth / **El.** (ft.)	Bottom of Fill Depth / **El.** (ft.)	Bottom of Swamp Deposits / **Buried Subsoil** Depth / **El.** (ft.)	Bottom of Sand and Gravel Depth / **El.** (ft.)	Bottom of Sand Depth / **El.** (ft.)	Bottom of Boring Depth / **El.** (ft.)
TP-1	92.0	9.5 / **82.5**	1.5 / **90.5**	7.0 / **85.0**	10.0 / **82.0**	- / **-**	11.0 [4]/ **81.0**	11.0 / **81.0**
TP-2	94.0	- / **-**	0.7 / **93.3**	5.5 / **88.5**	- / **-**	9.0 [3]/ **85.0**	- / **-**	9.0 / **85.0**
TP-2A	94.0	9.5 / **84.5**	1.5 / **92.5**	7.0 / **87.0**	- / **-**	11.3 [3]/ **82.7**	- / **-**	11.3 / **82.7**
TP-3	94.0	- / **-**	0.8 / **93.2**	2.3 / **91.7**	- / **-**	8.0 [3]/ **86.0**	- / **-**	8.0 / **86.0**
TP-4	95.0	- / **-**	1.0 / **94.0**	2.0 / **93.0**	**3.2** / **91.8**	9.0 [3]/ **86.0**	- / **-**	9.0 / **86.0**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled: “Existing Conditions Plan, 320 Salem Street, Wilmington, Massachusetts,” prepared by Nitsch Engineering, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 8, 2024.
2. Groundwater was measured during drilling, at the end of drilling, after drilling, or based on sample moisture whichever is shallower.
3. Test Pit terminated in the sand and gravel layer.
4. Test Pit terminated in the sand layer.
5. "**-**" means the groundwater or layer was not encountered.

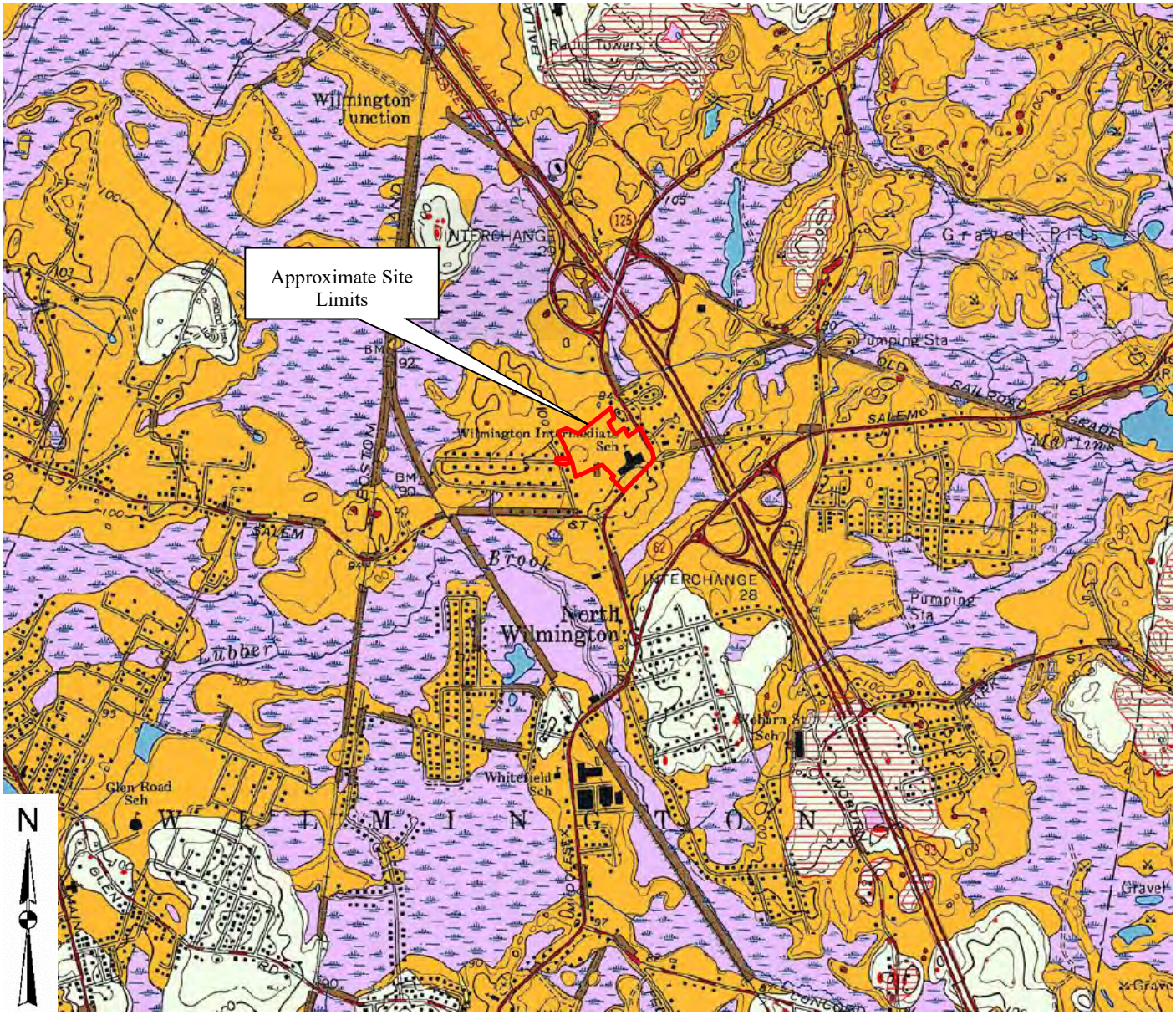
N

Contour Intervals: 10 feet

0.4 mi

Note: Figure based on USA Topo Maps of Wilmington, MA *ngmdb.usgs.gov/topoview/viewer*

Client:	Project:	Figure 1 – Site Location Map	
Dore and Whittier Architects, Inc.	Proposed Wildwood Early Childhood Center		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Wilmington, MA	LGCI Project No.: 2437	Date: Dec . 2024



Swamp deposits—Organic muck and peat that contain minor amounts of sand, silt, and clay, are stratified and poorly sorted, and occur in swamps and freshwater marshes, in kettle depressions, or in poorly drained areas. Unit is shown only where deposits are estimated to be at least 3 ft thick; most deposits are less than 10 ft thick. Swamp deposits overlie glacial deposits or bedrock. They locally overlie glacial till even where they occur within thin glacial meltwater deposits

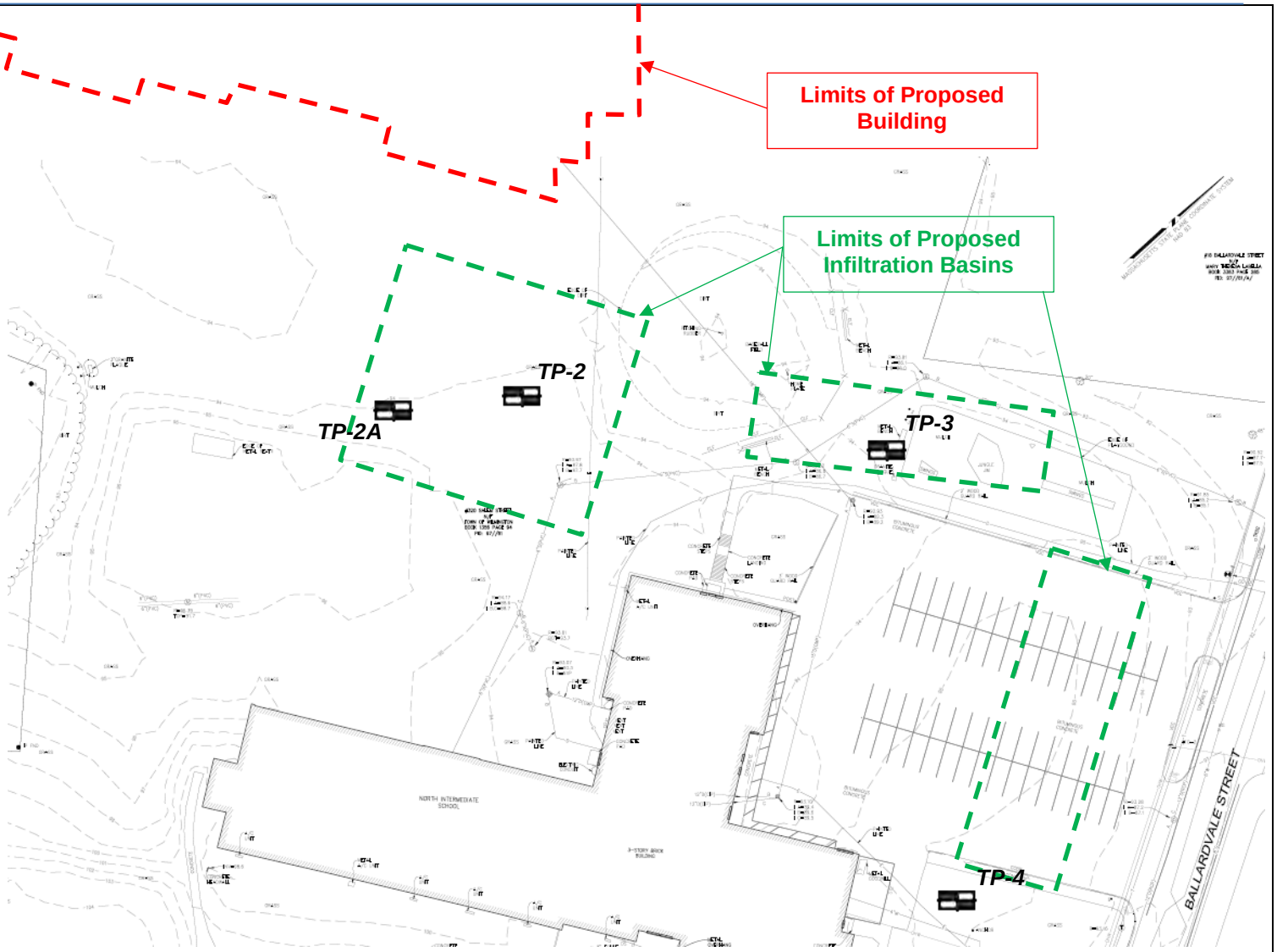
Coarse deposits consist of *gravel deposits*, *sand and gravel deposits*, and *sand deposits*, not differentiated in this report. *Gravel deposits* are composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises a few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. *Sand and gravel deposits* occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range between 25 and 50 percent gravel particles and between 50 and 75 percent sand particles. Layers are well sorted to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. *Sand deposits* are composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay

Note: Figure based on map titled: "Surficial Materials Map of Wilmington Quadrangle, Massachusetts," compiled by Byron D. Stone, Janet R. Stone, and Mary L. DiGiacomo-Cohen, Scientific Investigation Map 3402, Quadrangle 113 – Wilmington, 2018.

