GEOTECHNICAL SUMMARY REPORT FOR:
PROPOSED EXPANSION
PORTLAND SPORTS COMPLEX
WARREN AVENUE
PORTLAND, MAINE
TO:
MR. BILL BELANGER
SEACOAST CRANE
PO BOX 540
98 ROUTE 236
KITTERY, ME 03904

JTC PROJECT NO: 12-15-0023

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Geotechnical Summary Report

JOHN TURNER CONSULTING, INC
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NH-MA-ME-VT
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MEMORANDUM

TO: Bill Belanger
Seacoast Crane
P.O. Box 540
98 Route 236
Kittery, ME 03904

FROM: Carl Thunberg, P.E., Project Engineer
Kevin Martin, P.E., Geotechnical Engineer

DATE: June 13, 2012

RE: **GEOTECHNICAL SUMMARY REPORT**
PORTLAND SPORTS COMPLEX
PROPOSED BUILDING EXPANSION
WARREN STREET
PORTLAND, MAINE Project No. 12-15-023

This memorandum serves as a geotechnical study for the referenced project. The contents of this report are subject to the attached ***Limitations***.

SITE & PROJECT DESCRIPTION

The project site is located at the existing Portland Sports Center. Present development includes the original building with a later attached indoor sports center. The specific project site is located in the existing paved parking lot. The *Site Plan* shows grades in the project area to vary from about elevation ≈68-69 ft. The adjacent building (Sports Center) is shown to possess a first floor elevation (FFE) at 70.0 ft. The Sports Center is understood to be supported on driven steel piles. The floor is supported on-grade and the connector building is understood to be supported on shallow footers.

The project includes a new building expansion to the Sports Center. The expansion is understood to be a single-story, open-framed, pre-engineered metal building (Corel Building System) about 18,000 ft² in footprint area. Foundation column loads for the rigid frame structure (as provided by Corel) are to approach ≈70 kips in both vertical compression and lateral shear. The FFE is to be consistent with the existing building (70.0 ft). As such, some shallow fill about ≈1-2 ft will be necessary to achieve grade. Poor to marginal subgrade conditions are known to underlie the site. The purpose of this study is to provide a geotechnical evaluation as it pertains to foundation design and construction.

We were provided the *Geotechnical Investigation Report* for the adjacent Sports Center. This report was completed by R.W. Gillespie & Associates (RWG) dated July 2003. This report was referenced, in part, as it pertains to this study.

SUBSURFACE EXPLORATIONS & LABORATORY TESTING

Test Borings

The subgrade conditions were reviewed with the completion of four (4) test borings completed within the proposed building pad. The borings (B1 to B4) were advanced to refusal depths of about ≈56-102 ft utilizing NW casing and open hole techniques. Soil samples were typically retrieved or tested in the upper ≈20-25 ft. Due to the soft and cohesive nature of the site soils, some "undisturbed" Shelby Tube samples were obtained during the exploration program per ASTM D1587 *(Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*). Deeper exploration involved advancement of the drill rods until refusal was met. Standard Penetration Tests (SPTs) were performed in general accordance with ASTM-D1586 (*Standard Method for Penetration Test and Split-Barrel Sampling of Soils*). *Vane Shear Tests* (ASTM D2573) were also performed in the clay deposit to evaluate shear strength. Field descriptions and penetration resistance of the soils encountered, observed depth to groundwater, depth to apparent bedrock refusal and other pertinent data are contained on the attached *Test Boring Logs*.

We also reviewed the *Test Bore Logs* completed by RWG for the adjacent Sports Center.

Shear Strength Testing

The shear strength of the clay was evaluated in both the field and laboratory as follows:

ASTM D2573 (Vane Shear Tests in Cohesive Soils)
Vane shear tests were completed for this study using an Acker Vane with a torque wrench. These tests were randomly completed in the test holes. The test results are included on the *Test Bore Logs*. Several vane shear tests were also completed by RWG. The test results are relatively consistent.

Laboratory Vane Shear Tests
RWG completed manual, hand-held vane shear tests using a Geonor miniature vane. All the shear strength testing was collectively reviewed for the project.

Laboratory Testing Program

Some additional laboratory testing included the following:

Atterbergs Limits Tests (ASTM-D4318)
The Atterberg Limits were completed to determine the moisture index properties of the clay and correlate the results with empirical engineering relationships. The Atterberg Limits indicate the clay to be a low plastic silty Clay (CL).

One-Dimensional Consolidation Test (ASTM D2435)
JTC completed two (2) consolidation tests to determine the compressibility characteristics of the clay and assess its stress history. We also reviewed three (3) similar tests completed by RWG. The consolidation test indicates the clay to be slightly over-consolidated.

Gradation Analyses (ASTM D2217)
Particle Size Analyses were completed on the shallow sandy soils. The testing was used to review gradation distribution.

SUBGRADE CONDITIONS

The subgrade conditions below (1) a shallow Gravel Fill include (2) a silty Fine Sand underlain by (3) very soft silty Clay, (4) a thin Glacial Hardpan then (5) apparent Bedrock refusal. A *Subsurface Profile* showing the shallower soil and groundwater conditions to ≈30 ft is attached for review.

Sandy Fill (≈1-2 ft)

A gravelly Sand, little silt extends about ≈1-2 ft below grade. This shallow Fill is a gravel base for the bituminous pavement.

Silty Fine Sand (≈9-13 ft)

There is a Fine Sand with little to some silt which extends about ≈9-13 ft below grade. RWG identified this layer to be about ≈5-8 ft below grade. The relative density of this silty Sand is loose to medium dense. This soil is expected to be encountered throughout most of the foundation construction. The attached *Sketch* shows the depth of the Fine Sand throughout the project area.

Silty Clay (≈55-100 ft)

The predominate overburden consists of a silty Clay which extends about ≈50-100 ft below grade. This marine deposit is locally known as Presumpscot Clay. This deposit typically consists of a grey, silty Clay. Atterbergs Limits tests indicate a low plastic silty Clay (CL) which is typical of the area geology. This layer is very soft the entire depth. RWG did identify a stiff crust which does not intersect the new building footprint. The approximate limits of the stiff crust are shown on the *Sketch*.

Shear strength (cohesive strength) of the Clay ranges from about ≈300-450 psf. For design purposes, a shear strength value of ≈350 psf was used for this study. The low shear strength of the Clay renders it weak and sensitive. A collective summary of the shear strength testing is attached for review.

The consolidation behavior (settlement) of the clay was also reviewed for this study. The consolidation tests indicate the silty Clay to be slightly over-consolidated to normally consolidated. An over-consolidated is more favorable for the project. An over-consolidated clay will settle about 10 times less than a normally-consolidated clay. An over-consolidated clay has been exposed to past stresses greater than the existing overburden. A normally-consolidated clay has not been exposed to greater past stress than the existing overburden and additional stress will result in large settlements. In general, the Clay is slightly over-consolidated at shallower depths becoming progressively normally consolidated with depth. This is generally typical of the Presumpscot Clay.

The strength and consolidation of the Clay will given the foundation design.

Glacial Till (≈60-105 ft)

A thin or discontinuous layer of Glacial Till, Sand and/or Hardpan is present atop the Bedrock. Given the depth of the Till, there were no samples retrieved by either RWG or JTC. The Hardpan was qualitatively assessed based on penetration resistance of the drill rods.

Refusal (≈60-105 ft)

Test bore refusal, presumably bedrock, was met at depths of ≈56-102 ft below grade for this study. The highly variable depth to refusal suggests a steep bedrock contour. RWG encountered refusal about ≈50-90 ft below grade. The ledge is deeper to the south. The attached *Sketch* shows the depth to refusal at the respective test locations.

Groundwater (≈3 ft)

Groundwater was encountered in the test borings at depths of ≈3 ft below grade. RWG indicated groundwater about ≈1-5 ft below grade with estimated seasonal high groundwater near grade (elevation ≈68 ft). RWG also recommended a perimeter foundation drain which will locally depress the groundwater. It should 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 of the measurements.

FOUNDATION SUBGRADE RECOMMENDATIONS

It is intended to support the building on a shallow foundation (and not on deep driven piles). Both the strength and compressibility of the Soft Clay will govern the foundation design. The Clay is weak with an allowable bearing strength of ≈500-700 psf (FS=3). The Clay is also highly compressible and small pressures of ≈100-200 psf may induce intolerable settlement (greater than 1½ inches). A temporary surcharge program (press-stress of the clay) was considered but will not be feasible given schedule. As such, it appears the only feasible means to consider a shallow foundation while controlling strength and consolidation is a lightweight fill.

The depth of Silty Sand atop the Soft Clay varies from ≈9-12 ft in the pad area. The Sand can help dissipate foundation loads on the Clay. A pressure dispersion of 1H:2V below and laterally beyond the footing can reduce footing stress on the Clay. Based on this theory, the footings may be designed using an allowable bearing capacity of 1,000 psf (FS=3). This should reduce footing stress in the Clay to tolerable level. A base of crushed stone (protected with a geotextile filter fabric) will be necessary below the footings. The purpose of the stone base is to protect the sensitive soils from disturbance, facilitate construction dewatering and to provide a dry/stable base upon which to progress foundation construction. Further recommendations for foundation subgrade preparation and protection are outlined herein.

Stress of the Clay will also be transmitted from any increase in site grade. A ≈1-2 ft increase in site grade will result in a stress of ≈120-250 psf which will have negligible dissipation with depth. In order to control settlement (consolidation), stress in the Clay should be reduced to ≈250 psf for footing loads with no stress increase for site grading. The only means to achieve adequate stress reduction is to utilize a compensating lightweight fill. Lightweight fills considered for geotechnical applications include expanded polystyrene (EPS) geofoam (≈1-2 pcf), foamed concrete (≈20-50 pcf) and/or expanded shale aggregate (≈55-60 pcf). The attached *Profile* shows conceptually how the lightweight fill may be implemented on the project. Given the small stress that may impact the Clay, careful and specific review of foundation loads and site grading will be necessary for final design. JTC should have the opportunity to review the *Final Design Plans* and/or provide technical assistance during this design.

The lightweight fills are also buoyant and this should be considered for final design. The Geofoam may be structurally strapped to the foundation. Foundation drains may also be used around the foundation in this regard. The drains should be located about ≈3 ft below final grade (invert elevation ≈67 ft) and be located both outside and inside the building. The drains should consist of minimum 4-inch diameter perforated PVC SDR-35 pipe encased in 12 inches of ¾-inch stone and wrapped with a geotextile filter fabric such as Mirafi 140N or equal. The drains should not encroach within the *Footing Zone of Influence* defined as that area extending laterally one foot from the edge of footing then outward and downward at a 1H:1V splay. The drains should discharge into the storm drain system by gravity (not subject to surcharge) or daylight if grading permits. The Site Engineer should consider the outlet of the foundation drains. It is recommended that a backflow preventer be installed at the outlet of the under-drain to reduce the impact of surcharges in the event of high water. The drains should be provided with permanent clean-outs at convenient locations to access all sections of the system. Clean-outs should be located at bends and no greater than 175 ft on-center. The ground surface immediately adjacent to the foundation should be sloped away from the building to allow for positive drainage. It is also recommended that the surficial materials adjacent to the buildings be relatively impermeable to reduce the volume of precipitation infiltrating into the subsurface. Such impermeable materials include Portland cement concrete, bituminous concrete, or a vegetated silty topsoil. Roof gutters should discharge away from the basements or to controlled site structures.

Footings shall be provided with at least 48 inches of frost protection. Proper frost protection should be necessary during winter construction.

The subsurface conditions were reviewed with respect to seismic criteria set forth in the *International Building Code (2009)*. Based on the relative density of the site soils, the site does not appear susceptible to liquefaction (complete loss of shear resistance) in the event of an earthquake. Based on interpretation of the *Building Code* together with the project and site conditions, the *Site Classification* (Table 1613.5.2) is "E" (Soft Soil Profile).

The interior floor slab should rest on a minimum 10-inch base of *Clean Granular Fill* as outlined on Table 1 (or as specified by the floor manufacturer). The gravel base should be increased to no less than 15 inches for exterior slabs exposed to frost. We understand that a flexible floor system will be used inside the building. The floor slab should also be considered for post-construction settlement. Our model indicates about ≈3 inches of settlement for every ≈100 psf in increased dead load. Our experience suggests that the magnitude of predicted settlement is greater than actual settlement but any increase of load above 125 psf (≈1 ft of Fill) is expected to settle more than ≈1-2 inches. The settlement will take years to dissipate. We recommend a settlement of ≈1-2 inches of consolidation for every 125 psf increase in dead load (ie: Fill). To reduce settlement, a compensating lightweight fill may be used below the slab. A small temporary surcharge may also be considered during construction to remove some of the long-term consolidation.

The settlement should also consider underground utilities that enter or are located below the building. Flexible connections and over-sized sleeves allowing upwards of ≈2 inches of vertical settlement shall be used to mitigate the impact of long-term differential movement.

