

# **Weber Engineering Associates, LLC**

December 3, 2010

Mr. Brian Main, OPM  
Hopkinton Public Library  
13 Main Street  
Hopkinton MA 01748  
Phone: (508) 497-9870  
Email: [BMain@hopkinton.k12.ma.us](mailto:BMain@hopkinton.k12.ma.us)

**Reference: Preliminary Geotechnical Engineering Report  
Library Addition, 13 Main Street and 9 Church Street  
Hopkinton, Massachusetts  
Project No. 2010686**

Dear Mr. Main:

We are pleased to submit this letter summarizing Weber Engineering Associates', LLC (WEA) preliminary findings with respect to the proposed addition to the library building located at 13 Main Street in Hopkinton, Massachusetts. This study was undertaken in accordance with WEA's proposal dated November 12, 2010 and signed by a member of the Library Trustees on November 17, 2010.

The objective of the work reported herein was to provide a brief letter summarizing the anticipated subsurface conditions based upon subsurface information retrieved at the site on November 30, 2010 and outline the implication of these conditions on foundation design and earthwork.

## **Background**

We understand that the Town of Hopkinton is considering constructing an addition to the library located at 13 Main Street in Hopkinton, Massachusetts. The proposed addition will join the southern side of the existing library building and extend on to adjacent property located at 9 Church Street. We understand that the addition will have a one-level below ground basement section to match the below ground floor grade of the existing structure.

Sites, 13 Main Street rear and 9 Church Street are relatively level and grade from approximately El 480 at the library to El. 483 near the residential structure. The existing library site where the addition will join the library is currently occupied by lawn and paved parking for library staff. Nine Church Street is occupied by gravel parking area, lawn where the addition will be located and a two-story residential structure that will be demolished to provide on-site parking.

## **Surficial Geology**

The referenced site appears on the USGS Surficial Geologic Map of the Milford Quadrangle as shown below in Figure 1. According to the mapping, the native material at the site is comprised of a thin deposit of glacial till which is non-sorted, non-stratified matrix of sand, some silt, and little clay containing scattered gravel and few large boulders. The map also shows that the depth to bedrock is shallow within a relatively large area northeast of the site. The recent explorations verify the glacial till classification of the general subsurface conditions.

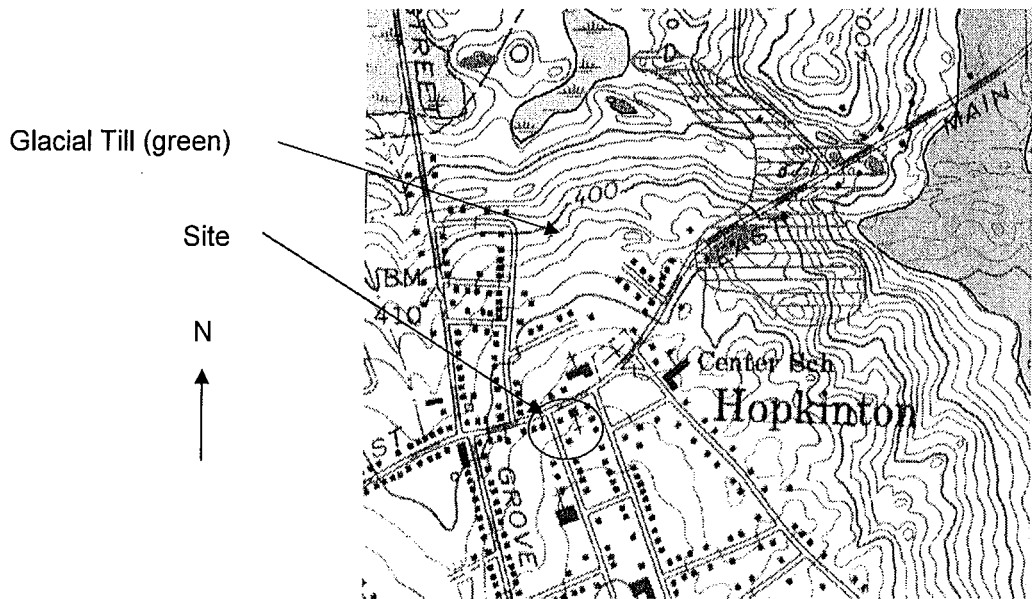


Figure 1 – Surficial Geology Map

### Subsurface Explorations

New Hampshire Boring, Inc. of Londonderry, New Hampshire conducted preliminary soil test borings at the site on November 30, 2010. The areas were selected by WEA and the boreholes were located using existing landmark features. The ground surface elevations shown on Figure 2 are approximate and based upon existing spot elevations shown on the site plan provided to us. The borehole locations are approximate and the general locations are shown in Figure 2, Exploration Location Plan.