Client:	Project:	Figure 2 – Surficial Geologic Map	
Dore and Whittier Architects, Inc.	Proposed Wildwood Early Childhood Center		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Wilmington, MA	LGCI Project No.: 2437	Date: Dec. 2024

Legend

Approximate location of test pits advanced by Soil Exploration, Corp. (Soil X) of Leominster, MA on October 30, 2024, and observed by Lahlaf Geotechnical Consulting, Inc. (LGCI).



Approximate Scale (ft.)

20 0 20 40 80

Note

Figure based on drawing titled: "Existing Conditions Plan, 320 Salem Street, Wilmington, Massachusetts", prepared by Nitsch Engineering, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 8, 2024.

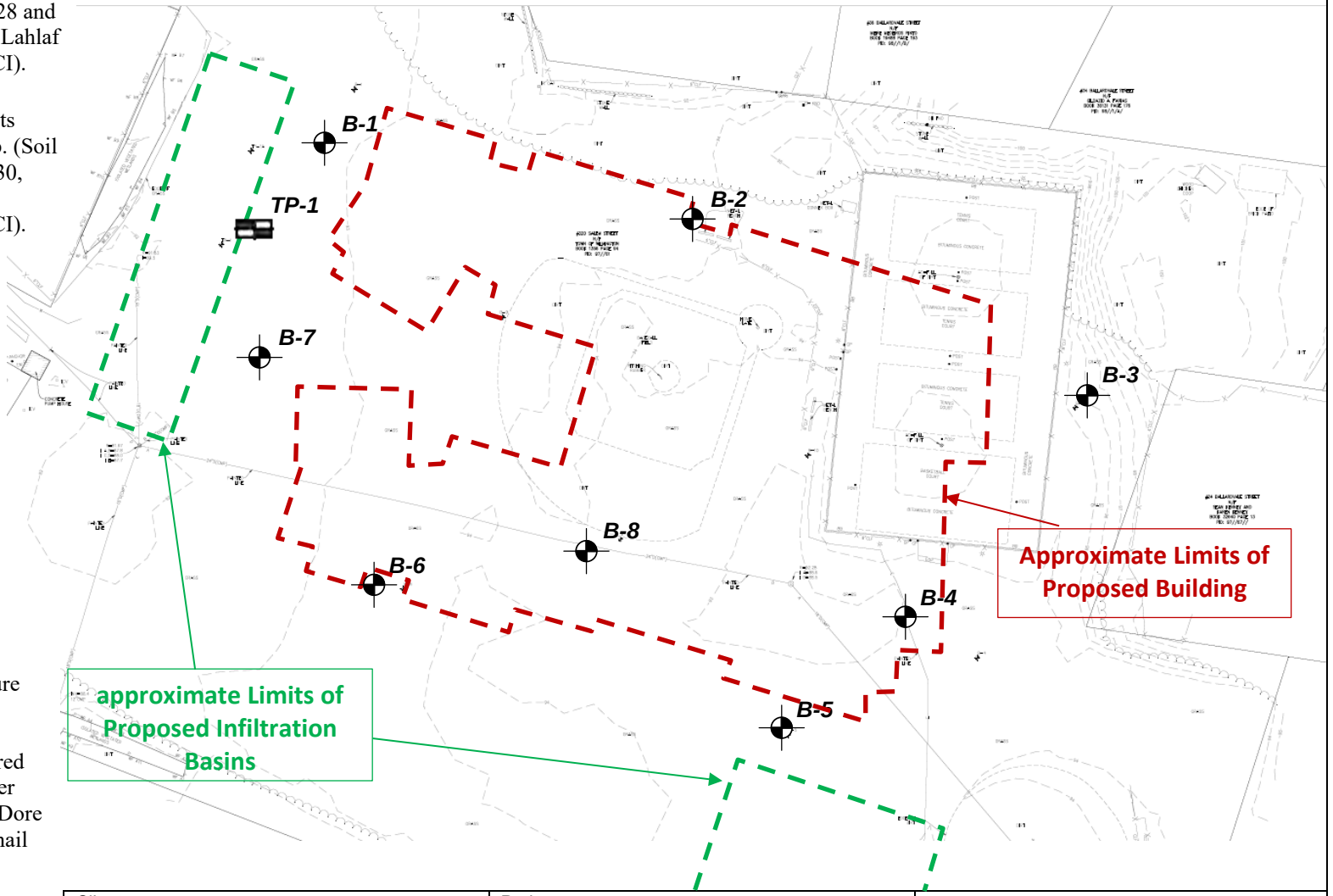
Limits of the proposed building and the infiltration basins are based on drawing titled: "Site Base Conditions, Wilmington Schools, North Intermediate, Wilmington, MA," prepared by Dore and Whittier, undated, and provided to LGCI by Dore and Whittier on October 11, 2024.

Client:	Project:	Figure 3A – Exploration Location Plan - South	
Dore and Whittier Architects, Inc.	Proposed Wildwood Early Childcare Center		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Wilmington, MA	LGCI Project No.: 2437	Date: Dec. 2024

Legend

Approximate location of borings advanced by Soil Exploration, Corp. (Soil X) of Leominster, MA on October 28 and October 29, 2024, and observed by Lahlaf Geotechnical Consulting, Inc. (LGCI).

Approximate location of test pits advanced by Soil Exploration, Corp. (Soil X) of Leominster, MA on October 30, 2024, and observed by Lahlaf Geotechnical Consulting, Inc. (LGCI).



MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83

Approximate Scale (ft.)

20 0 20 40 80

Note

Figure based on drawing titled: Figure based on drawing titled: "Existing Conditions Plan, 320 Salem Street, Wilmington, Massachusetts", prepared by Nitsch Engineering, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 8, 2024.

Limits of the proposed building and the infiltration basins are based on drawing titled: "Site Base Conditions, Wilmington Schools, North Intermediate, Wilmington, MA," prepared by Dore and Whittier, undated, and provided to LGCI by Dore and

Client:	Project:	Figure 3B – Exploration Location Plan - North	
Dore and Whittier Architects, Inc.	Proposed Wildwood Early Childcare Center		
LGCI Lahlaf Geotechnical Consulting, Inc.	Project Location: Wilmington, MA	LGCI Project No.: 2437	Date: Dec. 2024

Appendix A – LGCI's Boring Logs

LGCI
Lahlaf Geotechnical Consulting, Inc.

BORING LOG

B-1
PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/28/24 **DATE COMPLETED:** 10/28/24
BORING LOCATION: Near NW corner of prop. building
COORDINATES: NA
SURFACE El.: 93.0 ft. (see note 1) **TOTAL DEPTH:** 19 ft.
WEATHER: 60's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 9.0 ft. / El. 84.0 ft. based on sample moisture
AT END OF DRILLING: 9.5 ft. / El. 83.5 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0					Topsoil	0.6	S1 - Top 8": Topsoil
		0.6	S1 S1	3-8-15-38 (23)	24/17		Fill	92.4	S1 - Bot. 9": Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 15-20% fine to coarse subangular gravel, brown, moist S2 - Silty SAND with Gravel (SM), fine to coarse, 20% fines, 36.5% fine to coarse subangular gravel, brown, moist (Sieve Performed)
	90.0	2	S2	42-28-26-18 (54)	24/12				
5		4	S3	21-13-10-4 (23)	24/0				S3 - No recovery
		6	S4	10-8-5-3 (13)	24/6		Silt	6.0 87.0	S4 - SILT (ML), slightly plastic, 5-10% fine sand, grey, moist
	85.0	8						9.0	
		9	S5	4-7-5-6 (12)	24/24		Clay	84.0	S5 - Lean CLAY (CL), slightly plastic, 15-20% fine to coarse sand, grey, wet
10		11							
	80.0							14.0	
		14	S6	6-11-10-9 (21)	24/12		Sand and Gravel	79.0	S6 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 20-25% fine to coarse subangular gravel, brown, wet
15		16							
	75.0							19.0	
		19	S7	100/0"	0/0	1			REMARK 1: Split spoon and auger refused on possible large boulder or rock at a depth of 19.0 feet. S7 - No recovery Bottom of borehole at 19.0 feet. Backfilled borehole with drill cuttings.
20									
	70.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

BORING LOG

B-2
PAGE 1 OF 1

LGCI Lahlaf Geotechnical Consulting, Inc.

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/28/24 **DATE COMPLETED:** 10/28/24
BORING LOCATION: Near NW side of prop. building
COORDINATES: NA
SURFACE El.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 19 ft.
WEATHER: 50's / Sunny
GROUNDWATER LEVELS:
DURING DRILLING: 9.0 ft. / El. 85.0 ft. Based on sample moisture
AT END OF DRILLING: 13.0 ft. / El. 81.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** SG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	4-7-9-10 (16)	24/15		Topsoil	0.8 / 93.2	S1 - Top 10": Topsoil Bot. 5": Silty SAND with Gravel (SM), fine to medium, trace coarse, 15-20% fines, 20-25% fine to coarse subangular gravel, trace of organic soil, trace of roots, brown, moist
		2	S2	9-8-8-4 (16)	24/13		Fill	2.8 / 91.2	S2 - Top 10": Silty SAND (SM), mostly fine to medium, ~15% fines, ~10% fine to coarse subangular gravel, trace of organic soil, light brown to brown, moist Bot. 3": Silty SAND (SM), fine, 40-45% fines, trace of roots, black, moist (mostly organic soil)
	90.0	4	S3	5-5-10-10 (15)	24/19		Buried Organic Soil	4.0 / 90.0	S3 - Poorly Graded SAND (SP), fine to medium, 0-5% fines, light brown, moist
5		6	S4	13-13-17-16 (30)	24/17				S4 - Similar to S3, grey to light brown
	85.0	8							
		9	S5	10-15-13-11 (28)	24/18				▽ S5 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 5-10% fines, 15-20% fine to coarse subangular gravel, brown to orange, wet
10		11					Sand and Gravel		
	80.0	14	S6	19-20-21-29 (41)	24/14				▼ S6 - Silty SAND (SM), fine to medium, ~25% fines, 5-10% fine subangular gravel, grey, wet
15		16							
	75.0	19	S7	100/0"	0/0	1		19.0	REMARK 1: Split spoon and auger refusal at depth of 19 feet on possible boulder or rock. S7 - No Recovery Bottom of borehole at 19.0 feet. Backfilled borehole with drill cuttings.
20									
	70.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

LGCI
Lahlaf Geotechnical Consulting, Inc.

