Metric Construction Corp

TRANSMITTAL
No. 00005

55 Henshaw Street
Boston, MA 02135

Phone: (617) 787-1158
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PROJECT: Bay House, Portland ME

DATE: 9/12/2012

TO: JSN Associates, Inc.
1 Autumn Street
Portsmouth, NH 03801

REF: Rammed Agg Pier Submittals

PHONE: (603) 433-8639

FAX:

ATTN: Jeffrey Nawrocki

WE ARE SENDING:	SUBMITTED FOR:	ACTION TAKEN:
☑ Shop Drawings	☑ Approval	☐ Approved as Submitted
☐ Letter	☐ Your Use	☐ Approved as Noted
☐ Prints	☑ As Requested	☐ Returned After Loan
☐ Change Order	☐ Review and Comment	☐ Resubmit
☐ Plans		☐ Submit
☐ Samples	**SENT VIA:**	☐ Returned
☐ Specifications	☑ Attached	☐ Returned for Corrections
☑ Other: Made from Submittal	☐ Separate Cover Via: Mail	☐ Due Date:

ITEM NO.	COPIES	DATE	ITEM	NUMBER	REV. NO.	DESCRIPTION	STATUS
	4	9/12/2012	SUT	02-33-00-011	000	Dwg: Title: Rammed Aggregate Piers Desc: Design Calcs & Procedure	NEW

Remarks: Jeff,

See attached Design Calc's & proposed procedure for Rammed Aggregate Piers, for your review. Thanks.

FILE COPY

CC:

Signed: ____________________
Ryan Mador

Job No.:	Page:	
Job Title: The Bay House Portland, Maine		
Date: 9/4/12	Made by: KO	Checked by: BF

SUBSURFACE CONSTRUCTORS, INC.

Vibro Stone Column Installation Beneath Pad Foundations
For

The Bay House

In

Portland, Maine

METRIC CONSTRUCTION SUBMITTAL
JOB 12-283 Bay House
SUBMITTAL # 02-33-00-011
FOR Rammed Agg Pier Calc's & Proc.
PM RM
DATE 9/12/12

DESIGN CALCULATIONS

SUBSURFACE CONSTRUCTORS, INC.
St. Louis, Missouri

Prepared by: Kenneth Otten Date: 9/4/2012

Approved by: Bill Faherty Date: 9/4/2012

STATE OF MAINE
KENNETH R. OTTEN
No. 13044
9-4-2012
LICENSED
PROFESSIONAL ENGINEER

INTRODUCTION

Ground improvement using vibro stone columns has been proposed to accommodate the foundations for the proposed Bay House Project located between Middle Street, Hancock Street, Newbury Street and midway between Hancock and India Streets in Portland, Maine.

The objective of the vibro stone column ground improvement would be to introduce "reinforcing" elements (i.e. dense stone columns) into the soil profile to provide a stone column – soil composite with enhanced bearing capacity and settlement characteristics.

GROUND CONDITIONS

Fill materials were encountered in the borings within the proposed building to depths ranging from 3 to 6 feet. The fill generally consisted of sandy soils. The fill is generally underlain by marine deposits consisting of silt and lean clay to depths ranging from approximately 20 to 24 feet. The silt and lean clay soils are generally underlain by sand soils to the termination depth of the borings. The only exceptions were encountered in Boring B-4 where sand soils were encountered at 7 ft. and in Boring B-1 where sand was not encountered through the depths explored.

SOIL PROPERTIES

The soil profile below the anticipated founding depths for the addition is summarized in Table 1 below:

Table 1

Soil Unit	Average Depth Range	SPT "N" Value	Modulus of Vol. Compressibililty
Silt and Lean Clay (ML)	3 to 24 ft.	WHO to 15	0.05 to 0.1
Sand Soils	Below 21 to 34 ft.	1 to 28	.05 to 0.5

BEARING PRESSURE REQUIREMENTS

The ground improvement has been designed to support the following bearing pressures:

- A maximum uniformly distributed load (UDL) of up to 3,000 psf (143.4 kPa) beneath the pad footings and continuous wall footings.

PERFORMANCE REQUIREMENTS

In addition to safely supporting the specified foundation pressures, the ground improvement is based upon limiting post construction total settlements to a maximum of around 1 inch with a maximum differential of ½ inch.

DESIGN

Vibro stone columns will be installed beneath the designated footings at the frequency and spacing shown on the vibro stone column layout drawing. Vibro stone column installation will commence from the working platform level, with stone columns installed to a depth of approximately 23 feet, or refusal.

DESIGN CALCULATIONS

Settlement calculations have been produced (taking account of the loading conditions described above) and based upon the average soil profile for the Borings. The calculations are presented in Appendix B and notes on the calculation method are provided in Appendix A.

The calculations are based upon forming stone columns with a typical diameter of the order of 700-750mm (around 2 to 2.5 ft) with an assumed angle of internal friction for the stone column of 43 degrees.

The results of the settlement calculations indicate maximum post construction settlements of less than 1 inch. We would anticipate the maximum differential settlement to be less than ½ inch.

INSTALLATION OF SERVICES FOLLOWING STONE COLUMN INSTALLATION

Where installation of services are proposed following installation of vibro stone columns, appropriate measures need to be taken by the contractor installing the foundations and services, to ensure that the integrity of the vibro stone column treatment is not compromised. As a general rule, any excavation which potentially intersects a line drawn down at 45 degrees at underside of foundation level will potentially impact on the integrity of the treated ground due to disturbance of the treated ground. Where this occurs, the disturbed soil should be removed and replaced with suitable granular material placed and compacted in layers or lean mix concrete until back above the 45 degree line, (dependent upon the requirements of the Local Authority).

Pad & strip footing settlement Determination

Cohesive Soils

Immediate Settlement – Ueshita and Meyerhof (1968)

The solution of immediate (undrained) settlements within clays is provided by Ueshita and Meyerhof (1968). The solution provides the settlement at the corner of a loaded area, and in order to determine the maximum settlement at the center of a loaded area the principle of superposition should be applied. The expression used by Ueshita and Meyerhof (1968) is as follows:

$$\rho_I = \{q.B.I\}/E_u$$

where

- q = uniform applied pressure
- B = Foundation width
- I = Influence Factor (Fig. 1)
- E_u = Undrained shear modulus

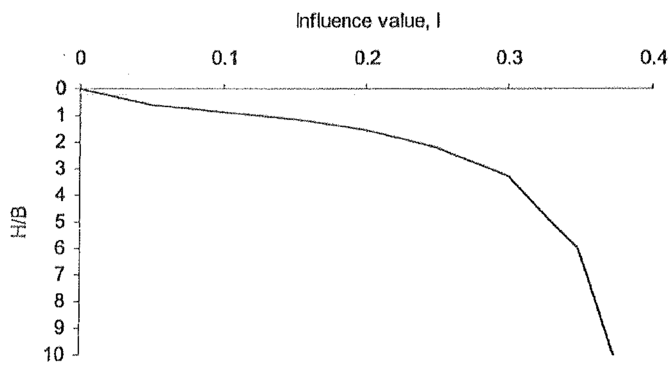

Figure 1: Influence values (I) based on L/B = 1, for various soil layer thickness (H)

Consolidation Settlements - Oedometer or M_v Method

Where cohesive soils are encountered, oedometer tests are often carried out to determine the consolidation characteristics of the soils. For a given pressure increase above the effective vertical stress at the depth the sample was collected, the m_v value can be measured (coefficient of volume compressibility). Using this m_v value the change in thickness/settlement for a soil layer is obtained using the following expression:

$$\rho_{oed} = m_v.H.\Delta\sigma$$

where

- m_v = coefficient of volume compressibility
- H = initial thickness of soil layer
- $\Delta\sigma$ = change in stress

Skempton and Bjerrum (1957) have taken this a stage further by stating that the settlements predicted by the above equation do not take into account the fact that soils beneath structures are not laterally confined as with the oedometer tests. They introduced a semi-empirical correction factor (μ), to give the consolidation settlement as:

$\rho_c = \mu . \rho_{oed}$

Granular Soils

Immediate Settlements – Burland and Burbridge (1985)

Based on the statistical analysis of observed settlements, Burland and Burbridge (1985) proposed that the average immediate settlement for a foundation founded on the surface of normally consolidated sands is given by:

$$\rho_i = f_s . f_l . q' . B^{0.7} . I_c$$

where,

- q' = average gross effective foundation pressure (kN/m^2)
- B = width of foundations (m)
- I_c = compressibility index
  = $(1.71)/(N^{1.4})$
- f_s = shape factor
  = $[\{1.25.(L/B)\}/\{(L/B)+0.2\}]$
- f_l = thickness factor
  = $(H_s/Z_l).\{2-(H_s/Z_l)\}$ for $H_s < Z_l$
  = 1 for $H_s > Z_l$

where,

- N = average SPT value over depth of influence
- L = foundation length (m)
- B = foundation breadth (m)
- Z_l = depth of influence (Fig. 2)
- H_s = thickness of sand below foundation (m)

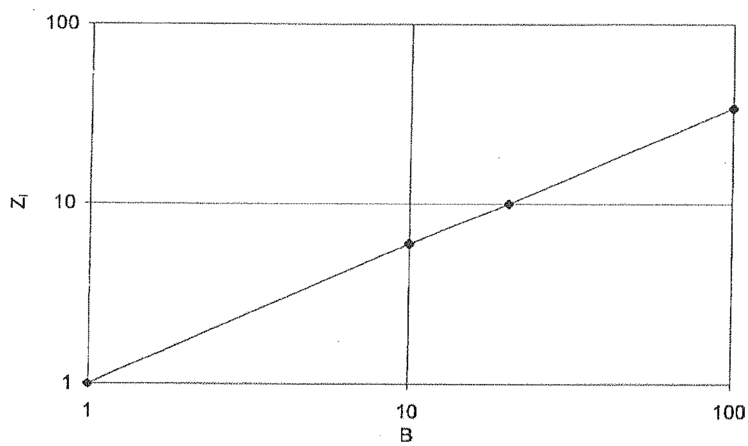

Figure 2: Depth of influence

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Job Title: The Bay House		
e:	Made by:	Checked by:

Creep Settlements (Granular Soils)

A correction is applied to the immediate settlement in granular soils to obtain the long term (or creep) settlement. The correction is given by the term:

$$f_t = 1 + R_3 + R_t.\log_{10}(t/3)$$

where

R_3 = 0.3 for static loads and 0.7 for fluctuating loads

R_t = 0.2 for static loads and 0.8 for fluctuating loads

The corrected immediate settlement is then given by:

$$\rho_t = f_t.\rho_i$$

Stress Distribution

Stress Distribution Beneath Main Foundations

Beneath pad/strip foundations a Bousinessq stress distribution is used.

