JTC
JOHN TURNER CONSULTING

GEOTECHNICAL ▼ **ENVIRONMENTAL** ▼ RESIDENT ENGINEERING ▼ TESTING

GEOTECHNICAL INVESTIGATION REPORT

PROPOSED IMPROVEMENTS TO OVERLOOK ROAD WINDHAM, MAINE

Prepared For:

Paul Hollis
Great Lots of Maine
28 Weare Road
Seabrook, New Hampshire 03874

Prepared By:

John Turner Consulting, Inc.
73 Rainmaker Drive
Portland, Maine 04103

JTC Project No.: 17-15-020

May 24, 2017

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Prepared by:

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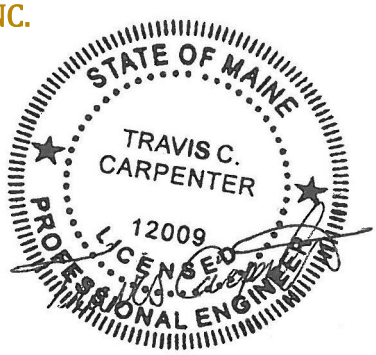


TO: Mr. Paul Hollis
Great Lots of Maine
28 Weare Road
Seabrook, New Hampshire 03874

FROM: Michael J Devoid, E.I.
Staff Geotechnical Engineer

Travis Carpenter, P.E.
Vice President – Engineering

DATE: May 24, 2017

RE: **Proposed Improvements to Overlook Road**
Windham, Maine
JTC Project No. 17-15-020

John Turner Consulting, Inc. (JTC) is pleased to present this *Geotechnical Investigation Report* for proposed improvements to the existing Overlook Road in Windham, Maine. Geotechnical explorations, laboratory testing, and engineering evaluations were conducted in general accordance with our proposed scope of services submitted to Great Lots of Maine (Paul Hollis) on March 30, 2017. Our work was authorized on April 11, 2017.

The purpose of the geotechnical investigation is to obtain information on the shallow subsurface conditions along the existing roadway; obtain bulk samples of existing base gravel, sub-base gravel, and/or subgrade materials; and provide geotechnical engineering recommendations to support the planning, design, and construction of the proposed roadway improvements. This investigation did not include an environmental assessment relative to oil, gasoline, solid waste, and/or other hazardous materials. Similarly, this investigation/evaluation did not include review of site design or construction issues such as surface water management, culvert sizing, infiltration systems, dry wells, underground utilities, protection of existing structures, retaining walls, temporary excavation support, and/or other site/temporary design issues unless specifically addressed herein. Similarly, this investigation did not include an evaluation of site grading, stormwater, and/or other site/civil design and construction related issues.

Geotechnical explorations and laboratory testing were performed in April of 2017. This report summarizes available project information, presents the geotechnical exploration and laboratory testing programs, describes the subsurface conditions encountered, and provides geotechnical engineering recommendations to support the planning, design, and construction of the proposed roadway improvements. The contents of this report are subject to the attached *Limitations*.

1.0 PROJECT INFORMATION

The following subsections provide general descriptions of the site, the regional geologic setting, and the proposed development.

1.1 Site Description

The site/property encompasses approximately 21.9 acres and is moderately to heavily wooded. An existing gravel-surfaced road, known as Overlook Road, bisects/traverses the property. Several large surface boulders were observed along the existing road. A *Concept Plan* (attached) prepared by Wayne Wood & Co. and dated March of 2017 indicates that the site has an undulating topography with several high spots and low areas throughout the site. The provided plan does not indicate specific ground surface elevations. The plan does indicate several existing wetland areas, some of which are immediately adjacent to the existing roadway.

1.2 Regional Geologic Setting

JTC's review of the "Surficial Geologic Map of the Cumberland Center Quadrangle and North Windham Quadrangle, Cumberland County, Maine" (Maine Geological Survey) indicates that the native site soils (i.e., subgrade) will likely consist of Glacial Till described as a loose to moderately compact, poorly-sorted, mixture of silt, sand, gravel, cobbles, and boulders that was deposited by glacial ice. The map indicates that the Glacial Till is generally less than 10 feet thick in this area.

1.3 Proposed Development

JTC understands that a new 17-unit subdivision is planned along Overlook Road (see attached *Concept Plan*). As such, roadway improvements are being considered/planned. We understand that the proposed improvements to Outlook Road will begin at Albion Road and extend just over 1700 linear feet to Joes Road. The provided plan(s) do not indicate proposed grading; however, JTC has assumed that the road will follow existing alignment and grade/topography as much as possible such that cuts and fills will be limited to about 2 feet each.

JTC understands that the intent is to improve/upgrade the existing road to meet the Town of Windham's Standards for a "Major Private Road", as defined by the Town's "Land Use Chapter 140 Requirements; Appendix B, Street Design and Construction Standards", and to install underground utilities along/within the roadway. The Standards require a Major Private Roadway to have a 20-foot wide (min) paved travel way, 2-foot wide primary shoulders (paved), and 2-foot wide secondary shoulders (gravel). The Standards require the following "road box"/cross-section:

- 1.5 inches Bituminous Surface Course (MDOT HMA 9.5 mm);
- 2.5 inches Bituminous Base Course (MDOT HMA 19.0 mm);
- 3.0 inches Crushed Gravel Base (MDOT 703.06 Type A); and
- 21.0 inches Gravel Subbase (MDOT 703.06 Type D).

Site/civil design and construction requirements pertaining to minimum/maximum roadway slopes, sight lines, turning radii, curbing, ditching, and drainage/stormwater management should be evaluated and incorporated into the design of the proposed improvements by a civil engineer.

2.0 GEOTECHNICAL EXPLORATIONS & LABORATORY TESTING

The primary components of the geotechnical exploration and laboratory testing programs are described in the following subsections.

2.1 Geotechnical Explorations

JTC subcontracted William P. Davis Excavation, LLC to perform sixteen (16) test pits (designated as TP-1 through TP-16, inclusive) via a Kubota KX-91-3 excavator. JTC directed the excavation and sampling activities and logged the subsurface conditions encountered at each test pit location.

The test pit locations were selected in relation to the existing site features and proposed development, and under the constraints of excavator/equipment access and utility conflicts. In general, the test pits were located at approximately 100-foot intervals along the existing roadway, alternating from one travel lane to the other. The relative location of each test pit was established via measurements from existing site features and scaling the dimensions onto the provided plan(s). The attached *Test Pit Location Plan* depicts the approximate test pit locations.

The test pits were advanced to depths ranging from 2.25 to 6 feet below the ground surface (bgs). JTC obtained representative bulk samples of each primary soil strata as the test pits were advanced. Upon completion, each test pit was backfilled with soil cuttings derived from the excavation. Selected soil samples were sealed in moisture-tight containers and returned to JTC's office for further review, classification, and/or geotechnical laboratory testing. Detailed records of the subsurface conditions observed at each test pit location are provided on the attached *Summary of Test Pit Observations*.

2.2 Geotechnical Laboratory Testing

JTC selected representative soil samples for geotechnical laboratory testing at our in-house laboratory. The following tests were performed:

- 8 Particle-size analyses.

Geotechnical laboratory testing was performed in general accordance with ASTM procedures. Test results are provided on the attached *Geotechnical Laboratory Testing Reports*.

3.0 SUBSURFACE CONDITIONS

The following subsections describe the site soil, bedrock, and groundwater conditions encountered, based on results of the geotechnical explorations and laboratory testing.

3.1 Soils

The native overburden soils encountered at the test pit locations appear to be consistent with those described by the published geologic data. The primary soil strata are briefly described in the paragraphs below.

3.1.1 Existing Base

Granular soils, interpreted to be "Existing Base" materials were encountered at the roadway/ground surface at most test pit locations. The Existing Base typically consisted of dark brown sand with silt and gravel (SP-SM). Where encountered, the Existing Base was about 0.2 to 0.7 feet thick. Two (2) particle-size analyses performed on Existing Base materials indicated 20 to 38% gravel; 56 to 70% sand; and 5% to 10% silt/clay.