BORING LOG

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PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/28/24 **DATE COMPLETED:** 10/28/24
BORING LOCATION: Near northern corner of prop. building
COORDINATES: NA
SURFACE El.: 95.0 ft. (see note 1) **TOTAL DEPTH:** 10.2 ft.
WEATHER: 50's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: NE
AT END OF DRILLING: NE
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** SG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0					Topsoil	0.7	S1 - Top 8": Topsoil
			S1	3-4-8-8 (12)	24/16		Fill	94.3	Bot. 8": Well Graded SAND (SW-SM), fine to coarse, 0-5% fines, ~5% fine subangular gravel, light brown to orange, moist
		2						2.0	
			S2	12-41-26-18 (67)	24/10			93.0	S2 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 30-35% fine to coarse subangular gravel, light brown, moist
		4							
5	90.0		S3	11-8-12-16 (20)	24/11				S3 - Silty SAND (SM), mostly fine to medium, 15-20% fines, ~10% fine to coarse subrounded gravel, light brown to orange, moist
		6				1	Sand and Gravel		REMARK 1: Auger chattering between depths of 6 to 9 feet.
			S4	26-20-22-80/2" (42)	20/0				S4 - No Recovery
		7.7							
		9							
10	85.0		S5	36-70-20/3" (90/9")	15/4				S5 - Silty SAND with Gravel (SM), mostly fine to medium, ~15% fines, 30-35% fine to coarse subangular gravel, grey, moist
		10.3				2		10.2	REMARK 2: Split spoon and auger refusal at depth of 10.2 feet on possible boulder or rock.
									Bottom of borehole at 10.2 feet. Backfilled borehole with drill cuttings.
15	80.0								
20	75.0								
25	70.0								

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

LGCI
Lahlaf Geotechnical Consulting, Inc.

BORING LOG

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PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/29/24 **DATE COMPLETED:** 10/29/24
BORING LOCATION: Near SE corner of prop. building
COORDINATES: NA
SURFACE El.: 93.0 ft. (see note 1) **TOTAL DEPTH:** 11 ft.
WEATHER: 60's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 9.0 ft. / El. 84.0 ft. based on sample moisture
AT END OF DRILLING: NE
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0					Topsoil	0.6 / 92.4	S1 - Top 8": Topsoil
			S1	3-8-10-20 (18)	24/15		Fill		Bot. 7": Well Graded SAND (SW), fine to coarse, 0-5% fines, 0-5% fine subangular gravel, light brown to orange, moist
		2				1		2.0 / 91.0	REMARK 1: Drill chattering observed from depth of 2 feet on possible boulder.
	90.0		S2	29-26-33-70/3" (59)	21/11				S2 - Silty SAND with Gravel (SM), fine to coarse, 20.5% fines, 36.9% fine to coarse subangular gravel, light brown, moist (Sieve Performed)
		3.8							
5		4	S3	15-17-36-52 (53)	24/16				S3 - Similar to S2, 25-30% fine to coarse subangular gravel, light brown to grey
		6	S4	16-29-29-39 (58)	24/11		Sand and Gravel		S4 - Silty SAND with gravel (SM), fine to coarse, 20-25% fines, 15-20% fine to coarse subangular gravel, brown, moist
	85.0	8							
		9	S5	18-82/4" (82/4")	10/5				S5 - Similar to S4, wet
10		9.8							
						2		11.0	REMARK 2: Split spoon and auger refusal at depth of 11 feet on possible large boulder or rock.
									Bottom of borehole at 11.0 feet. Backfilled borehole with drill cuttings.
	80.0								
15									
	75.0								
20									
	70.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

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BORING LOG

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PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/29/24 **DATE COMPLETED:** 10/29/24
BORING LOCATION: Near SE corner of prop. building
COORDINATES: NA
SURFACE El.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 10.5 ft.
WEATHER: 60's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 9.0 ft. / El. 85.0 ft. based on sample moisture
AT END OF DRILLING: 9.0 ft. / El. 85.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	3-5-5-5 (10)	24/14		Topsoil	0.7	S1 - Top 9": Topsoil
		2	S2	4-4-3-3 (7)	24/3		Fill	93.3	Bot. 5": Well Graded SAND with Silt (SW-SM), fine to coarse, 10-15% fines, trace of organic soil, trace roots, dark brown, moist S2 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 10-15% fine to coarse subangular gravel, trace of organic soil, trace roots, dark brown, moist
	90.0	4				1	Buried Organic Soil	4.0 90.0 4.4 89.6	REMARK 1: Split spoon bouncing at depth of 4 feet. Borehole offset 4 feet East.
5		6	S3	10-16-22-20 (38)	24/18				S3 - Top 4": Silty SAND (SM), fine to medium, 25-30% fines, trace of organic soil, trace roots, dark brown, moist
		8	S4	21-33-24-17 (57)	24/12	2	Sand and Gravel		Bot. 14": Silty SAND (SM), fine to coarse, 15-20% fines, 20-25% fine subangular gravel, brown, moist REMARK 2: Drill chattering observed on possible boulders from depth of 6 feet. S4 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 35-40% fine to coarse subangular gravel, brown to grey, moist
	85.0	9							
		9.2	S5	100/2"	2/1				S5 - Similar to S3 Bot. 14", wet, (little to no recovery)
10		10.5	S6	100/0"	0/0	3		10.5	REMARK 3: Auger and split spoon refusal on possible boulder or rock at depth of 10.5 feet. Due to time contraint boring was terminated. S6 - No recovery Bottom of borehole at 10.5 feet. Backfilled borehole with drill cuttings.
	80.0								
15									
	75.0								
20									
	70.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

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PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/29/24 **DATE COMPLETED:** 10/29/24
BORING LOCATION: Near southern face of prop. building
COORDINATES: NA
SURFACE El.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 19.7 ft.
WEATHER: 60's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 14.0 ft. / El. 80.0 ft. based on sample moisture
AT END OF DRILLING: 18.0 ft. / El. 76.0 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0							
			S1	2-2-6-11 (8)	24/16		Topsoil	2.0	S1 - Topsoil
		2						92.0	
			S2	12-9-12-17 (21)	24/14		Fill		S2 - Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, ~15% fine to coarse subangular gravel, orange to light brown, moist (possibly reworked)
	90.0	4							
5			S3	13-19-21-18 (40)	24/15				S3 - Similar to S2
		6						6.0	
			S4	15-13-22-23 (35)	24/17			88.0	S4 - Silty SAND (SM), fine to coarse, 15-20% fines, 0-5% fine to coarse subangular gravel, brown, moist
		8							
	85.0	9							
			S5	13-22-80/3" (102/9")	15/13	1			REMARK 1: Drill chattering observed on possible boulders at depth 9 feet. S5 - Similar to S4
10		10.3							
							Sand and Gravel		
	80.0	14							
			S6	14-17-26-35 (43)	24/21				S6 - Similar to S4, wet
15		16							
	75.0	19						19.0	
			S7	22-80/3" (80/3")	9/4		Weathered Rock	75.0 19.7	S7 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 35-40% fine to coarse subangular gravel, trace of weathered rock, black to brown, wet
20		19.8							Bottom of borehole at 19.7 feet. Backfilled borehole with drill cuttings.
	70.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

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LGCI Lahlaf Geotechnical Consulting, Inc.

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/29/24 **DATE COMPLETED:** 10/29/24
BORING LOCATION: Near SW corner of prop. building
COORDINATES: NA
SURFACE El.: 92.0 ft. (see note 1) **TOTAL DEPTH:** 20.2 ft.
WEATHER: 50's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 10.0 ft. / El. 82.0 ft. based on sample moisture
AT END OF DRILLING: 10.5 ft. / El. 81.5 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	2-3-7-9 (10)	24/14		Topsoil	0.9	S1 - Top 11": Topsoil
	90.0	2	S2	8-7-10-10 (17)	24/0		Fill	91.1	Bot. 3": Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, ~10% fines, 20-25% fine to coarse subangular gravel, brown, moist S2 - No recovery
5		4	S3	14-10-5-6 (15)	24/0				S3 - No recovery
	85.0	6	S4	17-17-23-24 (40)	24/4		Buried Organic Soil	6.0 86.0	S4 - Silty SAND (SM), fine to medium, 25-30% fines, 0-5% fine to coarse subangular gravel, trace of organic soil, dark brown to black, moist
		8	S5	11-11-12-11 (23)	24/16			8.0 84.0	S5 - Poorly Graded SAND with Silt (SP-SM), fine to medium, ~10% fines, grey, moist
10		10	S6	7-10-15-15 (25)	24/15				S6 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 15-20% fine to coarse subangular gravel, brown, wet
	80.0	12							
		14	S7	9-14-12-43/3" (26)	21/12		Sand and Gravel		S7 - Similar to S6, 25-30% fine to coarse subangular gravel
15		15.8							
	75.0	19	S8	24-26-75/3" (101/9")	15/11				S8 - Silty SAND (SM), fine to coarse, 15-20% fines, ~5% fine subangular gravel, brown, wet
20		20.3						20.2	
	70.0								Bottom of borehole at 20.2 feet. Backfilled borehole with drill cuttings.
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

BORING LOG

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PAGE 1 OF 1

LGCI Lahlaf Geotechnical Consulting, Inc.

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/28/24 **DATE COMPLETED:** 10/28/24
BORING LOCATION: Near center of prop. building
COORDINATES: NA
SURFACE El.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 19.8 ft.
WEATHER: 50's / Cloudy
GROUNDWATER LEVELS:
DURING DRILLING: 9.0 ft. / El. 85.0 ft. Based on sample moisture
AT END OF DRILLING: 16.5 ft. / El. 77.5 ft.
OTHER: -

DRILLING SUBCONTRACTOR: Soil X, Corp.
DRILLING FOREMAN: Edwin Fajardo
DRILLING METHOD: Hollow Stem Auger (4-1/4" I.D.)
DRILL RIG TYPE/MODEL: Diedrich D-70 Turbo ATV
HAMMER TYPE: Automatic
HAMMER WEIGHT: 140 lb. **HAMMER DROP:** 30 in.
SPLIT SPOON DIA.: 1.375 in. I.D., 2 in. O.D.
CORE BARREL SIZE: NA
LOGGED BY: BH **CHECKED BY:** SG

Depth (ft.)	El. (ft.)	Sample Interval (ft.)	Sample Number	Blow Counts (N Value)	Pen./Rec. (in.)	Remark	Strata	Depth El.(ft.)	Material Description
		0	S1	4-5-6-11 (11)	24/20		Fill	0.7 93.3	S1 - Top 9": Silty SAND (SM), fine, 25-30% fines, trace of roots, brown, moist Mid. 10": Silty SAND (SM), fine to medium, 30-35% fines, 0-5% fine subangular gravel, trace of organic soil, trace of roots, black, moist
		2	S2	8-6-8-8 (14)	24/16		Subsoil		Bot. 1": Silty SAND with Gravel (SM), fine to coarse, ~15% fines, ~15% fine to coarse subangular gravel, trace of organic soil, orange, moist S2 - Top 10": Silty SAND (SM), fine, 25-30% fines, ~5% fine subangular gravel, brown, moist
	90.0	4						4.0 90.0	Bot. 6": Silty SAND (SM), fine to coarse, 15-20% fines, 5-10% fine to coarse subangular gravel, light brown, moist
5			S3	12-18-25-24 (43)	24/15				S3 - Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, ~30% fine to coarse subangular gravel, light brown, moist
		6	S4	24-21-23-29 (44)	24/18				S4 - Similar to S3, ~15% fine subangular gravel
		8							
	85.0	9	S5	18-82	12/8				S5 - Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 15-20% fine to coarse subangular gravel, grey to olive, wet
10		10					Sand and Gravel		
	80.0	14	S6	20-25-25-45 (50)	24/14				S6 - Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, 10-15% fines, 25-30% fine to coarse subangular gravel, olive to grey, wet
15		16							
	75.0	19	S7	10-95/4" (95/4")	10/8				S7 - Similar to S6
20		19.8				1		19.8	REMARK 1: Split spoon refusal at depth of 19.8 feet on possible boulder or rock. Bottom of borehole at 19.8 feet. Backfilled borehole with drill cuttings.
	70.0								
25									

GENERAL NOTES:

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

Appendix B – LGCI's Test Pit Logs

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TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/30/24 **DATE COMPLETED:** 10/30/24
TEST PIT LOCATION: Near western face of prop. school
COORDINATES: NA
SURFACE EL.: 92.0 ft. (see note 1) **TOTAL DEPTH:** 11 ft.
GROUNDWATER LEVELS:
▽ **DURING EXCAVATION:** NE
▼ **AT END OF EXCAVATION:** 9.5 ft. / El. 82.5 ft.

