Nine Mile Point 3 Nuclear Power Plant

Combined License Application

Part 11F: Boring Logs B409 to B416

Revision 0
September, 2008

Graphic Legend:

Surficial Deposits	Oswego Transition Zone
Fill	Pulaski Formation
Glacial Till	Whetstone Gulf Formation
Oswego Sandstone	Marker Bed

Rock Field Hardness:

A measure of resistance to scratching or abrasion.

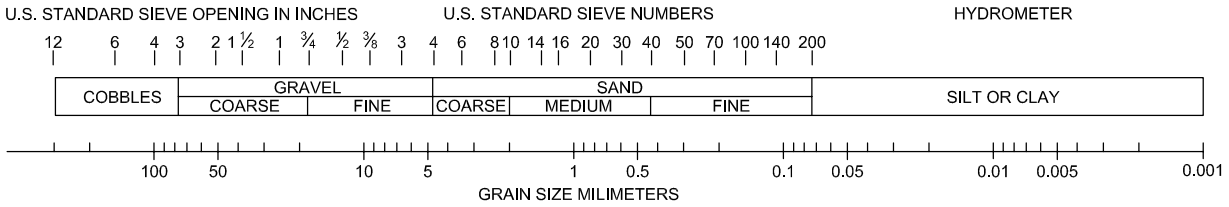
Hard	Scratches with point of steel blade with difficulty.
Medium	Scratches readily with point of steel blade.
Soft	Grooves readily with point of steel blade.

Rock Weathering:

The action of the elements in altering the color, texture, and composition of the rock.

Fresh	Crystals bright, some slight staining of joints.
Slight	Rock generally fresh, joints stained.
Moderate	Joints stained, discoloration extends 1-inch into rock.
Severe	Rock discolored, rock strength reduced to strong soil.

Soil Grain Size Scale:



Nine Mile Point Unit 3 Site Characterization Oswego, New York	GEI Consultants	FINAL BORING LOG LEGEND
AREVA NP Marlborough, Massachusetts	Project 07223	Rev. 1, July 2008

Final Boring Log

Boring No. **B409**

Boring Information

Northing : 1283086.4 **Easting :** 543070.2
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 232.8
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 4/24/2008 - 4/27/2008
Driller Name: N. Short
Logged By : H. Shields, A. Cummings, M. MacLeod
Drilling Company : Nothnagle
Total Depth (ft) : 184.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 3 inch NW

Core Barrel Type: NQ2 Wireline
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13.1 ft

Drilling Method: 4 in. ID casing to 1.5 ft. below mudline (no sediment), rollerbit to clean out casing, cored rock 1.9-184 ft.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
							Started using roller bit to make sure casing was seated in solid rock. Encountered sediment at 0.5-1 ft, used roller bit to 1.9 ft. Reset casing at 1.5 ft. below mudline (32.5 ft. below deck of barge). Rollerbit to 1.9 ft.			Approximate top of Oswego Sandstone at depth 0 ft (El. 232.8 ft).
230			C1	25/25	94	2.5 2.5				C1: SANDSTONE, gray, medium hardness, bedded, fine grained, well sorted sandstone, unweathered, fractures generally horizontal, planar, and smooth, spaced 1.5-9 in., siltstone lenses and clasts at 15-16 in., non planar fracture at 17 in.
			C2	116/120	78	2 3 2.5 2.5 3.5 2 2.5 2.5 3 3				C2: SANDSTONE, similar to C1, unweathered, fractures generally horizontal, planar, and smooth, spaced 0.5-23.5 in., cross bedding at 24 in., 65-67 in., and 92-115 in., non planar fracture at 25 in.
	10									
220										Approximate top of Oswego Transition Zone at depth 14.5 ft (El. 218.3 ft).
			C3	120/120	94	2.5 2.5 2.5 3 3 2.5 2.5 2.5 4 4	5-inch-long vertical fracture with calcite. Highly fractured zone. 2-inch-long vertical fracture with calcite.			C3: SANDSTONE WITH INTERBEDDED SILTSTONE, sandstone is gray, medium hardness, bedded, fine grained, well sorted, siltstone is dark gray, soft, laminated, fine grained, well sorted, unweathered throughout, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 23 in., siltstone clasts at 5-9 in., 12 in., 17 in., 20 in., 26 in., 39 in., 67 in., and 84 in., vertical fractures at 49-51 in. and 51-53 in., highly fractured zone at 53-54 in.
	20									
210										
			C4	124/118	92	NM 2.5 2.5 2.5 2.5 NM 2.5 2.5 3 3	3-inch-long incipient fracture with calcite infill. 2-inch-long vertical fracture in siltstone. 4-inch-thick siltstone layer. Shaly partings.			C4: SANDSTONE WITH INTERBEDDED SILTSTONE, sandstone and siltstone similar to C3, fractures generally planar, horizontal, and smooth, spaced 0.5-20.5 in., vertical fracture at 6-9 in., 114-116 in. vertical fracture at 14-14.5 in., siltstone clasts at 37-40 in., 68 in. fossil layer at 12.5-13.5 in.
	30									Approximate top of Pulaski Formation - Unit A at depth 31.5 ft (El. 201.3 ft).