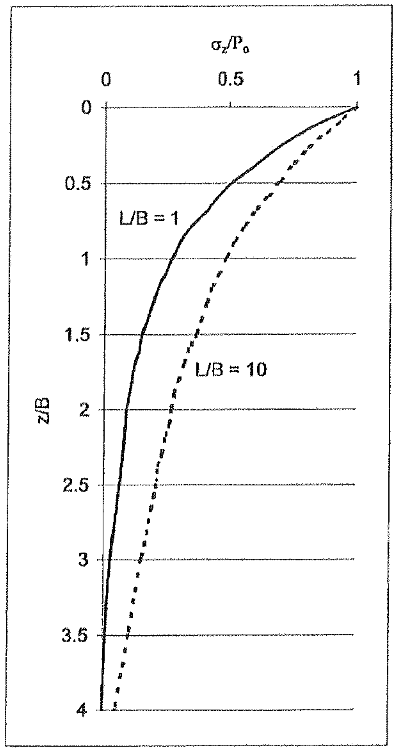

Figure 1: Mean Vertical Stress (σ_z) at a depth z beneath a rectangular area (L x B) loaded to a uniform bearing pressure of P_o.

Stress Distribution Beneath Floor Slabs

The stress beneath a floor slab is determined using the expression of Hobbs (1974):

$$P_z = B.L.P_o \cdot \frac{1}{(B+1.2z)(L+1.2z)}$$

Where,

P_z = Stress at depth z below foundation

P_o = Imposed load from foundation

B = Width of slab area

L = Length of slab area

z = depth below foundation

The settlement beneath the floor slab is only considered to a depth where the applied stress becomes less than 20% of the overburden pressure or where the soils are considered to be incompressible.

Determination of Settlements Beneath Floor Slab

Reduction of Settlements due to Stone Columns

When analysing the effect of stone columns on the settlements beneath floor slab areas, consideration is given to reduction in stress on the in situ soils: If you consider that the settlements beneath the floor slab are a function of the imposed foundation load, then by reducing that applied load on the soils you effectively reduce the settlements. Where stone columns are installed they are generally a magnitude stiffer than the surrounding soils, and by principles of stress share the stone columns will take a greater proportion of the load which is defined by Baumann and Bauer (1974) in the following expressions:

$$\frac{P_c}{P_s} = \frac{1+2\left(\frac{E_s}{E_c}\right).k_s.\ln.\left(\frac{a}{r_o}\right)}{2.\left(\frac{E_s}{E_c}\right)k_c.\ln\left(\frac{a}{r_o}\right)}$$

$$P_o.A_o = P_c.A_c + P_s.A_s$$

Where,

P_o = Imposed load from foundation
P_c = Stress on stone column
P_s = Stress on soil
A_o = Unit area per stone column
A_s = Cross sectional area of stone column
A_c = Cross section area of treated soil
E_c = Modulus of deformation for stone column aggregate
E_s = modulus of deformation for soil
k_s = Earth pressure co-efficient for column
k_c =Earth pressure co-efficient for soil
r_o = stone column radius
a = $(Ao/\Pi)^{0.5}$

From the above equations the values of P_s and P_c can be determined. In determining the settlements beneath the floor slab, post treatment (stone column installation), the value P_s is used for the treated depth, beyond which the imposed load (P_o) used.

References

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UESHITA, K. AND MEYERHOF, G. G. (1968) Surface displacement of an elastic layer under uniformly distributed loads. *Highway Research Board Record No. 228*, 1-10.

APPENDIX B

MFSCALC

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Calculation Reference: 2.5' strip footing

Contract Number:

P_o = 143.4 kN/m^2

A_o = 1.9 m^2

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
				Column Compressibility										Overburden Constraint					
	1.37				16														
1	3.05	0.70	4.94	22.5	16	0.33	2.41	2.00	0.19	0.15	5.56	0.10	1.59	35.36	7.17	648	0.32	1.13	1.80
2	4.27	0.70	4.94	9	8	0.33	2.41	5.00	0.19	0.42	1.37	0.16	2.05	53.68	7.61	533	0.32	1.28	2.61
3	5.18	0.70	4.94	9	8	0.33	2.41	5.00	0.19	0.42	1.37	0.16	2.05	62.2	7.61	533	0.32	1.33	2.73
4	6.09	0.70	4.94	12	8	0.33	2.41	3.75	0.19	0.33	2.00	0.14	1.94	69.48	7.50	555	0.32	1.37	2.65
5	7.16	0.70	4.94	12	8	0.33	2.41	3.75	0.19	0.33	2.00	0.14	1.94	77.4	7.50	555	0.32	1.43	2.76
6	7.62	0.70	4.94	19.6	8	0.33	2.41	2.30	0.19	0.19	4.28	0.11	1.68	83.52	7.26	620	0.32	1.41	2.36
7	8.38	0.70	4.94	21	8	0.33	2.41	2.14	0.19	0.17	4.86	0.10	1.63	88.4	7.21	633	0.32	1.43	2.33
8	9.45	0.70	4.94	30	8	0.33	2.41	1.50	0.19	0.08	11.17	0.06	1.37	95.72	6.96	729	0.32	1.39	1.91

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.90 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 0.762 m
L = 15.239 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	1.102	66	1.87		0.05	0.2	1.11	95	450	0.28		0.00	1.54	0.00	1.39	y	1.59	0.88
2.90	1.22	2.29	3.005	22	0.40		0.5	0.9	11.81	18	180	0.19		0.00	1.54	0.00	12.00	y	2.05	5.86
3.81	0.91	3.355	4.403	7	0.12		0.5	0.9	2.94	18	180	0.03		0.00	1.54	0.00	2.97	y	2.05	1.45
4.72	0.91	4.265	5.597	0	0.00		0.3	0.7	0.00	24	250	0.00		0.00	1.54	0.00	0.00	y	1.94	0.00
5.79	1.07	5.255	6.897	0	0.00		0.3	0.7	0.00	24	250	0.00		0.00	1.54	0.00	0.00	y	1.94	0.00
6.25	0.46	6.02	7.901	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
7.01	0.76	6.63	8.701	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
8.08	1.07	7.545	9.902	0	0.00				0.00			0.00	20	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 16.36 mm
Post Treatment Settlement = 8.19 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 5' strip footing

P_o = 143.4 kN/m²

A_o = 1.3 m²

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m²

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m²	γ_s kN/m³	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	3.38	22.5	16	0.33	3.32	2.00	0.19	0.15	5.56	0.11	1.70	35.36	7.28	613	0.32	1.14	1.94
2	4.27	0.70	3.38	9	8	0.33	3.32	5.00	0.19	0.42	1.37	0.21	2.48	53.68	8.02	464	0.32	1.33	3.30
3	5.18	0.70	3.38	9	8	0.33	3.32	5.00	0.19	0.42	1.37	0.21	2.48	62.2	8.02	464	0.32	1.40	3.48
4	6.09	0.70	3.38	12	8	0.33	3.32	3.75	0.19	0.33	2.00	0.19	2.27	69.48	7.82	494	0.32	1.43	3.25
5	7.16	0.70	3.38	12	8	0.33	3.32	3.75	0.19	0.33	2.00	0.19	2.27	77.4	7.82	494	0.32	1.51	3.41
6	7.62	0.70	3.38	19.6	8	0.33	3.32	2.30	0.19	0.19	4.28	0.13	1.84	83.52	7.41	578	0.32	1.45	2.66
7	8.38	0.70	3.38	21	8	0.33	3.32	2.14	0.19	0.17	4.86	0.12	1.77	88.4	7.34	595	0.32	1.47	2.60
8	9.45	0.70	3.38	30	8	0.33	3.32	1.50	0.19	0.08	11.17	0.07	1.41	95.72	7.00	711	0.32	1.41	1.99

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

MFSCALC

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.30 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 1.5239 m
L = 15.239 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	0.551	100	2.84		0.05	0.2	1.69	95	450	0.34		0.00	1.54	0.00	2.03	y	1.70	1.19
2.90	1.22	2.29	1.503	53	0.99		0.5	0.9	29.13	18	180	0.24		0.00	1.54	0.00	29.37	y	2.48	11.84
3.81	0.91	3.355	2.202	34	0.55		0.5	0.9	14.09	18	180	0.03		0.00	1.54	0.00	14.12	y	2.48	5.70
4.72	0.91	4.265	2.799	29	0.42		0.3	0.7	5.62	24	250	0.04		0.00	1.54	0.00	5.66	y	2.27	2.49
5.79	1.07	5.255	3.448	22	0.28		0.3	0.7	4.83	24	250	0.14		0.00	1.54	0.00	4.97	y	2.27	2.19
6.25	0.46	6.02	3.950	14	0.17				0.00			0.00	14	0.71	1.54	1.09	1.09		1.00	1.09
7.01	0.76	6.63	4.351	7	0.08				0.00			0.00	14	0.47	1.54	0.73	0.73		1.00	0.73
8.08	1.07	7.545	4.951	1	0.01				0.00			0.00	20	0.06	1.54	0.09	0.09		1.00	0.09

Pre-Treatment Settlement = 58.06 mm

Post Treatment Settlement = 25.33 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

MFSCALC

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 3' x 3' footing

P_o = 143.4 kN/m²

A_o = 0.8 m²

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m²

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m²)	γ_s (kN/m³)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	2.08	22.5	16	0.33	6.06	2.00	0.19	0.15	5.56	0.13	1.84	35.36	7.41	578	0.32	1.15	2.12
2	4.27	0.70	2.08	9	8	0.33	6.06	5.00	0.19	0.42	1.37	0.29	3.25	53.68	8.77	387	0.32	1.42	4.63
3	5.18	0.70	2.08	9	8	0.33	6.06	5.00	0.19	0.42	1.37	0.29	3.25	62.2	8.77	387	0.32	1.53	4.97
4	6.09	0.70	2.08	12	8	0.33	6.06	3.75	0.19	0.33	2.00	0.25	2.80	69.48	8.33	427	0.32	1.54	4.29
5	7.16	0.70	2.08	12	8	0.33	6.06	3.75	0.19	0.33	2.00	0.25	2.80	77.4	8.33	427	0.32	1.64	4.57
6	7.62	0.70	2.08	19.6	8	0.33	6.06	2.30	0.19	0.19	4.28	0.16	2.04	83.52	7.60	535	0.32	1.50	3.06
7	8.38	0.70	2.08	21	8	0.33	6.06	2.14	0.19	0.17	4.86	0.14	1.94	88.4	7.50	555	0.32	1.52	2.94
8	9.45	0.70	2.08	30	8	0.33	6.06	1.50	0.19	0.08	11.17	0.08	1.46	95.72	7.04	694	0.32	1.42	2.07

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

MFSCALC

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 0.80 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 0.9144 m
L = 0.9144 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	0.919	43	1.22		0.05	0.2	0.72	95	450	0.18		0.00	1.54	0.00	0.90	y	1.84	0.49
2.90	1.22	2.29	2.504	9	0.17		0.5	0.9	5.12	18	180	0.07		0.00	1.54	0.00	5.19	y	3.25	1.60
3.81	0.91	3.355	3.669	1	0.02		0.5	0.9	0.59	18	180	0.01		0.00	1.54	0.00	0.59	y	3.25	0.18
4.72	0.91	4.265	4.664	0	0.00		0.3	0.7	0.00	24	250	0.00		0.00	1.54	0.00	0.00	y	2.80	0.00
5.79	1.07	5.255	5.747	0	0.00		0.3	0.7	0.00	24	250	0.00		0.00	1.54	0.00	0.00	y	2.80	0.00
6.25	0.46	6.02	6.584	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
7.01	0.76	6.63	7.251	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
8.08	1.07	7.545	8.252	0	0.00				0.00			0.00	20	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 6.69 mm