EXCAVATION SUBCONTRACTOR: Wilmington DPW
EXCAVATION FOREMAN: Sean Moon
EXCAVATOR TYPE/MODEL: Volvo EWR150E
WEATHER: 60's / Cloudy
TEST PIT DIMENSIONS: 9' X 6'
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth / El. (ft.)	Material Description
		E		Topsoil	1.5 / 90.5	0 ft. - 1.5 ft.: Topsoil
		M				
	90.0	M		Fill		1.5 ft. - 5 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 10-15% fines, 10-15% fine to coarse subangular gravel, trace of organic soil, trace of roots, brown, moist (cobbles up to 12 inches make up 5-10% of stockpile)
2.5		D				
	87.5					
5.0			1			5 ft. - 7 ft.: Silty SAND with Gravel (SM), mostly fine to medium, 27% fines, 14.1% fine subangular gravel, brown, moist (Sieve Performed) REMARK 1: Double ring infiltrometer test performed at depth of 5 feet beneath the ground surface.
		D				
	85.0				7.0 / 85.0	
7.5		D		Swamp Deposits		7 ft. - 10 ft.: Silty SAND with Gravel (SM), fine to medium, 20-25% fines, 10-15% fine to coarse subangular gravel, trace of organic soil, trace of roots, trace of organic odor, grey, moist to wet
	82.5					▼
10.0					10.0 / 82.0	
		D		Sand		10 ft. - 11 ft.: Poorly Graded SAND (SP), fine to medium, 0-5% fines, grey, wet
			2		11.0	REMARK 2: Test pit terminated due to excavator refusal at depth of 11 feet on possible boulder or rock. Bottom of test pit at 11.0 feet. Backfilled test pit with excavated material in 12 inch lifts and tamped with excavator.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

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Lahlaf Geotechnical Consulting, Inc.

TEST PIT LOG

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PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/30/24 **DATE COMPLETED:** 10/30/24
TEST PIT LOCATION: Near southern face of proposed school
COORDINATES: NA
SURFACE EL.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: NE
AT END OF EXCAVATION: NE

EXCAVATION SUBCONTRACTOR: Wilmington DPW
EXCAVATION FOREMAN: Sean Moon
EXCAVATOR TYPE/MODEL: Volvo EWR150E
WEATHER: 60's / Cloudy
TEST PIT DIMENSIONS: 10' X 7'
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Topsoil	0.7	0 ft. - 0.7 ft.: Topsoil
	92.5	E		Fill	93.3	0.7 ft. - 4 ft.: Well Graded SAND (SW), fine to coarse, 5-10% fines, ~10% fine to coarse subangular gravel, trace of roots, trace of organic soil, brown to orange, moist
2.5						
	90.0		1			
		M	2			4 ft. - 5.5 ft.: Silty SAND (SM), mostly fine to medium, 15.9% fines, 6.8% mostly fine subangular gravel, brown to orange, moist (Sieve Performed) REMARK 1: Double ring infiltrometer test performed at depth of 4 feet beneath the ground surface. REMARK 2: Unmarked cast iron pipe encuntered near the southwestern corner of the test pit, excavator bucket pulled and bent pipe. Pipe does not appear to be broken. DPW indicated that they are not aware of utilties at this location.
5.0					5.5	
	87.5	M		Sand and Gravel	88.5	5.5 ft. - 9 ft.: Well Graded SAND (SW), fine to coarse, 0-5% fines, 10-15% fine to coarse subangular gravel, light brown, moist
7.5						
	85.0				9.0	Bottom of test pit at 9.0 feet. Backfilled test pit with excavated material in 12 inch lifts and tamped with excavator.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

LGCI
Lahlaf Geotechnical Consulting, Inc.

TEST PIT LOG

TP-2A
PAGE 1 OF 1

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/30/24 **DATE COMPLETED:** 10/30/24
TEST PIT LOCATION: Near southern face of prop. school
COORDINATES: NA
SURFACE EL.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 11.3 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: NE
AT END OF EXCAVATION: 9.5 ft. / El. 84.5 ft.

EXCAVATION SUBCONTRACTOR: Wilmington DPW
EXCAVATION FOREMAN: Sean Moon
EXCAVATOR TYPE/MODEL: Volvo EWR150E
WEATHER: 60's / Cloudy
TEST PIT DIMENSIONS: 10' X 3'
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
	92.5	E		Topsoil	1.5 92.5	0 ft. - 1.5 ft.: Topsoil
2.5		E		Fill		1.5 ft. - 7 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, 15-20% fine to coarse subangular gravel, trace of roots, trace of organic soil, brown to orange, moist
	90.0					
5.0		M				
	87.5				7.0 87.0	
7.5				Sand and Gravel		7 ft. - 11.3 ft.: Well Graded SAND (SW), fine to coarse, 0-5% fines, 10-15% fine to coarse subangular gravel, light brown, moist (wet after 9.5 feet)
	85.0	M				
10.0						
		V	1		11.3	REMARK 1: Test pit terminated due to excavator refusal at depth of 11.3 feet on possible boulder or rock.
						Bottom of test pit at 11.3 feet. Backfilled test pit with excavated material in 12 inch lifts and tamped with excavator.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

TEST PIT LOG

TP-3
PAGE 1 OF 1

LGCI Lahlaf Geotechnical Consulting, Inc.

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/31/24 **DATE COMPLETED:** 10/31/24
TEST PIT LOCATION: Near eastern face of prop. school
COORDINATES: NA
SURFACE EL.: 94.0 ft. (see note 1) **TOTAL DEPTH:** 8 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: NE
AT END OF EXCAVATION: NE

EXCAVATION SUBCONTRACTOR: Wilmington DPW
EXCAVATION FOREMAN: Sean Moon
EXCAVATOR TYPE/MODEL: Volvo EWR150E
WEATHER: 70's / Sunny
TEST PIT DIMENSIONS: 11' X 6'
LOGGED BY: BH **CHECKED BY:** JKW

Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Topsoil	0.8	0 ft. - 0.8 ft.: Topsoil
		E		Fill	93.2	0.8 ft. - 1 ft.: Well Graded SAND (SW), fine to coarse, 0-5% fines, light brown, moist 1 ft. - 2.3 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, 15-20% fine to coarse subangular gravel, trace of organic soil, trace of roots, dark brown, moist
	92.5	E				
2.5		E		Sand and Gravel	2.3 91.7	2.3 ft. - 4 ft.: Well Graded SAND with Gravel (SW), fine to coarse, 0-5% fines, 20-25% fine to coarse subangular gravel, light brown to orange, moist
		M				
	90.0		1			4 ft. - 8 ft.: Poorly Graded SAND with Gravel (SP), mostly medium to coarse, 1.5% fines, 31.4% fine to coarse subangular gravel, light brown to orange, moist (Sieve Performed) REMARK 1: Double ring infiltrometer test performed at depth of 4 feet beneath the ground surface.
5.0		M				
	87.5	D				
7.5		V			8.0	
			2			REMARK 2: Test pit terminated due to excavator refusal at depth of 8 feet on possible boulder or rock. Bottom of test pit at 8.0 feet. Backfilled test pit with excavated material in 12 inch lifts and tamped with excavator.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

LGCI
Lahlaf Geotechnical Consulting, Inc.

TEST PIT LOG

TP-4

CLIENT: Dore and Whittier Architects, Inc.
PROJECT NAME: Proposed Wildwood Early Childhood Center
LGCI PROJECT NUMBER: 2437
PROJECT LOCATION: Wilmington, MA

DATE STARTED: 10/31/24 **DATE COMPLETED:** 10/31/24
TEST PIT LOCATION: Near eastern face of exisitng school
COORDINATES: NA
SURFACE EL.: 95.0 ft. (see note 1) **TOTAL DEPTH:** 9 ft.
GROUNDWATER LEVELS:
DURING EXCAVATION: NE
AT END OF EXCAVATION: NE

EXCAVATION SUBCONTRACTOR: Wilmington DPW
EXCAVATION FOREMAN: Sean Moon
EXCAVATOR TYPE/MODEL: Volvo EWR150E
WEATHER: 70's / Sunny
TEST PIT DIMENSIONS: 10' X 6'
LOGGED BY: BH **CHECKED BY:** JKW