3.1.2 Existing Sub-Base

Granular soils, interpreted to be "Existing Sub-Base" materials, were encountered beneath the Existing Base at most test pit locations at depths ranging from 0.2 to 0.7 feet bgs. The Existing Sub-Base materials were typically described as brown silty sand with gravel (SM) to sand with silt and gravel (SP-SM/SW-SM). Where encountered, the Existing Sub-Base was 0.5 to 2.3 feet thick and extended to depths ranging from about 0.7 to 2.5 feet bgs. Four (4) particle-size analyses performed on Existing Sub-Base materials indicated 23 to 34% gravel; 54 to 66% sand; and 6 to 18% silt/clay.

3.1.3 Former Topsoil/Forest Mat/Organics

Granular soils typically described as black silty sand (SM) were encountered beneath the Existing Base and/or Existing Sub-Base materials at most test pit locations at depths ranging from about 0.4 to 2.5 feet bgs. JTC interprets these soils to be the former ground surface (i.e., former Topsoil/Forest Mat/Organics) prior to the construction of the existing roadway. Where encountered, the thickness of the Former Topsoil/Forest Mat/Organics ranged from about 0.2 to 1.5 feet and extended to depths ranging from 0.9 to 3 feet bgs.

3.1.4 Subgrade/Glacial Till

Brown gravel with clay and sand (GP-GC) to clayey sand and with gravel (SC) was encountered beneath the Existing Base, Existing Sub-Base, and/or Former Topsoil/Forest Mat/Organics at most test pit locations at depths ranging from 0.9 to 3 feet bgs. This stratum contains frequent cobbles and boulders in some areas and is interpreted to be native Glacial Till. Two (2) particle-size analyses performed on native Glacial Till materials indicated 15 to 52% gravel; 40 to 50% sand; and 8% to 35% silt/clay.

3.2 Boulders/Possible Bedrock

Practical refusal to further penetration/advancement was encountered in test pits TP-1, TP-4, TP-5, TP-9, TP-11, TP-13, TP-14, and TP-16 at depths ranging from 2.3 to 5.5 feet bgs. These

refusals are interpreted to be refusal on a boulder and/or possible bedrock. A definitive conclusion (i.e., large boulder or bedrock) was not possible due to the limited footprint/extent of each test pit and the size/capability of the excavator. JTC noted large boulders over 6 feet in diameter at the ground surface at various locations along the existing roadway.

3.3 Groundwater

Groundwater and/or wet soils were encountered in test pits TP-4, TP-7, TP-8, TP-9, and TP-12 at depths ranging from 2 to 4.5 feet bgs at the time of excavation. Short-term (i.e., during excavation, upon completion of excavation, and/or a few hours after excavation) water levels observed in test pits performed in fine grained soils should be considered approximate. JTC estimates that this investigation occurred during a period of seasonally normal to high ground water conditions. Site groundwater levels should be expected to fluctuate seasonally and in response to precipitation events, construction activity, site use, and adjacent site use.

4.0 GEOTECHNICAL DESIGN & CONSTRUCTION RECOMMENDATIONS

The evaluation of the site and the proposed roadway improvements was based on the subsurface conditions encountered at the test pit locations, results of geotechnical laboratory testing, and assumed/preliminary site plans and grading, as described herein. Key findings are summarized as follows:

- The Existing Base materials do not meet the specifications/standards for Crushed Gravel Base (MDOT 703.06 Type A). In general, the Existing Base materials are too "fine" in most areas;
- The Existing Sub-Base materials do not meet the specifications/standards for Gravel Subbase (MDOT 703.06 Type D). In general, the Existing Sub-Base materials are also too "fine" in most locations; and
- The Former Topsoil/Forest Mat/Organic layer appears to be of limited thickness (i.e., less than 0.5 feet thick) at most test pit locations. However, this layer should be removed and replaced (R&R), where it is 0.5 feet or more in thickness (i.e., areas proximate to TP-5, TP-7, TP-8, TP-10, TP-11, and TP-15), wherever it becomes exposed during subgrade preparations, and/or wherever its presence prevents adequate subgrade preparation (i.e., proof-rolling of subgrade results in excessive deflections and/or pumping, rutting, or weaving), as described herein.

JTC's recommendations for design and construction of the proposed improvements to Overlook Road (to meet the Town of Windham's Standards) are presented in the following subsections.

4.1 Site Preparation and Grading

Site preparation and grading should be performed in accordance with the following procedures:

- A geotechnical engineer should directly observe site preparation and grading activities;

- If shallow and/or perched groundwater is encountered, it must be removed in advance of excavation and continuously maintained at least 1 foot below the bottom of excavation and subsequent construction grade until the backfilling is complete;
- The site soils contain substantial proportions of fine sand, silt, and clay, and may degrade and/or become unworkable when subjected to construction traffic or other disturbance during wet conditions. As such, site preparations, grading, and earthworks should be performed during a dry season if possible. The Contractor shall be aware of these conditions and must take precautions to minimize subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling excavations as soon as practicable, grading (and compacting) exposed subgrades to promote surface water run-off, and maintaining an effective dewatering program, as necessary. Over-excavation to remove degraded or unworkable subgrade soils should be anticipated and budgeted (cost and schedule);
- The roadway alignment/footprint (including travel way and associated shoulders) should be cleared and stripped of any existing surficial vegetation not designated to remain, topsoil, rootmat, loamy/organic-laden subsoil, and any otherwise unsuitable materials;
    - This investigation indicates the presence of existing surficial topsoil, forest mat, and/or organic soils at the ground surface immediately adjacent to the existing roadway in most areas.
- Former Topsoil/Forest Mat/Organics present beneath the Existing Base and Existing Sub-Base should be removed where it is 0.5 feet or more in thickness (i.e., areas proximate to TP-5, TP-7, TP-8, TP-10, TP-11, and TP-15), where it becomes exposed during subgrade preparations, and/or where its presence prevents adequate subgrade preparation (i.e., proof-rolling of subgrade results in excessive deflections, pumping, rutting, and/or weaving);
- The final foot of excavation in cut areas and/or in areas of targeted over-excavation should be performed using a smooth-edged cutting bucket (no teeth) to minimize subgrade disturbance;
    - If wet subgrade conditions are encountered during cutting/excavation and/or over-excavation, a minimum of 6 inches of ¾-inch minus Crushed Stone base should be placed atop the exposed subgrade soils. The Crushed Stone should be immediately placed atop the undisturbed subgrade and then tamped with a plate compactor until exhibiting stable conditions. The Crushed Stone should be protected, as required, with a geotextile filter fabric such as Mirafi 140N or equal.
- Following clearing, stripping, removal of Former Topsoil/Forest Mat/Organics (as described herein), and/or cutting to subgrade, the exposed subgrade soils should be proof-rolled using a large (10 ton) smooth-drum roller. However, proof-rolling should not be performed if/when the exposed subgrade soils are wet (i.e., due to presence of groundwater, stormwater, perched water, etc.) because this may result in soil pumping and instability. Therefore, the proof-rolling efforts, including the number of passes and whether to employ static or vibratory methods, should be directed by the on-site geotechnical engineer;

- Any loose, soft, wet, and/or otherwise unsuitable soils (typically evidenced by rutting, pumping, and/or deflection of the subgrade) should be over-excavated to expose suitable soils, or other remedial measures should be taken, as approved by the on-site geotechnical engineer; and
- Any over-excavations should be backfilled with properly placed and compacted *Gravel Sub-Base*.

- *Common Fill* is acceptable for subgrade fill in roadway areas. The placement of *Common Fill* materials to achieve design subgrades in roadway areas should not begin until the exposed subgrade soils have been directly observed and approved by the on-site geotechnical engineer; and
- *Common Fill* materials and placement and compaction requirements are provided in *Table 1* (attached).

4.2 Flexible Pavements

The flexible pavement recommendations are based on our experience with similar projects and reference to the Town of Windham's "Land Use Chapter 140 Requirements; Appendix B, Street Design and Construction Standards". The following is a summary of the minimum recommended flexible pavement structure, based on the subgrade soil conditions at the test pit locations, the assumed traffic intensity/loading conditions, and the referenced Town Standards:

	Cut Areas	**Fill Areas**
Pavement Course/Layer	*Thickness*	*Thickness*
Bituminous Surface Course MaineDOT HMA 9.5 mm	1½ inches	1½ inches
Bituminous Base Course MaineDOT HMA 19 mm	2½ inches	2½ inches
Crushed Gravel Base MaineDOT 703.06 Type "A"	3 inches[1]	3 inches[1]
Gravel Sub-Base MaineDOT 703.06 Type "D"	21 inches[1]	15 inches[1]
TOTAL:	**28 inches**	**22 inches**

NOTES:

1. The Town Standard indicates 3 inches. JTC recommends increasing this thickness by 3 inches (to 6 total inches of *Crushed Gravel Base*) followed by a corresponding 3-inch reduction in the thickness of the *Gravel Sub-Base*.