Post Treatment Settlement = 2.27 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

MFSCALC

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 4' x 4' footing

P_o = 143.4 kN/m^2

A_o = 1.5 m^2

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	3.90	22.5	16	0.33	2.91	2.00	0.19	0.15	5.56	0.11	1.66	35.36	7.24	625	0.32	1.14	1.89
2	4.27	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	53.68	7.85	489	0.32	1.31	3.01
3	5.18	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	62.2	7.85	489	0.32	1.37	3.16
4	6.09	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	69.48	7.69	517	0.32	1.41	3.00
5	7.16	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	77.4	7.69	517	0.32	1.47	3.14
6	7.62	0.70	3.90	19.6	8	0.33	2.91	2.30	0.19	0.19	4.28	0.12	1.78	83.52	7.35	593	0.32	1.43	2.54
7	8.38	0.70	3.90	21	8	0.33	2.91	2.14	0.19	0.17	4.86	0.11	1.72	88.4	7.29	609	0.32	1.45	2.50
8	9.45	0.70	3.90	30	8	0.33	2.91	1.50	0.19	0.08	11.17	0.07	1.40	95.72	6.99	717	0.32	1.40	1.96

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.50 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 1.2191 m
L = 1.2191 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	0.689	65	1.82		0.05	0.2	1.08	95	450	0.27		0.00	1.54	0.00	1.35	y	1.66	0.81
2.90	1.22	2.29	1.878	16	0.29		0.5	0.9	8.66	18	180	0.11		0.00	1.54	0.00	8.77	y	2.30	3.81
3.81	0.91	3.355	2.752	9	0.15		0.5	0.9	3.82	18	180	0.03		0.00	1.54	0.00	3.85	y	2.30	1.67
4.72	0.91	4.265	3.498	4	0.06		0.3	0.7	0.82	24	250	0.02		0.00	1.54	0.00	0.84	y	2.13	0.40
5.79	1.07	5.255	4.310	0	0.00		0.3	0.7	0.00	24	250	0.00		0.00	1.54	0.00	0.00	y	2.13	0.00
6.25	0.46	6.02	4.938	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
7.01	0.76	6.63	5.438	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
8.08	1.07	7.545	6.189	0	0.00				0.00			0.00	20	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 14.82 mm

Post Treatment Settlement = 6.69 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

MFSCALC

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 5' x 5' footing

P_o = 143.4 kN/m²

A_o = 1.2 m²

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m²

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m²	γ_s kN/m³	υ_s	n_0	E_c/E_s (Column Compressibility)	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$ (Overburden Constraint)	P_c/P_s	P_c	K_{oc}	f_d	n_2
	1.37				16														
1	3.05	0.70	3.12	22.5	16	0.33	3.60	2.00	0.19	0.15	5.56	0.12	1.73	35.36	7.30	607	0.32	1.14	1.97
2	4.27	0.70	3.12	9	8	0.33	3.60	5.00	0.19	0.42	1.37	0.22	2.59	53.68	8.13	450	0.32	1.34	3.48
3	5.18	0.70	3.12	9	8	0.33	3.60	5.00	0.19	0.42	1.37	0.22	2.59	62.2	8.13	450	0.32	1.42	3.68
4	6.09	0.70	3.12	12	8	0.33	3.60	3.75	0.19	0.33	2.00	0.20	2.35	69.48	7.90	482	0.32	1.45	3.40
5	7.16	0.70	3.12	12	8	0.33	3.60	3.75	0.19	0.33	2.00	0.20	2.35	77.4	7.90	482	0.32	1.52	3.58
6	7.62	0.70	3.12	19.6	8	0.33	3.60	2.30	0.19	0.19	4.28	0.14	1.87	83.52	7.44	570	0.32	1.46	2.73
7	8.38	0.70	3.12	21	8	0.33	3.60	2.14	0.19	0.17	4.86	0.13	1.80	88.4	7.37	588	0.32	1.48	2.65
8	9.45	0.70	3.12	30	8	0.33	3.60	1.50	0.19	0.08	11.17	0.07	1.42	95.72	7.01	708	0.32	1.41	2.00

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

MFSCALC

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.20 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 1.5239 m
L = 1.5239 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils: Consolidation			Cohesive Soils: Immediate			Granular Soils: Immediate		Granular Soils: Creep			Improvement: Vibro	Improvement: Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	0.551	73	2.07		0.05	0.2	1.23	95	450	0.38		0.00	1.54	0.00	1.60	y	1.73	0.93
2.90	1.22	2.29	1.503	22	0.40		0.5	0.9	11.81	18	180	0.10		0.00	1.54	0.00	11.91	y	2.59	4.60
3.81	0.91	3.355	2.202	11	0.18		0.5	0.9	4.70	18	180	0.01		0.00	1.54	0.00	4.71	y	2.59	1.82
4.72	0.91	4.265	2.799	9	0.13		0.3	0.7	1.78	24	250	0.01		0.00	1.54	0.00	1.79	y	2.35	0.76
5.79	1.07	5.255	3.448	4	0.06		0.3	0.7	0.97	24	250	0.03		0.00	1.54	0.00	0.99	y	2.35	0.42
6.25	0.46	6.02	3.950	1	0.02				0.00			0.00	14	0.06	1.54	0.09	0.09		1.00	0.09
7.01	0.76	6.63	4.351	0	0.00				0.00			0.00	14	0.00	1.54	0.00	0.00		1.00	0.00
8.08	1.07	7.545	4.951	0	0.00				0.00			0.00	20	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 21.10 mm

Post Treatment Settlement = 8.62 mm

A_c = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 6' x 6' footing

P_o = 143.4 kN/m^2

A_o = 1.1 m^2

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m^2)	γ_s (kN/m^3)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	2.86	22.5	16	0.33	3.96	2.00	0.19	0.15	5.56	0.12	1.75	35.36	7.32	600	0.32	1.14	2.00
2	4.27	0.70	2.86	9	8	0.33	3.96	5.00	0.19	0.42	1.37	0.24	2.72	53.68	8.25	436	0.32	1.36	3.69
3	5.18	0.70	2.86	9	8	0.33	3.96	5.00	0.19	0.42	1.37	0.24	2.72	62.2	8.25	436	0.32	1.44	3.91
4	6.09	0.70	2.86	12	8	0.33	3.96	3.75	0.19	0.33	2.00	0.21	2.44	69.48	7.98	470	0.32	1.46	3.57
5	7.16	0.70	2.86	12	8	0.33	3.96	3.75	0.19	0.33	2.00	0.21	2.44	77.4	7.98	470	0.32	1.55	3.77
6	7.62	0.70	2.86	19.6	8	0.33	3.96	2.30	0.19	0.19	4.28	0.14	1.91	83.52	7.47	562	0.32	1.47	2.80
7	8.38	0.70	2.86	21	8	0.33	3.96	2.14	0.19	0.17	4.86	0.13	1.83	88.4	7.40	580	0.32	1.49	2.72
8	9.45	0.70	2.86	30	8	0.33	3.96	1.50	0.19	0.08	11.17	0.07	1.43	95.72	7.02	704	0.32	1.41	2.02

A_o = Area per stone column
A_c = Cross sectional area of stone column
d = depth to bottom of layer from ground level
Δd = Layer Thickness
K_{oc} = Coeficient of Earth Pressure at rest of column
K_{ac} = Coeficient for Active Earth Pressure of column
E_c = Modulus of Stone Column
E_s = Modulus of Soil

n_0 = Basic improvement factor
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint
P_o = Imposed Stress
P_c = Imposed Stress on Column
P_s = Imposed Stress on Soil
γ_s = Unit Weight of soil
υ_s = Poissions Ratio
ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.10 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 1.8287 m
L = 1.8287 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	0.459	85	2.39		0.05	0.2	1.42	95	450	0.35		0.00	1.54	0.00	1.77	y	1.75	1.01
2.90	1.22	2.29	1.252	30	0.56		0.5	0.9	16.53	18	180	0.16		0.00	1.54	0.00	16.69	y	2.72	6.15
3.81	0.91	3.355	1.835	16	0.25		0.5	0.9	6.46	18	180	0.02		0.00	1.54	0.00	6.48	y	2.72	2.39
4.72	0.91	4.265	2.332	11	0.15		0.3	0.7	2.06	24	250	0.02		0.00	1.54	0.00	2.07	y	2.44	0.85
5.79	1.07	5.255	2.874	9	0.12		0.3	0.7	2.09	24	250	0.01		0.00	1.54	0.00	2.11	y	2.44	0.87
6.25	0.46	6.02	3.292	4	0.05				0.00			0.00	14	0.20	1.54	0.31	0.31		1.00	0.31
7.01	0.76	6.63	3.626	1	0.02				0.00			0.00	14	0.09	1.54	0.14	0.14		1.00	0.14
8.08	1.07	7.545	4.126	0	0.00				0.00			0.00	20	0.00	1.54	0.00	0.00		1.00	0.00

Pre-Treatment Settlement = 29.56 mm
Post Treatment Settlement = 11.70 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 7' x 7' footing

P_o = 143.4 kN/m^2

A_o = 1.5 m^2

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m^2)	γ_s (kN/m^3)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	3.90	22.5	16	0.33	2.91	2.00	0.19	0.15	5.56	0.11	1.66	35.36	7.24	625	0.32	1.14	1.89
2	4.27	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	53.68	7.85	489	0.32	1.31	3.01
3	5.18	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	62.2	7.85	489	0.32	1.37	3.16
4	6.09	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	69.48	7.69	517	0.32	1.41	3.00
5	7.16	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	77.4	7.69	517	0.32	1.47	3.14
6	7.62	0.70	3.90	19.6	8	0.33	2.91	2.30	0.19	0.19	4.28	0.12	1.78	83.52	7.35	593	0.32	1.43	2.54
7	8.38	0.70	3.90	21	8	0.33	2.91	2.14	0.19	0.17	4.86	0.11	1.72	88.4	7.29	609	0.32	1.45	2.50
8	9.45	0.70	3.90	30	8	0.33	2.91	1.50	0.19	0.08	11.17	0.07	1.40	95.72	6.99	717	0.32	1.40	1.96

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

MFSCALC

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.50 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 2.1335 m
L = 2.1335 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils: Consolidation			Cohesive Soils: Immediate			Granular Soils: Immediate		Granular Soils: Creep			Improvement		
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	Vibro y/n	Priebe n1	ρ_{Tn}
1.68	1.68	0.84	0.394	96	2.72		0.05	0.2	1.61	95	450	0.23		0.00	1.54	0.00	1.84	y	1.66	1.11
2.90	1.22	2.29	1.073	39	0.72		0.5	0.9	21.26	18	180	0.05		0.00	1.54	0.00	21.31	y	2.30	9.26
3.81	0.91	3.355	1.573	22	0.35		0.5	0.9	8.81	18	180	0.03		0.00	1.54	0.00	8.84	y	2.30	3.84
4.72	0.91	4.265	1.999	14	0.21		0.3	0.7	2.74	24	250	0.03		0.00	1.54	0.00	2.77	y	2.13	1.30
5.79	1.07	5.255	2.463	10	0.13		0.3	0.7	2.26	24	250	0.02		0.00	1.54	0.00	2.27	y	2.13	1.07
6.25	0.46	6.02	2.822	9	0.11				0.00			0.00	14	0.48	1.54	0.74	0.74		1.00	0.74
7.01	0.76	6.63	3.108	4	0.05				0.00			0.00	14	0.29	1.54	0.45	0.45		1.00	0.45
8.08	1.07	7.545	3.536	1	0.01				0.00			0.00	20	0.06	1.54	0.10	0.10		1.00	0.10