Structural fill necessary within and below the foundation should conform to the attached *Specifications* (Table 1). The site soils are **not** suitable for re-use as structural fill.

CONSTRUCTION CONCERNS

The contractor should be required to maintain a stable-dewatered subgrade for the building foundation and other concerned areas during construction. Subgrade disturbance may be influenced by excavation methods, moisture, precipitation, groundwater control and construction activities. The silty Fine Sand soils are considered vulnerable to disturbance when exposed to wet conditions and construction activities. The moisture sensitivity of these soils is associated with the high percentage of fine-grained material which acts to retain moisture. The presence of a shallow groundwater will further impact the subgrade stability. The contractor should be aware of the moisture concerns and take precautions to reduce 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 footings as soon as practicable, and maintaining an effective dewatering program. Soils exhibiting weaving or instability should be over-excavated to a competent bearing soil and replaced with a crushed stone or gravel. The moisture concerns are typically more problematic if construction takes place during the winter to spring season or other periods of inclement weather. The wet subgrade shall be protected with a minimum ≈8 inch base of ¾ inch minus crushed stone encased in a geotextile fabric (Mirafi 600X or equal). A lightweight expanded shale aggregate may be used in lieu of the crushed stone for further load reduction. The expanded shale is buoyant and will require groundwater control. The stone shall be tamped with a plate compactor and exhibit stable conditions. The purpose of the stone base is to protect the sensitive soils from disturbance when exposed to construction activities and wet conditions. The subgrade shall also be excavated with a smooth blade and be protected immediately upon exposure. Bearing subgrades that become weakened or disturbed due to wet conditions will be rendered unsuitable for structural support.

Adequate dewatering and storm water management are also necessary for maintaining the competency of the site soils. Groundwater or ponded storm water should be continuously maintained at least one foot below construction grade. The groundwater is expected to be controlled with conventional filtered sumps and pumps together with a base of crushed stone. The footing trenches should have a positive slope towards the sumps. The sumps shall extend at least ≈2 ft below construction grade and be protected with filter stone. Soils which become softened/disturbed during construction will be rendered unsuitable for structural bearing support. The foundation subgrades should ultimately be stable, dewatered, protected from frost and compact throughout construction. An Engineer from JTC should be scheduled to review the subgrade conditions and preparation.

CLOSING

The strength and compressibility of the Soft Clay will impact the final foundation design. Conceptual means to control settlement were outlined in the report. JTC should have the opportunity to review Final Plans to observe compliance with our engineering recommendations. We can also assist with the *Final Plans, Technical Specifications* and/or review of *Technical Submittals*.

CONSTRUCTION MONITORING

It is recommended that a qualified engineer or representative be retained to review earthwork activities such as the preparation of the foundation bearing subgrade and the placement/compaction of Structural Fill. It is recommended that JTC be retained to provide construction monitoring services. This is to observe compliance with the design concepts presented herein.

We trust the contents of this memorandum 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.

kmm50/jtc12/PortlandSportsCenter.wpd

LIMITATIONS

Explorations

1. The analyses, recommendations and designs submitted in this report are based in part upon the data obtained from preliminary subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, 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 soil 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 this firm be given the opportunity to review final design drawings and specifications to evaluate the appropriate implementation of the 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 this firm 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 Seacoast Crane 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 geotechnical design considerations.

TABLE 1

Portland Sports Complex
Building Expansion
Portland, Maine

Recommended Soil Gradation & Compaction Specifications

Clean Granular Fill
(Select Gravel Fill)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
3 inch	100
3/4 inch	60-90
No. 4	20-70
No. 200	2-8

NOTE: For minimum 8-inch base below Floor Slab-on-Grade
For minimum 15-inch base for exterior concrete slabs exposed to frost

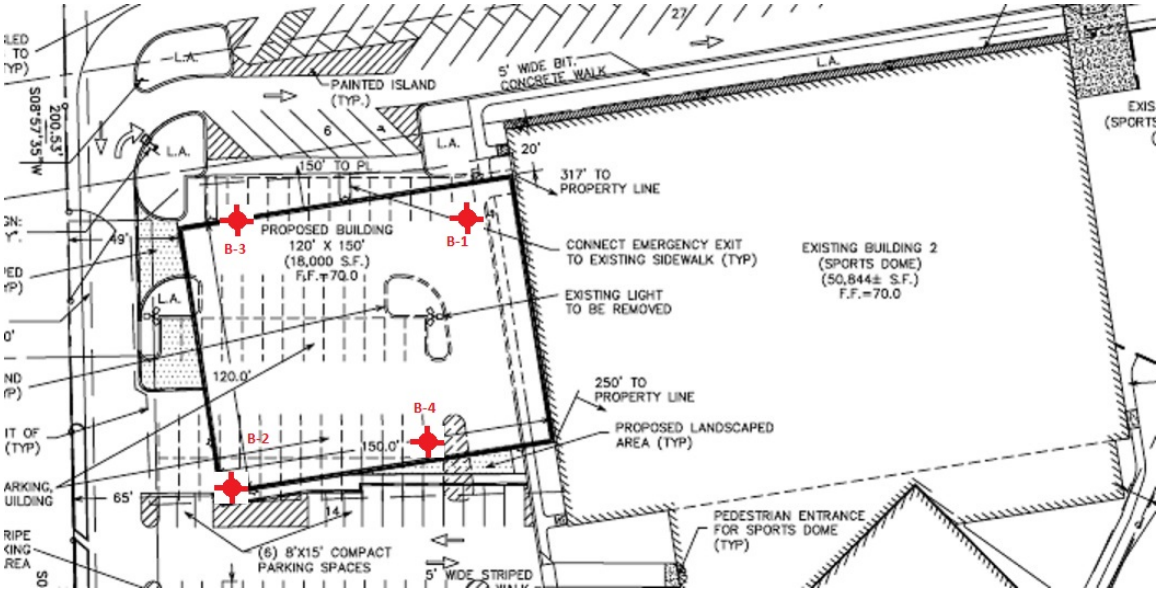
Structural Fill
(Gravelly SAND, trace Silt)

SIEVE SIZE	PERCENT PASSING BY WEIGHT
5 inch	100
3/4 inch	60-100
No. 4	20-85
No. 200	0-10

NOTE: For use as structural load support below the foundations
For use as backfill behind unbalanced foundation/retaining walls
A ¾-inch crushed stone may be used in wet conditions

Structural Fill placed beneath the foundation should include the *Footing Zone of Influence* which is defined as that area extending laterally one foot from the edge of the footing then outward and downward at a 1H:1V splay. Structural Fill should be placed in loose lifts not exceeding 12 inches for heavy vibratory rollers and 8 inches for vibratory plate compactors. Structural Fill should be compacted to at least 95 percent of maximum dry density as determined by the Modified Proctor Test (ASTM-D1557). Structural Fill should be compacted within ±3% of optimum moisture content. The adequacy of the compaction efforts should be verified by field density testing which is also a requirement of the *State Building Code*.

Boring Location Plan & Boring Logs



Notes:

1. Test borings were performed on May 11, 2012 under the direction of JTC.
2. Boring locations were determined by taping from prominent site features and should be considered approximate.
3. Refer to the individual test boring logs for subsurface conditions at Each location.

MR. BILL BELANGER
SEACOAST CRANE
PO BOX 540
98 ROUTE 236
KITTERY, ME 03904

PROPOSED EXPANSION

PORTLAND SPORTS COMPLEX

PORTLAND, MAINE

CONSULTING TESTING INSPECTION JTC inc. GEOTECHNICAL • CONSTRUCTION

BORING LOCATION PLAN

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-1
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	68.2
TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
0-1	S-1	0.5-2.5	12	3 in. bituminous concrete asphalt		11-13-13-13	26
1-2				S-1: Light brown, moist, fine to medium SAND, little Silt,			
2-3				some Gravel (probable bank-run gravel pavement support)			
3-4							
4-5							
5-6	S-2	5-7	18	Gray, wet, fine SAND, some Silt		4-6-6-4	12
6-7							
7-8	S-3	7-9	18	Similar to S-2.		2-2-2-2	4
8-9							
9-10					10		
10-11	S-4	10-12	12	Gray, wet, very soft CLAY		WOH/24	0
11-12							
12-13	S-5	12-14	24	Gray wet, very soft CLAY		WOH/24	0
13-14							
14-15	S-6	14-16	24	Gray, wet, very soft CLAY		WOH/24	0
15-16							
16-17	S-7	16-18	24	Gray, wet, very soft CLAY		WOH/24	0
17-18							
18-19				Continue boring as rod probe to determine clay thickness			
19-20							
20-21							
21-22							
22-23							
23-24							
24-25							
25-26							
26-27							
27-28							
28-29							
29-30							
30-31							
31-32							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-1
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	68.2

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
32-33							
33-34							
34-35							
35-36							
36-37							
37-38							
38-39							
39-40				Gray very soft CLAY			
41-42							
42-43							
43-44				Continue boring as rod probe through very soft Clay			
44-45				to determine clay thickness.			
45-46							
46-47							
47-48							
48-49							
49-50							
50-51							
51-52							
52-53							
53-54							
54-55							
55-56							
56-57							
57-58							
58-59							
59-60							
60-61							
61-62							
62-63							
63-64							
64-65							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
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5/11/2012	3.5	While Drilling

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65-66							
66-67							
67-68							
68-69							
69-70							
71-72							
72-73							
73-74				Gray very soft CLAY			
74-75							
75-76							
76-77				Continue boring as rod probe through very soft Clay			
77-78				to determine clay thickness.			
78-79							
79-80							
80-81							
81-82							
82-83							
83-84							
84-85							
85-86							
86-87							
87-88							
88-89							
89-90				Rod probe abrupt refusal at 89 feet. 50 blows/1 in. penetration			
90-91							
91-92							
92-93							
93-94							
94-95							
95-96							
96-97							
97-98							

REMARKS:

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DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
0-1	S-1	0.5-2.5	12	3 in. bituminous concrete asphalt		5-6-6-6	12
1-2				S-1: Light brown, moist, fine to medium SAND, little Silt,			
2-3	S-2	2.5-4.5	4	some Gravel (probable bank-run gravel pavement material			
3-4				S-2: Reddish brown, wet fine SAND, little Silt		7-10-11-13	21
4-5							
5-6	S-3	5-7	10	Similar to S-2.		1-2-3-4	5
6-7							
7-8	S-4	7-9	20	Gray, wet fine SAND, little to some Silt		1-3-3-2	6
8-9							
9-10							
10-11	S-5	10-12	24	12 in. Similar to S-4.	11	4-2-1-1	3
11-12				12 in. Gray, wet, CLAY			
12-13	S-6	12-14	24	Gray wet, very soft CLAY		WOH/24	0
13-14							
14-15	S-7	14-16	24	Gray, wet, very soft CLAY		WOH/24	0
15-16							
16-17	S-8	16-18	24	Gray, wet, very soft CLAY		WOH/24	0
17-18							
18-19	S-9	18-20	24	Gray, wet, very soft CLAY		WOH/24	0
19-20							
20-21	S-10	20-22	24	Gray, wet, very soft CLAY		WOH/24	0
21-22							
22-23				Continue boring as rod probe to determine clay thickness			
23-24							
24-25							
25-26							
26-27							
27-28							
28-29							
29-30							
30-31							
31-32							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-2
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
32-33							
33-34							
34-35							
35-36							
36-37							
37-38							
38-39							
39-40				Gray very soft CLAY			
41-42							
42-43							
43-44				Continue boring as rod probe through very soft Clay			
44-45				to determine clay thickness.			
45-46							
46-47							
47-48							
48-49							
49-50							
50-51							
51-52							
52-53							
53-54							
54-55							
55-56							
56-57							
57-58							
58-59							
59-60							
60-61							
61-62							
62-63							
63-64							
64-65							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-2
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
65-66				Gray very soft CLAY			
66-67					67		
67-68				Increased rod resistance at 67 feet in granular materials			
68-69							
69-70					70		
71-72				Rod refusal at 70 feet. 50 blows/0 penetration			
72-73							
73-74							
74-75							
75-76							
76-77							
77-78							
78-79							
79-80							
80-81							
81-82							
82-83							
83-84							
84-85							
85-86							
86-87							
87-88							
88-89							
89-90							
90-91							
91-92							
92-93							
93-94							
94-95							
95-96							
96-97							
97-98							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-3
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling
i		