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 233
Vertical Datum : NGVD 29
Date Start / End: 4/24/2008 - 4/27/2008
Total Depth (ft) : 184.0

Boring No.
B409

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
200							16-inch-long incipient vertical fracture.			
			C5	114/122	79	NM	Fossils.			C5: SANDSTONE WITH INTERBEDDED SILTSTONE, gray, medium hardness, bedding typically mottled, some laminated, cross bedding present at 66 in, siltstone dark gray and soft, fractures generally planar, spaced 1-27 in., unweathered, 60° fractures at 56-59 in. and 61-63 in., fossil layers at 6.5 in. and 10-11 in.
						NM				
						NM				
						NM				
						NM				
						NM				
						3	Highly fractured zone with two 60° fractures.			
	40					2.5				
						2.5				
						3.5				
190										
			C6	120/114	100	3.5	Dolomite vugs.			C6: SANDSTONE WITH INTERBEDDED SILTSTONE, gray, medium hardness, bedding typically laminated, some mottled bedding, calcite clasts at 3-4 in., well-sorted medium grains, unweathered, fractures planar, spaced 1.5-47 in.
						3				
						2.5				
						3				
						2.5				
						2.5				
						3.5				
	50					3				
						2.5				
						2.5				
180							Thin green veins.			
			C7	112/120	93	2				C7: SANDSTONE WITH INTERBEDDED SILTSTONE, gray sandstone, dark gray siltstone, hard sandstone, medium hard siltstone, bedded sandstone, laminated siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5-23 in., 4 in. green mineral veins at 36 in., mottling from 53-57 in., 69-71 in., 70-91 in., and 98-112 in.
						2.5				
						2				
						2				
						2				
						2				
						3				
						2.5				
	60					2.5				
						2.5				
170										Approximate top of Pulaski Formation - Unit B at depth 63.5 ft (El. 169.3 ft).
			C8	99/110	88	3.5				C8: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 2-53 in., fossil layer 36-44 in., mottling throughout.
						3				
						2.5				
						2.5				
						3				
						3	Fossils.			
						3.5				
	70					3				
						3.5				
										C9: Similar to C8, no fractures, fossil layer from 10-12 in., mottling throughout.
160			C9	22/16	100	2.5				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Form 150.2 rev. 1

Ground Surface Elev. (ft): 233
Vertical Datum : NGVD 29
Date Start / End: 4/24/2008 - 4/27/2008
Total Depth (ft) : 184.0