Additional geotechnical design recommendations for the flexible pavements are provided as follows:

- The prevention of storm water infiltration into the subgrade is essential for the successful performance of the pavement. Both the subgrade and the pavement surface should have a minimum slope of 1/4-quarter inch per foot with suitable catch basins and associated storm drain piping to promote surface drainage and minimize infiltration into pavement base, sub-base, and subgrade soils. At the edges of pavement, the sub-base and base courses should extend laterally beyond the limits of pavement to side ditches and/or ditch drain pipes should be provided to drain any infiltrated water;
- The *Gravel Sub-Base* should consist of Aggregate Subbase, Type D meeting the requirements of Subsections 304.02 and 703.06b of the MaineDOT Standard Specifications, latest edition;
- The *Crushed Gravel Base* should consist of Aggregate Base, Type A meeting the requirements of Subsections 304.02 and 703.06a of the MaineDOT Standard Specifications, latest edition; and
- The recommended pavement structures should not be construed as adequate for support of haul roads, staging areas, and other construction traffic. The design and maintenance of such temporary construction roads shall be reviewed by the Contractor.

Recommendations for pavement subgrade preparation and construction are provided as follows:

- In cut areas, the exposed subgrade should be proof-rolled with a large smooth-drum roller as described in Subsection 4.1 and/or as directed by the on-site geotechnical engineer;
- In fill areas, the pavement subgrade should consist of *Common Fill* or *Gravel Sub-Base* built up from properly prepared subgrade soils (Subsection 4.1);
- *Gravel Subbase* should be placed in uniform horizontal lifts having a maximum lift thickness of 12 inches and compacted to at least 95 percent of its MPMDD. In-place field density tests should be performed to confirm that the specified compaction is achieved;
- *Crushed Gravel Base* should be placed in uniform horizontal lifts having a maximum lift thickness of 9 inches and compacted to at least 95 percent of its MPMDD. In-place field density tests should be performed to confirm that the specified compaction is achieved;
- Bituminous concrete should be placed and constructed in accordance with the MaineDOT Standard Specifications, latest edition. In particular, bituminous concrete should be compacted to 92 to 97% of percent of its maximum theoretical density (MTD) within the specified temperature range. Placement temperatures of bituminous concrete mixes, in general, range between 270 and 310 degrees Fahrenheit; and
- A tack coat shall be placed between successive layers of the bituminous concrete. Specifically, a tack coat shall be placed atop the binder course pavement prior to placing the top course. Similarly, an asphalt jointing-compound should be applied to any cold joints, if applicable.

4.3 Re-Use of Site Soils

Most of the Existing Base and Existing Sub-Base materials encountered at the exploration locations should be suitable for re-use as *Common Fill* (i.e., subgrade fill). Some of the Existing Base and Existing Sub-Base materials encountered should be suitable for *Gravel Subbase*. Any re-use of these materials is contingent upon them being appropriately segregated from excessively silty, wet, and/or otherwise unsuitable materials and tested to meet project specifications. The Existing Base and Existing Sub-Base and materials are not expected to be suitable for re-use as *Crushed Gravel Base*.

The Former Topsoil/Forest Mat/Organics encountered at the exploration locations are not expected to be suitable for re-use as *Common Fill*, *Gravel Sub-Bas*e, or *Crushed Gravel Base*. These soils may be re-used in areas to be landscaped, subject to conformance with the project specifications.

Some of the native subgrade soils (i.e., Glacial Till) encountered at the exploration locations should be suitable for re-use as Common Fill, provided that they are appropriately segregated from excessively silty, wet, and/or otherwise unsuitable materials and tested to meet project specifications. The native subgrade soils/Glacial Till materials are not expected to be suitable for re-use as *Gravel Sub-Bas*e or *Crushed Gravel Base*.

4.4 Construction Monitoring and Quality Control Testing

A qualified geotechnical engineer or representative should be retained to review the site preparation and grading activities and foundation subgrade preparations, at a minimum. Similarly, quality control testing, including in-place field density and moisture tests, should be performed to confirm that the specified compaction is achieved. It is recommended that JTC be retained to provide earthwork construction monitoring and quality control testing services.

Quality control testing recommendations are provided as follows:

- During placement and compaction of *Common Fill* in pavement areas, 3 field density tests should be performed for every 100 linear feet of fill placement. At least 3 tests should be performed on each lift of material even if the lift is less than 100 linear feet on a particular day;
- During placement and compaction of *Gravel Sub-Base* and *Crushed Gravel Base* materials in pavement areas, 3 field density tests should be performed for every 100 linear feet of fill placement. At least 3 tests should be performed on each lift of material even if the lift is less than 100 linear feet on a particular day; and
- During backfilling of utility trenches, at least 1 test should be conducted per 50 linear feet (per lift) of trench.

4.5 Additional Considerations

Additional construction recommendations are provided as follows:

- A hydraulic hammer or possibly blasting may be needed in some areas to install underground utilities;
- Safe temporary excavation and/or fill slopes are the responsibility of the Contractor. Excavations should be conducted in accordance with local, state, and federal (OSHA) requirements, at a minimum. If an excavation cannot be properly sloped or benched due to space limitations, adjacent structures, and/or seepage, the Contractor should install an engineered shoring system to support the temporary excavation;
- Subgrade conditions will be influenced by excavation methods, precipitation, stormwater management, groundwater control(s), and/or construction activities. Areas of the site soils are poorly-drained, moisture-sensitive, and considered susceptible to disturbance when exposed to wet conditions and construction activities. As such, the Contractor shall be aware of these conditions and must take precautions to minimize subgrade disturbance. Such precautions may include diverting storm run-off away from construction areas, reducing traffic in sensitive areas, minimizing the extent of exposed subgrade if inclement weather is forecast, backfilling excavations as soon as practicable, and maintaining an effective dewatering program, as necessary;
- Temporary excavation dewatering may be needed in some areas for underground utility installation;
- Proper groundwater control and stormwater management are necessary to maintain site stability. Groundwater should be removed in advance of excavation and continuously maintained at least 1 foot below the working construction grade until earthworks and/or backfilling are complete;
- If groundwater seepage and/or wet soils due to shallow groundwater are observed, a minimum of six (6) inches of ¾-inch minus crushed stone base should be placed atop the exposed subgrade soils. The stone should be immediately placed atop the undisturbed subgrade and then tamped with a plate compactor until exhibiting stable conditions. The stone shall be protected, as required, with a geotextile filter fabric such as Mirafi 140N or equal. The purpose of the stone base is to protect the wet subgrade, facilitate dewatering, and provide a dry/stable base upon which to progress construction; and
- All slopes should be protected from erosion during (and after) construction.

5.0 CLOSING

We trust the contents of this report are responsive to your needs at this time. Should you have any questions or require additional assistance, please do not hesitate to contact our office.

LIMITATIONS

Explorations

1. The analyses and recommendations presented in this report are based in part upon the data obtained from widely-spaced subsurface explorations. Subsurface conditions between exploration locations may vary from those encountered at the exploration locations. The nature and extent of variations between explorations may not become evident until construction. If variations appear, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretation of widely-spaced explorations and samples; actual strata transitions are probably more gradual. For specific information, refer to the individual test pit and/or boring logs.

3. Water level readings have been made in the test pits and/or test borings under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from the time the measurements were made.

Review

4. It is recommended that John Turner Consulting, Inc. be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the geotechnical engineering recommendations provided herein.

5. In the event that any changes in the nature, design, or location of the proposed areas are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by John Turner Consulting, Inc.