The exploration program consisted of taking 3 borings within the proposed building footprint at the approximate locations shown. Borings B-1 and B-2 extended to a depth of approximately 21.8 feet and 14 feet below ground surface (BGS) respectively before reaching sampler and / or auger refusal. At the original location of B-3, refusal was encountered at a depth of 6 feet BGS (probably on boulder material) and the borehole was moved approximately 6 feet east before continuing. At the second location, the borehole extended to a depth of 20.3 feet BGS before encountering refusal.

Soil samples were retrieved at the ground surface and at 5-foot intervals to provide material for the visual classification shown on the logs. The samples were retrieved using a standard split spoon sampler driven with a 140-pound safety hammer falling 30-inches at each sampling depth. The sampler was driven a distance of 24-inches or as otherwise shown on the logs. The number of hammer blows required to drive the sampler into the soil in 6-inch increments is recorded on the logs and the sum of the safety hammer blows for the second and third interval provides the Standard Penetration Resistance (N).

The soil classification and strata shown on the logs are based upon our interpretation of the subsurface conditions. It is possible that there might be thin layers of material lying between the

sampling intervals that are not described on the logs and which might not become known until construction. Likewise, the depth to each soil stratum is considered to be approximate and may be more gradual or different in the field. Logs of the borings were prepared by WEA and are attached to this report for reference.

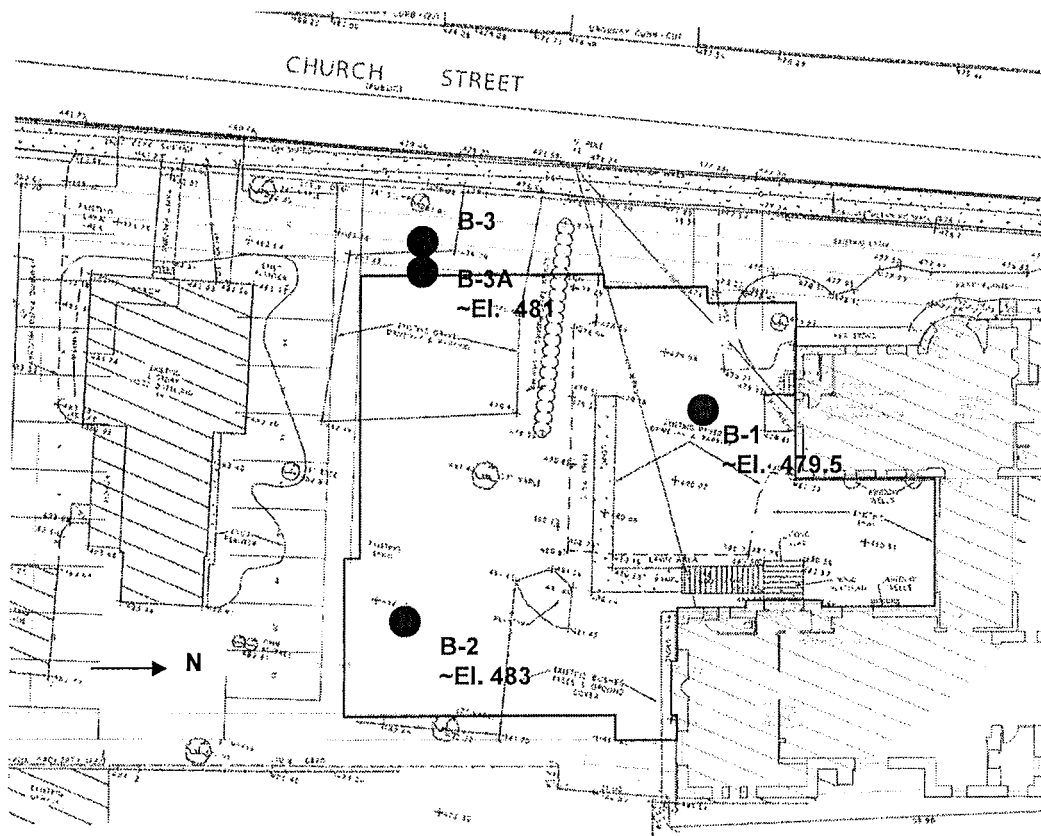


Figure 2 – Exploration Location Plan

### Subsurface Conditions

The subsurface conditions reported herein are based upon the three soil test borings conducted on November 30, 2010 and supplemented by the surficial geology presented in Figure 1. Borings B-1 and B-2 encountered 2 to 4 feet of fill respectively consisting of loose to medium dense fine or fine to coarse sand with trace to little silt, trace gravel. The fill, which probably results from site grading, was not encountered at boring B-3. The fill at borehole B-1 is underlain by an approximately 2-1/2 foot thick layer of fine sand little silt. Thereafter the material within each of the three boreholes consists predominately of very dense fine sand some silt occasional fine to coarse sand, occasional gravel. This material is glacial till and the Standard Penetration Resistance (N-value) ranges from 51 to over 100 blows per foot.