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
0-1	S-1	0.5-2.5	12	3 in. bituminous concrete asphalt		16-16-6-6	22
1-2				S-1: Gray, moist, fine to coarse SAND, little Silt,			
2-3	S-2	2.5-4.5	4	some Gravel (probable bank-run gravel pavement material		8-12-12-6	24
3-4				S-2: Reddish brown, wet fine SAND, little Silt			
4-5							
5-6	S-3	5-7	10	Gray, wet, fine SAND, little Silt		1-2-3-3	5
6-7							
7-8	S-4	7-9	24	Gray, wet, fine SAND, little to some Silt		3-3-3-3	6
8-9							
9-10							
10-11	S-5	10-12	24	Similar to S-4.		2-2-4-4	6
11-12							
12-13	S-6	12-14	24	18 in. Similar to S-5.	13.5	2-2-1-1	0
13-14				Gray, wet, very soft CLAY			
14-15							
15-16				Field Vane Shear Test (FVST)-1: 15 to 15.8 ft.			
16-17	U-1	16-18	24	Undisturbed = 413 psf Remolded = 22 psf			
17-18				Undisturbed Shelby Tube sample U-1 from 16-18 ft.			
18-19				FVST-2: 18 to 18.8 ft.			
19-20				Undisturbed = 272 psf Remolded = 0 psf			
20-21				FVST-3: 18.6 to 19.4 ft			
21-22				Undisturbed = 152 psf Remolded = 0 psf			
22-23	U-2	22-24	24	Undisturbed Shelby Tube sample U-2 from 22-24 ft.			
23-24							
24-25							
25-26				Continue boring as rod probe to determine clay thickness			
26-27							
27-28							
28-29							
29-30							
30-31							
31-32							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-3
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
32-33							
33-34							
34-35							
35-36							
36-37							
37-38							
38-39							
39-40				Gray very soft CLAY			
41-42							
42-43							
43-44				Continue boring as rod probe through very soft Clay			
44-45				to determine clay thickness.			
45-46							
46-47							
47-48							
48-49							
49-50							
50-51							
51-52							
52-53							
53-54							
54-55							
55-56							
56-57							
57-58							
58-59							
59-60							
60-61							
61-62							
62-63							
63-64							
64-65							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-3
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
65-66							
66-67							
67-68							
68-69							
69-70							
71-72							
72-73							
73-74				Gray very soft CLAY			
74-75							
75-76							
76-77				Continue boring as rod probe through very soft Clay			
77-78				to determine clay thickness.			
78-79							
79-80							
80-81							
81-82							
82-83							
83-84							
84-85							
85-86							
86-87							
87-88							
88-89							
89-90							
90-91							
91-92							
92-93							
93-94							
94-95							
95-96							
96-97				Rod probe abrupt refusal at 102.5 feet			
97-98							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-4
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69.4
TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
0-1	S-1	0.5-2.5	12	4 in. bituminous concrete asphalt		7-10-8-8	18
1-2				S-1: Gray, moist, fine to coarse SAND, little Silt,			
2-3	S-2	2.5-4.5	20	some Gravel (probable bank-run gravel pavement material		7-8-7-7	15
3-4				S-2: Gray, wet fine SAND, little Silt			
4-5	S-3	4.5-6.5	20	S-3: Similar to S-2.		1-2-1-2	3
5-6							
6-7	S-4	6.5-8.5	18	S-4: Gray, wet, fine SAND, little to some Silt		WOH/18 - 1	0
7-8							
8-9	S-5	8.5-10.5	24	6 in. Similar to S-4.	9	WOH/24	0
9-10				18 in. Gray, wet, very soft CLAY			
10-11							
11-12							
12-13				Field Vane Shear Test (FVST)-1: 12 to 12.8 ft.			
13-14				Undisturbed = 326 psf Remolded = 22 psf			
14-15	U-1	14-16	24	FVST-2: 12.8 to 13.6 ft.			
15-16				Undisturbed = 390 psf Remolded = 22 psf			
16-17				Undisturbed Shelby Tube sample U-1 from 14-16 ft.			
17-18				FVST-3: 16 to 16.8 ft.			
18-19				Undisturbed = 304 psf Remolded = 11 psf			
19-20				FVST-4: 16.8 to 17.6 ft			
20-21				Undisturbed = 304 psf Remolded = 11 psf			
21-22							
22-23							
23-24							
24-25							
25-26				Continue boring as rod probe to determine clay thickness			
26-27							
27-28							
28-29							
29-30							
30-31							
31-32							

REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

TEST BORING LOG

JOHN TURNER CONSULTING, INC.
19 DOVER STREET
DOVER, NH 03820
(603) 749-1841 www.consultjtc.com

CLIENT:	Seacoast Crane
PROJECT:	Portland Sports Complex
LOCATION:	Warren Street, Portland, ME
PROJECT No:	12-15-023
BORING No:	B-4
DATE:	5/11/2012
LOCATION:	See Plan
SURFACE EL:	69.4

TYPE OF BORING:	Drive & Wash
DRILLING Co:	Great Works Test Boring
RIG:	CME 85
DRILLER:	Pete Michaud
JTC REP.:	Carl Thunberg

GROUNDWATER OBSERVATIONS

DATE:	DEPTH:	TIME:
5/11/2012	3.5	While Drilling

FT	NO.	SAMPLE DEPTH (FT.)	REC. (IN.)	SOIL & ROCK CLASSIFICATION-DESCRIPTION BURMEISTER SYSTEM (SOIL) U.S. CORPS OF ENGINEERS SYSTEM (ROCK)	STRATUM CHANGE (FT.)	BLOWS PER 6 INCHES	SPT (N)
32-33							
33-34							
34-35							
35-36							
36-37							
37-38							
38-39							
39-40				Gray very soft CLAY			
41-42							
42-43							
43-44				Continue boring as rod probe through very soft Clay			
44-45				to determine clay thickness.			
45-46							
46-47							
47-48							
48-49							
49-50							
50-51					50		
51-52				Change in rod probe resistance at 50 feet in granular materials		17	
52-53						22	
53-54						25	
54-55						45	
55-56						40	
56-57					56.5	50/4	
57-58				Rod probe refusal at 56.5 ft. 50 blows/4 in. penetration			
58-59							
59-60							
60-61							
61-62							
62-63							
63-64							
64-65							

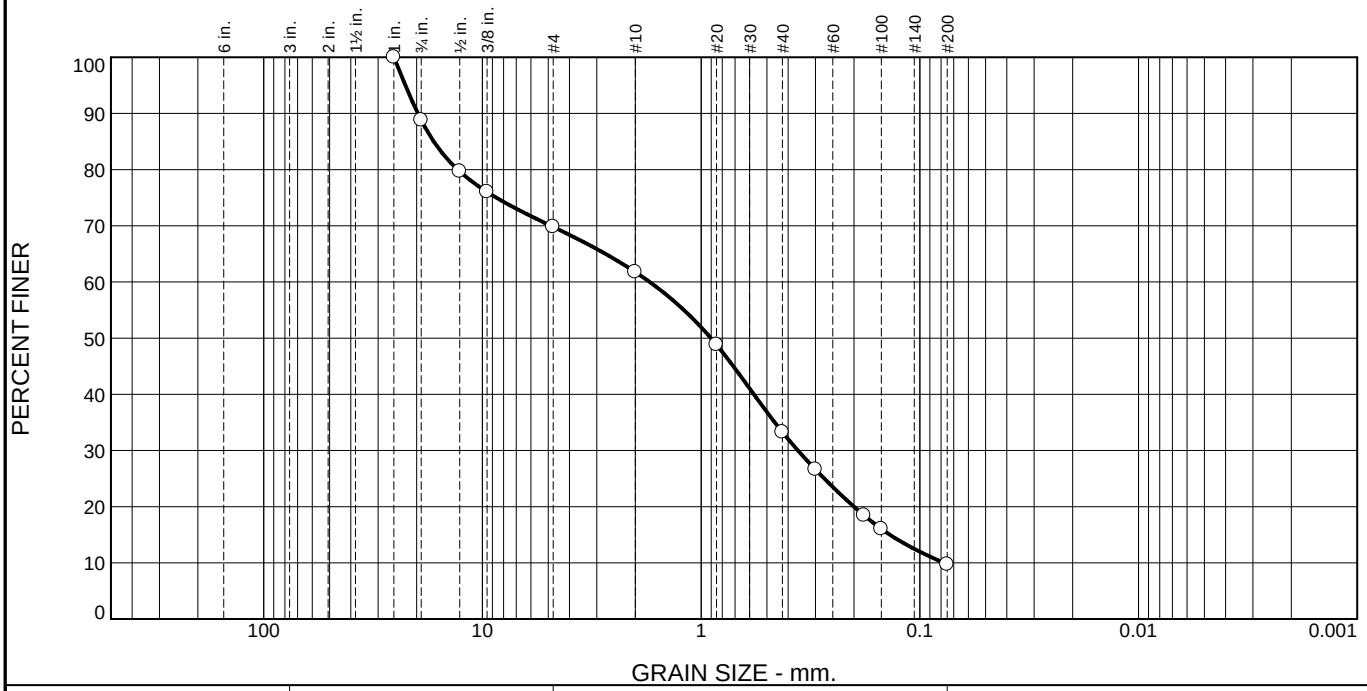
REMARKS:

Standard Penetration Tests (SPT) = 140# hammer falling 30" (ASTM D1586)
Blows are per 6 inches with a 24" long by 2" O.D. by 1 3/8" I.D. split spoon sampler unless otherwise noted
S = split-spoon sample; C = rock core sample; U = undisturbed

REMARKS: *The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Water level readings have been made in the test borings at times and under conditions stated in the test boring logs. Fluctuations in the level of the groundwater may occur due to other factors than those present at the time measurements were made.*
Proportions used: trace (0-10%), little (10-20%), some (20-35%), and (35-50%)

SOIL LABORATORY REPORTS

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	11.2	19.0	8.0	28.5	23.6	9.7	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
1	100.0		
3/4	88.8		
1/2	79.7		
3/8	76.0		
#4	69.8		
#10	61.8		
#20	48.8		
#40	33.3		
#50	26.6		
#80	18.4		
#100	16.0		
#200	9.7		

* (no specification provided)

Material Description

TBD

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 19.7370 D_{85}= 16.6942 D_{60}= 1.7192
D_{50}= 0.9019 D_{30}= 0.3610 D_{15}= 0.1371
D_{10}= 0.0778 C_u= 22.10 C_c= 0.97

Remarks

Date Received: 6-5-12 **Date Tested:** 6-8-12

Tested By: Scott TeBordo

Checked By: Derek Richards

Title: Branch Manager

Location: B-4, S-1, 0.5-2.5 **Date Sampled:** 6-5-12

Sample Number: 12-018 **Depth:** GEO

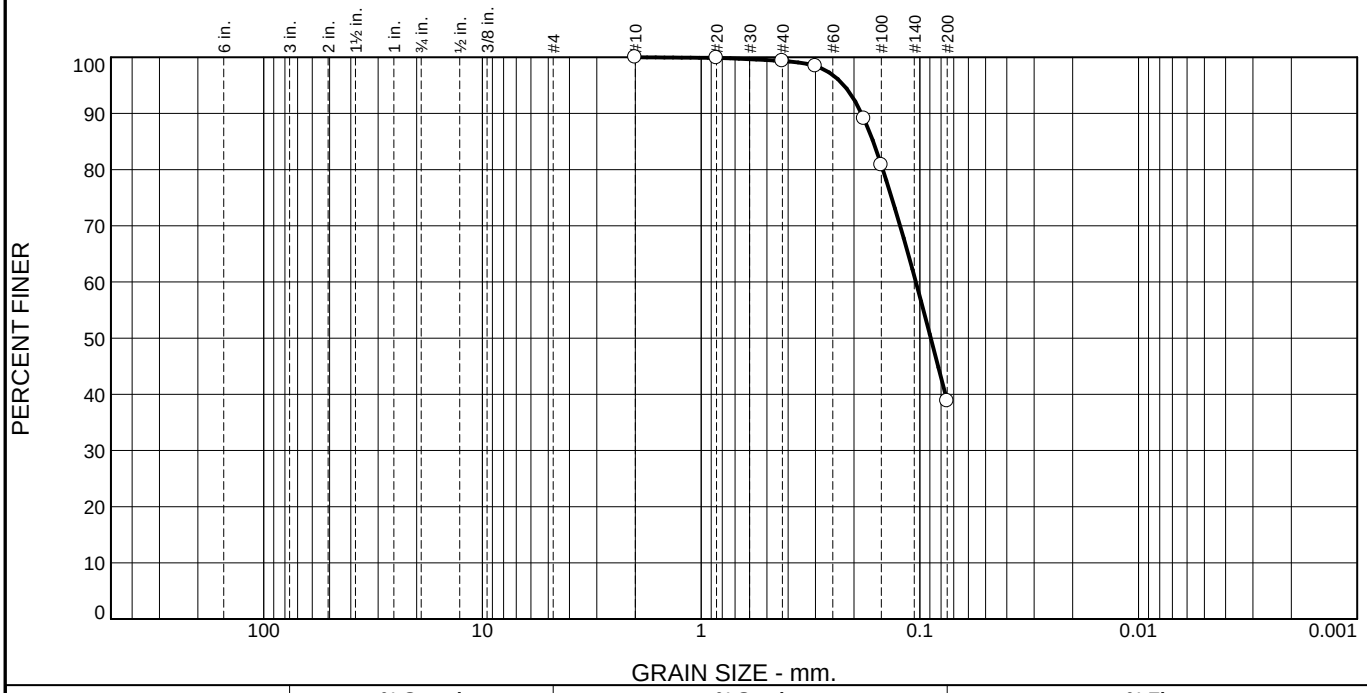
JOHN TURNER
Dover, NH

Client: Seacoast Crane

Project: Portland Sports Complex

Project No: 12-15-023 **Figure** 001

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.7	60.5	38.8	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	99.9		
#40	99.3		
#50	98.4		
#80	89.1		
#100	80.8		
#200	38.8		