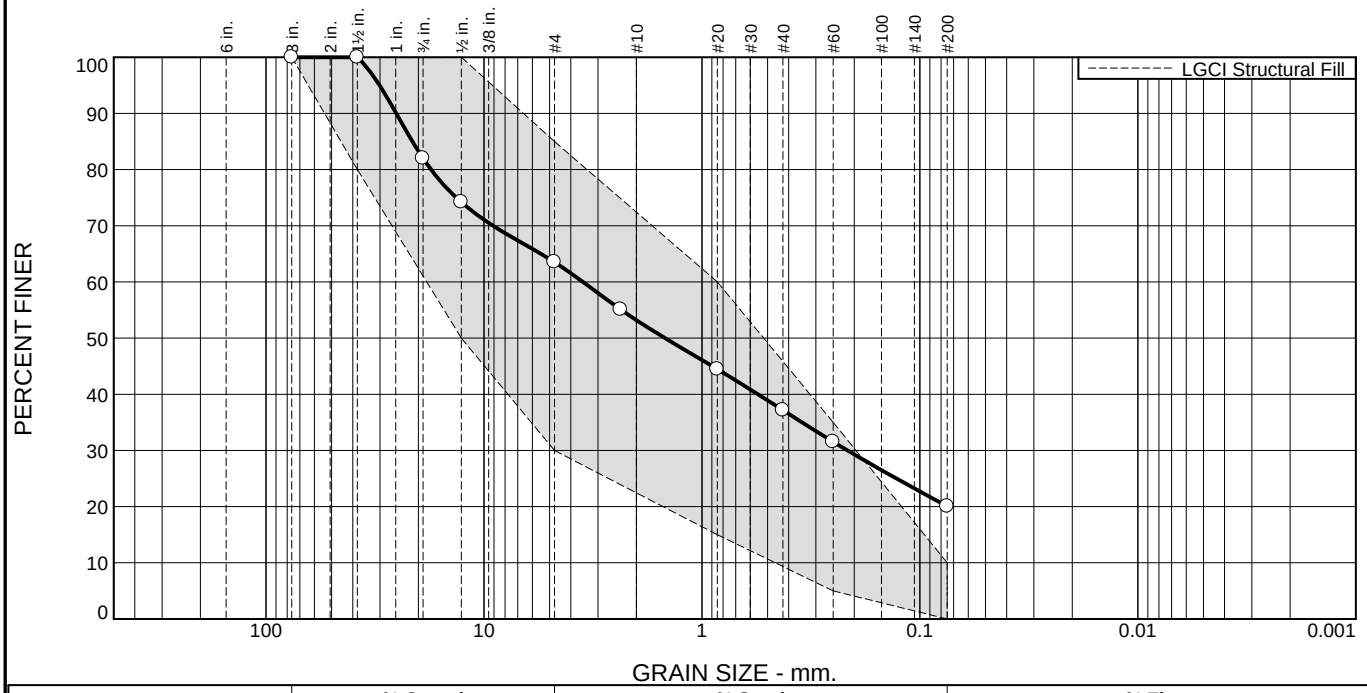
Depth (ft)	El. (ft)	Excavation Effort	Remark	Strata	Depth El.(ft.)	Material Description
		E		Topsoil	1.0	0 ft. - 1 ft.: Topsoil
		E		Fill	94.0 2.0	1 ft. - 2 ft.: Poorly Graded SAND with Silt (SP-SM), fine to medium, trace coarse, 5-10% fines, 0-5% fine to coarse subangular gravel, light brown, moist
2.5	92.5	E		Subsoil	93.0 3.2	2 ft. - 3.2 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, 0-5% fine to coarse subangular gravel, trace of organic soil, trace of roots, orange, moist
		E		Sand and Gravel	91.8	3.2 ft. - 4.6 ft.: Well Graded SAND (SW), fine to coarse, 0-5% fines, 0-5% fine subangular gravel, light brown to orange, moist
		M	1			
5.0	90.0	M				4.6 ft. - 9 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly fine to medium, 11% fines, 30.4% fine to coarse subangular gravel, brown to orange, moist (Sieve Performed) REMARK 1: Double ring infiltrometer test performed at depth of 4.6 feet beneath the ground surface.
		D				
7.5	87.5	V				
			2		9.0	REMARK 2: Test pit terminated due to excavator refusal at depth of 9 feet on possible boulder or rock. Bottom of test pit at 9.0 feet. Backfilled test pit with excavated material in 12 inch lifts and tamped with excavator.

GENERAL COMMENTS: **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest foot from drawing titled "Existing Conditions Plan 320 Salem Street Wilmington, Massachusetts," prepared by Dore AND Whittier 212 Battery Street, Burlington, VT 05401, dated October 24, 2024, and provided to LGCI by Dore and Whittier Architects, Inc. via e-mail on November 08, 2024.

Appendix C – Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.0	18.5	10.3	16.0	17.2	20.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1 1/2"	100.0	80.0 - 100.0	
3/4"	82.0		
1/2"	74.2	50.0 - 100.0	
#4	63.5	30.0 - 85.0	
#8	55.1		
#20	44.5	15.0 - 60.0	
#40	37.2		
#60	31.5	5.0 - 35.0	
#200	20.0	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM) , fine to coarse, 20% fines, 36.5% fine to coarse subangular gravel, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 25.2612 D_{85}= 21.2913 D_{60}= 3.5169
D_{50}= 1.4776 D_{30}= 0.2147 D_{15}=
D_{10}= C_u= C_c=

Remarks

Fill Sample.

Date Received: 10/28/24 **Date Tested:** 10/31/24

Tested By: LC

Checked By: JKW

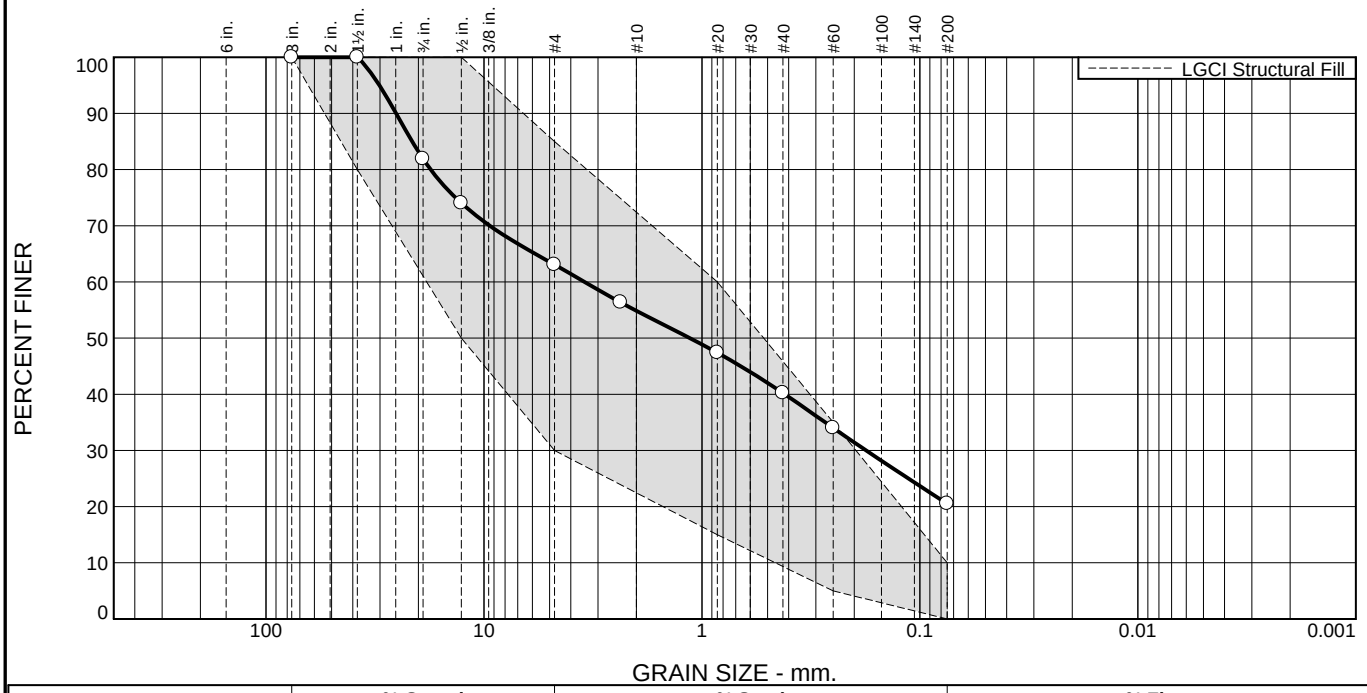
Location: B-1
Sample Number: S2 **Depth:** 2'-4'

Date Sampled: 10/28/24

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Dore and Whittier Architects, Inc.
Project: Proposed Wildwood Early Childhood Center
Wilmington, MA
Project No: 2437 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	18.1	18.8	8.2	14.7	19.7	20.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1 1/2"	100.0	80.0 - 100.0	
3/4"	81.9		
1/2"	74.0	50.0 - 100.0	
#4	63.1	30.0 - 85.0	
#8	56.4		
#20	47.4	15.0 - 60.0	
#40	40.2		
#60	34.0	5.0 - 35.0	
#200	20.5	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM) , fine to coarse, 20.5% fines, 36.9% fine to coarse subangular gravel, light brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 25.3090 D_{85}= 21.3513 D_{60}= 3.4571
D_{50}= 1.1367 D_{30}= 0.1765 D_{15}=
D_{10}= C_u= C_c=

Remarks

Sand and Gravel Sample.

Date Received: 10/29/24 **Date Tested:** 10/31/24

Tested By: LC

Checked By: JKW

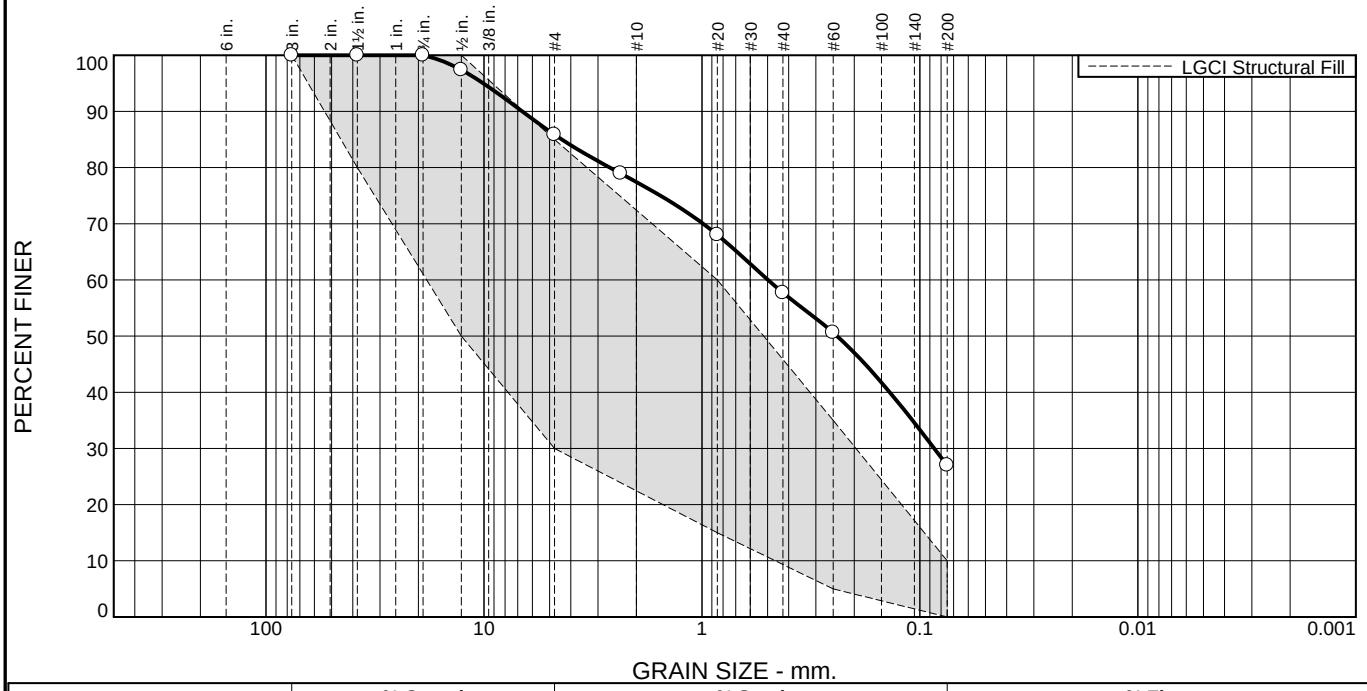
Location: B-4
Sample Number: S2 **Depth:** 2'-4'

Date Sampled: 10/29/24

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Dore and Whittier Architects, Inc.
Project: Proposed Wildwood Early Childhood Center
Wilmington, MA
Project No: 2437 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	14.1	8.5	19.7	30.7	27.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1 1/2"	100.0	80.0 - 100.0	
3/4"	100.0		
1/2"	97.4	50.0 - 100.0	
#4	85.9	30.0 - 85.0	X
#8	79.0		
#20	68.0	15.0 - 60.0	X
#40	57.7		
#60	50.6	5.0 - 35.0	X
#200	27.0	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Silty SAND with Silt and Gravel (SM), mostly fine to medium, 27% fines, 14.1% fine subangular gravel, brown

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 6.6746 D_{85}= 4.3959 D_{60}= 0.4977
D_{50}= 0.2399 D_{30}= 0.0859 D_{15}=
D_{10}= C_u= C_c=

Remarks

Fill Sample.
Infiltrometer Test.