At boring B-3, refusal was encountered at a depth of approximately 6 feet BGS. After moving the borehole approximately 6 feet east the boring continued to a depth of 20.3 feet BGS. These

conditions are characteristic of the boulders that might be encountered within the glacial till deposit. The 3 borings extended top depths ranging from 14 feet to 21.8 feet BGS where refusal was encountered in each of the boreholes. Refusal is defined as the inability to advance the borehole further without using rock coring methods and can be attributed to bedrock or boulder material. It is our opinion that although the material is probably bedrock, it should be verified by using rock coring methods especially if the material might encroach within the building excavation.

Evidence of groundwater was encountered at a depth of approximately 15 feet BGS in boring B-1 where the material was wet. Although the material near the bottom of the borehole at B-3A was moist, groundwater was not observed within the depth explored. Since the glacial till is very dense and silty, groundwater does not freely flow through the material. Therefore the wet areas observed within boring B-1 can be caused by groundwater seeping through sand lenses within the glacial till.

The groundwater conditions stated on the logs are applicable to the time when the readings were made. The level of groundwater below the ground surface fluctuates based on conditions such as season, temperature and amount of precipitation that may be different from the time when the observations were made. Therefore, the groundwater levels may be higher or lower during construction and during the life of the structure. This fact should be taken into consideration when preparing foundation design and developing earthwork procedures.

## Findings

Based upon the limited information described above, it is our opinion that:

1. The subsurface conditions consist of approximately 2 feet to 4 feet of fill at locations defined by borings B-1 and B-2. Thereafter, the soil is natural and except for a thin layer of silty sand at boring B-1, the native material consists of very dense glacial till. The glacial till material is suitable for supporting the proposed building foundations. Since the building will have a basement, the fill material will be removed to construct the basement and therefore will not result in an additional construction cost.
2. Spread footing foundations are suitable for supporting the structure.
3. The excavated material except for the underlying silt can be reused as general site fill but in WEA's opinion, not as structural fill. Structural fill should be imported borrow.
4. Boulders should be expected when excavating into the glacial till. It is possible that rock might also be encountered within the basement excavation in the vicinity of boring B-2 where refusal was encountered at a depth of approximately 14 feet BGS (~El. 479). Whether rock might be encountered depends upon the grade of the basement level footings and below slab utilities. Explorations taken for design should include at least one rock core to verify whether the refusal material is bedrock or boulder.
5. The site is not susceptible to liquefaction and probably classifies as Site Class D.
6. Groundwater is apparently 15 feet BGS although there could be perched levels in sandy layers within the glacial till. Foundation and underslab drains should be installed around the building addition and below the slab since the native material is poorly draining. A groundwater observation well should be installed in at least one of the design borings taken to assess the actual stabilized groundwater level.

### **Limitations**

This report is delivered subject to the following limitations:

1. The findings presented herein reflect our opinions and are based upon reviewing the available site information described herein. A limited number of explorations was conducted for this project. If other information becomes available especially subsurface conditions from more detailed explorations, we reserve the right to modify these findings.
2. The studies and recommendations summarized herein are based upon generally accepted geotechnical engineering practices. No other warranty, expressed or implied is made.
3. WEA did not provide any service to investigate or detect the presence of contamination in the subsurface environment.

If you have any questions regarding this letter, please do not hesitate to call.

Very truly yours,

**WEBER ENGINEERING ASSOCIATES, LLC**



Richard P. Weber, P.E.  
Manager

Attachment:  
Soil Test Boring Logs

**TEST BORING LOG**

Sheet 1

Weber Engineering Associates, LLC  
Project No. 2010686

Hopkinton Public Library  
13 Main St, Addition

**BORING NO. B-1**

**DATE: 12/3/10**

**Ground Elevation:**  
**Date Started: 11/30/10**  
**Date Finished: 11/30/10**  
**Driller: New Hampshire Boring Inc.**