* (no specification provided)

Material Description

TBD

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 0.1847 D_{85}= 0.1635 D_{60}= 0.1043
D_{50}= 0.0891 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 6-5-12 **Date Tested:** 6-8-12

Tested By: Scott TeBordo

Checked By: Derek Richards

Title: Branch Manager

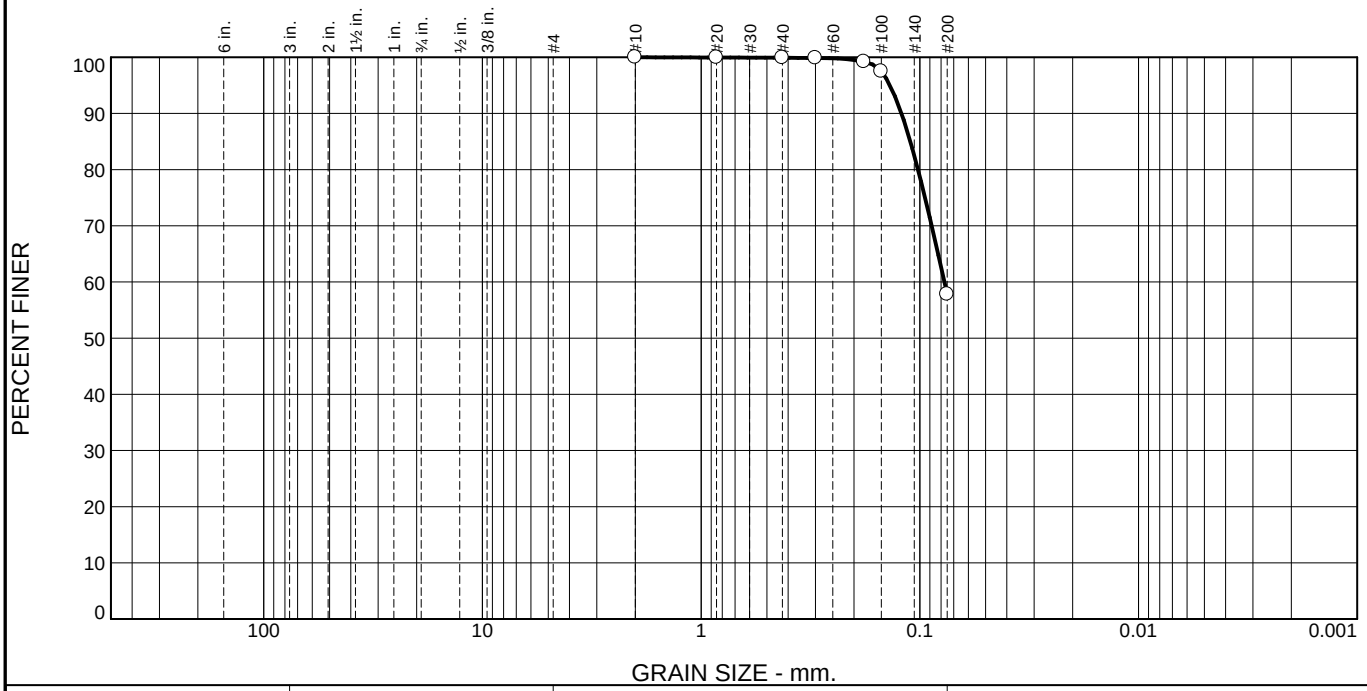
Location: B-4, S-2, 2.5-4.5 **Date Sampled:** 6-5-12
Sample Number: 12-019 **Depth:** GEO

JOHN TURNER
Dover, NH

Client: Seacoast Crane
Project: Portland Sports Complex

Project No: 12-15-023 **Figure** 002

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.1	42.1	57.8	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.9		
#50	99.9		
#80	99.2		
#100	97.5		
#200	57.8		

* (no specification provided)

Material Description

TBD

Atterberg Limits (ASTM D 4318)

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

Classification

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

Coefficients

D_{90}= 0.1213 D_{85}= 0.1105 D_{60}= 0.0772
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Date Received: 6-5-12 **Date Tested:** 6-8-12

Tested By: Scott TeBordo

Checked By: Derek Richards

Title: Branch Manager

Location: B-3, S-2, 5-7 **Date Sampled:** 6-5-12
Sample Number: 12-020 **Depth:** GEO

JOHN TURNER
Dover, NH

Client: Seacoast Crane
Project: Portland Sports Complex

Project No: 12-15-023 **Figure** 003

REPORT OF ATTERBERG LIMITS TEST RESULTS

CLIENT: Seacoast Crane **PROJECT: Portland Sports Complex**

DATE: 6-14-12 **REPORT #: 12-15-023-004**

Sampled Source: B-1, S-5 12-14 **Soil Type: TBD**

Soil ID#: 12-021 **Intended Use: GEO**

Date Received: 6-5-12 **Sampled By: Carl T.**

Method Used: ASTM D 4318 **Tested By: Scott TeBordo**

ATTERBERG LIMITS TEST RESULTS

Plastic Limit: 19

Liquid Limit: 36

Plasticity Index: 17

Remarks:

JOHN TURNER CONSULTING, INC.

19 DOVER STREET
DOVER NH 03820
T 603.749.1841 **F** 603.516.6851

6 CLINTON AVENUE
WESTFIELD MA 01085
T 413.642.0138 **F** 413.642.0164

585 RIVERSIDE STREET, #73
PORTLAND ME 04103
T 207.883.7878

REPORT OF ATTERBERG LIMITS TEST RESULTS

CLIENT: Seacoast Crane **PROJECT: Portland Sports Complex**

DATE: 6-14-12 **REPORT #: 12-15-023-005**

Sampled Source: B-2, S-7, 14-16 **Soil Type: TBD**

Soil ID#: 12-022 **Intended Use: GEO**

Date Received: 6-5-12 **Sampled By: Carl T.**

Method Used: ASTM D 4318 **Tested By: Scott TeBordo**

ATTERBERG LIMITS TEST RESULTS

Plastic Limit: 24

Liquid Limit: 37

Plasticity Index: 13

Remarks:

JOHN TURNER CONSULTING, INC.

19 DOVER STREET
DOVER NH 03820
T 603.749.1841 **F** 603.516.6851

6 CLINTON AVENUE
WESTFIELD MA 01085
T 413.642.0138 **F** 413.642.0164

585 RIVERSIDE STREET, #73
PORTLAND ME 04103
T 207.883.7878

REPORT OF ATTERBERG LIMITS TEST RESULTS

CLIENT: Seacoast Crane **PROJECT: Portland Sports Complex**

DATE: 6-14-12 **REPORT #: 12-15-023-006**

Sampled Source: B-4, S-5, 8.5-10.5 **Soil Type: TBD**

Soil ID#: 12-022 **Intended Use: GEO**

Date Received: 6-5-12 **Sampled By: Carl T.**

Method Used: ASTM D 4318 **Tested By: Scott TeBordo**

ATTERBERG LIMITS TEST RESULTS

Plastic Limit: 22

Liquid Limit: 40

Plasticity Index: 18

Remarks:

JOHN TURNER CONSULTING, INC.

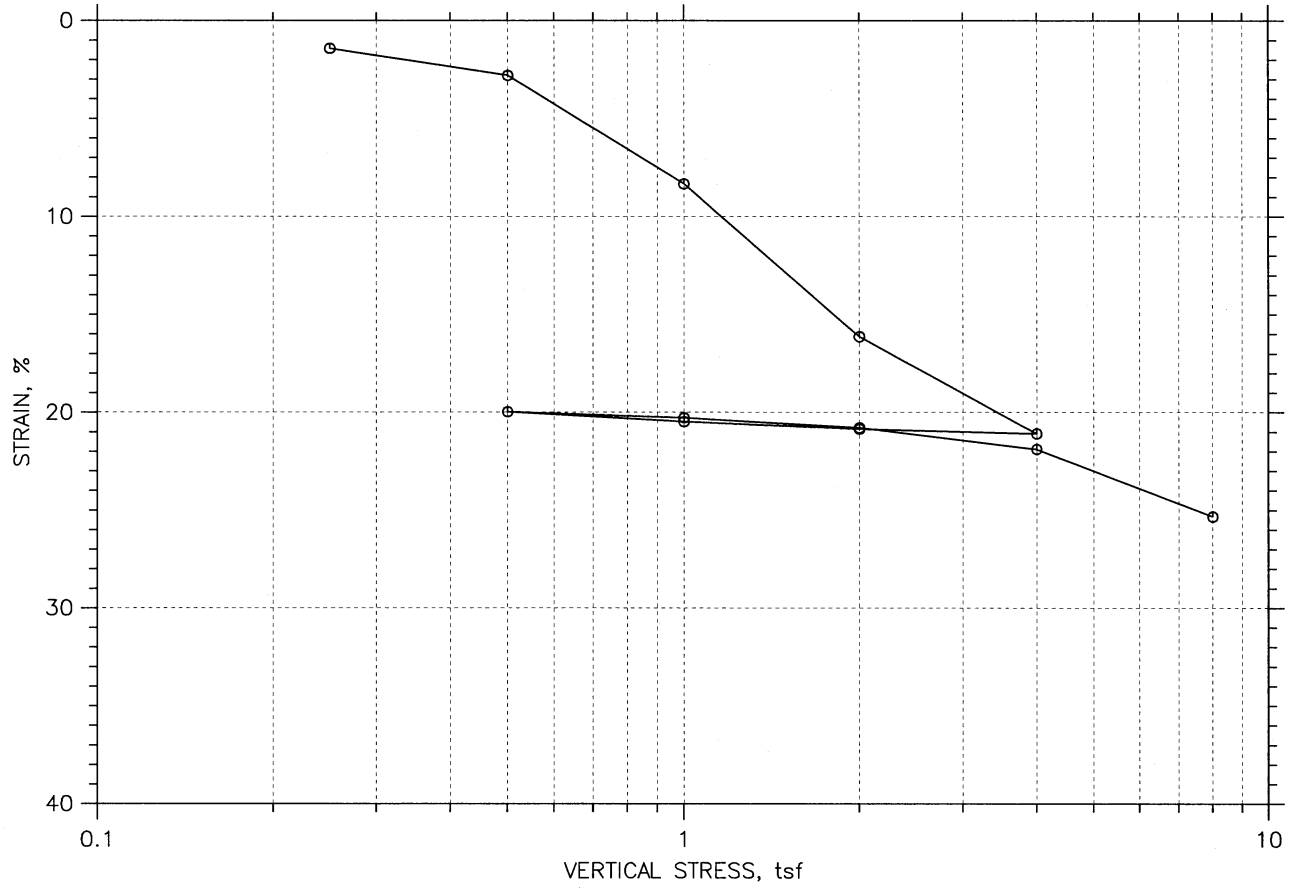
19 DOVER STREET
DOVER NH 03820
T 603.749.1841 **F** 603.516.6851

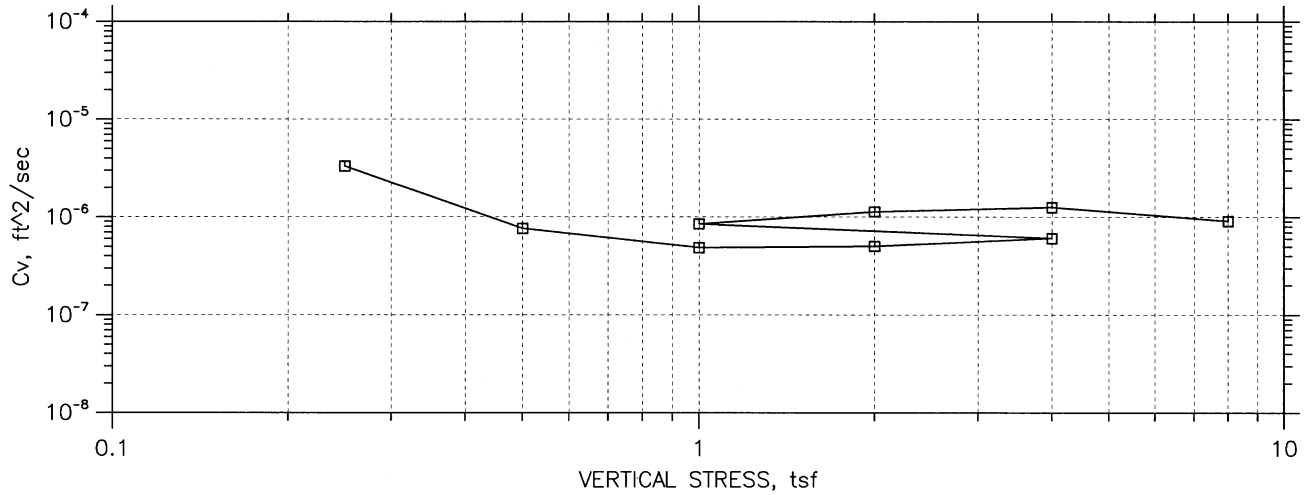
6 CLINTON AVENUE
WESTFIELD MA 01085
T 413.642.0138 **F** 413.642.0164