Pre-Treatment Settlement = 38.31 mm

Post Treatment Settlement = 17.86 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 8' x 8' footing

P_o = 143.4 kN/m^2

A_o = 1.5 m^2

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d (m)	Dia. (m)	A_o/A_c	E_s (MN/m^2)	γ_s (kN/m^3)	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	3.90	22.5	16	0.33	2.91	2.00	0.19	0.15	5.56	0.11	1.66	35.36	7.24	625	0.32	1.14	1.89
2	4.27	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	53.68	7.85	489	0.32	1.31	3.01
3	5.18	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	62.2	7.85	489	0.32	1.37	3.16
4	6.09	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	69.48	7.69	517	0.32	1.41	3.00
5	7.16	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	77.4	7.69	517	0.32	1.47	3.14
6	7.62	0.70	3.90	19.6	8	0.33	2.91	2.30	0.19	0.19	4.28	0.12	1.78	83.52	7.35	593	0.32	1.43	2.54
7	8.38	0.70	3.90	21	8	0.33	2.91	2.14	0.19	0.17	4.86	0.11	1.72	88.4	7.29	609	0.32	1.45	2.50
8	9.45	0.70	3.90	30	8	0.33	2.91	1.50	0.19	0.08	11.17	0.07	1.40	95.72	6.99	717	0.32	1.40	1.96

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.50 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 2.4383 m
L = 2.4383 m
Time = 50 years

depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Cohesive Soils: Consolidation			Cohesive Soils: Immediate			Granular Soils: Immediate		Granular Soils: Creep			Improvement		
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	Vibro y/n	Priebe n1	ρ_{Tn}
1.68	1.68	0.84	0.345	96	2.72		0.05	0.2	1.61	95	450	0.26		0.00	1.54	0.00	1.88	y	1.66	1.13
2.90	1.22	2.29	0.939	43	0.80		0.5	0.9	23.62	18	180	0.06		0.00	1.54	0.00	23.68	y	2.30	10.29
3.81	0.91	3.355	1.376	27	0.44		0.5	0.9	11.16	18	180	0.04		0.00	1.54	0.00	11.20	y	2.30	4.87
4.72	0.91	4.265	1.749	17	0.25		0.3	0.7	3.29	24	250	0.04		0.00	1.54	0.00	3.32	y	2.13	1.56
5.79	1.07	5.255	2.155	12	0.16		0.3	0.7	2.74	24	250	0.03		0.00	1.54	0.00	2.76	y	2.13	1.30
6.25	0.46	6.02	2.469	10	0.12				0.00			0.00	14	0.32	1.54	0.50	0.50		1.00	0.50
7.01	0.76	6.63	2.719	9	0.11				0.00			0.00	14	0.46	1.54	0.70	0.70		1.00	0.70
8.08	1.07	7.545	3.094	4	0.04				0.00			0.00	20	0.16	1.54	0.25	0.25		1.00	0.25

Pre-Treatment Settlement = 44.30 mm

Post Treatment Settlement = 20.60 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 9' x 9' footing

P_o = 143.4 kN/m²

A_o = 1.5 m²

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m²

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m²	γ_s kN/m³	υ_s	n_0	E_c/E_s (Column Compressibility)	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$ (Overburden Constraint)	P_c/P_s	P_c	K_{oc}	f_d	n_2
	1.37				16														
1	3.05	0.70	3.90	22.5	16	0.33	2.91	2.00	0.19	0.15	5.56	0.11	1.66	35.36	7.24	625	0.32	1.14	1.89
2	4.27	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	53.68	7.85	489	0.32	1.31	3.01
3	5.18	0.70	3.90	9	8	0.33	2.91	5.00	0.19	0.42	1.37	0.19	2.30	62.2	7.85	489	0.32	1.37	3.16
4	6.09	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	69.48	7.69	517	0.32	1.41	3.00
5	7.16	0.70	3.90	12	8	0.33	2.91	3.75	0.19	0.33	2.00	0.17	2.13	77.4	7.69	517	0.32	1.47	3.14
6	7.62	0.70	3.90	19.6	8	0.33	2.91	2.30	0.19	0.19	4.28	0.12	1.78	83.52	7.35	593	0.32	1.43	2.54
7	8.38	0.70	3.90	21	8	0.33	2.91	2.14	0.19	0.17	4.86	0.11	1.72	88.4	7.29	609	0.32	1.45	2.50
8	9.45	0.70	3.90	30	8	0.33	2.91	1.50	0.19	0.08	11.17	0.07	1.40	95.72	6.99	717	0.32	1.40	1.96

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.50 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 2.7431 m
L = 2.7431 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
depth	Δd	z	z/B	P_o	P_o/σ_v	Soil Profile	Consolidation			Immediate			Immediate		Creep			Vibro	Priebe	
m	m	m		kN/m^2			m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	y/n	n1	ρ_{Tn}
1.68	1.68	0.84	0.306	96	2.72		0.05	0.2	1.61	95	450	0.30		0.00	1.54	0.00	1.91	y	1.66	1.15
2.90	1.22	2.29	0.835	49	0.91		0.5	0.9	26.77	18	180	0.08		0.00	1.54	0.00	26.85	y	2.30	11.67
3.81	0.91	3.355	1.223	30	0.48		0.5	0.9	12.33	18	180	0.05		0.00	1.54	0.00	12.38	y	2.30	5.38
4.72	0.91	4.265	1.555	22	0.31		0.3	0.7	4.11	24	250	0.05		0.00	1.54	0.00	4.16	y	2.13	1.95
5.79	1.07	5.255	1.916	14	0.19		0.3	0.7	3.22	24	250	0.03		0.00	1.54	0.00	3.26	y	2.13	1.53
6.25	0.46	6.02	2.195	12	0.15				0.00			0.00	14	0.43	1.54	0.66	0.66		1.00	0.66
7.01	0.76	6.63	2.417	10	0.11				0.00			0.00	14	0.53	1.54	0.82	0.82		1.00	0.82
8.08	1.07	7.545	2.751	9	0.10				0.00			0.00	20	0.38	1.54	0.59	0.59		1.00	0.59

Pre-Treatment Settlement = 50.63 mm
Post Treatment Settlement = 23.75 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

MFSCALC

Determination of Improvement Factors (Priebe 1995)

Contract Name: The Bay House - Portland, ME

Contract Number:

Calculation Reference: 10' x 10' footing

P_o = 143.4 kN/m^2

A_o = 1 m^2

Founding Depth = 1.37 m

ϕ_c = 43

E_c = 45 MN/m^2

Layer Ref.	d m	Dia. m	A_o/A_c	E_s MN/m^2	γ_s kN/m^3	υ_s	n_0	E_c/E_s	K_{ac}	$(A_c/A_o)_1$	$\Delta(A_o/A_c)$	A_c/A_o	n_1	$\Sigma(\gamma_s.\Delta d)$	P_c/P_s	P_c	K_{oc}	f_d	n_2
								Column Compressibility						Overburden Constraint					
	1.37				16														
1	3.05	0.70	2.60	22.5	16	0.33	4.43	2.00	0.19	0.15	5.56	0.12	1.78	35.36	7.35	593	0.32	1.15	2.04
2	4.27	0.70	2.60	9	8	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	53.68	8.39	420	0.32	1.38	3.94
3	5.18	0.70	2.60	9	8	0.33	4.43	5.00	0.19	0.42	1.37	0.25	2.86	62.2	8.39	420	0.32	1.46	4.20
4	6.09	0.70	2.60	12	8	0.33	4.43	3.75	0.19	0.33	2.00	0.22	2.54	69.48	8.08	456	0.32	1.48	3.77
5	7.16	0.70	2.60	12	8	0.33	4.43	3.75	0.19	0.33	2.00	0.22	2.54	77.4	8.08	456	0.32	1.57	3.99
6	7.62	0.70	2.60	19.6	8	0.33	4.43	2.30	0.19	0.19	4.28	0.15	1.95	83.52	7.51	553	0.32	1.48	2.88
7	8.38	0.70	2.60	21	8	0.33	4.43	2.14	0.19	0.17	4.86	0.13	1.86	88.4	7.43	572	0.32	1.50	2.78
8	9.45	0.70	2.60	30	8	0.33	4.43	1.50	0.19	0.08	11.17	0.07	1.44	95.72	7.03	701	0.32	1.41	2.03

A_o = Area per stone column

A_c = Cross sectional area of stone column

d = depth to bottom of layer from ground level

Δd = Layer Thickness

K_{oc} = Coeficient of Earth Pressure at rest of column

K_{ac} = Coeficient for Active Earth Pressure of column

E_c = Modulus of Stone Column

E_s = Modulus of Soil

n_0 = Basic improvement factor

n_1 = Improvement factor with Column Compressibility

n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress

P_c = Imposed Stress on Column

P_s = Imposed Stress on Soil

γ_s = Unit Weight of soil

υ_s = Poissions Ratio

ϕ_c = Friction angle of Stone Column

Determination of Settlement Beneath Pad/Strip Foundation

Contract Name: and, ME
Contract Number: 0

P_o = 143 kN/m^2
A_o = 1.00 m^2
Improvement factor = n1 (n0, n1 or n2)

B = 3.0479 m
L = 3.0479 m
Time = 50 years

							Cohesive Soils						Granular Soils					Improvement		
							Consolidation			Immediate			Immediate		Creep					
depth m	Δd m	z m	z/B	P_o kN/m^2	P_o/σ_v	Soil Profile	m_v	μ	ρ_c	C_u	E_s/C_u	ρ_i	SPT N	ρ_i	f_t	$\rho_i + \rho_{cr}$	ρ_T	Vibro y/n	Priebe n1	ρ_{Tn}
1.68	1.68	0.84	0.276	109	3.08		0.05	0.2	1.83	95	450	0.07		0.00	1.54	0.00	1.91	y	1.78	1.07
2.90	1.22	2.29	0.751	57	1.07		0.5	0.9	31.49	18	180	0.10		0.00	1.54	0.00	31.59	y	2.86	11.03
3.81	0.91	3.355	1.101	34	0.55		0.5	0.9	14.09	18	180	0.06		0.00	1.54	0.00	14.16	y	2.86	4.94
4.72	0.91	4.265	1.399	27	0.39		0.3	0.7	5.21	24	250	0.07		0.00	1.54	0.00	5.28	y	2.54	2.08
5.79	1.07	5.255	1.724	17	0.22		0.3	0.7	3.87	24	250	0.04		0.00	1.54	0.00	3.91	y	2.54	1.54
6.25	0.46	6.02	1.975	14	0.17				0.00			0.00	14	0.54	1.54	0.84	0.84		1.00	0.84
7.01	0.76	6.63	2.175	12	0.14				0.00			0.00	14	0.70	1.54	1.07	1.07		1.00	1.07
8.08	1.07	7.545	2.476	10	0.10				0.00			0.00	20	0.44	1.54	0.68	0.68		1.00	0.68