Final Boring Log

Boring No.
B409

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
									Approximate top of Pulaski Formation - Unit C at depth 76 ft (El. 156.8 ft).
			C10	120/120	89	3			C10: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5-26 in., 45° fracture at 98 in., fossil layers from 7-9 in. and 51-59 in., mottling throughout, cross bedding from 85-85 in. and 95-100 in., siltstone clasts from 51-55 in. and 87-88 in., thicker sandstone interbeds at 26 in.
						3			
						2.5			
						2	Fossils.		
						3			
						3.5			
						3			
	80					3			
						3.5			
						2.5	45° fracture.		
150							Irregular fracture along siltstone bed, vertical striations on fracture surface.		
			C11	109/120	76	2	Fossils.		C11: SILTSTONE AND SHALE INTERBEDDED WITH SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 13 in., incipient vertical fracture from 8-12 in., mottling from 15-17 in. and 24-25 in., thicker siltstone and sandstone interbeds.
						4	4-inch-long vertical incipient fracture with calcite infill.		
						4	Highly fractured.		
						3	Highly fractured.		
						3.5	Highly fractured.		
						4			
						5			
	90					4			
						4			
						4.5			
140									C12: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard to medium hard sandstone, siltstone and shale soft, bedding generally laminated but some mottling and cross bedding present, sandstone fine grained, well sorted, fractures generally planar and exhibit slight weathering, fractures spaced 1-21 in., heavily fractured zones at 7-8 in., 38-40 in., 92-99 in., vertical fractures at 36-40 in., 92-94 in., 96-99 in., and 109 in.
			C12	116/116	67	4	1-inch-long vertical fracture in siltstone.		
						3			
						3			
						3.5			
						4	4-inch-long vertical fracture.		
						3			
						2.5			C13: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, medium hardness sandstone, soft siltstone and shale, bedding laminated with very little cross bedding or mottling, sandstone fine grained and well sorted, fractures planar with slight weathering, spaced 0.5-28 in., heavily fractured zones at 61-65 in., 81-82 in., vertical fractures at 1-4 in., 61-65 in., 81-82 in., and 102-106 in.
	100					3			
						3			
							Shaly partings.		
130							3-inch-long vertical fracture.		
			C13	109/113	73	4	4-inch-long vertical fracture in sandstone.		
						4.5			
						3			C14: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, light gray sandstone, dark gray siltstone, black shale, medium hardness sandstone, soft siltstone and shale, bedding generally laminated with some cross bedding and mottling, sandstone fine grained and well sorted, fractures generally planar with slight weathering, spaced 0.5-17 in., heavily fractured at 17.5-19.5 in. and 41-43 in., apparent fossil layers at 64 in. and 67-68 in., conspicuous calcite clasts at 79 in., 3 in. incipient vertical fracture at 86 in., 30° fracture at 107 in.
						2.5			
						5			
						3.5			
						3	Highly fractured zone of siltstone and shale.		
	110					4			
						2.5			
						1			
120							1-inch-long vertical fracture in siltstone bed.		
			C14	122/109	80	4/0.8 ft.	5-inch-long vertical fracture.		Approximate top of Whetstone Gulf Formation - Unit A at depth 115 ft (El. 117.8 ft).
						3.5			
						3	Shaly partings.		

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 233
Vertical Datum : NGVD 29
Date Start / End: 4/24/2008 - 4/27/2008
Total Depth (ft) : 184.0