Construction

6. It is recommended that John Turner Consulting, Inc. be retained to provide geotechnical engineering services during the earthwork phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

Use of Report

7. This report has been prepared for the exclusive use of Great Lots of Maine in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

8. This report has been prepared for this project by John Turner Consulting, Inc. This report was completed for preliminary design purposes and may be limited in its scope to complete an accurate bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to preliminary geotechnical design considerations.

TABLE 1

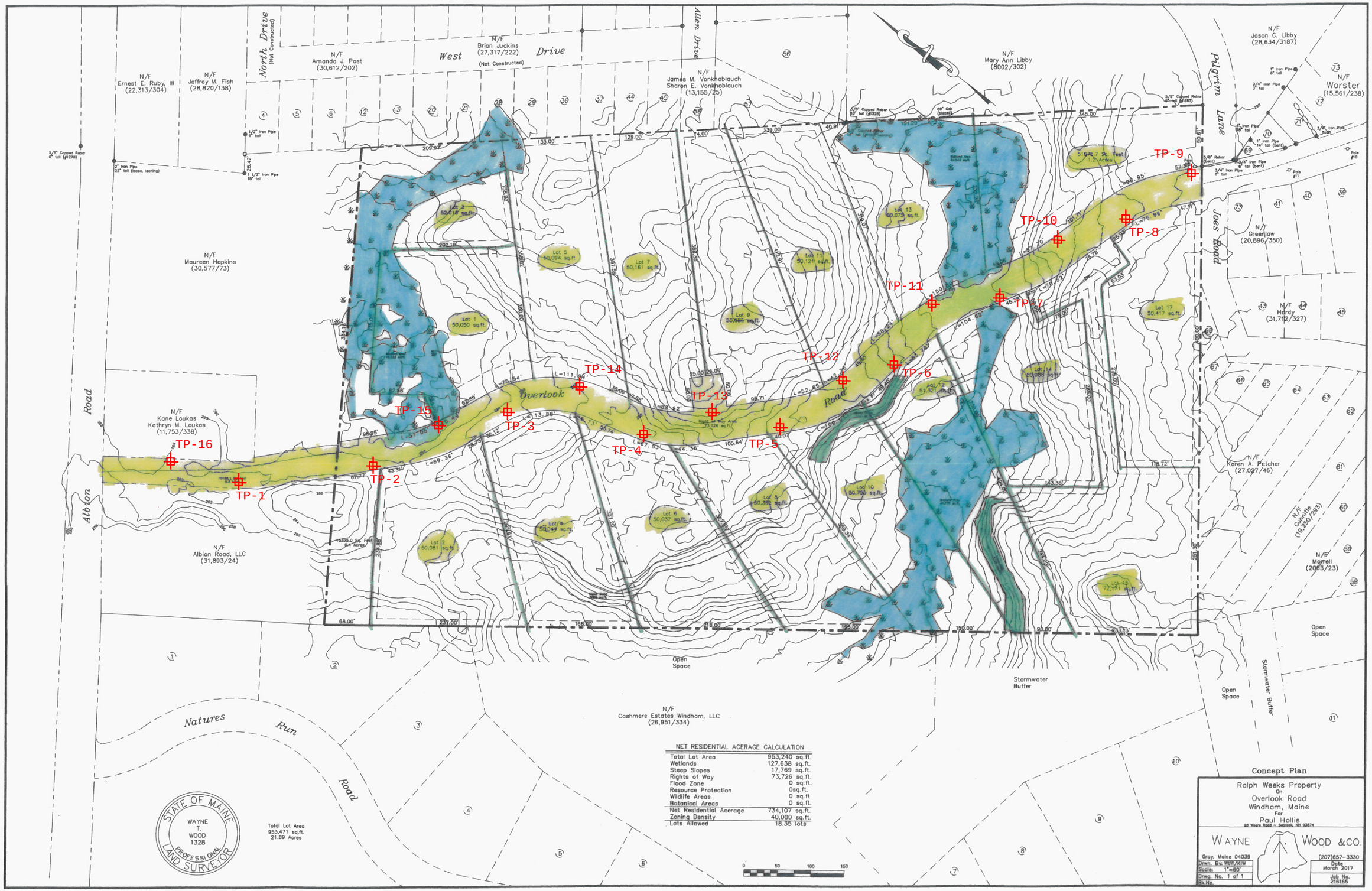
Recommended Soil Gradation & Compaction Specifications

Common Fill

SIEVE SIZE	PERCENT PASSING BY WEIGHT
6-inch	100
¾-inch	60 – 100
No. 4	20 – 85
No. 200	0 – 25

NOTES:
1. For use as common/subgrade fill in parking areas and roadway embankments.
2. Place in lifts not exceeding 12 inches.
3. Maximum stone size should not exceed ½ the actual lift thickness.
4. Compact to at least 93% relative compaction per ASTM D1557 when placed as subgrade fill in parking areas or roadway embankments.
5. Compaction efforts should be verified by field density testing.

Concept Plan/Test Pit Location Plan



NET RESIDENTIAL ACREAGE CALCULATION

Total Lot Area	953,240 sq.ft.
Wetlands	127,638 sq.ft.
Steep Slopes	17,769 sq.ft.
Rights of Way	73,726 sq.ft.
Flood Zone	0 sq.ft.
Resource Protection	0sq.ft.
Wildlife Areas	0 sq.ft.
Botanical Areas	0 sq.ft.
Net Residential Acerage	734,107 sq.ft.
Zoning Density	40,000 sq.ft.
Lots Allowed	18.35 lots

Total Lot Area
953,471 sq.ft.
21.89 Acres

STATE OF MAINE
WAYNE T. WOOD
1328
PROFESSIONAL LAND SURVEYOR

0 50 100 150

Concept Plan

Ralph Weeks Property
On
Overlook Road
Windham, Maine
For
Paul Hollis
28 Weare Road – Nebrook, NH 03874

WAYNE WOOD &CO.
Gray, Maine 04039 (207)657-3330
Drwn. By: WTW/KJW
Scale: 1"=60'
Drwg. No. 1 of 1
Rx No.
Date: March 2017
Job No. 216165