Date Received: 10/30/24 **Date Tested:** 10/31/24

Tested By: LC

Checked By: SG

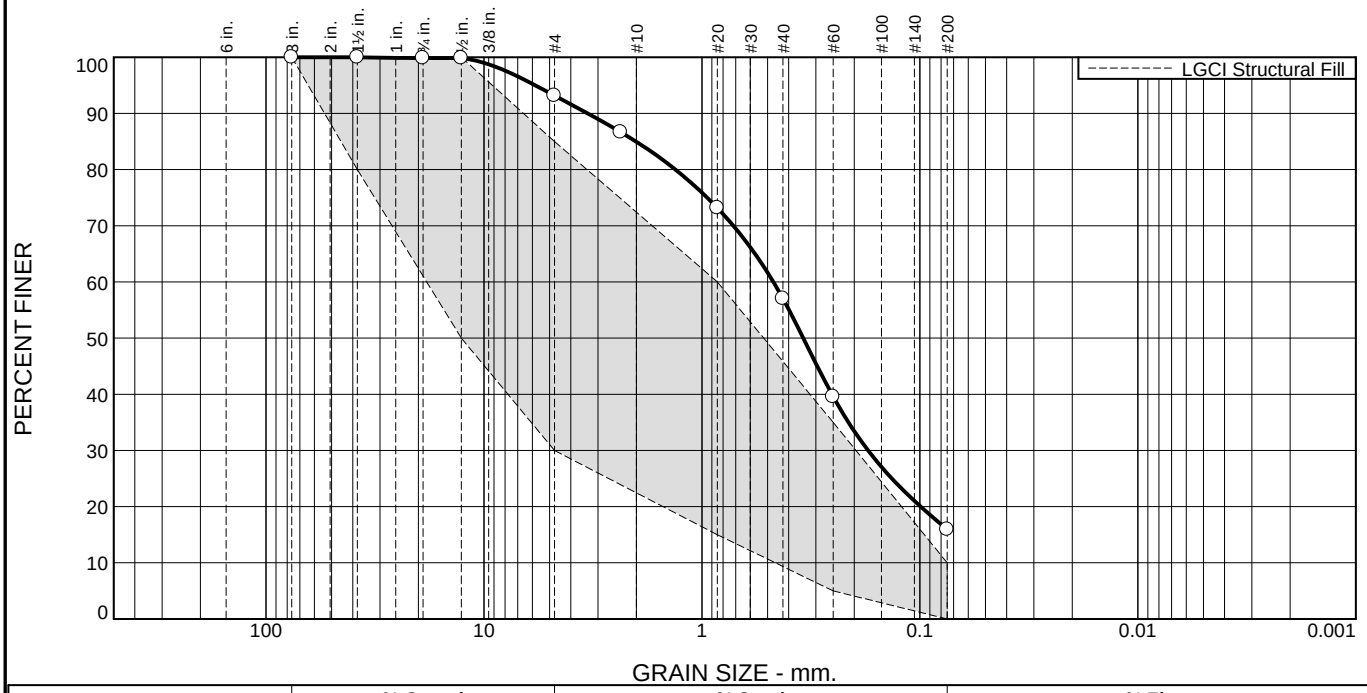
Location: TP-1
Sample Number: Infiltrometer **Depth:** 5'

Date Sampled: 10/30/24

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Dore and Whittier Architects, Inc.
Project: Proposed Wildwood Early Childhood Center
Wilmington, MA
Project No: 2437 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.2	6.6	8.2	28.0	41.1	15.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1 1/2"	100.0	80.0 - 100.0	
3/4'	99.8		
1/2"	99.8	50.0 - 100.0	
#4	93.2	30.0 - 85.0	X
#8	86.7		
#20	73.2	15.0 - 60.0	X
#40	57.0		
#60	39.6	5.0 - 35.0	X
#200	15.9	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Silty SAND (SM), mostly fine to medium, 15.9% fines, 6.8% mostly fine subangular gravel, brown to orange

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 3.3438 D_{85}= 2.0080 D_{60}= 0.4704
D_{50}= 0.3428 D_{30}= 0.1729 D_{15}=
D_{10}= C_u= C_c=

Remarks

Fill Sample.
Infiltrometer Test.

Date Received: 10/30/24 **Date Tested:** 10/31/24

Tested By: LC

Checked By: SG

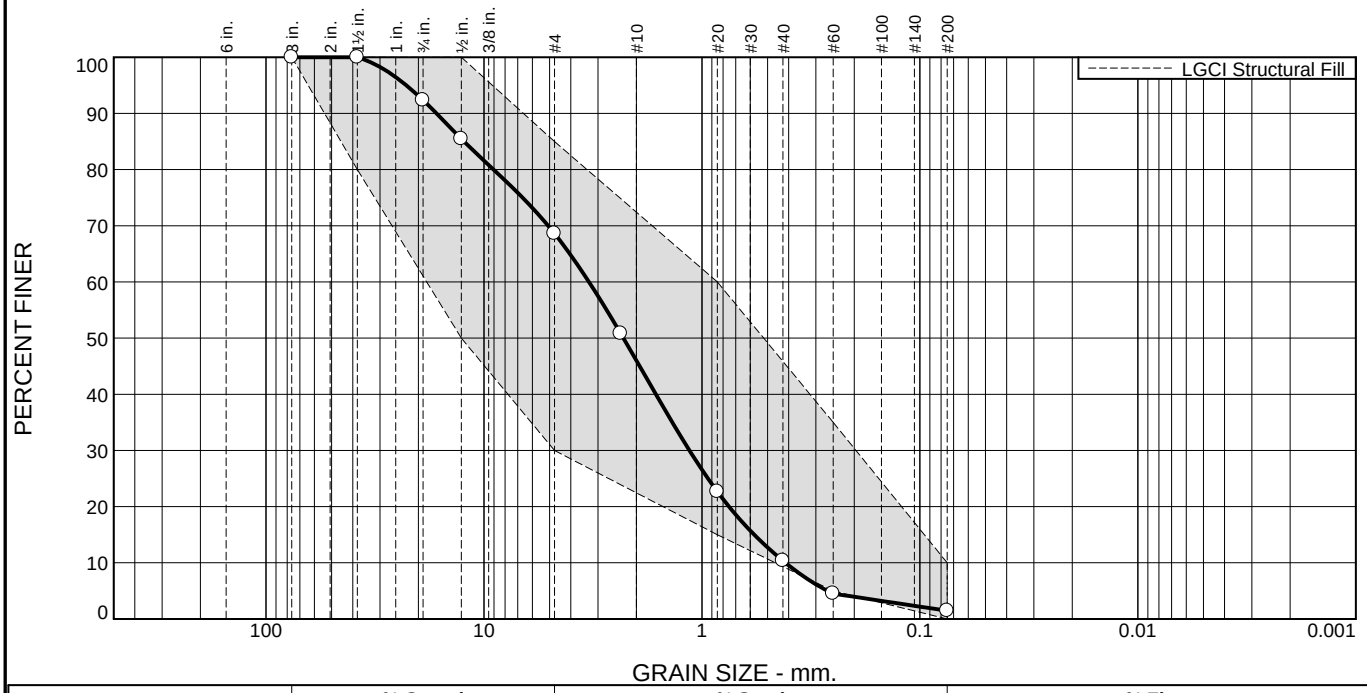
Location: TP-2
Sample Number: Infiltrometer **Depth:** 4'

Date Sampled: 10/30/24

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Dore and Whittier Architects, Inc.
Project: Proposed Wildwood Early Childhood Center
Wilmington, MA
Project No: 2437 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.6	23.8	22.6	35.6	8.9	1.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1 1/2"	100.0	80.0 - 100.0	
3/4"	92.4		
1/2"	85.5	50.0 - 100.0	
#4	68.6	30.0 - 85.0	
#8	50.8		
#20	22.7	15.0 - 60.0	
#40	10.4		
#60	4.5	5.0 - 35.0	X
#200	1.5	0.0 - 10.0	

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Poorly Graded SAND with Gravel (SP), fine to coarse, 1.5% fines, 31.4% fine to coarse subangular gravel, light brown to orange

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= SP **AASHTO (M 145)=**

Coefficients

D_{90}= 16.5194 D_{85}= 12.3470 D_{60}= 3.2999
D_{50}= 2.2934 D_{30}= 1.1409 D_{15}= 0.5758
D_{10}= 0.4140 C_u= 7.97 C_c= 0.95

Remarks

Sand and Gravel Sample.
Infiltrometer Test.