Boring No.
B409

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						2	2-inch-long vertical fracture.			
						4				
						3.5	Highly fractured zone.			
						5				
						3.5				
	120					5/1.3 ft.	Incipient vertical fracture.			C15: SILTSTONE AND SHALE WITH INTERBEDDED SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5-5 in.
							30° fracture.			
							3-inch-long vertical fracture.			
110			C15	21/20	70	3	Quartz and calcite vug.			
						3.5/0.7				
			C16	106/120	86	ft.	Shaly partings.			
						2	Fossil layer.			C16: SANDSTONE WITH SOME SILTSTONE, gray sandstone, dark gray siltstone, hard sandstone, medium hard siltstone, bedded sandstone, laminated siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 3-103 in., 21 in. fossil layer from 4-25 in., 80 in. sandstone interbed from 26-106 in.
						2	Shaly partings.			
						3				
						2				
						2				
						2				
	130					2				
						2				
						2				
100						2				
			C17	117/108	79	2				C17: SANDSTONE WITH BEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 40 in., 60° fracture at 80 in., 3 in. vertical fracture at 57 in., 5 in. vertical fracture at 92 in., 2 in. vertical fracture at 112 in., mottling from 36-38 in. and from 110-112 in., cross bedding at 15 in.
						2				
						2				
						3.5				
						5				
						6				
						4.5	Vertical fracture.			
	140					1.5	60° fracture.			
						3	3-inch-long vertical fracture in siltstone.			
							Highly fractured.			
90							Vertical fracture.			
			C18	11/12	91	2.5	Vertical fracture.			C18: SILTSTONE AND SHALE, dark gray siltstone, medium hard siltstone and shale, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar and smooth, spaced at 10 in., 30° fracture at 10 in.
			C19	112/115	88	3.5	30° fracture.			
						3	3-inch-long vertical fracture in siltstone.			
						3.5	8-inch-thick zone at 147 ft with irregular vertical fractures (driller created).			Approximate top of Whetstone Gulf Formation - Unit B at depth 148 ft (El. 84.8 ft).
						3				
						3.5	Vertical fracture.			
						3	Vertical incipient fracture.			C19: SILTSTONE AND SHALE AND INTERBEDDED SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 26 in., 3 in. vertical fracture at 9 in., 3 in. vertical fracture at 35 in., 3 in. vertical fracture at 38 in., 2 in. vertical fracture at 42 in., 3 in. incipient vertical fracture at 44 in., mottling from 50-57 in. and 67-76 in., calcite clasts and fossils from 82-91 in., 3 in. fossil layer at 91 in.
						3				
	150					3.5				
						3.5				
						2.5/0.7				
80						ft.	Fossil layers.			
			C20	124/112	89	4	Vertical fracture.			
						4	3-inch-long vertical fracture.			
						3				
						4.5				
						3.5				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 233
Vertical Datum : NGVD 29
Date Start / End: 4/24/2008 - 4/27/2008
Total Depth (ft) : 184.0

Boring No.
B409

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						5				
						5.5				
						4	20° fracture.			C20: SILTSTONE AND SHALE WITH SOME INTERBEDDED SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-38 in., 3 in. vertical fracture from 0-3 in., 30° fracture at 72 in., mottling from 23-36 in., 38-39 in., 88-91 in., 101-103 in., and 116-117 in., cross bedding at 39 in. and 44 in.
	160					4				
70			C21	12/13	100	2.5				C21: SANDSTONE, gray, hard, bedded, fine grained, well sorted, unweathered, no fractures.
			C22	110/120	84	5				
						4				
						3				
						4				
						2.5				
						5				C22: SANDSTONE WITH BEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5 in.-29 in., mottling from 4-5 in., 21-25 in., 48-52 in., and 101-110 in., 1 in. fossil layer from 45-46 in. and 5 in. fossil layer from 90-95 in.
						4				
	170					3.5				
						4.5				
						3				
60							Fossil layer.			
			C23	116/110	93	3				
						5				C23: Similar to C22, fractures generally horizontal, planar, and smooth, spaced 1-28 in, mottling at 57-66 in.
						5				
						3.5				
						3				
						6				
						2.5				
	180					4				
						4				
							40° fracture.			
							Fractured zones of siltstone.			C24: Similar to C22, one 20° planar fracture at 12 in., unweathered, cross bedding at 1-3 in.
50			C24	13/10	100	3	20° fracture.			
							General Comments about Core Samples:			Bottom of boring at depth 184 ft (El. 48.8 ft). Borehole grouted to top of lake bed upon completion.
							Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone.			
	190						Vertical fractures occasionally present in sandstone beds.			
40							Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport.			
							Fracture surfaces are generally unweathered unless otherwise noted.			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log Signature Page	Boring No. B409

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B410**

Boring Information

Northing : 1283206.9 **Easting :** 543072
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 229.6
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 4/18/2008 - 4/20/2008
Driller Name: N. Short
Logged By : H. Shields, A. Hare, M. MacLeod
Drilling Company : Nothnagle
Total Depth (ft) : 182.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 3 inch NW

Core Barrel Type: NQ2
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13.1 ft