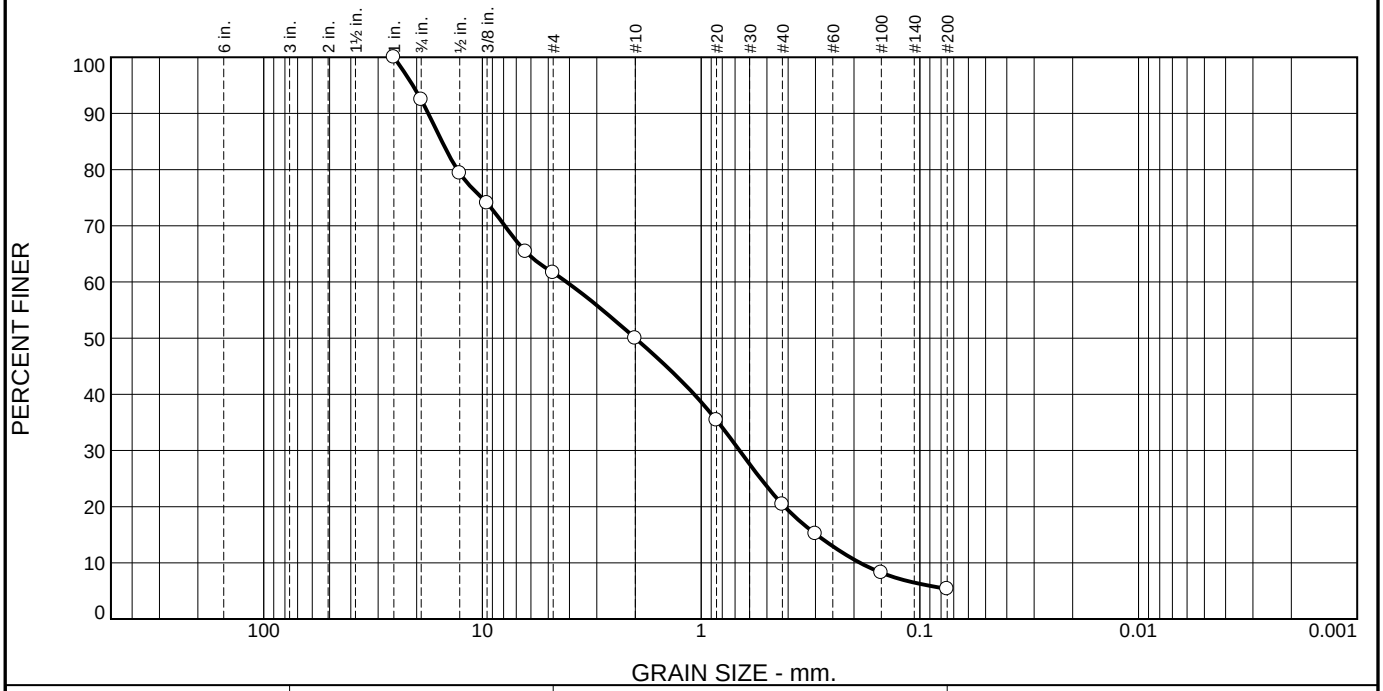
Summary of Test Pit Observations

Summary of Test Pit Observations
Overlook Road - Windham, Maine

Primary Strata	General Description	Approximate Location Of Test Pits (Depths are feet below ground surface)																	
		Albian Road 0+00	1+00	2+00	3+00	4+00	5+00	6+00	7+00	8+00	9+00	10+00	11+00	12+00	13+00	14+00	15+00	16+00	17+00	Joes Road
Test Pit #		-	TP-16	TP-1	-	TP-2	TP-15	TP-3	TP-14	TP-4	TP-13	TP-5	TP-12	TP-6	TP-11	TP-7	TP-10	TP-8	TP-9	-
Existing Base	Dark brown sand with silt and gravel (SP-SM)	-	0.0-0.3'	-	-	0.0-0.5'	0.0-0.3'	0.0-0.3'	0.0-0.2'	0.0-0.3'	0.0-0.2'	0.0-0.3'	0.0-0.3'	0.0-0.2'	0.0-0.2'	0.0-0.6'	0.0-0.3	0.0-0.4'	0.0-0.3'	-
Existing Sub-base	Brown, silty sand with gravel (SM) to sand with silt and gravel (SP-SM; SW-SM)	-	0.3-0.8'	0-2.25	-	0.5-1.8'	0.3-2.5'	0.3-2.3'	0.2-0.7'	0.3-2.0'	0.2-1.0'	0.3-1.0'	0.3-1.8'	0.2-1.0'	0.2-1.0'	0.6-2.0'	0.3-1.5'	-	0.3-1.0'	-
Former Ground Surface/ Organics	Former ground surface consiting of black silty sand with frequent organics, peat, rootlets		0.8-1.1'	-	-	1.8-2.1'	2.5-3.0'	2.3-2.6'	0.7-1.0'	-	1.0-1.3'	1.0-2.5'	1.8-2.0'	-	1.0-2.0'	2.0-2.9'	1.5-2.0'	0.4-0.9'	1.0-1.3'	-
Subgrade	Brown to gray clayey sand with gravel (SC) to gravel with clay and sand (GP-GC); areas with frequent cobbles and boulders; areas with olive stiff clay	-	1.1-3.5'	-	-	1.8-6.0'	3.0-5.0'	2.6-4.5'	1.0-4.0'	2.0-5.5'	1.3-3.8'	2.5-3.0'	2.0-4.0	1.0-5.0'	2.0-4.5'	2.9-5'	2.0-5.0	0.9-5.0	1.3-4.0'	-
Refusal Bedrock/Large Boulder	Large Boulder or possible Bedrock; unable to excavate further	-	3.5'	2.25'	-	-	-	-	4.0'	5.5'	3.8'	3.0'	-	-	4.5'	-	-	-	4.0'	-
	Termination depth of test pit	-	3.5'	2.25'	-	6.0'	5.0'	4.5'	4.0'	5.5'	3.8'	3.0'	4.0'	5.0'	4.5'	5.0'	5.0'	5.0'	4.0'	-

Geotechnical Laboratory Testing Reports

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.6	30.7	11.7	29.6	15.0	5.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
3/4"	92.4		
1/2"	79.3		
3/8"	74.0		
1/4"	65.4		
#4	61.7		
#10	50.0		
#20	35.4		
#40	20.4		
#50	15.2		
#100	8.2		
#200	5.4		

* (no specification provided)

Material Description

Existing Base - Sand with silt and gravel (SP-SM)

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 17.6827 D_{85}= 15.3106 D_{60}= 4.1233
D_{50}= 2.0026 D_{30}= 0.6672 D_{15}= 0.2960
D_{10}= 0.1876 C_u= 21.98 C_c= 0.58

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-2 0-6"
Sample Number: P17-018

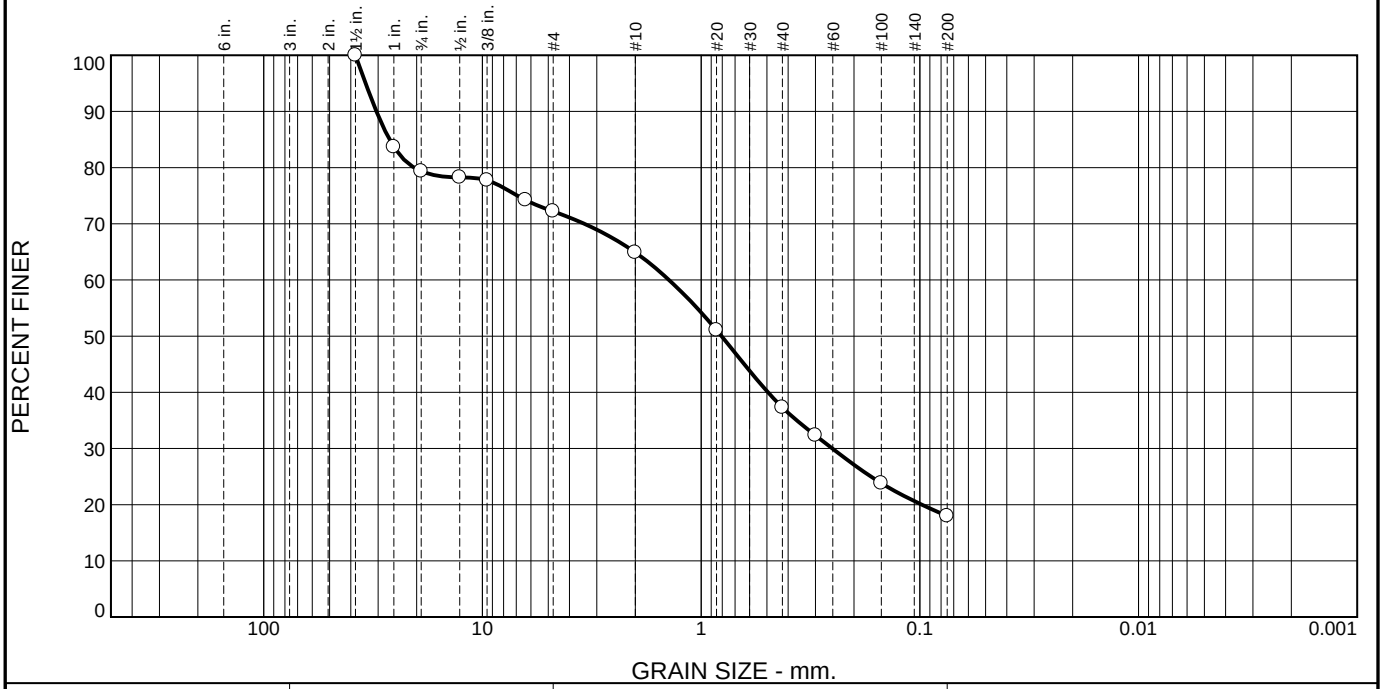
Date Sampled: 04-20-17

JTC
John Turner Consulting

Client: Paul Hollis
Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	20.6	7.2	7.3	27.6	19.3	18.0	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	83.7		
3/4"	79.4		
1/2"	78.3		
3/8"	77.7		
1/4"	74.2		
#4	72.2		
#10	64.9		
#20	51.1		
#40	37.3		
#50	32.3		
#100	23.8		
#200	18.0		

* (no specification provided)

Material Description

Existing Sub-Base - Silty sand with gravel (SM)