Date Received: 10/31/24 **Date Tested:** 10/31/24

Tested By: LC

Checked By: SG

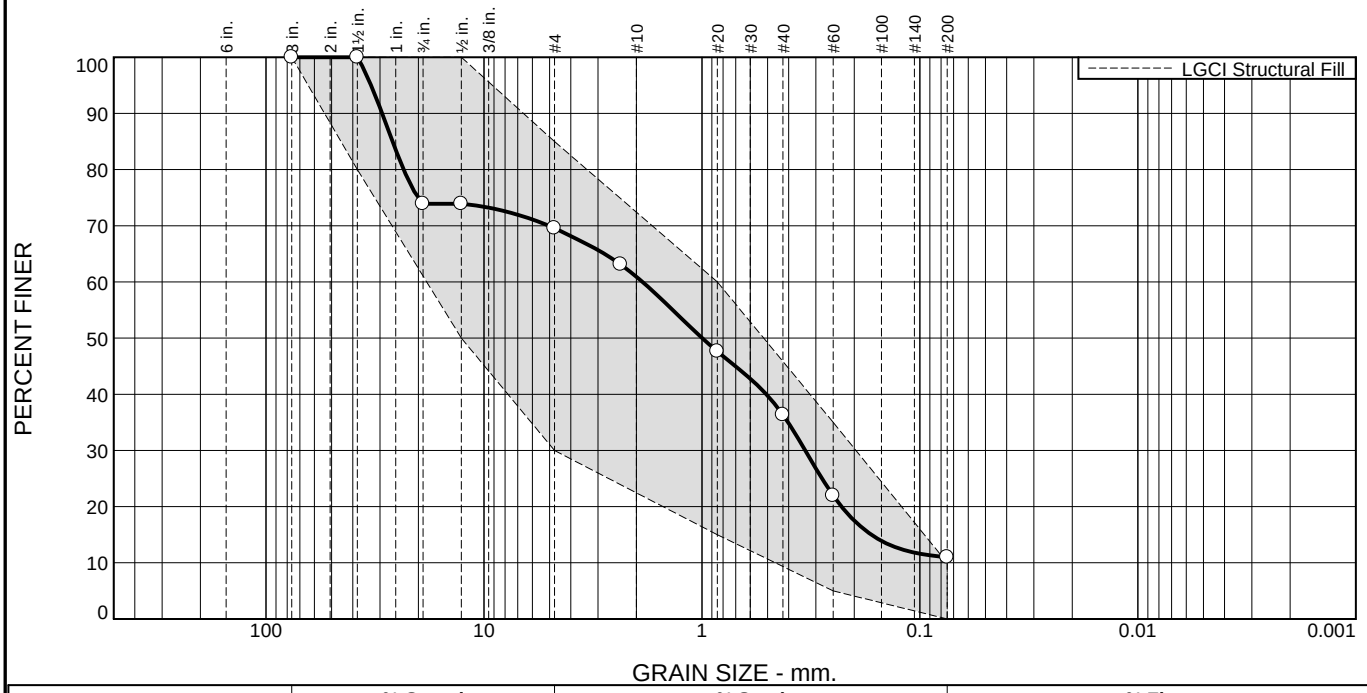
Location: TP-3
Sample Number: Infiltrometer **Depth:** 4'

Date Sampled: 10/31/24

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Dore and Whittier Architects, Inc.
Project: Proposed Wildwood Early Childhood Center
Wilmington, MA
Project No: 2437 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	26.1	4.3	8.7	24.6	25.3	11.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0	100.0	
1 1/2"	100.0	80.0 - 100.0	
3/4"	73.9		
1/2"	73.9	50.0 - 100.0	
#4	69.6	30.0 - 85.0	
#8	63.1		
#20	47.6	15.0 - 60.0	
#40	36.3		
#60	22.0	5.0 - 35.0	
#200	11.0	0.0 - 10.0	X

* LGCI Structural Fill

Material Description

ASTM (D 2488) Classification: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly fine to medium, 11% fines, 30.4% fine to coarse subangular gravel, brown to orange

Atterberg Limits (ASTM D 4318)

PL= **LL=** **PI=**

Classification

USCS (D 2487)= **AASHTO (M 145)=**

Coefficients

D_{90}= 29.3481 D_{85}= 26.2822 D_{60}= 1.8746
D_{50}= 0.9972 D_{30}= 0.3357 D_{15}= 0.1671
D_{10}= C_u= C_c=

Remarks

Sand and Gravel Sample.
Infiltrometer Test.

Date Received: 10/31/24 **Date Tested:** 10/31/24

Tested By: LC

Checked By: SG

Location: TP-4
Sample Number: Infiltrometer **Depth:** 4.6'

Date Sampled: 10/31/24

LGCI
Lahlaf Geotechnical Consulting, Inc.

Client: Dore and Whittier Architects, Inc.
Project: Proposed Wildwood Early Childhood Center
Wilmington, MA
Project No: 2437 **Figure**

Appendix D – Results of Double Ring Infiltrometer Tests

LGCI
Lahlaf Geotechnical Consulting, Inc.

Double Ring Infiltrometer Test

Project: Name: Proposed Wilmington School, 320 Salem Street
Location: Wilmington, MA
LGCI Project Number: 2437

Test Location: TP-1

Test Procedure: General accordance with ASTM D 3385

Test Date 10/30/2024

LGCI Representative: BH

Weather Conditions: 60's / Cloudy

Test Depth: 5 feet

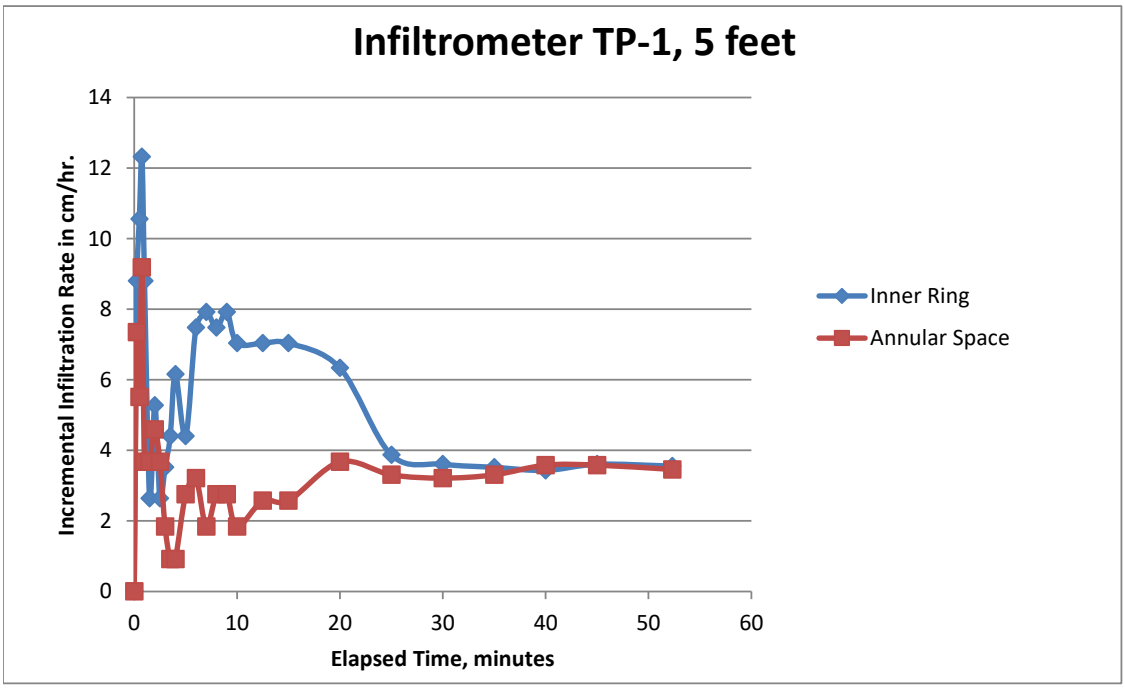
Groundwater Depth: 9.5 ft. / El. 82.5 ft. at the end of excavation

Soil Stratum: ASTM (D 2488) Classification: Silty SAND with Silt and Gravel (SM), mostly fine to medium, 27% fines, 14.1% fine gravel, brown

	Inner Ring	Annular Space
Area (sq. cm)	730	2189
Depth Driven (in)	3	3
Water Depth (in)	3	3
Mariotte tube (cc/div.)	53.52	167.53

Elapsed Time	Time Increment	Inner Ring			Annular Space		
		Reading	Volume	Infiltration Rate	Reading	Volume	Infiltration Rate
(min)	(min)	(div)	(cc)	(cm/hr.)	(div)	(cc)	(cm/hr.)
0	0	56.3	0	0	57.2	0	0
0.25	0.25	55.8	27	8.8	56.8	67	7.3
0.5	0.25	55.2	32	10.6	56.5	50	5.5
0.75	0.25	54.5	37	12.3	56.0	84	9.2
1	0.25	54.0	27	8.8	55.8	34	3.7
1.5	0.5	53.7	16	2.6	55.4	67	3.7
2	0.5	53.1	32	5.3	54.9	84	4.6
2.5	0.5	52.8	16	2.6	54.5	67	3.7
3	0.5	52.4	21	3.5	54.3	34	1.8
3.5	0.5	51.9	27	4.4	54.2	17	0.9
4	0.5	51.2	37	6.2	54.1	17	0.9
5	1	50.2	54	4.4	53.5	101	2.8
6	1	48.5	91	7.5	52.8	117	3.2
7	1	46.7	96	7.9	52.4	67	1.8
8	1	45.0	91	7.5	51.8	101	2.8
9	1	43.2	96	7.9	51.2	101	2.8
10	1	41.6	86	7.0	50.8	67	1.8
12.5	2.5	37.6	214	7.0	49.4	235	2.6
15	2.5	33.6	214	7.0	48.0	235	2.6
20	5	26.4	385	6.3	44.0	670	3.7
25	5	22.0	235	3.9	40.4	603	3.3
30	5	17.9	219	3.6	36.9	586	3.2
35	5	13.9	214	3.5	33.3	603	3.3
40	5	10.0	209	3.4	29.4	653	3.6
45	5	5.9	219	3.6	25.5	653	3.6
52.3	7.3	0.0	316	3.6	20.0	921	3.5

Notes:



Estimated K = 1.00E-03 cm/sec

LGCI
Lahlaf Geotechnical Consulting, Inc.

Double Ring Infiltrometer Test

Project: Name: Proposed Wilmington School, 320 Salem Street
Location: Wilmington, MA
LGCI Project Number: 2437

Test Location: TP-2

Test Procedure: General accordance with ASTM D 3385

Test Date 10/30/2024

LGCI Representative: BH

Weather Conditions: 60's / Cloudy

Test Depth: 4 feet

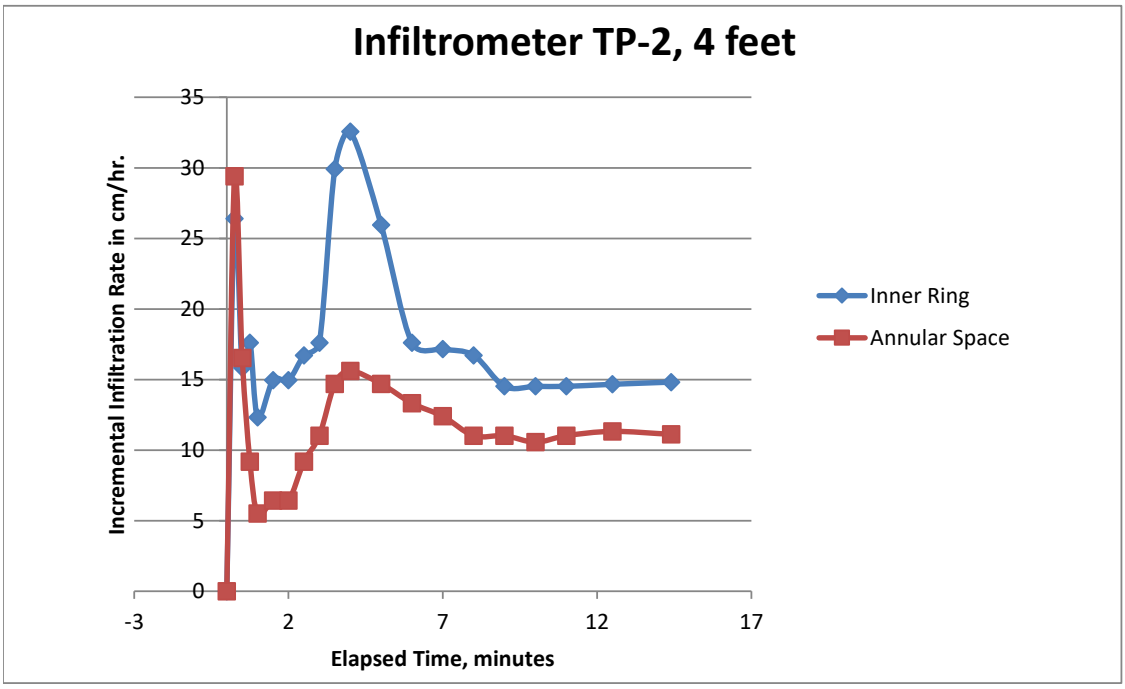
Groundwater Depth: Not Encountered

Soil Stratum: ASTM (D 2488) Classification: Silty SAND (SM), moslty fine to medium, 15.9% fines, 6.8% mostly fine subangular gravel, brown to orange