Drilling Method: 4-inch ID flush joint casing to top of rock, cored rock to 182 ft below top of mudline.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
			S1	16/24	NM	NA				S1: WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM), ~70% widely-graded sand, ~20% gravel up to 1/2 inch, ~10% non-plastic fines, light brown, rock fragments at 0-2 in. and 7-9 in. LAKE SEDIMENT.
			S2	14/14	34-35-100/2 in.	NA				S2: Similar to S1, fewer rock fragments. LAKE SEDIMENT.
										Approximate top of Oswego Sandstone at depth 3.8 ft (El. 225.8 ft).
			C1	38/38	88	3 3 2.5	45° fracture. Hard drilling at 5 ft. Fractured argillaceous sandstone.			C1: SANDSTONE, gray, medium hardness, bedded, some crossbedding at 36-38 in., well sorted, fine grained, slightly weathered, fractures generally planar, horizontal and smooth, spaced 1-9 in. 2 in. 45° inclined fracture at top of core.
			C2	58/60	93	2.5 NM NM 3 3	10° fracture.			C2: Similar to C1, 0-39 in is hard sandstone, crossbedding in several layers, siltstone clasts and lenses at 26-27 in, 30-30.5 in, 40-42 in and 44-45 in., fractures generally horizontal, planar and smooth, spaced 0.5 to 12 in.
220	10									
										Approximate top of Oswego Transition Zone at depth 13.2 ft (El. 216.4 ft).
			C3	122/120	63	2.5 3.5 3 2.5 3 5 4 3 3 2	Fractured zone of argillaceous sandstone and siltstone spaced 1-4 in. Shaly partings.			C3: SANDSTONE WITH INTERBEDDED SILTSTONE, gray to dark gray, medium hard sandstone, soft siltstone, bedded sandstone, laminated siltstone, fine grained, well sorted, unweathered with some slightly weathered joints, fractures generally planar, horizontal, and smooth, spaced 0.25 in. to 18 in., vertical fracture at 61-65 in., siltstone clasts in sandstone at 120 in.
210	20									
			C4	61/60	85	NM	2-inch-long incipient fracture with calcite infill. 12-inch-long vertical fracture with calcite infill.			C4: SANDSTONE WITH SOME INTERBEDDED SILTSTONE, gray to dark gray, medium hardness, bedded, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.25 to 14 in., vertical fractures at 10-13 in. and 54-59 in., vertical fracture at 47 - 54 in., siltstone lenses at 12 in., 16 in., and 35 in., siltstone clasts at 40 - 42 in.
										Approximate top of Pulaski Formation - Unit A at depth 26.9 ft (El. 202.7 ft).
			C5	58/60	90	4 3.5 3 2.5 2.5	Core blocked at 27 ft. 4-inch-thick siltstone layer. 2.5-inch-long incipient fracture with calcite infill.			C5: SILTSTONE WITH SOME SANDSTONE, dark gray and gray, medium hardness, bedded, fine grained, well sorted, unweathered, fractures generally planar, horizontal and smooth, spaced 0.75 to 48 in., fossils at 32-33 in., 37.5-38.5 in. and 42-42.5 in., siltstone clasts in sandstone at 55-56 in.
200	30									

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 230
Vertical Datum : NGVD 29
Date Start / End: 4/18/2008 - 4/20/2008
Total Depth (ft) : 182.0

Boring No. **B410**

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
			C6	119/120	77	3 2.5 2 NM NM 2.5 2.5 2 2 3	Fractured zones of siltstone. Highly fractured zone. Shaly partings.			C6: SILTSTONE WITH INTERBEDDED SANDSTONE, gray to dark gray, medium hardness sandstone and soft siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 26 in., mottling throughout up to 4 in. thick.
190	40									
			C7	122/120	95	2 2 2 2 2 2 2 2 2 2			C7: Similar to C6, fractures generally planar, horizontal, and smooth, spaced from 0.5 to 23.5 in., mottling throughout up to 8 in.
180	50									C8: Similar to C6, fractures generally planar, horizontal, and smooth, spaced from 0.5 to 34.5 in., mottling throughout up to 18 in., thinner interbedded bands of siltstone and sandstone.
			C8	119/120	92	NM	Thin green veins. Shaly partings.			Approximate top of Pulaski Formation - Unit B at depth 55.4 ft (El. 174.2 ft).
170	60									
			C9	117/120	98	NM NM NM NM 2.5 3 3 2 2.5 2.5	2-inch-long incipient fracture with calcite infill.			C9: Similar to C6, fewer sandstone layers, fractures generally planar, horizontal, and smooth, spaced 5 to 39 in, mottling throughout up to 6 in. thick, fossil layer at 92-97 in.
160	70									Approximate top of Pulaski Formation - Unit C at depth 72 ft (El. 157.6 ft).
			C10	125/120	83	NM NM				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
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GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 230
Vertical Datum : NGVD 29
Date Start / End: 4/18/2008 - 4/20/2008
Total Depth (ft) : 182.0