585 RIVERSIDE STREET, #73
PORTLAND ME 04103
T 207.883.7878

One-Dimensional Consolidation by ASTM D 2435 - Method B

SUMMARY REPORT

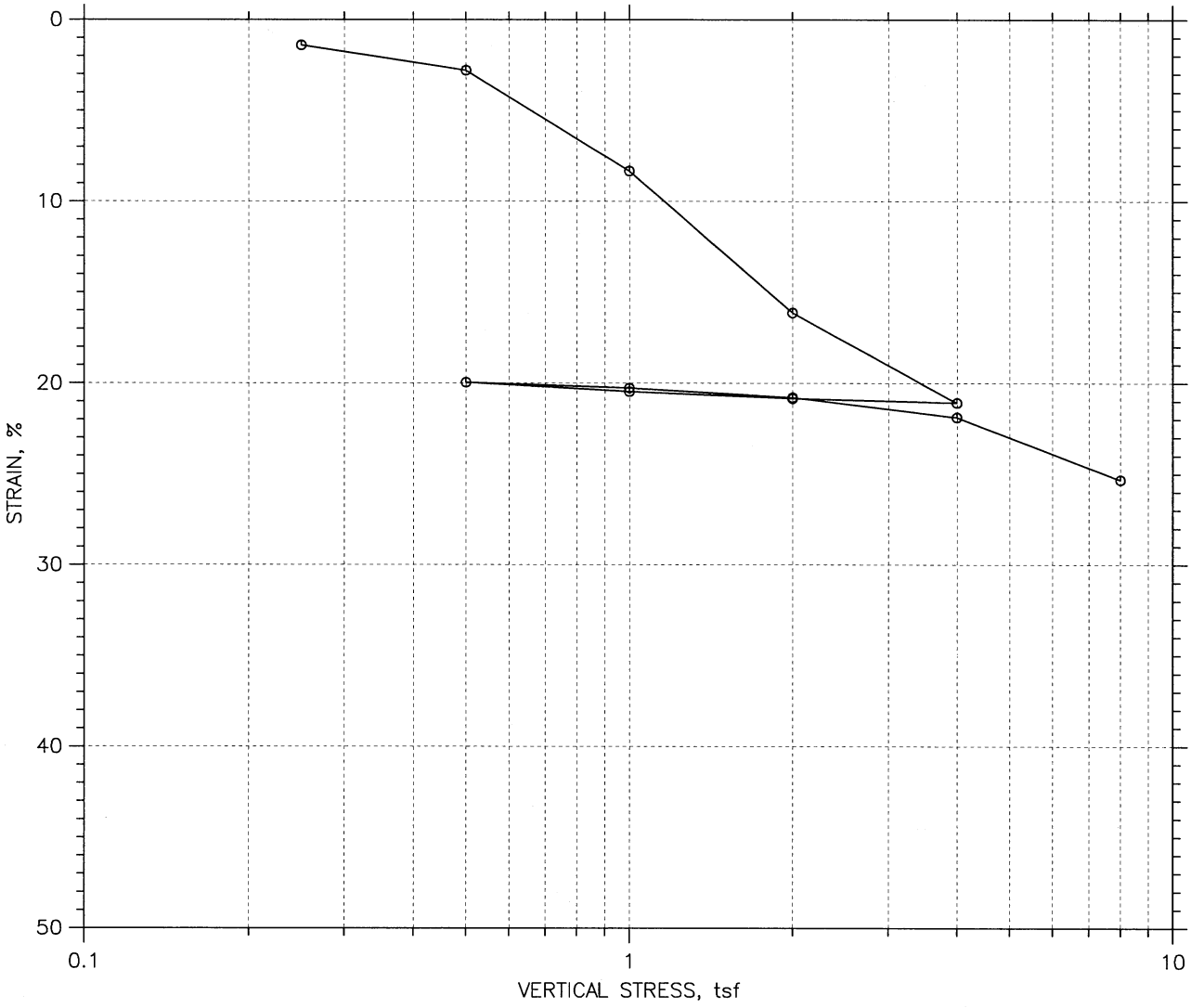




GeoTesting EXPRESS	Project: Portland Sports Complex	Location: Portland, ME	Project No.: GTX-11834
	Boring No.: B-4	Tested By: md	Checked By: jdt
	Sample No.: U-1	Test Date: 5/22/12	Test No.: IP-2
	Depth: 14-16 ft	Sample Type: intact	Elevation: ---
	Description: Wet, gray silty clay		
	Remarks: System Y		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D 2435 - Method B

SUMMARY REPORT



				Before Test	After Test
Overburden Pressure: ---			Water Content, %	52.49	31.53
Preconsolidation Pressure: ---			Dry Unit Weight, pcf	70.787	93.141
Compression Index: ---			Saturation, %	99.61	100.00
Diameter: 2.5 in		Height: 1 in	Void Ratio	1.48	0.89
LL: ---	PL: ---	PI: ---	GS: 2.82		

GeoTesting EXPRESS	Project: Portland Sports Complex	Location: Portland, ME	Project No.: GTX-11834
	Boring No.: B-4	Tested By: md	Checked By: jdt
	Sample No.: U-1	Test Date: 5/22/12	Test No.: IP-2
	Depth: 14-16 ft	Sample Type: intact	Elevation: ---
	Description: Wet, gray silty clay		
	Remarks: System Y		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D 2435 - Method B

Project: Portland Sports Complex
Boring No.: B-4
Sample No.: U-1
Test No.: IP-2

Location: Portland, ME
Tested By: md
Test Date: 5/22/12
Sample Type: intact

Project No.: GTX-11834
Checked By: jdt
Depth: 14-16 ft
Elevation: ---

Soil Description: Wet, gray silty clay
Remarks: System Y

Estimated Specific Gravity: 2.82
Initial Void Ratio: 1.48
Final Void Ratio: 0.888

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.76 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	9940	RING		8392
Wt. Container + Wet Soil, gm	438.82	248.24	229.12	126.20
Wt. Container + Dry Soil, gm	291.67	200.36	200.36	97.920
Wt. Container, gm	7.5200	109.15	109.15	8.2300
Wt. Dry Soil, gm	284.15	91.211	91.211	89.690
Water Content, %	51.79	52.49	31.53	31.53
Void Ratio	---	1.48	0.888	---
Degree of Saturation, %	---	99.61	100.00	---
Dry Unit Weight, pcf	---	70.787	93.141	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D 2435 - Method B

Project: Portland Sports Complex
Location: Portland, ME
Project No.: GTX-11834
Boring No.: B-4
Tested By: md
Checked By: jdt
Sample No.: U-1
Test Date: 5/22/12
Depth: 14-16 ft
Test No.: IP-2
Sample Type: intact
Elevation: ---

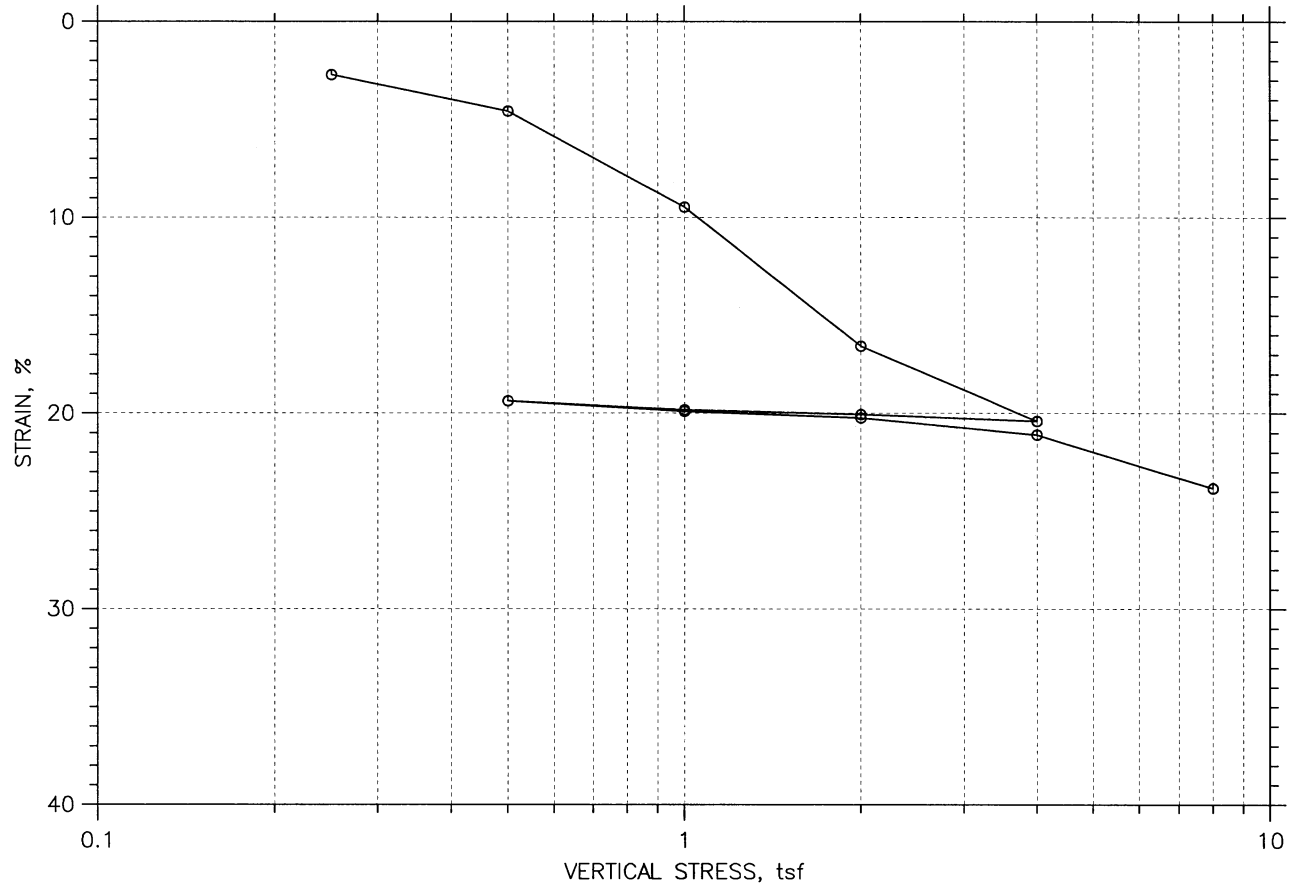
Soil Description: Wet, gray silty clay
Remarks: System Y
Displacement at End of Increment

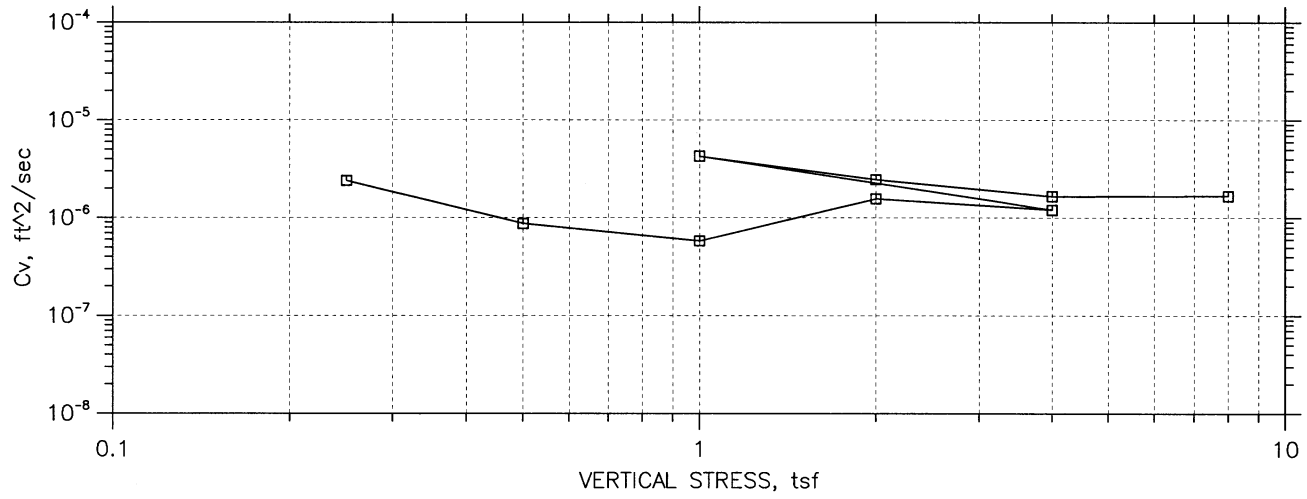
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft^2/sec	Mv 1/tsf	k ft/day
1	0.250	0.01413	1.45	1.41	8.513	2.84e-006	5.65e-002	4.33e-004
2	0.500	0.02793	1.42	2.79	24.138	9.74e-007	5.52e-002	1.45e-004
3	1.00	0.08328	1.28	8.33	42.899	5.10e-007	1.11e-001	1.52e-004
4	2.00	0.1613	1.08	16.1	34.140	5.54e-007	7.80e-002	1.16e-004
5	4.00	0.2108	0.961	21.1	26.517	6.13e-007	2.48e-002	4.09e-005
6	2.00	0.2085	0.967	20.8	2.231	6.87e-006	1.18e-003	2.18e-005
7	1.00	0.2047	0.976	20.5	7.566	2.04e-006	3.78e-003	2.08e-005
8	0.500	0.1996	0.989	20.0	17.736	8.81e-007	1.02e-002	2.41e-005
9	1.00	0.2027	0.981	20.3	11.662	1.34e-006	6.27e-003	2.27e-005
10	2.00	0.2078	0.968	20.8	10.507	1.47e-006	5.11e-003	2.03e-005
11	4.00	0.2188	0.941	21.9	13.805	1.10e-006	5.48e-003	1.63e-005
12	8.00	0.2532	0.855	25.3	15.866	9.03e-007	8.61e-003	2.10e-005