	Inner Ring	Annular Space
Area (sq. cm)	730	2189
Depth Driven (in)	3	3
Water Depth (in)	3	3
Mariotte tube (cc/div.)	53.52	167.53

Elapsed Time	Time Increment	Inner Ring			Annular Space		
		Reading	Volume	Infiltration Rate	Reading	Volume	Infiltration Rate
(min)	(min)	(div)	(cc)	(cm/hr.)	(div)	(cc)	(cm/hr.)
0	0	57.4	0	0	57.5	0	0
0.25	0.25	55.9	80	26.4	55.9	268	29.4
0.5	0.25	55.0	48	15.8	55.0	151	16.5
0.75	0.25	54.0	54	17.6	54.5	84	9.2
1	0.25	53.3	37	12.3	54.2	50	5.5
1.5	0.5	51.6	91	15.0	53.5	117	6.4
2	0.5	49.9	91	15.0	52.8	117	6.4
2.5	0.5	48.0	102	16.7	51.8	168	9.2
3	0.5	46.0	107	17.6	50.6	201	11.0
3.5	0.5	42.6	182	29.9	49.0	268	14.7
4	0.5	38.9	198	32.6	47.3	285	15.6
5	1	33.0	316	26.0	44.1	536	14.7
6	1	29.0	214	17.6	41.2	486	13.3
7	1	25.1	209	17.2	38.5	452	12.4
8	1	21.3	203	16.7	36.1	402	11.0
9	1	18.0	177	14.5	33.7	402	11.0
10	1	14.7	177	14.5	31.4	385	10.6
11	1	11.4	177	14.5	29.0	402	11.0
12.5	1.5	6.4	268	14.7	25.3	620	11.3
14.4	1.9	0.0	343	14.8	20.7	771	11.1

Notes:



Estimated K = 4.06E-03 cm/sec

LGCI
Lahlaf Geotechnical Consulting, Inc.

Double Ring Infiltrometer Test

Project: Name: Proposed Wilmington School, 320 Salem Street
Location: Wilmington, MA
LGCI Project Number: 2437

Test Location: TP-3

Test Procedure: General accordance with ASTM D 3385

Test Date 10/31/2024

LGCI Representative: BH

Weather Conditions: 60's / Cloudy

Test Depth: 4 feet

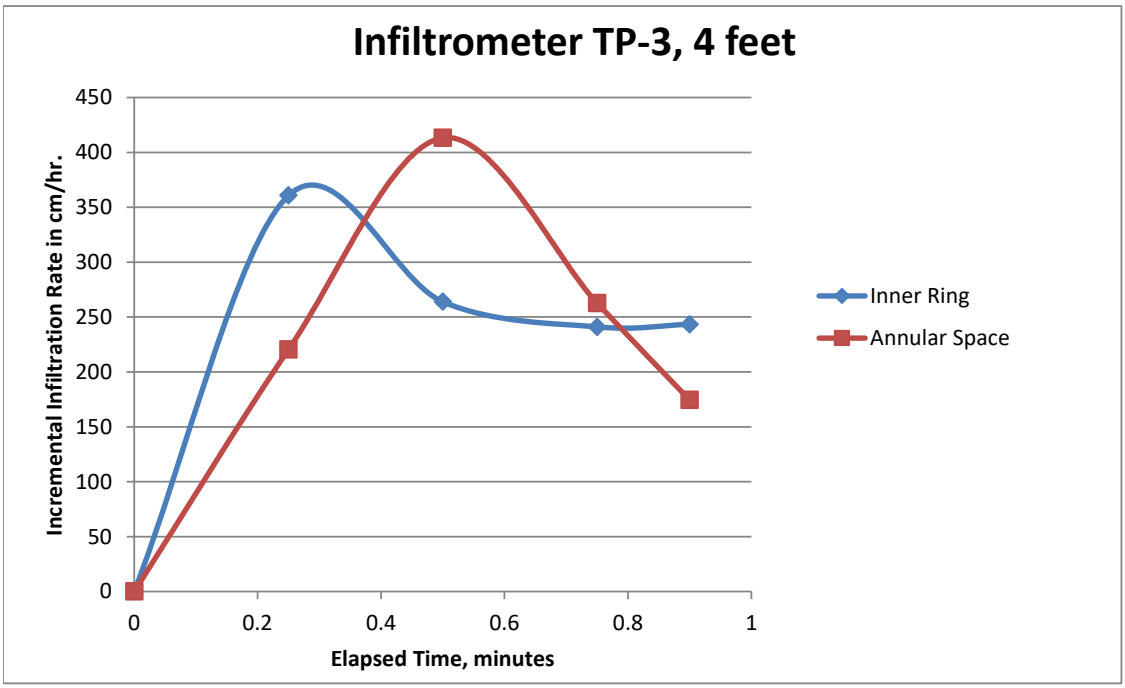
Groundwater Depth: Not Encountered

Soil Stratum: ASTM (D 2488) Classification: Poorly Graded SAND with Gravel (SP), fine to coarse, 1.5% fines, 31.4% fine to coarse subangular gravel, light brown to orange

	Inner Ring	Annular Space
Area (sq. cm)	730	2189
Depth Driven (in)	3	3
Water Depth (in)	3	3
Mariotte tube (cc/div.)	53.52	167.53

Elapsed Time	Time Increment	Inner Ring			Annular Space		
		Reading	Volume	Infiltration Rate	Reading	Volume	Infiltration Rate
(min)	(min)	(div)	(cc)	(cm/hr.)	(div)	(cc)	(cm/hr.)
0	0	57.5	0	0	57.5	0	0
0.25	0.25	37.0	1097	360.7	45.5	2010	220.4
0.5	0.25	22.0	803	263.9	23.0	3769	413.3
0.75	0.25	8.3	733	241.1	8.7	2396	262.7
0.9	0.15	0.0	444	243.4	3.0	955	174.5

Notes:



Estimated K 6.73E-02 cm/sec

LGCI
Lahlaf Geotechnical Consulting, Inc.

Double Ring Infiltrometer Test

Project: Name: Proposed Wilmington School, 320 Salem Street
Location: Wilmington, MA
LGCI Project Number: 2437

Test Location: TP-4

Test Procedure: General accordance with ASTM D 3385

Test Date 10/31/2024

LGCI Representative: BH

Weather Conditions: 60's / Cloudy

Test Depth: 4.5 feet

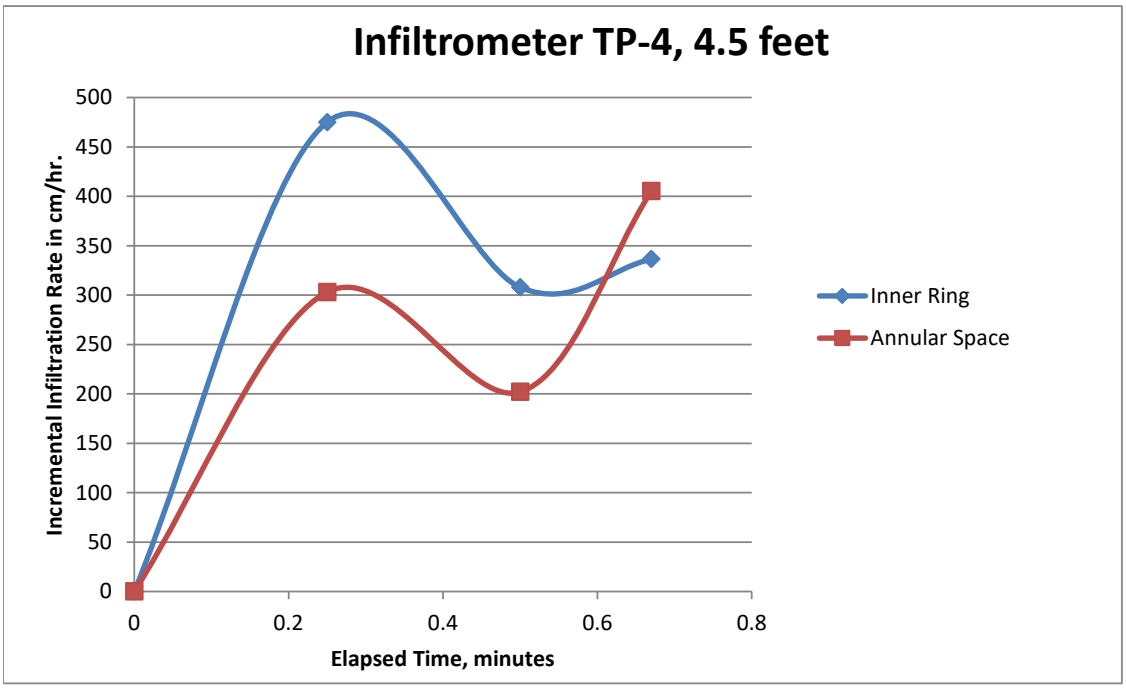
Groundwater Depth: Not Encountered

Soil Stratum: ASTM (D 2488) Classification: Poorly Graded SAND with Silt and Gravel (SP-SM), mostly fine to medium, 11% fines, 30.4% fine to coarse gravel, brown to orange

	Inner Ring	Annular Space
Area (sq. cm)	730	2189
Depth Driven (in)	3	3
Water Depth (in)	3	3
Mariotte tube (cc/div.)	53.52	167.53

Elapsed Time	Time Increment	Inner Ring			Annular Space		
		Reading	Volume	Infiltration Rate	Reading	Volume	Infiltration Rate
(min)	(min)	(div)	(cc)	(cm/hr.)	(div)	(cc)	(cm/hr.)
0	0	57.5	0	0	57.5	0	0
0.25	0.25	30.5	1445	475.1	41.0	2764	303.1
0.5	0.25	13.0	937	307.9	30.0	1843	202.0
0.67	0.17	0.0	696	336.4	15.0	2513	405.2

Notes:



Estimated K* = 8.95E-02 cm/sec

* Value may not be reliable to short time to complete test