Pre-Treatment Settlement = 59.44 mm

Post Treatment Settlement = 23.26 mm

A_o = Area per stone column
B = foundation width
C_u = cohesion of soil
depth = depth to top of layer below foundation level
E_s = Youngs modulus
L = foundation Length
m_v = coefficient of volumn compressibility
n_1 = Improvement factor with Column Compressibility
n_2 = Improvement factor with Overburden Constraint

P_o = Imposed Stress
z = depth below foundation to midpoint of layer
Δd = Layer Thickness
μ = correction factor for 3D consolidation
ρ_c = Consolidation Settlement
ρ_i = Immediate Settlement
ρ_{cr} = Creep Settlement
ρ_T = Total Settlement
ρ_{Tn} = Total Settlement with Improvement
σ_v = overburden stress

INSTALLATION PROCEDURE

GROUND STABILIZATION BY BOTTOM/TOP FEED PROCESS

METHOD STATEMENT

PLANT & EQUIPMENT

The technique involves the use of a vibroflot, comprising a hydraulic powered eccentric weight assembly enclosed in heavy tubular steel casing. The vibroflot is suspended from a crawler crane. The basic length of the vibroflot assembly is 8 meters although extension tubes may be added to increase the vibroflot length as the depth of treatment dictates. The vibrator diameter is 310mm and is powered by a 130 kW portable diesel power pack and thus generates high centrifugal forces in the horizontal plane at a frequency of 50 cycles per second in most cases. The nose of the vibroflot is tapered to aid penetration of the ground while vertical fins prevent the vibroflot rotating during penetration. Attached to the vibroflot is a tube of 200mm diameter, and a stone hopper. If pre-drilling is required, it will be accomplished with a Watson 300 or equivalent drill rig.

DRY STONE COLUMNS TECHNIQUE

This is a completely dry technique and the cycle of operations is described as follows. The vibroflot and a stone hopper suspended from the crane, are lowered to the ground and penetrate quickly through the weak soils. Where stiff or dense soils or rubble fill materials are encountered, the hole may be predrilled through these layers. After reaching the required depth, the sluice gate is open in the hopper, graded aggregate (usually 40mm SS) then travels down the tube, aided by compressed air, this aggregate is then released into the ground at the tip of the vibroflot, where it is compacted. This process is a continuous method and the stone column is fully formed when removal of the flot from the ground occurs.

In areas where the hole is stable, the stone column may be formed using the dry top feed method. Using this method, the vibroflot is withdrawn and a small quantity of graded stone aggregate is introduced into the hole. The vibroflot s lowered again to compact the infill and interlock it tightly with the surrounding soil. This cycle is repeated until a stone column is built up to ground level.

In granular soils, the effect of the vibrations is to produce a marked improvement in the Relative Density of the surrounding material thus significantly improving the allowable bearing capacity and settlement characteristics. In cohesive soils, little improvement occurs in the engineering properties of the clay soils between stone columns and the improvement of the formation is achieved by the combined effect of the weak soils and the stiffer stone columns.

STONE COLUMNS

Compacted stone columns are constructed to effect stabilization of the treated ground. Typically, stone column diameters are in the order of 700-750mm. The column diameter will naturally vary with the technique and soils condition, but generally the weaker the soils, the larger the diameter of the stone column.

The stone columns are normally constructed directly beneath the main foundations, usually in single or multiple rows beneath strip foundations and in groups beneath pad foundations. Area or floor slab treatment is normally carried out in grid spacing. The spacing and arrangements of the stone columns are dependent on the soils conditions and the loads carried by the foundations.

MODULUS TEST

PLATE LOAD TEST

METHOD STATEMENT

A shallow pit shall be excavated to a depth of approximately 300-600 mm with a base of at least 1,000 mm square. A 600mm diameter rigid steel plate will then be bedded down by hand on the surface exposed by the pit excavation. (A thin layer of sand or quick set may be used if required.)

The load shall be applied centrally to the circular bearing plate by means of a hydraulic jack and the loads measured by an independently calibrated hydraulic gauge or load cell. Two (2) gauges mounted on a reference frame, on either side of the test, will record the deflection of the plate. Certificates of calibration for the gauges jack or load cell will be available on site for inspection.

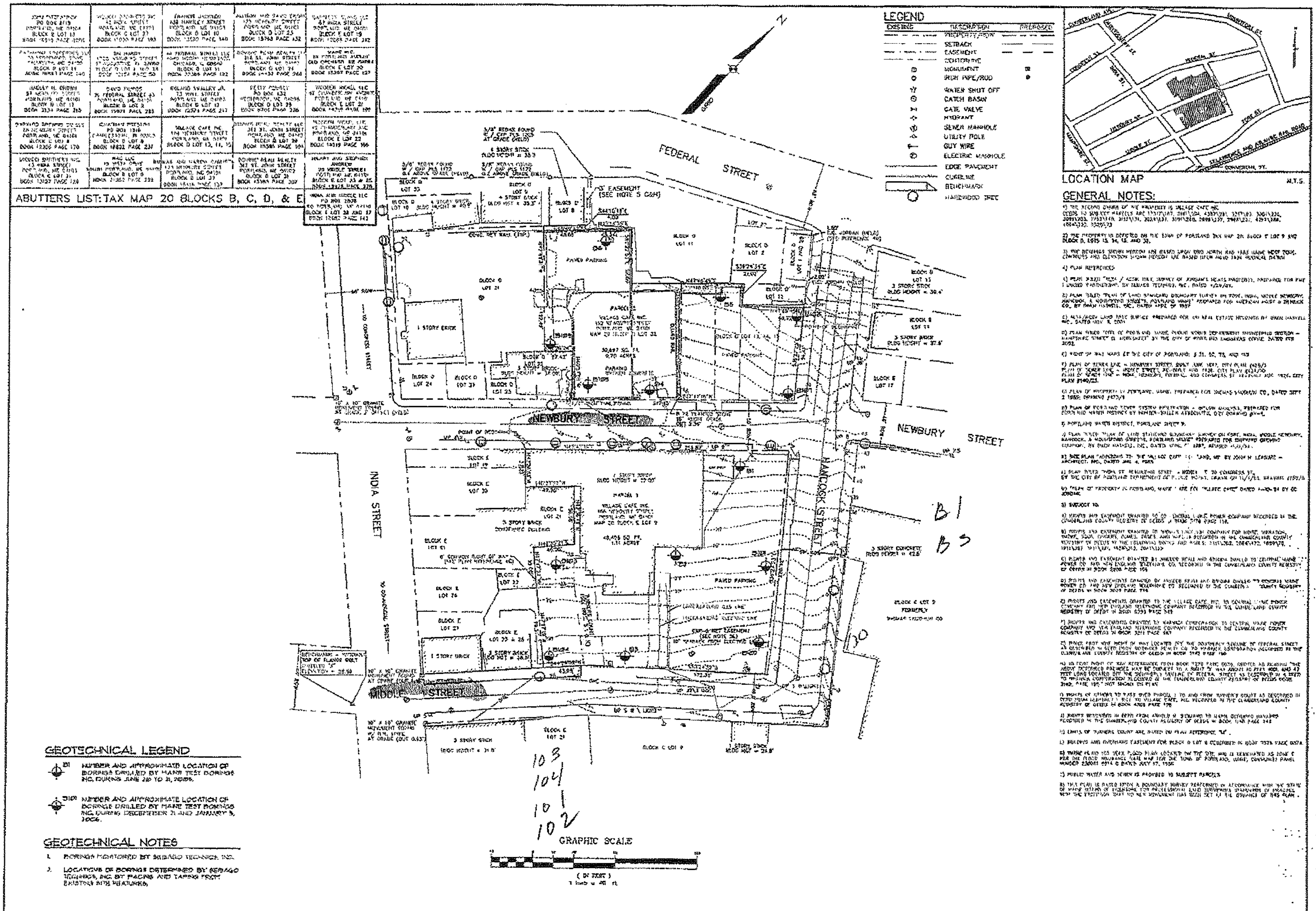
A preload of 2 tons will be permitted. The loading shall be applied at the rate of 2 tons per 5 minutes or until the rate of settlement does not exceed 0.1mm in 1 minute, up to a maximum applied load of two times working load.

At maximum test load, the load shall be held until the rate of settlement is less than 0.1 mm per minute or 10 minutes whichever is the greater.

The elastic compression shall be determined by measuring the recovery which takes place on completely removing the total applied load at the end of the test.

Along the plate load test, individual stone columns records are recorded with the on board computer monitoring system. The data collected is sent electronically to the ftp site of Subsurface Constructors, Inc. and is downloaded by the software that processes the data. Subsurface Constructors, Inc. engineers will then review the installed data and provide installation records to the client.

SOIL BORINGS



10/3/07,

REV.	BY:	DATE:	STATUS:
A	BT	2/21/06	GEOTECHNICAL BORINGS

Sebago Technics

PROJECT NO.	FIELD BOOK	DESIGN	CHKD	DRAWN
03109	DIGITAL		DCS	DFB

SUBSURFACE EXPLORATIONS PLAN
OF
VILLAGE CAFE INC.
112 NEWBURY ST., 113 NEWBURY ST., 40 HANCOCK ST.
PORTLAND, MAINE
FOR
GFI ACQUISITIONS I, LLC
BOSTON, MA 02110

DATE	SCALE
7/12/05	1"=40'

SHEET 1 OF 1

SEBAGO TECHNICS, INC.	TEST BORING REPORT	BORING NO. B1
		Page 1 of 2

PROJECT	VILLAGE CAFÉ REDEVELOPMENT	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	6/20/2005
DRILLER	B. ENOS	DATE FINISHED	6/20/2005

Elevation 40.7 ft. | Datum | Boring Location: See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1.375	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model: Mobil B53

- ☑ Truck ☐ ATV ☐ Track ☐ Skid
- ☐ Tripod ☐ Geoprobe ☐ Air Track
- ☐ Cat-Head ☑ Winch ☐ Roller Bit ☑ Cutting Head

Hammer Type: ☑ Safety ☐ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance: Type Method Depth: HSA/SPIN/30.0

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0																	
					0.3		-BITUMINOUS CONCRETE-										
	7	S1	0.3			SW	Medium dense, brown well-graded SAND with gravel (SW), mps =	10	10	30	25	20	5				
	18				1.0		1.3 in., dry -FILL-										
	12				1.2		Medium dense, red BRICK, dry -FILL-										
	13	10	2.3			SM	Medium dense, black silty SAND (SM), mps = 0.1 in., dry				5	80	15				
							-FILL-										
					3.5												
							Note: gray sandy silt in auger cuttings at 3.5 ft.										
5																	
	2	S2	5.0			SM	Very loose, gray silty SAND (SM), frequent silt seams, mps = 0.02					80	20				
	2						in., wet										
	1																
	1	15	7.0														
							-MARINE DEPOSITS-										
10																	
	1	S3	10.0		10.5	SW	Very loose, gray well-graded SAND (SW), mps = 0.2 in., wet			10	40	45	5				
	WOH					ML	Soft, gray SILT (ML), frequent sand partings, mps = 0.02 in.,					15	85		L	N	
	WOH						wet										
	WOH	16	12.0														
							-MARINE DEPOSITS-										
15																	
	1	S4	15.0			ML	Soft, gray SILT (ML), frequent sand seams, mps = 0.02 in.,					20	80		L	N	
	WOH						trace clay, wet										
	WOH																
	WOH	24	17.0														
							-MARINE DEPOSITS-										
					18.5												
20																	
	1	S5	20.0			CL	Soft, gray lean CLAY (CL), frequent sand partings to seams,					15	85	N	M	M	
	WOH						mps = 0.02 in., wet										
	WOH																
	1	24	22.0														
							-MARINE DEPOSITS-										
25																	
	WOR	S6	25.0			CL	Soft, gray lean CLAY (CL), frequent sand seams, mps = 0.2 in.,			5	10	15	75	N	M	M	
	WOR						wet										
	WOR																
	WOH	12	27.0														
							-MARINE DEPOSITS-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/20/2005	1212		Caved	9.8	7.0