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft^2/sec	Mv 1/tsf	k ft/day	Ca %
1	0.250	0.01413	1.45	1.41	0.000	0.00e+000	5.65e-002	0.00e+000	0.00e+000
2	0.500	0.02793	1.42	2.79	0.000	0.00e+000	5.52e-002	0.00e+000	0.00e+000
3	1.00	0.08328	1.28	8.33	9.939	5.12e-007	1.11e-001	1.53e-004	0.00e+000
4	2.00	0.1613	1.08	16.1	9.204	4.77e-007	7.80e-002	1.00e-004	0.00e+000
5	4.00	0.2108	0.961	21.1	5.464	6.91e-007	2.48e-002	4.62e-005	0.00e+000
6	2.00	0.2085	0.967	20.8	0.000	0.00e+000	1.18e-003	0.00e+000	0.00e+000
7	1.00	0.2047	0.976	20.5	0.000	0.00e+000	3.78e-003	0.00e+000	0.00e+000
8	0.500	0.1996	0.989	20.0	3.665	9.90e-007	1.02e-002	2.71e-005	0.00e+000
9	1.00	0.2027	0.981	20.3	4.433	8.21e-007	6.27e-003	1.39e-005	0.00e+000
10	2.00	0.2078	0.968	20.8	3.398	1.06e-006	5.11e-003	1.46e-005	0.00e+000
11	4.00	0.2188	0.941	21.9	2.724	1.29e-006	5.48e-003	1.91e-005	0.00e+000
12	8.00	0.2532	0.855	25.3	3.706	8.98e-007	8.61e-003	2.08e-005	0.00e+000

One-Dimensional Consolidation by ASTM D 2435 - Method B

SUMMARY REPORT

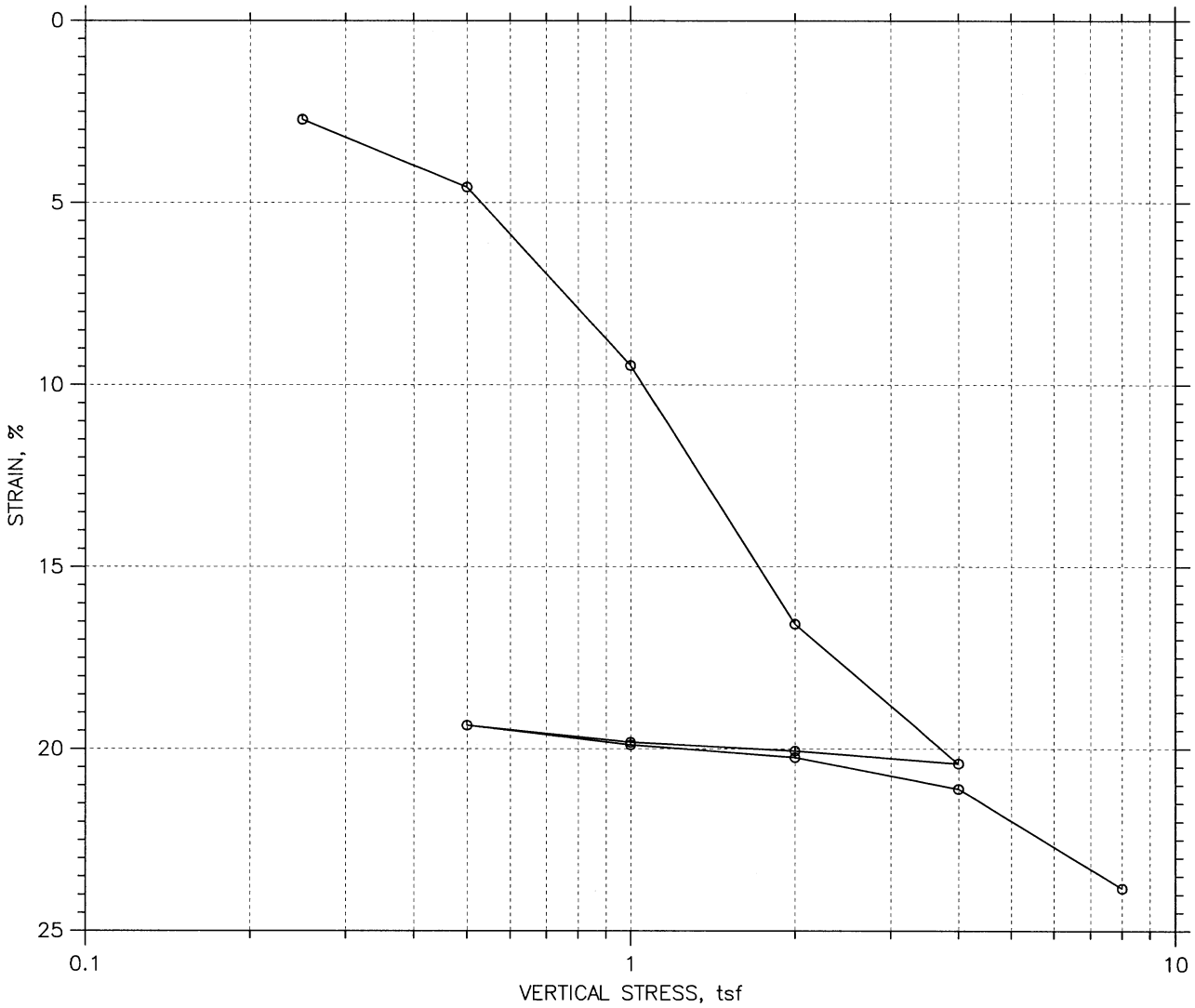




GeoTesting EXPRESS	Project: Portland Sports Complex	Location: Portland, ME	Project No.: GTX-11834
	Boring No.: B-3	Tested By: md	Checked By: jdt
	Sample No.: U-2	Test Date: 5/22/12	Test No.: IP-1
	Depth: 22-24 ft	Sample Type: intact	Elevation: ---
	Description: Wet, gray silty clay		
	Remarks: System W		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D 2435 - Method B

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: ---				Water Content, %	40.86	26.55
Preconsolidation Pressure: ---				Dry Unit Weight, pcf	80.529	100.66
Compression Index: ---				Saturation, %	97.16	100.00
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.19	0.75
LL: ---	PL: ---	PI: ---	GS: 2.82			

GeoTesting EXPRESS	Project: Portland Sports Complex	Location: Portland, ME	Project No.: GTX-11834
	Boring No.: B-3	Tested By: md	Checked By: jdt
	Sample No.: U-2	Test Date: 5/22/12	Test No.: IP-1
	Depth: 22-24 ft	Sample Type: intact	Elevation: ---
	Description: Wet, gray silty clay		
	Remarks: System W		
	Displacement at End of Increment		

One-Dimensional Consolidation by ASTM D 2435 - Method B

Project: Portland Sports Complex
Boring No.: B-3
Sample No.: U-2
Test No.: IP-1

Location: Portland, ME
Tested By: md
Test Date: 5/22/12
Sample Type: intact

Project No.: GTX-11834
Checked By: jdt
Depth: 22-24 ft
Elevation: ---

Soil Description: Wet, gray silty clay
Remarks: System W

Estimated Specific Gravity: 2.82
Initial Void Ratio: 1.19
Final Void Ratio: 0.748

Liquid Limit: ---
Plastic Limit: ---
Plasticity Index: ---

Specimen Diameter: 2.50 in
Initial Height: 1.00 in
Final Height: 0.80 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	9941	RING		8758
Wt. Container + Wet Soil, gm	370.35	255.68	240.83	134.41
Wt. Container + Dry Soil, gm	261.57	213.28	213.28	107.95
Wt. Container, gm	7.5100	109.52	109.52	8.2800
Wt. Dry Soil, gm	254.06	103.76	103.76	99.670
Water Content, %	42.82	40.86	26.55	26.55
Void Ratio	---	1.19	0.748	---
Degree of Saturation, %	---	97.16	100.00	---
Dry Unit Weight, pcf	---	80.529	100.66	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

One-Dimensional Consolidation by ASTM D 2435 - Method B

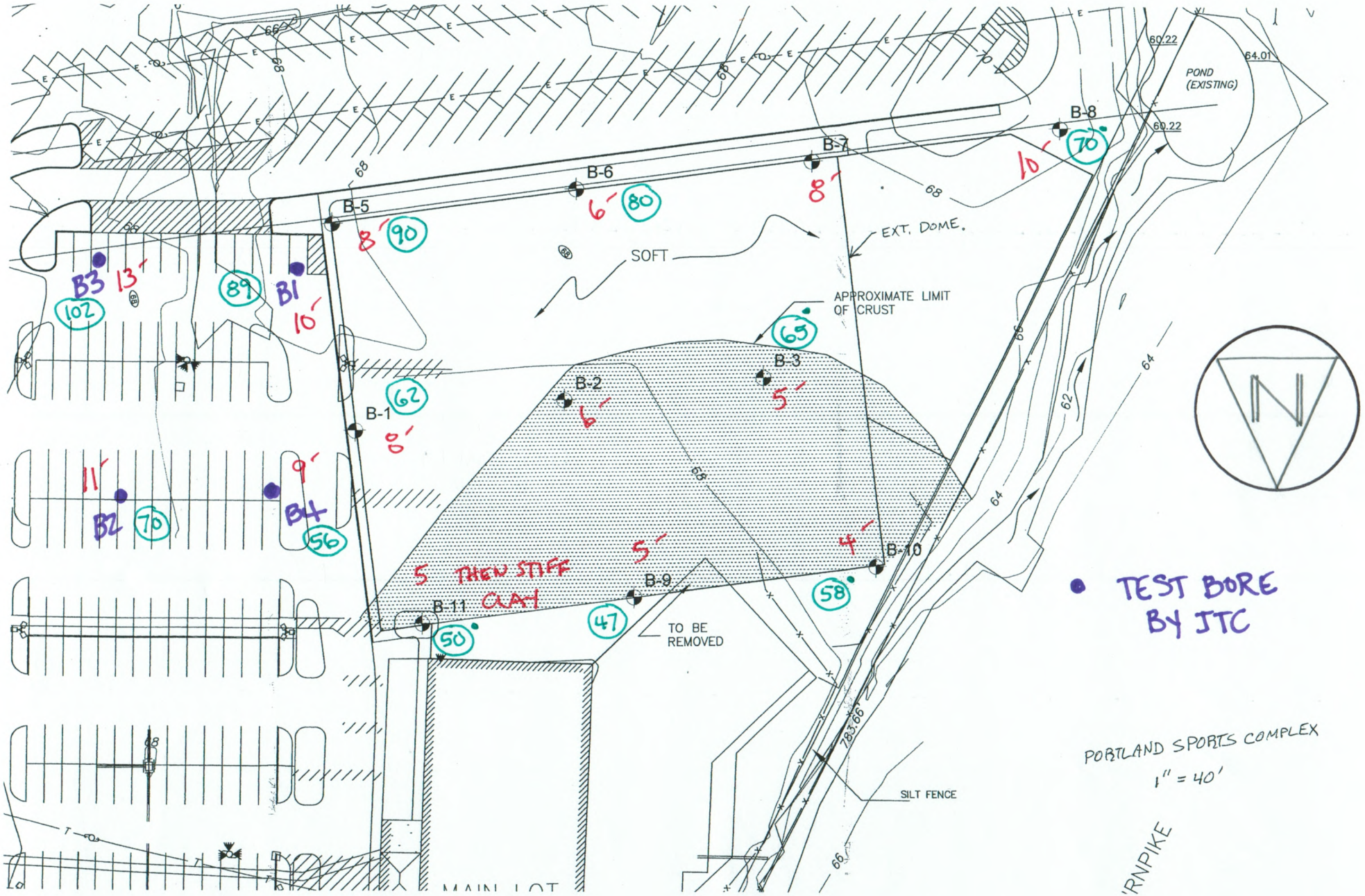
Project: Portland Sports Complex
Location: Portland, ME
Project No.: GTX-11834
Boring No.: B-3
Tested By: md
Checked By: jdt
Sample No.: U-2
Test Date: 5/22/12
Depth: 22-24 ft
Test No.: IP-1
Sample Type: intact
Elevation: ---