**Groundwater Observations**

Date	Depth (ft)	Casing	Stabilization Time
11/30/10	15	15	During exploration

Depth (ft)	Sample				Type	Strata	Visual Description	Note
	No.	Pen / Rec.	Depth	Blows / 6"				
0						Fill	1" Bituminous to brown fine to coarse SAND trace Silt trace Gravel to tan fine SAND little Silt	
1	1	24/15	0-2	11-4-3-3	Ss	___2'___		
2								
3						Silty Sand		
4						___4.5'___		
5								
6	2	24/19	5-7	25-20-31-49	Ss			
7								
8								
9								
10								
11	3	24/15	10-12	18-30-38-31	Ss			
12								
13						Glacial Till		
14								
15								
16	4	24/20	15-17	10-22-28-26	Ss			
17								
18								
19								
20								
21	5	22/12	20-21.8	30-43-44-100/4"	Ss			
22						___21.8'___		
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								

**Notes:**

Sample Type / Field Test ss = split spoon A = Auger U = Undisturbed Tv = Pocket Torvane Pp = Pocket Penetrometer	Proportioned Used Trace 0 – 10% Little 10 – 20 % Some 20 – 35% And 35-50%	Casing	Sampler	Core	
		Type	HSA	ss	
		ID	3	1-3/8"	
		Hammer	Safety	140 lbs.	

**TEST BORING LOG**

Sheet 1

Weber Engineering Associates, LLC  
Project No. 2010686

Hopkinton Public Library  
13 Main St, Addition

**BORING NO. B-2**

**DATE: 12/3/10**

**Ground Elevation:**  
**Date Started: 11/30/10**  
**Date Finished: 11/30/10**  
**Driller: New Hampshire Boring Inc.**

**Groundwater Observations**

Date	Depth (ft)	Casing	Stabilization Time
11/30/10	Dry		During exploration

Depth (ft)	Sample				Type	Strata	Visual Description	Note
	No.	Pen / Rec.	Depth	Blows / 6"				
0								
1	1	24/9	0-2	4-5-7-7	Ss	Fill	Brown fine SAND little Silt trace Gravel trace Brick, Cobbles	
2						— 4' —		
3								
4								
5								
6	2	24/18	5-7	18-28-28-35	Ss	Glacial Till	Brown fine SAND some Silt trace Gravel	
7								
8								
9								
10								
11	3	24/17	10-12	13-29-40-40	Ss		Brown fine SAND some Silt trace Gravel, Possible rock fragments	
12								
13								
14	4	0/0	14-14	50/0	Ss	— 14 —		
15							Refusal	
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								

**Notes:**

<b>Sample Type / Field Test</b> ss = split spoon A = Auger U = Undisturbed Tv = Pocket Torvane Pp = Pocket Penetrometer	<b>Proportioned Used</b> Trace 0 – 10% Little 10 – 20 % Some 20 – 35% And 35-50%		<b>Casing</b>	<b>Sampler</b>	<b>Core</b>
		<b>Type</b>	HSA	ss	
		<b>ID</b>	3	1-3/8"	
		<b>Hammer</b>	Safety	140 lbs.	

**TEST BORING LOG**

Sheet 1

Weber Engineering Associates, LLC  
Project No. 2010686

Hopkinton Public Library  
13 Main St, Addition

**BORING NO. B-3, 3A**

**DATE: 12/3/10**

**Ground Elevation:**  
**Date Started: 11/30/10**  
**Date Finished: 11/30/10**  
**Driller: New Hampshire Boring Inc.**

**Groundwater Observations**

Date	Depth (ft)	Casing	Stabilization Time
11/30/10	Dry		During exploration

Depth (ft)	Sample				Type	Strata	Visual Description	Note	
	No.	Pen / Rec.	Depth	Blows / 6"					
0							6" Topsoil to brown fine SAND some Silt trace Gravel		
1	1	24/14	0-2	3-3-4-4	Ss	Glacial Till			
2									
3									
4									
5									
6	2	16/16	5-6.3	24-35-100/4"	Ss			Brown fine SAND some Silt trace Gravel	
7									
8									
9									
10									
11	3	24/14	10-12	19-34-59-57	Ss		Brown fine SAND some Silt trace Gravel		
12									
13									
14									
15									
16	4	12/6	15-16	95-100/6"	Ss		Brown fine SAND some Silt trace Gravel		
17									
18									
19									
20	5	3/0	20-20.3	120/3"	Ss	20.3'	No recovery		
21							Refusal		
22									
23									
24							Refusal at 6 feet (probably boulder), moved 6 feet east and augered to 10 feet to continue boring		
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									

**Notes:**

Sample Type / Field Test	Proportioned Used	Type	Casing	Sampler	Core
ss = split spoon	Trace 0 – 10%				
A = Auger	Little 10 – 20 %		HSA	ss	
U = Undisturbed	Some 20 – 35%				
Tv = Pocket Torvane	And 35-50%				
Pp = Pocket Penetrometer					
		<b>ID</b>	3	1-3/8"	
		<b>Hammer</b>	Safety	140 lbs.	