Sample ID

- D Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (Linear ft.)	32.0
Rock Cored (Linear ft.)	--
Number of Samples	7S
BORING NO.	B1

Field Tests: Dilatancy: R - Rapid S - Slow N - None; Plasticity: N - Nonplastic L - Low M - Medium H - High

Toughness: L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.	TEST BORING REPORT	BORING NO. B1

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
30																	
	WOR	S7	30.0			CL	Soft, gray lean CLAY (CL), frequent fine sand seams, mps =				5	15	80	N	M	M	
	1						0.1 in., , wet										
	WOH						-MARINE DEPOSITS-										
	1	24	32.0														
							Bottom of exploration at 32.0 ft. below ground surface										
							No refusal										
35																	
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 05169 BORING NO. B1

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B2**

PROJECT	VILLAGE CAFÉ REDEVELOPMENT	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	6/20/2005
DRILLER	B. ENOS	DATE FINISHED	6/20/2005

Elevation 35.6 ft. | Datum | Boring Location: See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	2.5	1.375	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model: Mobil B53 — ☑ Truck ☐ ATV ☐ Track ☐ Skid ☐ Tripod ☐ Geoprobe ☐ Air Track ☐ Cat-Head ☑ Winch ☐ Roller Bit ☑ Cutting Head

Hammer Type: ☑ Safety ☐ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance (Type Method Depth): HSA/SPIN/30.0

Drilling Notes: 2.0 x 7.0 in. Field Vane

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0					0.2		-BITUMINOUS CONCRETE-										
	3	S1	0.3			SW	Loose, brown well-graded SAND (SW), mps = 0.2 in., dry			30	40	25	5				
	3				0.8		-FILL-										
	2					SM	Loose, dark brown silty SAND (SM), mps = 0.2 in., traces brick,										
	2	15	2.3				glass, ash, damp			20	15	50	15				
							-FILL-										
					4.0												
5	2	S2	5.0			CL	Stiff, gray-brown mottled lean CLAY (CL), damp						100	N	M	M	
	4																
	6																
	7	24	7.0														
							-MARINE DEPOSITS-										
					8.5												
10	WOH	S3	10.0			CL	Soft, gray lean CLAY (CL), occasional sand seams, mps = 0.02					5	95	N	M	M	
	WOH						in., wet										
	WOH																
	2	24	12.0														
							-MARINE DEPOSITS-										
15	WOR	FV1	15.0-15.6				FV1 from 15.0 to 15.6 ft. = 7/3 ft. lb., Su = 260 psf										
	WOH	S4	15.0			CL	Soft, gray CLAY (CL), occasional sand partings, mps = 0.02 in.,					5	95	N	M	M	
	WOH						wet										
	WOH	24	17.0														
							-MARINE DEPOSITS-										
20	WOR	S5	20.0			CL	Soft, gray lean CLAY (CL), frequent sand seams, mps = 0.02					10	90	N	M	M	
	WOR				21.0		in., wet										
	WOH					SM	Very loose, gray silty SAND (SM), frequent clay seams, mps = 0.02					80	20				
	WOH	24	22.0				in., wet										
							-MARINE DEPOSITS-										
25	WOR	S6	25.0			SP	Very loose, gray poorly-graded SAND (SP), occasional silt seams,					95	5				
	1						mps = 0.02 in., wet										
	WOH				26.9		-MARINE DEPOSITS-										
	5	10	27.0														
							-GLACIAL TILL DEPOSITS-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/21/2005	0840		Caved	19.0	11.3

Sample ID

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe
FV Field Vane

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (Linear ft.) 30.1
Rock Cored (Linear ft.) --
Number of Samples 7S

BORING NO. B2

Field Tests — Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.	# TEST BORING REPORT	BORING NO. B2
		Page 2 of 2

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
30																	
	50/.1	S7	30.0			SM	Very dense, gray silty SAND (SM), mps = 1.0 in., wet	5		10	10	60	15				
		2	30.1		30.1		-GLACIAL TILL DEPOSITS-										
							Split spoon refusal at 30.1 ft. on probable bedrock										
							Bottom of exploration at 30.1 ft. below ground surface										
35																	
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 05109 BORING NO. B2

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. B3

Page 1 of 2

PROJECT	VILLAGE CAFÉ REDEVELOPMENT	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	6/21/2005
DRILLER	B. ENOS	DATE FINISHED	6/21/2005

Elevation 28.8 ft. Datum — Boring Location: See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	–
Inside Diameter (in.)	2.5	1.375	–
Hammer Weight (lb.)	–	140	
Hammer Fall (in.)	–	30	

Rig Make & Model: Mobil B53 — ☑ Truck ☐ ATV ☐ Track ☐ Skid ☐ Tripod ☐ Geoprobe ☐ Air Track ☐ Cat-Head ☑ Winch ☐ Roller Bit ☑ Cutting Head

Hammer Type: ☑ Safety ☐ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance — Type Method Depth: HSA/SPIN/30.0

Drilling Notes: 2.0 x 7.0 Field Vane

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0					0.2		-BITUMINOUS CONCRETE-										
	13	S1	0.3			SW	Dense, brown well-graded SAND with gravel (SW), mps = 1.3 in.,	10	5	30	30	20	5				
	18				0.7		dry -FILL-										
	15				1.0		Dense, red BRICK, dry -FILL-										
	12	14	2.3			SM	Dense, black silty SAND (SM), mps = 0.3 in., traces ash, brick, dry		5	20	20	40	15				
							-FILL-										
					3.3		Note: 7 in. cobble at approximately 1.0 ft. Brown silty sand in auger cuttings from 1.5 to 3.3 ft.										
5	6	S2	5.0			CL	Stiff, gray lean CLAY (CL), mps = 0.02 in., damp					5	95	N	M	M	
	5																
	5																
	7	16	7.0														
							-MARINE DEPOSITS-										
10	WOH	S3	10.0			CL	Medium stiff, gray lean CLAY (CL), frequent sand partings, mps = 0.02 in., wet					5	95	N	M	M	
	WOH																
	WOH																
	WOH	24	12.0														
							-MARINE DEPOSITS-										
15	WOR	FV1	15.0-15.6				FV1 from 15.0 to 15.6 ft. = 17/7 ft. lb., Su = 630 psf										
	WOH	S4	15.0			CL	Medium stiff, gray lean CLAY (CL), frequent sand partings to seams, mps = 0.02 in., wet					10	90	N	M	M	
	WOH																
	WOH	24	17.0														
							-MARINE DEPOSITS-										
20	WOH	S5	20.0			CL	Medium stiff, gray lean CLAY (CL), frequent sand seams, three 0.25 in. dropstones at 21.2 ft., wet					15	85	N	M	M	
	WOH																
	2				21.5												
	5	24	22.0			SP	Very loose, gray poorly-graded SAND (SP), mps = 0.02 in., wet					100					
							-MARINE DEPOSITS-										
25	WOH	S6	25.0			SM	Loose, gray silty SAND (SM), frequent silt seams, mps = 0.1 in.,				5	80	15				
	3				26.0		wet										
	3					SM	Loose, gray silty SAND with gravel (SM), mps = 1.3 in., wet	5	10	25	20	25	15				
	4	24	27.0														
							-GLACIAL TILL-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
6/21/2005	1047		Caved	19.8	10.9

Sample ID

O Open End Rod
T Thin Wall Tube
U Undisturbed Sample
S Split Spoon Sample
G Geoprobe
FV Field Vane

Well Diagram

Riser Pipe
Screen
Filler Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (Linear ft.) 32.0
Rock Cored (Linear ft.) –
Number of Samples 7S

BORING NO. B3

Field Tests — Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. B3

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
30																	
	5	S7	30.0			SM	Medium dense, gray silty SAND with gravel (SM), mps = 1.2 in.,	10	10	30	20	15	15				
	7						wet										
	5						-GLACIAL TILL DEPOSITS-										
	8	24	32.0														
							Bottom of exploration at 32.0 ft. below ground surface										
							No refusal										
35																	
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 05109 | BORING NO. B3

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

6655 Fox Lake Rd

SEBAGO TECHNICS, INC.	TEST BORING REPORT	BORING NO. B101
		Page 1 of 2

PROJECT	FINAL DESIGN INVESTIGATION, REDEVELOPMENT OF VILLAGE CAFÉ	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	1/4/2006
DRILLER	R. IDANO	DATE FINISHED	1/5/2006

Elevation 34.2 ft. Datum NGVD 1929 Boring Location See Plan

Item	Casing	Sampler	Core Barrel	Rig Make & Model: Mobile B47			Hammer Type	Drilling Mud	Casing Advance
Type	NW	SS	--	☐ Truck	☐ Tripod	☐ Cat-Head	☐ Safety	☐ Bentonite	Type Method Depth
Inside Diameter (in.)	4.0	1.375	--	☐ ATV	☐ Geoprobe	☑ Winch	☑ Doughnut	☐ Polymer	NW/DRIVEN/30.0
Hammer Weight (lb.)	300	140		☐ Track	☐ Air Track	☐ Roller Bit	☐ Automatic	☑ None	
Hammer Fall (in.)	16	30		☐ Skid	☑ Trailer	☑ Cutting Head	Drilling Notes: 2.0 x 7.0 Field Vane		