Soil Description: Wet, gray silty clay
Remarks: System W
Displacement at End of Increment

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Sq.Rt T90 min	Cv ft^2/sec	Mv 1/tsf	k ft/day
1	0.250	0.02711	1.13	2.71	9.541	2.50e-006	1.08e-001	7.32e-004
2	0.500	0.04565	1.09	4.57	39.738	5.73e-007	7.42e-002	1.15e-004
3	1.00	0.09462	0.979	9.46	33.359	6.36e-007	9.79e-002	1.68e-004
4	2.00	0.1657	0.824	16.6	13.676	1.36e-006	7.10e-002	2.60e-004
5	4.00	0.2040	0.740	20.4	13.359	1.22e-006	1.92e-002	6.31e-005
6	2.00	0.2005	0.747	20.1	2.662	5.87e-006	1.73e-003	2.74e-005
7	1.00	0.1982	0.752	19.8	4.755	3.31e-006	2.34e-003	2.09e-005
8	0.500	0.1935	0.763	19.4	11.851	1.34e-006	9.36e-003	3.38e-005
9	1.00	0.1989	0.751	19.9	3.927	4.04e-006	1.08e-002	1.17e-004
10	2.00	0.2023	0.743	20.2	4.239	3.70e-006	3.42e-003	3.41e-005
11	4.00	0.2110	0.724	21.1	12.179	1.27e-006	4.33e-003	1.48e-005
12	8.00	0.2383	0.665	23.8	7.519	1.96e-006	6.82e-003	3.61e-005

	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	Log T50 min	Cv ft^2/sec	Mv 1/tsf	k ft/day	Ca %
1	0.250	0.02711	1.13	2.71	0.000	0.00e+000	1.08e-001	0.00e+000	0.00e+000
2	0.500	0.04565	1.09	4.57	3.779	1.40e-006	7.42e-002	2.80e-004	0.00e+000
3	1.00	0.09462	0.979	9.46	8.979	5.49e-007	9.79e-002	1.45e-004	0.00e+000
4	2.00	0.1657	0.824	16.6	2.628	1.64e-006	7.10e-002	3.14e-004	0.00e+000
5	4.00	0.2040	0.740	20.4	3.157	1.20e-006	1.92e-002	6.20e-005	0.00e+000
6	2.00	0.2005	0.747	20.1	0.000	0.00e+000	1.73e-003	0.00e+000	0.00e+000
7	1.00	0.1982	0.752	19.8	0.000	0.00e+000	2.34e-003	0.00e+000	0.00e+000
8	0.500	0.1935	0.763	19.4	0.000	0.00e+000	9.36e-003	0.00e+000	0.00e+000
9	1.00	0.1989	0.751	19.9	0.000	0.00e+000	1.08e-002	0.00e+000	0.00e+000
10	2.00	0.2023	0.743	20.2	1.769	2.06e-006	3.42e-003	1.90e-005	0.00e+000
11	4.00	0.2110	0.724	21.1	1.433	2.50e-006	4.33e-003	2.92e-005	0.00e+000
12	8.00	0.2383	0.665	23.8	2.141	1.60e-006	6.82e-003	2.95e-005	0.00e+000

Analyses



● TEST BORE BY JTC

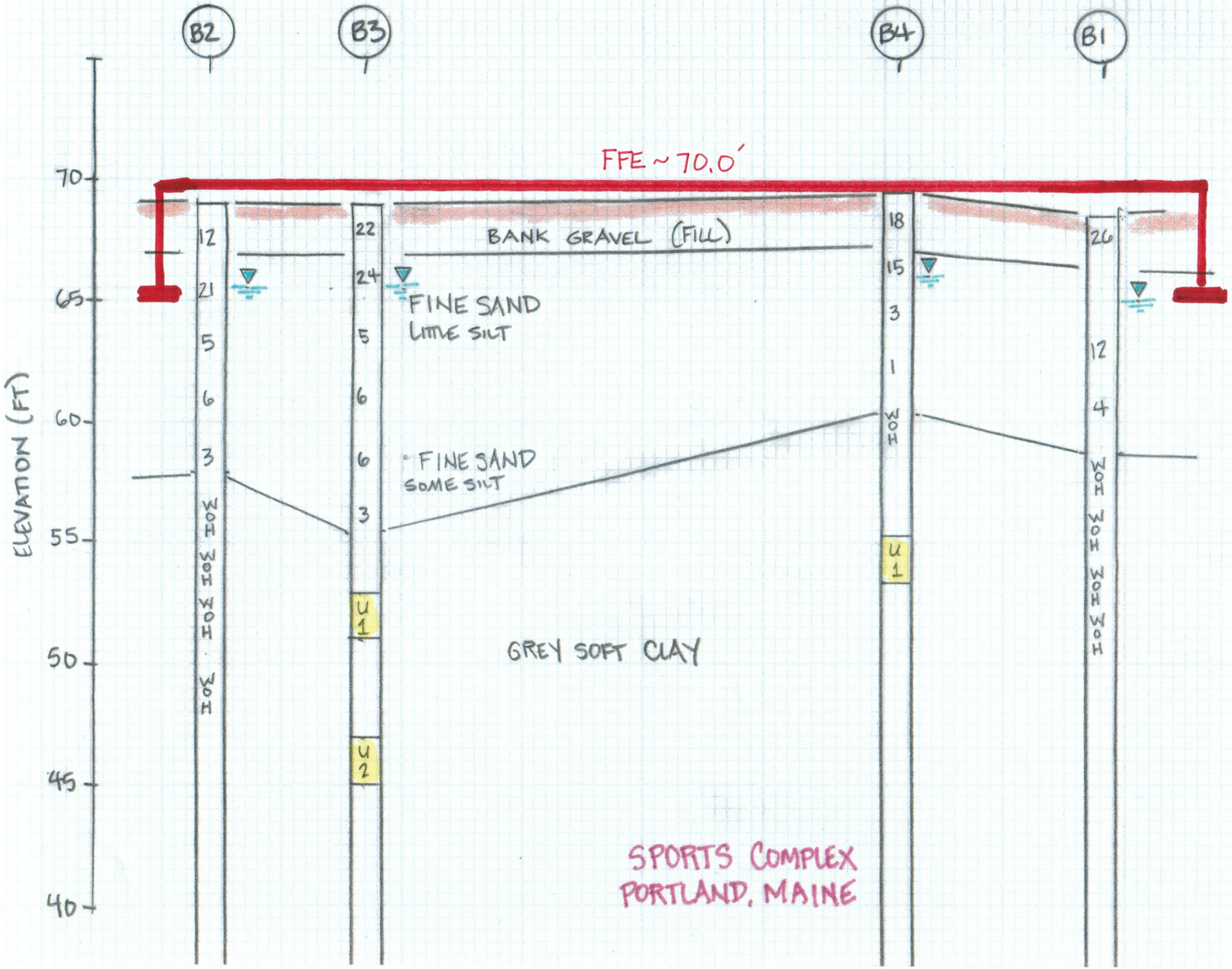
PORTLAND SPORTS COMPLEX

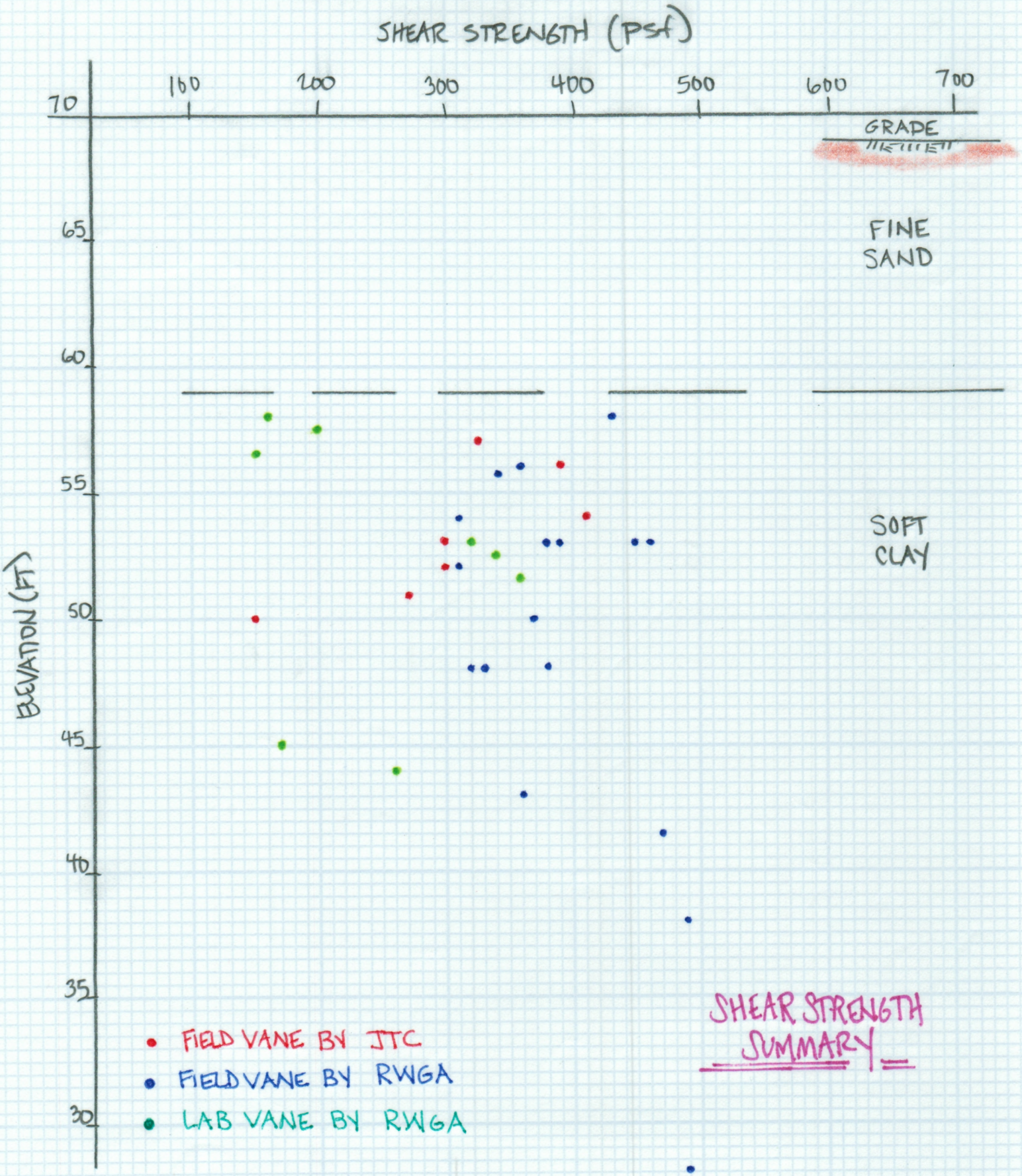
1" = 40'