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

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

Coefficients

D_{90}= 30.5305 D_{85}= 26.6026 D_{60}= 1.4019
D_{50}= 0.8070 D_{30}= 0.2512 D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-2 6-18"
Sample Number: P17-019

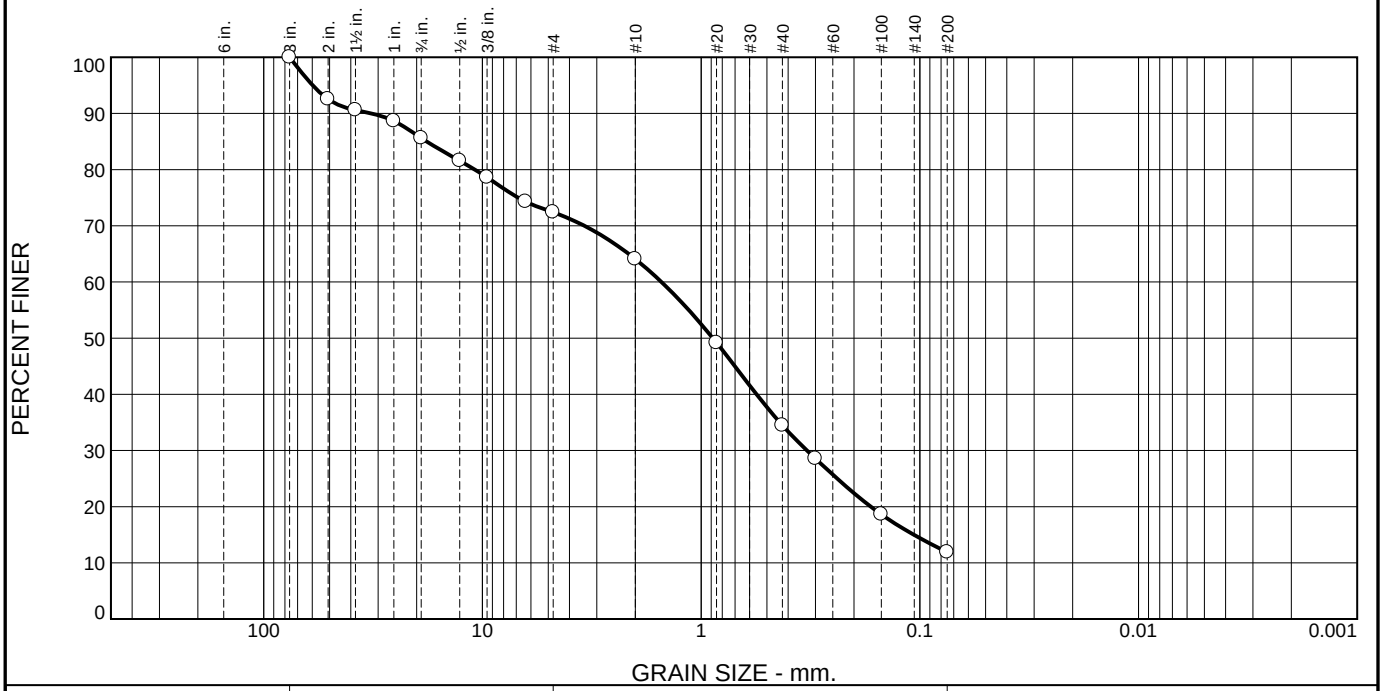
Date Sampled: 04-20-17

JTC
John Turner Consulting

Client: Paul Hollis
Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.4	13.2	8.3	29.6	22.6	11.9	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0		
2"	92.5		
1-1/2"	90.6		
1"	88.7		
3/4"	85.6		
1/2"	81.6		
3/8"	78.6		
1/4"	74.3		
#4	72.4		
#10	64.1		
#20	49.2		
#40	34.5		
#50	28.6		
#100	18.6		
#200	11.9		

* (no specification provided)

Material Description

Existing Sub-Base - Sand with silt and gravel (SP-SM)

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 32.2202 D_{85}= 17.9876 D_{60}= 1.5185
D_{50}= 0.8842 D_{30}= 0.3281 D_{15}= 0.1065
D_{10}= C_u= C_c=

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-3 6-30"
Sample Number: P17-020

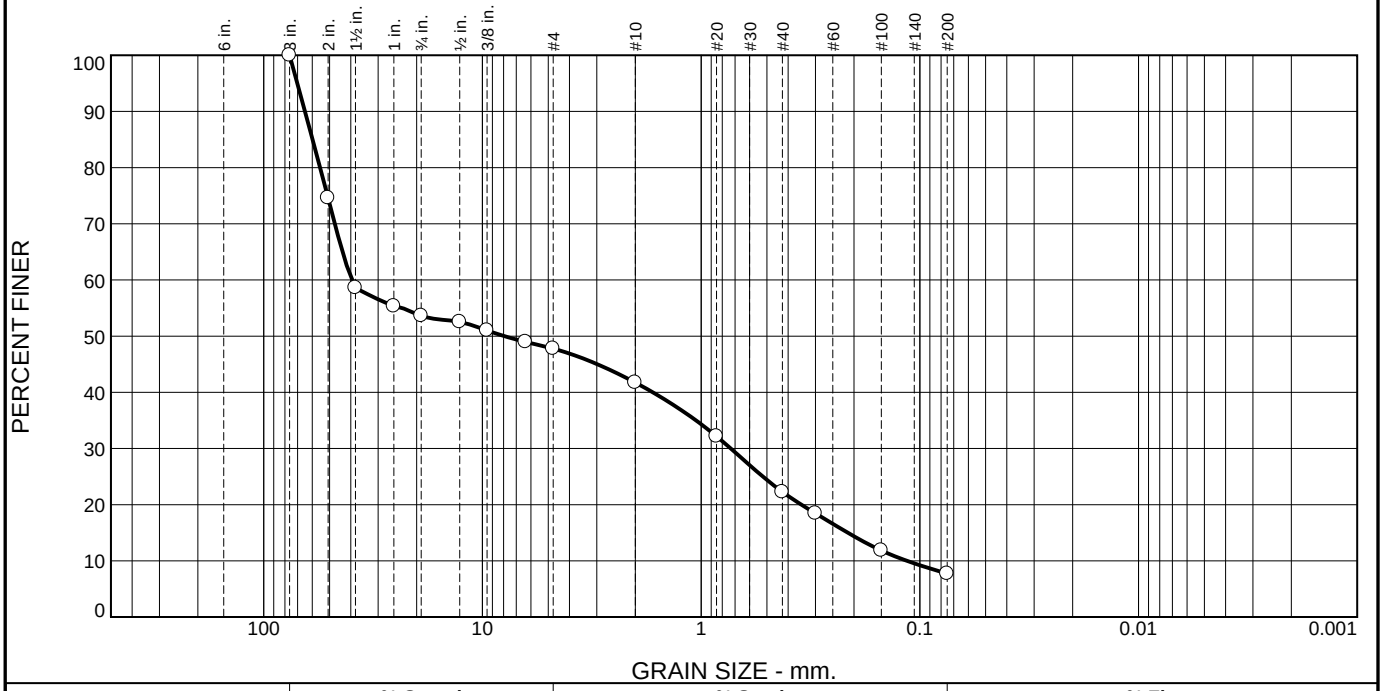
Date Sampled: 04-20-17

JTC
John Turner Consulting

Client: Paul Hollis
Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	46.4	5.8	6.1	19.4	14.6	7.7	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0		
2"	74.6		
1-1/2"	58.6		
1"	55.3		
3/4"	53.6		
1/2"	52.5		
3/8"	51.0		
1/4"	49.0		
#4	47.8		
#10	41.7		
#20	32.2		
#40	22.3		
#50	18.5		
#100	11.9		
#200	7.7		

* (no specification provided)

Material Description

Subgrade - Gravel with clay and sand (GP-GC)

Atterberg Limits (ASTM D 4318)

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

Classification

USCS (D 2487)= (GP-GC) **AASHTO (M 145)=**

Coefficients

D_{90}= 64.7930 D_{85}= 59.8007 D_{60}= 39.5184
D_{50}= 7.9288 D_{30}= 0.7319 D_{15}= 0.2133
D_{10}= 0.1145 C_u= 345.11 C_c= 0.12