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0					0.2		-BITUMINOUS CONCRETE-										
							Note: augered to 1.1 ft.- probable boulder. Moved boring- augered to 1.0 ft.										
	14	S1	1.0			SM	Dense, dark brown silty SAND (SM), mps = 1.0 in., dry	5	5	30	30	15	15				
	18																
	20						-FILL-										
	12	7	3.0		3.0												
							Note: gray-brown clay in wash at 3.0 ft.										
1.5 1.37							-MARINE DEPOSITS-										
					4.5												
5							Note: gray clay in wash at 4.5 ft.										
	11	NR	5.0				No recovery										
	7																
	8																
	5		7.0				95,48,.05,.2 -MARINE DEPOSITS-										
3.05																	
10	HYDR.	U1	10.0			CL	Gray lean CLAY (CL)										
	PUSH						.5										
							-MARINE DEPOSITS-										
		24	12.0				18,9,.4,.8										
	WOR	FV1	12.0-12.6				FV1 from 12.0 to 12.6 ft. = 9/1 ft. lb., Su = 330 psf										
4 4.27	WOH	S2	12.0			CL	Soft, gray lean CLAY (CL), sand parting at 13.0 ft., mps = 0.02 in.,						100	N	M	M	
	WOH						occasional dark streaks, wet										
	WOH	24	14.0														
							-MARINE DEPOSITS- .5										
15	HYDR.	U2	15.0			CL	Gray lean CLAY (CL) 18,9,.4,.8										
7 5.18	PUSH						-MARINE DEPOSITS-										
		18	17.0				24,12,3,.7										
	WOR	FV2	17.0-17.6				FV2 from 17.0 to 17.6 ft. = 21/5 ft. lb., Su = 780 psf										
	WOR	S3	17.0			CL	Medium stiff, gray lean CLAY (CL), occasional sand partings, 1 in. dropstone					5	95	N	M	M	
	1						at 17.2 ft., wet										
	WOH	24	19.0														
20 6.09							-MARINE DEPOSITS-										
20	WOR	S4	20.0			CL	Medium stiff, gray lean CLAY (CL), frequent sand partings to seams, mps =					15	85	N	M	M	
	1						0.02 in., wet										
	WOH						24,12,3,.7										
	WOH	7	22.0				-MARINE DEPOSITS-										
3.5 7.16					23.7												
5 7.62							N=14										
25	3	SS	25.0			SP	Medium dense, gray poorly-graded SAND (SP), mps = 0.02 in., wet					95	5				
	6																
	10						-MARINE DEPOSITS-										
27.5 8.38	11	6	27.0														
					27.2												
							N=20										
							-GLACIAL TILL DEPOSITS-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Bottom of Casing	Bottom of Hole	Water
1/5/2006	1200		30.0	30.5	8.5
1/5/2006	1223		--	25.8	7.2

(Depth in feet to: Bottom of Casing, Bottom of Hole, Water)

Sample ID
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
- Overburden (Linear ft.) 30.5
- Rock Cored (Linear ft.) --
- Number of Samples 6S, 2U
- BORING NO. B101

Field Tests: Dilatancy: R - Rapid S - Slow N - None; Plasticity: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. B101

31 9.45

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
30																	
	45	S6	30.0		30.5	SM	Dense, gray silty SAND (SM), mps = 0.2 in., wet			25	20	40	15				
	50/.1	2	30.6		30.6		-GLACIAL TILL DEPOSITS-										
							Very dense, dark gray weathered rock fragments-WEATHERED BEDROCK-										
							Split spoon refusal at 30.6 ft.										
							Bottom of exploration at 30.6 ft. below ground surface										
35																	
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 05109

BORING NO. B101

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.	TEST BORING REPORT	BORING NO. B102
		Page 1 of 2

PROJECT	FINAL DESIGN INVESTIGATION, REDEVELOPMENT OF VILLAGE CAFÉ	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	12/30/2005
DRILLER	M. PORTER/R. IDANO	DATE FINISHED	1/3/2006

Elevation 28.5 ft. | Datum NGVD 1929 | Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	
Inside Diameter (in.)	3.375	1.375	
Hammer Weight (lb.)		140	
Hammer Fall (in.)		30	

Rig Make & Model: Mobile B47

- ☐ Truck ☐ Tripod ☐ Cat-Head
- ☐ ATV ☐ Geoprobe ☑ Winch
- ☐ Track ☐ Air Track ☐ Roller Bit
- ☐ Skid ☑ Trailer ☑ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance — Type Method Depth: HSA/SPIN/30.0

Drilling Notes: 2.0 x 7.0 Field Vane

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																	
					0.2		-BITUMINOUS CONCRETE-										
	11	S1	0.5			SW	Very dense, brown well-graded SAND (SW), mps = 0.75 in., damp	5	10	30	30	20	5				
	12				0.7		-FILL-										
	44	8	2.0			SM	Very dense, gray-brown silty SAND (SM), ash, brick, mps = 1.3 in., wet	5	5	10	15	50	15				
							Note: probable cobbles from 2.0 to 4.0 ft.										
							-FILL-										
					4.0												
5																	
	4	S2	5.0			SM	Loose, brown silty SAND (SM), frequent clay seams to layers, mps = 0.2 in., wet			5	5	65	25				
	4																
	6				6.4		-MARINE DEPOSITS-										
	8	24	7.0			CL	Stiff, gray-brown lean CLAY (CL), wet						100	N	M	M	
							-MARINE DEPOSITS-										
10																	
	WOR	FV1	10.0-10.6				FV1 from 10.0 to 10.6 ft. = 12/2 ft. lb., Su = 440 psf										
	WOH	S3	10.0			CL	Soft, gray lean CLAY (CL), frequent sand partings, occasional black streaks, mps = 0.02 in., wet					5	95	N	M	M	
	WOH																
	WOH	24	12.0														
							-MARINE DEPOSITS-										
15																	
	WOR	S4	15.0			CL	Soft, gray lean CLAY (CL), frequent sand partings, mps = 0.02 in., wet					5	95	N	M	M	
	WOR																
	WOH						-MARINE DEPOSITS-										
	WOH	24	17.0														
					20.0												
20																	
	WOR	FV2	20.0-20.6				FV2 from 20.0 to 20.6 ft. = 18/2 ft. lb., Su = 670 psf										
	WOR	S5	20.0			CL	Medium stiff, gray lean CLAY (CL), frequent sand seams to layers, mps = 0.02 in., wet					20	80	N	M	M	
	7				21.5												
	6	24	22.0			SP	Loose, gray poorly-graded SAND (SP), mps = 0.02 in., wet					95	5				
							-MARINE DEPOSITS-										
25																	
	1	S6	25.0			SP	Very loose, gray poorly-graded SAND (SP), mps = 0.02 in., occasional silt laminae, wet					95	5				
	WOH																
	3																
	7	24	27.0														
							-MARINE DEPOSITS-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
1/3/2006	1115		30.0	26.0	18.5
1/19/2006			Well	20.0	2.6

Sample ID

- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary

Overburden (Linear ft.) 32.0

Rock Cored (Linear ft.) --

Number of Samples 7S

BORING NO. B102

Field Tests: Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.	TEST BORING REPORT	BORING NO. B102

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
30																	
	14	S7	30.0		30.4	SP	Medium dense, gray poorly-graded SAND (SP), mps = 0.02 in., wet					100					
	5						-MARINE DEPOSITS-										
	14					SM	Medium dense, gray silty SAND with gravel (SM), mps = 1.2 in., wet	5	10	10	10	50	15				
	31	24	32.0				-GLACIAL TILL DEPOSITS-										
							Bottom of exploration at 32.0 ft. below ground surface										
							No refusal										
							Note: Installed 1.0 in. PVC observation well at 20.0 ft.										
35																	
40																	
45																	
50																	
55																	
60																	
65																	
70																	

NOTES:

FILE NO. 05109 — BORING NO. B102

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. B103

PROJECT	FINAL DESIGN INVESTIGATION, REDEVELOPMENT OF VILLAGE CAFÉ	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	12/30/2005
DRILLER	M. PORTER	DATE FINISHED	12/30/2005

Elevation 34.1 ft. Datum NGVD 1929 Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	–
Inside Diameter (in.)	3.375	1.375	–
Hammer Weight (lb.)	–	140	
Hammer Fall (in.)	–	30	

Rig Make & Model: Mobile B47
☐ Truck ☐ Tripod ☐ Cat-Head
☐ ATV ☐ Geoprobe ☑ Winch
☐ Track ☐ Air Track ☐ Roller Bit
☐ Skid ☑ Trailer ☑ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic
Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None
Casing Advance: Type Method Depth: HSA/SPIN/20.0
Drilling Notes: 1.0 x 7.0 in. Field Vane

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0					0.1		-BITUMINOUS CONCRETE-										
	10	S1	0.5			SM	Dense, gray-brown silty SAND (SM), ash, brick, mps = 0.75 in.,		5	10	20	50	15				
	15						dry										
	16				2.3		-FILL-										
	15	14	2.5			SW	Dense, brown well-graded SAND (SW), mps = 0.5 in., dry		5	30	40	25					
					3.0		-FILL-										
									5	15	20	40	20				
5																	
	2	S2	5.5			SM	Medium dense, dark brown silty SAND (SM), ash, mps = 0.3 in., wet		5	15	20	40	20				
	5																
	8				6.3		-FILL-										
	12	24	7.5			CL	Stiff, gray lean CLAY (CL), frequent sand partings, mps = 0.02 in.,					15	85	N	M	M	
							wet										
							-MARINE DEPOSITS-										
10																	
	WOH	FV1	10.5-11.1				FV1 from 10.5 to 11.1 ft. = 22/3 ft. lb., Su = 820 psf										
	WOH	S3	10.5			CL	Medium stiff, gray lean CLAY (CL), frequent sand seams, mps =					10	90	N	M	M	
	WOH						0.02 in., wet										
	1	24	12.5														
							-MARINE DEPOSITS-										
15																	
	WOR	S4	15.5			CL	Medium stiff, gray lean CLAY (CL), frequent sand layers, mps = 0.02 in.,					20	80	N	M	M	
	4						wet										
	1				17.3		-MARINE DEPOSITS-										
	10	24	17.5			SP	Loose, gray poorly-graded SAND (SP), mps = 0.02 in., wet					95	5				
							-MARINE DEPOSITS-										
							Advanced HSA to 20.0 ft. Running sand conditions in augers										
20																	
							Bottom of exploration at 20.0 ft. below ground surface										
							No refusal										
25																	
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
12/30/2005	0949		--	17.0	6.0

Sample ID: O Open End Rod; T Thin Wall Tube; U Undisturbed Sample; S Split Spoon Sample; G Geoprobe; FV Field Vane

Well Diagram: Riser Pipe; Screen; Filter Sand; Cuttings; Grout; Concrete; Bentonite Seal

Summary

Overburden (Linear ft.) 20.0
Rock Cored (Linear ft.) –
Number of Samples 4S

BORING NO. B103

Field Tests: Dilatancy: R - Rapid S - Slow N - None; Toughness: L - Low M - Medium H - High; Plasticity: N - Nonplastic L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

SEBAGO TECHNICS, INC.