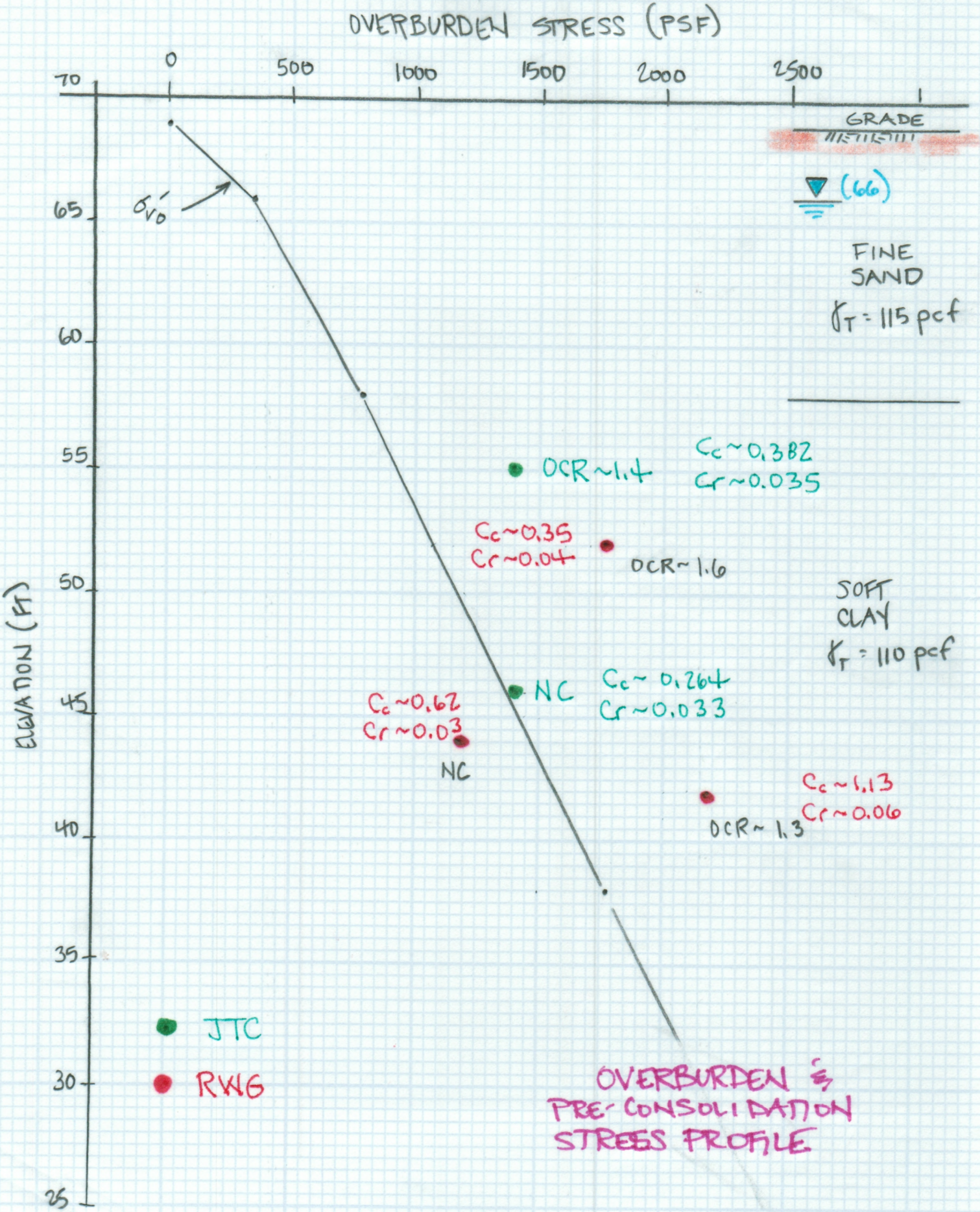
'RNPIKE

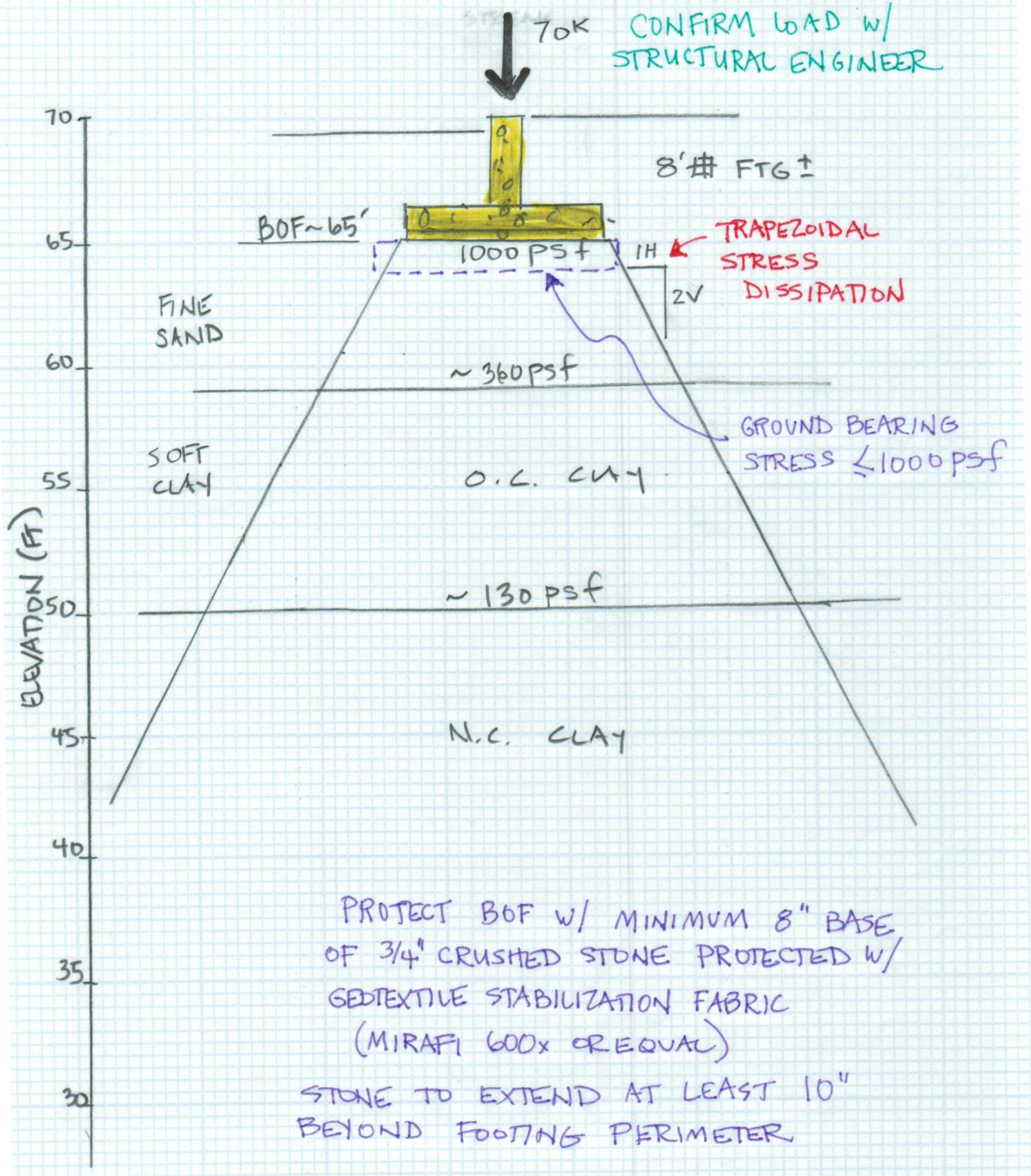
(X) DEPTH TO REFUSAL

X': DEPTH OF SAND ±


B2
B3
B4
B1
FFE ~ 70.0'
BANK GRAVEL (FILL)
FINE SAND
LITTLE SILT
FINE SAND
SOME SILT
GREY SOFT CLAY
U1
U2
ELEVATION (FT)
70
65
60
55
50
45
40
12
21
5
6
3
WOH WOH WOH WOH WOH
22
24
5
6
6
3
18
15
3
1
WOH
26
12
4
WOH WOH WOH WOH
SPORTS COMPLEX
PORTLAND, MAINE

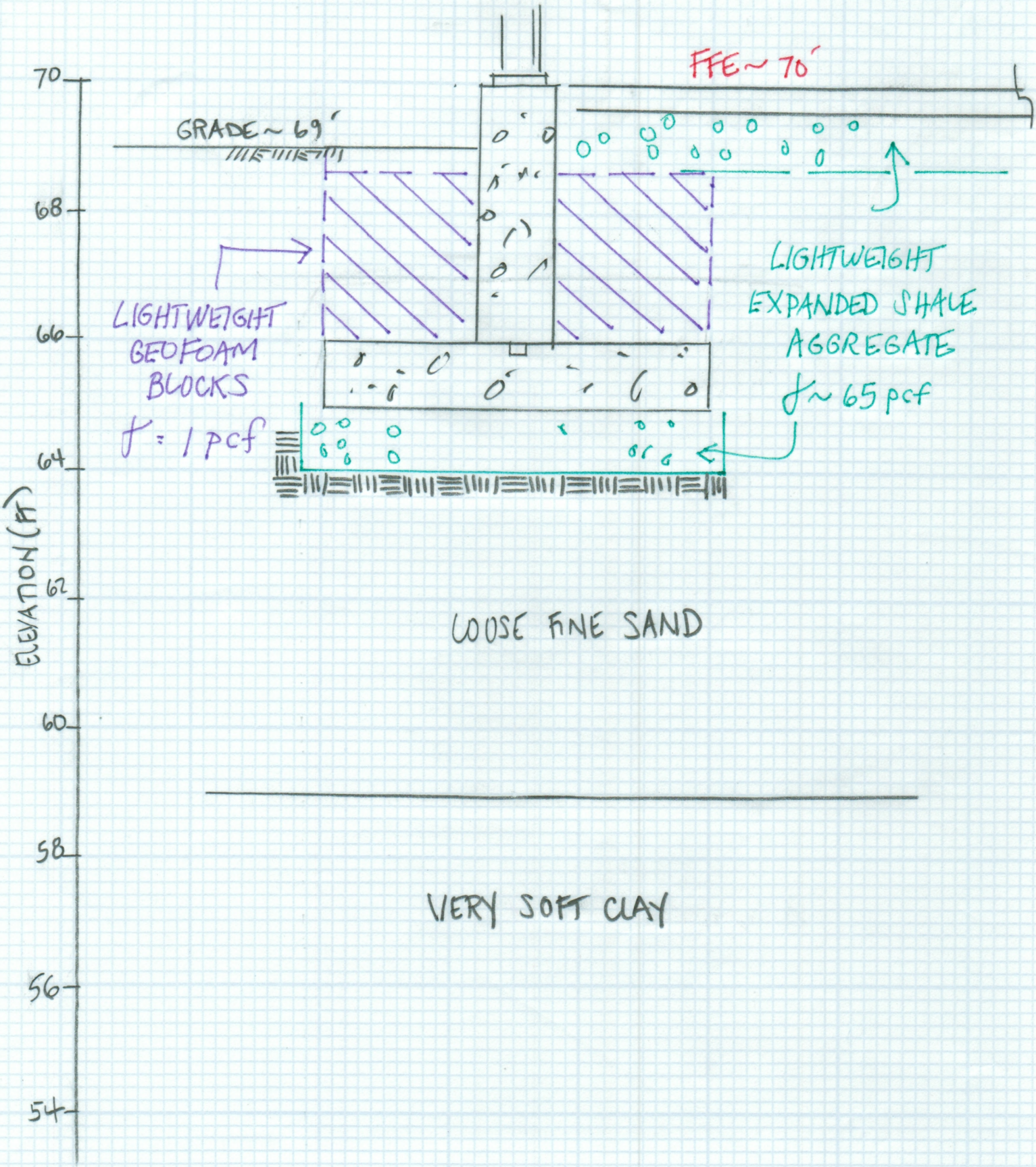

SHEAR STRENGTH (psf)
100
200
300
400
500
600
700
70
GRADE
65
FINE SAND
60
55
SOFT CLAY
50
45
40
35
30
ELEVATION (FT)
FIELD VANE BY JTC
FIELD VANE BY RWGA
LAB VANE BY RWGA
SHEAR STRENGTH SUMMARY


OVERBURDEN STRESS (PSF)
0
500
1000
1500
2000
2500
70
65
60
55
50
45
40
35
30
25
ELEVATION (FT)
GRADE
(66)
σ'_{vo}
FINE SAND
γ_T = 115 pcf
OCR ~ 1.4
C_c ~ 0.382
C_r ~ 0.035
C_c ~ 0.35
C_r ~ 0.04
OCR ~ 1.6
SOFT CLAY
γ_T = 110 pcf
NC
C_c ~ 0.264
C_r ~ 0.033
C_c ~ 0.62
C_r ~ 0.03
NC
C_c ~ 1.13
C_r ~ 0.06
OCR ~ 1.3
JTC
RWG
OVERBURDEN & PRE-CONSOLIDATION STRESS PROFILE



PROTECT BOF W/ MINIMUM 8" BASE OF 3/4" CRUSHED STONE PROTECTED W/ GEOTEXTILE STABILIZATION FABRIC (MIRAFI 600x OR EQUAL)

STONE TO EXTEND AT LEAST 10" BEYOND FOOTING PERIMETER


70
68
66
64
62
60
58
56
54
ELEVATION (FT)
FFE ~ 70'
GRADE ~ 69'
LIGHTWEIGHT GEOFOAM BLOCKS
ɣ = 1 pcf
LIGHTWEIGHT EXPANDED SHALE AGGREGATE
ɣ ~ 65 pcf
LOOSE FINE SAND
VERY SOFT CLAY

Site Photos

SITE PHOTOGRAPHS
PROPOSED ADDITION
PORTLAND SPORTS COMPLEX
PORTLAND, MAINE

Overall View of Addition Area
Facing Existing Dome

Overall View of Addition Area
Facing Existing Dome

Boring B-3 Location

DigSafe Clearance Marks