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-5 20"+

Sample Number: P17-021

Date Sampled: 04-20-17

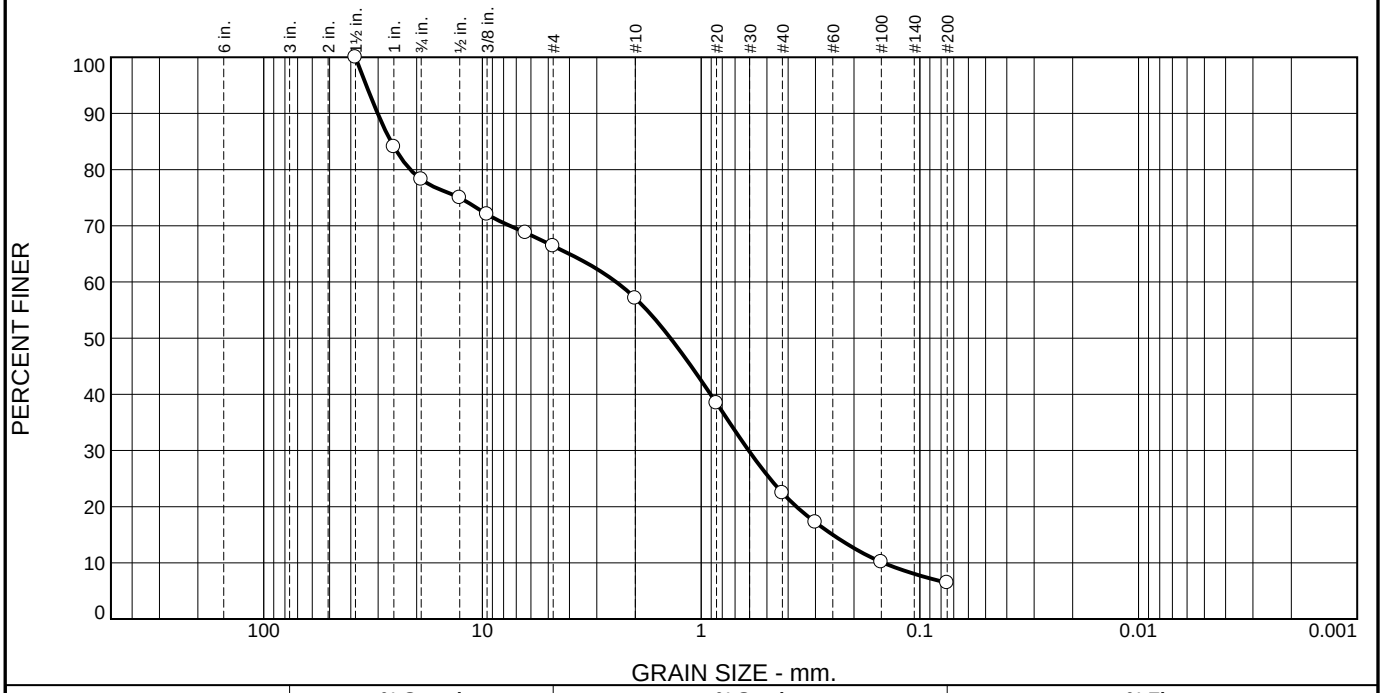
JTC
John Turner Consulting

Client: Paul Hollis

Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.7	11.9	9.3	34.7	16.0	6.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1-1/2"	100.0		
1"	84.1		
3/4"	78.3		
1/2"	75.0		
3/8"	72.0		
1/4"	68.8		
#4	66.4		
#10	57.1		
#20	38.4		
#40	22.4		
#50	17.2		
#100	10.2		
#200	6.4		

* (no specification provided)

Material Description

Existing Sub-Base - Sand with silt and gravel (SW-SM)

Atterberg Limits (ASTM D 4318)

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

Classification

USCS (D 2487)= (SW-SM) **AASHTO (M 145)=**

Coefficients

D_{90}= 30.1374 D_{85}= 26.2004 D_{60}= 2.4473
D_{50}= 1.3811 D_{30}= 0.6058 D_{15}= 0.2502
D_{10}= 0.1468 C_u= 16.67 C_c= 1.02

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-7 6-24"
Sample Number: P17-022

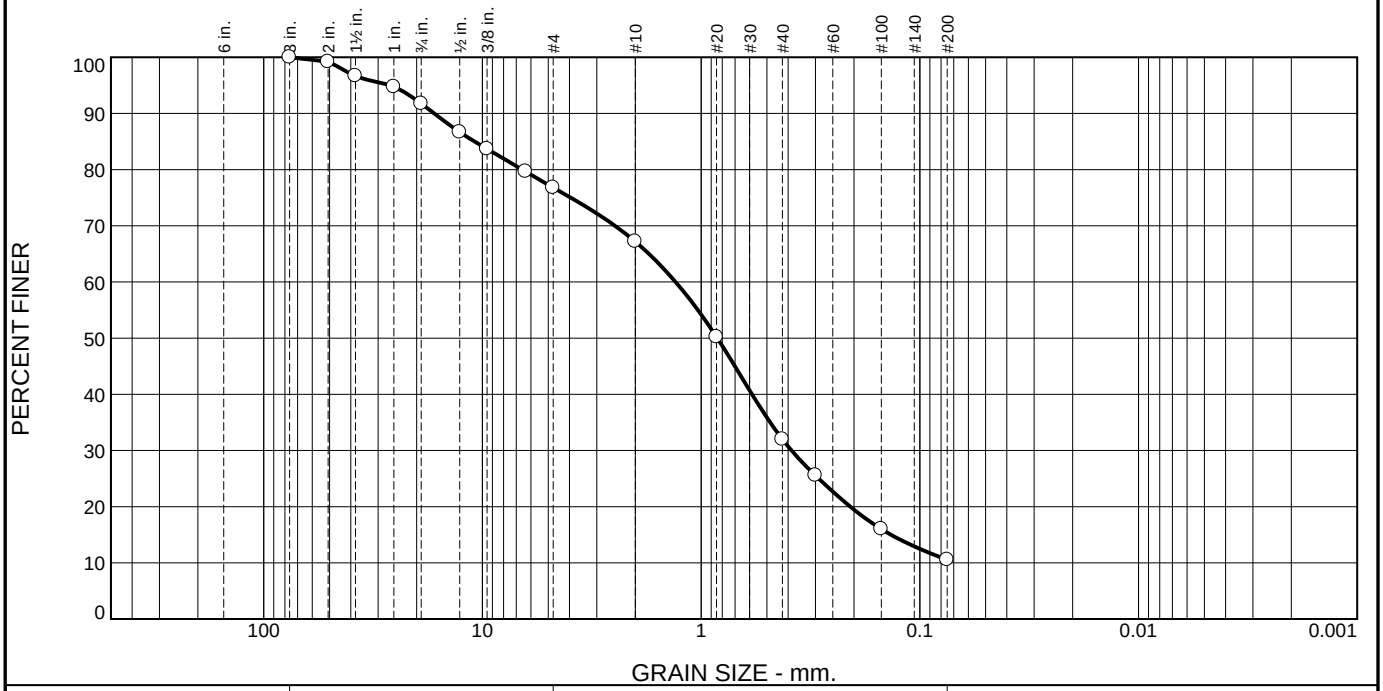
Date Sampled: 04-20-17

JTC
John Turner Consulting

Client: Paul Hollis
Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.2	15.0	9.6	35.2	21.5	10.5	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3"	100.0		
2"	99.2		
1-1/2"	96.7		
1"	94.7		
3/4"	91.8		
1/2"	86.7		
3/8"	83.7		
1/4"	79.7		
#4	76.8		
#10	67.2		
#20	50.2		
#40	32.0		
#50	25.6		
#100	16.0		
#200	10.5		

* (no specification provided)

Material Description

Existing Sub-Base - Sand with silt and gravel (SP-SM)

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 16.6080 D_{85}= 10.8700 D_{60}= 1.3085
D_{50}= 0.8431 D_{30}= 0.3863 D_{15}= 0.1356
D_{10}= C_u= C_c=

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouion

Checked By: M. Pellerin

Title:

Location: TP-9 4-12"
Sample Number: P17-023

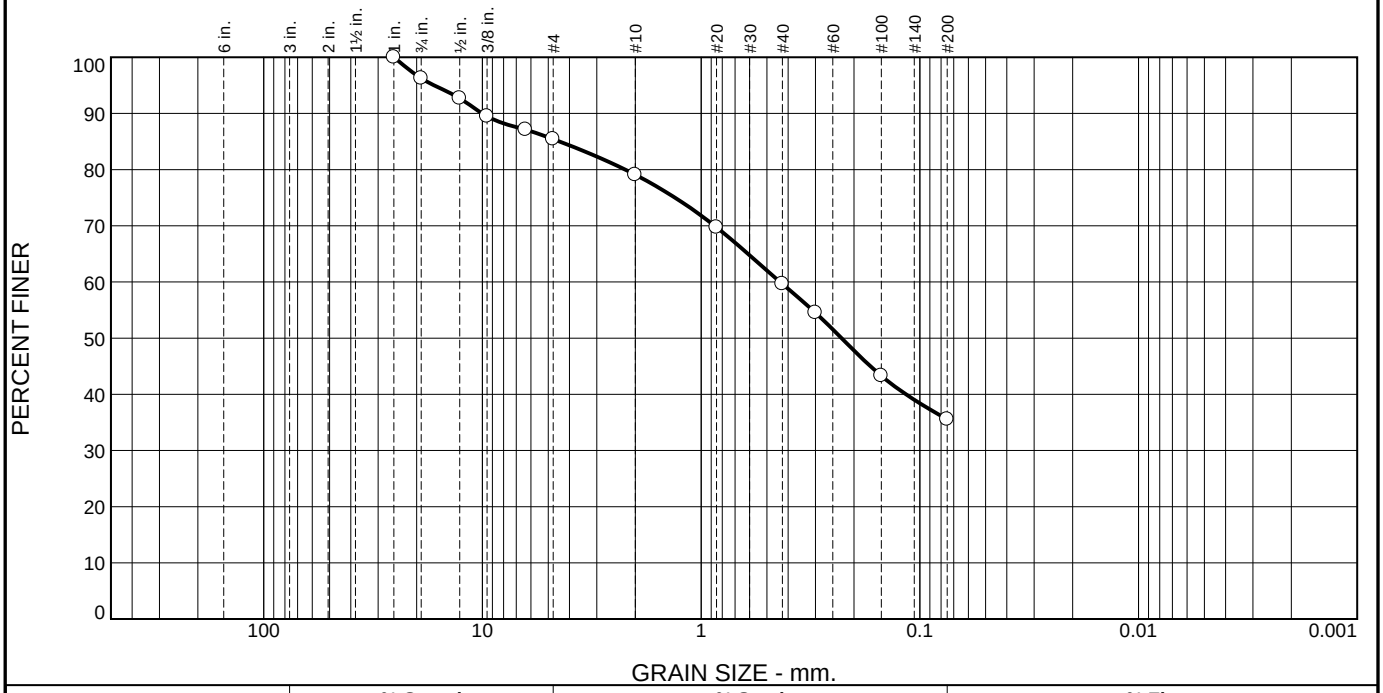
Date Sampled: 04-20-17

JTC
John Turner Consulting

Client: Paul Hollis
Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	3.8	10.8	6.3	19.5	24.0	35.6	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	96.2		
1/2"	92.7		
3/8"	89.5		
1/4"	87.1		
#4	85.4		
#10	79.1		
#20	69.7		
#40	59.6		
#50	54.5		
#100	43.3		
#200	35.6		

* (no specification provided)

Material Description

Subgrade - Clayey sand with gravel (SC)

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 10.0253 D_{85}= 4.4418 D_{60}= 0.4356
D_{50}= 0.2279 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-10 18"+

Sample Number: P17-024

Date Sampled: 04-20-17

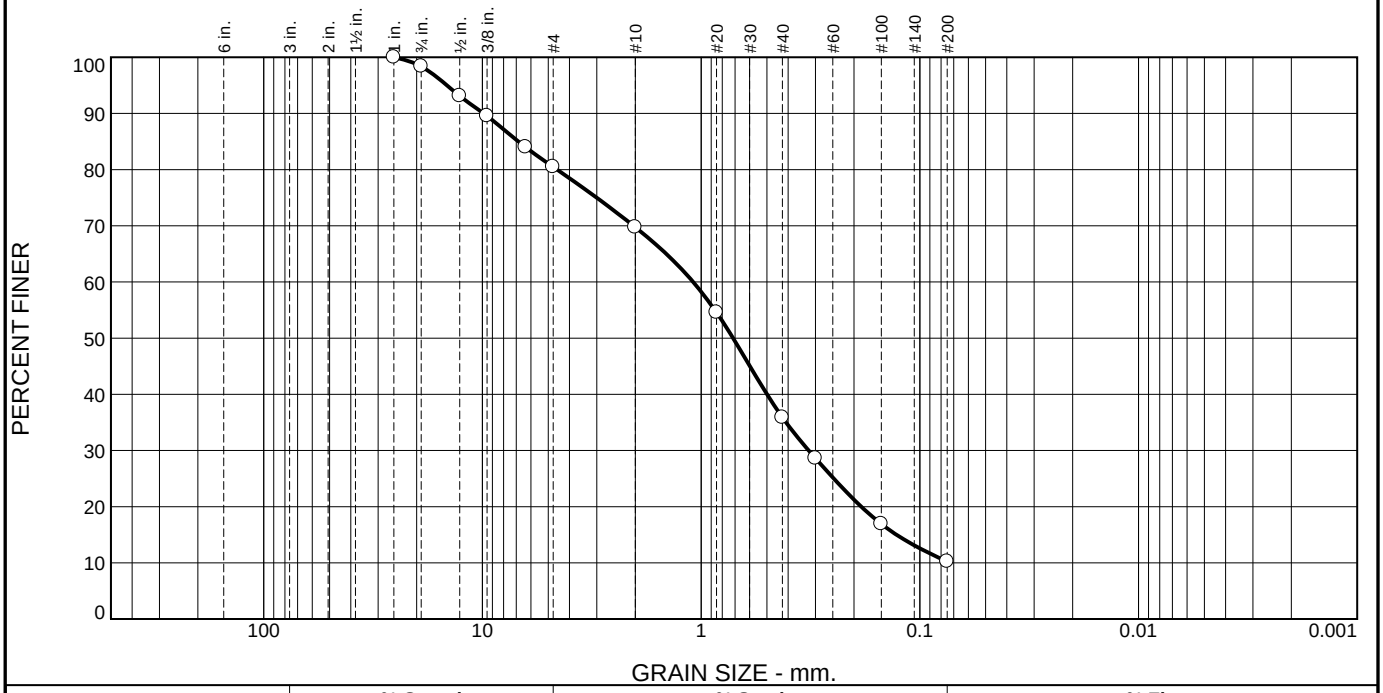
JTC
John Turner Consulting

Client: Paul Hollis

Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.6	17.9	10.8	33.8	25.7	10.2	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1"	100.0		
3/4"	98.4		
1/2"	93.1		
3/8"	89.5		
1/4"	84.0		
#4	80.5		
#10	69.7		
#20	54.6		
#40	35.9		
#50	28.6		
#100	16.9		
#200	10.2		

* (no specification provided)

Material Description

Existing Base - Sand with silt and gravel (SP-SM)

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 9.8821 D_{85}= 6.8490 D_{60}= 1.0875
D_{50}= 0.7145 D_{30}= 0.3222 D_{15}= 0.1278
D_{10}= C_u= C_c=

Remarks

Date Received: 04-20-17 **Date Tested:** 04-21-17

Tested By: J. Sigouin

Checked By: M. Pellerin

Title:

Location: TP-12 Top 4"
Sample Number: P17-025

Date Sampled: 04-20-17

JTC
John Turner Consulting

Client: Paul Hollis
Project: Overlook Road - Windham, Maine

Project No: 17-15-020 **Figure**

Site Photographs

SITE PHOTOGRAPHS
PROPOSED IMPROVEMENTS TO OVERLOOK ROAD
FROM ALBION ROAD TO JOES ROAD
WINDHAM, MAINE

Large Boulders Present in Area

TP-7

Frequent Cobbles and Boulders

Proper Ditching Needed

TP-3

TP-1, Refusal