TEST BORING REPORT

BORING NO. **B104**

PROJECT	FINAL DESIGN INVESTIGATION, REDEVELOPMENT OF VILLAGE CAFÉ	STI JOB NO.	05109
LOCATION	NEWBURY STREET, PORTLAND, MAINE	PROJECT MGR.	C. DIMATTEO
CLIENT	GFI ACQUISITIONS I, LLC	FIELD REP.	K. B. STEPHENSON
CONTRACTOR	MAINE TEST BORINGS, INC.	DATE STARTED	12/29/2005
DRILLER	M. PORTER	DATE FINISHED	12/29/2005

Elevation 29.0 ft. Datum NGVD 1929 Boring Location See Plan

Item	Casing	Sampler	Core Barrel
Type	HSA	SS	--
Inside Diameter (in.)	3.375	1.375	--
Hammer Weight (lb.)	--	140	
Hammer Fall (in.)	--	30	

Rig Make & Model: Mobile B47
- ☐ Truck ☐ Tripod ☐ Cat-Head
- ☐ ATV ☐ Geoprobe ☑ Winch
- ☐ Track ☐ Air Track ☐ Roller Bit
- ☐ Skid ☑ Trailer ☑ Cutting Head

Hammer Type: ☐ Safety ☑ Doughnut ☐ Automatic

Drilling Mud: ☐ Bentonite ☐ Polymer ☑ None

Casing Advance: Type Method Depth: HSA/SPIN/40.0

Drilling Notes:

Depth (ft.)	Sampler Blows per 6 in.	Sample No. & Recovery (in.)	Sample Depth (ft.)	Well Diagram	Stratum Change (ft.)	USCS Symbol	Visual-Manual Identification & Description (density/consistency, color, GROUP NAME & SYMBOL, maximum particle size*, structure, odor, moisture, optional descriptions, geologic interpretation)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0					0.2		-BITUMINOUS CONCRETE-										
	5	S1	0.5			SW-SM	Very dense, brown well-graded SAND with silt and gravel (SW-SM), mps = 1.3 in., wet	10	10	30	30	10	10				
	12																
	75/.4	7	1.9				-FILL-										
							Note: brick, 3 to 6 in. rock fragments from 1.9 to 5.0 ft.										
							-FILL-										
5	2	S2	5.0		5.2	SW-SM	Loose, brown well-graded SAND with silt and gravel (SW-SM), wet	10	10	30	30	10	10				
	1				6.0	SM	Loose, brown silty SAND (SM), frequent silt seams, wet-MARINE DEPOSITS					70	30				
	6				6.5	SM	Loose, gray silty SAND (SM), one 1 in. gravel piece, wet	5			10	65	20				
	9	15	7.0		7.0	SW-SM	Loose, brown well-graded SAND with silt and gravel (SW-SM), mps = 1.0 in., wet -GLACIAL TILL DEPOSITS-	10	10	30	30	10	10				
10	1	S3	10.0			SM	Medium dense, gray-brown silty SAND (SM), one in. gravel piece, wet	50		10	10	15	15				
	2																
	9						-GLACIAL TILL DEPOSITS-										
	16	1	12.0														
15	1	S4	15.0			SM	Very loose, gray silty SAND with gravel (SM), mps = 1.3 in., wet	10	5	10	30	30	15				
	1																
	2																
	3	24	17.0														
							-GLACIAL TILL DEPOSITS-										
20	WOR	S5	20.0			SM	Very loose, gray silty SAND (SM), mps = 0.2 in., wet			10	45	30	15				
	WOH																
	4						Note: probably pushed gravel										
	3	2	22.0														
							-GLACIAL TILL DEPOSITS-										
25	8	NR	25.0				No recovery										
	13																
	15																
	8		27.0														
							-GLACIAL TILL DEPOSITS-										
30																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth in feet to: Bottom of Casing	Bottom of Hole	Water
12/29/2005	1515		--	9.4	7.8

Sample ID
- O Open End Rod
- T Thin Wall Tube
- U Undisturbed Sample
- S Split Spoon Sample
- G Geoprobe
- FV Field Vane

Well Diagram
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary
- Overburden (Linear ft.) 42.0
- Rock Cored (Linear ft.) --
- Number of Samples 8S
- BORING NO. B104

Field Tests: Dilatancy: R - Rapid S - Slow N - None; Plasticity: N - Nonplastic L - Low M - Medium H - High; Toughness: L - Low M - Medium H - High; Dry Strength: N - None L - Low M - Medium H - High V - Very High

*NOTE: Maximum Particle Size is determined by direct observation within the limitations of sampler size.

NOTE: Soil identifications based on visual-manual methods of the USCS system as practiced by Sebago Technics, Inc.

DATE: 9/4/12

SHEET 1 OF 4

FOR STONE COLUMN LAYOUT ONLY
FOR ALL OTHER BUILDING INFORMATION REFER TO STRUCTURAL PLANS

FOUNDATION PLAN

GROUND IMPROVEMENT STONE COLUMNS

THE BAY HOUSE
PORTLAND, MAINE

SUBSURFACE CONSTRUCTORS

110 ANGELICA STREET ST. LOUIS MISSOURI

THE BAY HOUSE
PORTLAND, MAINE

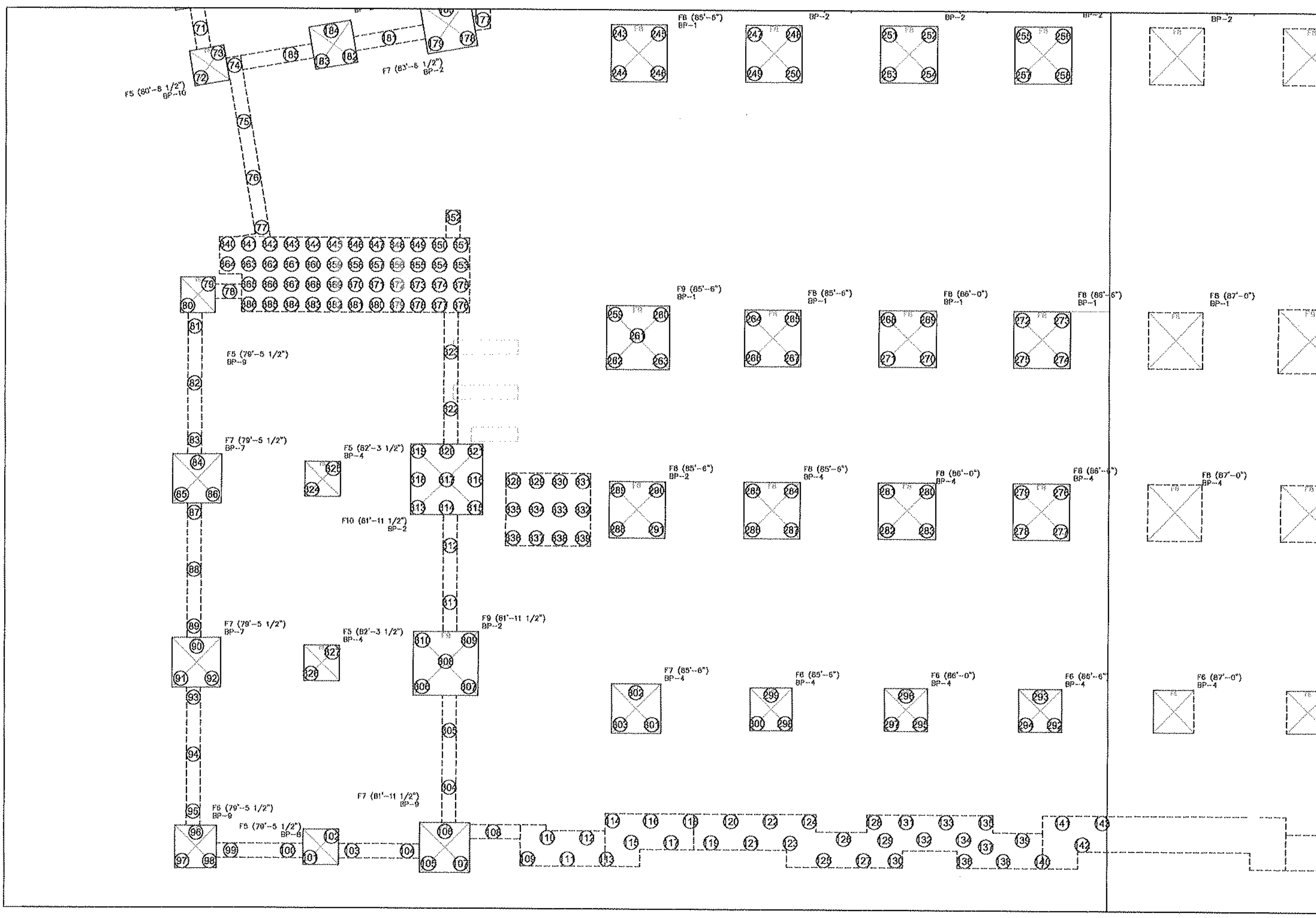
SUBSURFACE CONSTRUCTORS

FOUNDATION PLAN
GROUND IMPROVEMENT
STONE COLUMNS

FOR STONE COLUMN LAYO
ONLY
FOR ALL OTHER BUILDING INFORMATION REFER TO STRUCTURAL PLANS

DATE: 9/4/1

SHEET
2 OF 4



THE BAY HOUSE
PORTLAND, MAINE

SUBSURFACE CONSTRUCTORS

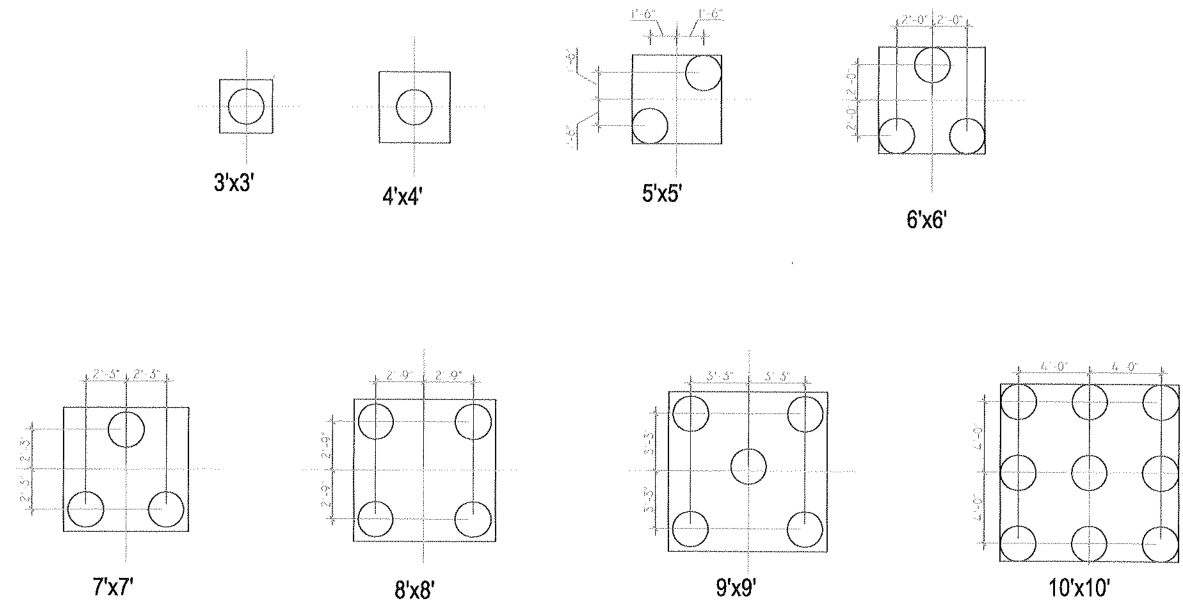
110 ANGELICA STREET ST. LOUIS MISSOURI 63147 PHONE (314)421 2460

FOUNDATION PLAN
GROUND IMPROVEMENT STONE COLUMNS

FOR STONE COLUMN LAYOUT ONLY
FOR ALL OTHER BUILDING INFORMATION REFER TO STRUCTURAL PLANS

DATE: 9/4/12

SHEET
3 OF 4



THE BAY HOUSE
PORTLAND, MAINE
SUBSURFACE CONSTRUCTORS

FOUNDATION PLAN
GROUND IMPROVEMENT
STONE COLUMNS

FOR STONE COLUMN LAYO
ONLY
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INFORMATION REFER TO
STRUCTURAL PLANS

DATE: 9/4/1

SHEET
4 OF 4