Boring No.
B410

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						NM NM NM 2 2 4 2 3	Shaly partings. 2-inch-long incipient fracture with calcite infill. 4-inch-long vertical fracture. Highly fractured zone. Shaly partings. Fractured shale zones.			C10: SANDSTONE WITH INTERBEDDED SILTSTONE, gray to dark gray, medium hardness sandstone, bedded, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 42.5 in., soft siltstone lenses at 38 in., 53 in., 60 in., and 110 in.
150	80									
		C11		119/120	50	NM NM NM 3 3 2 4 3 4 4	Highly fractured zone. Highly fractured zone. Shaly partings. 2.5-inch-long incipient fracture with calcite infill. Shaly partings.			C11: SILTSTONE WITH SOME SANDSTONE, dark gray and gray, soft siltstone, medium hardness sandstone, laminated, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5 in. to 9.5 in. shale layers at 30 in., 38 in., 67 in., up to 1.5 in. thick, mottling at 102-104 in., 107-108 in. and 110 in.
140	90									
		C12		117/120	76	4 4 4 4 3 3 3 2 2 2	Highly fractured zone. 1-inch-long vertical fracture. Shaly partings.			C12: Similar to C11, sandstone layers are thicker, up to 15 in., fractures spaced 0.5 to 24.5 in., shale at 26.5 to 27.5 in., alternating 1 in. layers of siltstone and sandstone at 0 to 32 in.
130	100									
		C13		121/120	77	2 2 4 3 2 2 2 3 3 3	Highly fractured zone. Shaly partings. Irregular fracture along siltstone clast. Siltstone clasts in sandstone.			C13: SANDSTONE WITH INTERBEDDED SILTSTONE, gray and dark gray, medium hardness sandstone, soft siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal and smooth, spaced from highly fractured to 24 in., siltstone clasts at 14 in., 58 in., 63 in. and 81 in. Approximate top of Whetstone Gulf Formation - Unit A at depth 109.5 ft (El. 120.1 ft).
120	110									
		C14		115/120	73	4 6 4.5 2.5	Fractured zones of siltstone and shale. Highly fractured zone.			C14: SANDSTONE WITH INTERBEDDED SHALE, gray and dark gray, medium hardness sandstone, medium hardness shale, fine grained, well sorted, unweathered, fractures generally horizontal, planar, and smooth, spaced from highly fractured to 17.5 in., mottling throughout up to 4 in. thick.

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 230
Vertical Datum : NGVD 29
Date Start / End: 4/18/2008 - 4/20/2008
Total Depth (ft) : 182.0

Boring No.
B410

Elev. (ft)	Depth (ft)	Sample information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						4				
						3				
						4	5-inch-long vertical fracture with calcite.			
						2.5	Highly fractured zone of siltstone and shale.			
110	120					2	Sandstone clasts in siltstone.			
						2				
							Crossbedding.			
			C15	112/111	94	2				C15: SANDSTONE WITH SOME INTERBEDDED SILTSTONE, siltstone layers up to 4 in. thick, gray, medium hardness, bedded, crossbedding at 27-32 in., fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 3 in. to 63 in., mottling at 80 in., soft shale at 105-110 in., irregular fractures at 106-109 in.
						2				
						2				
						1.5				
						2				
						2				
						2				
						2				
						2				
100	130					4				
			C16	10/9	50	2.5	4-inch-long vertical fracture with crosscutting horizontal fracture.			C16: SILTSTONE AND SANDSTONE, siltstone dark gray, soft, laminated, sandstone gray, medium hardness, bedded, fine-grained, well-sorted, unweathered, fractures planar, horizontal and smooth, spaced 0.25 to 3 in.
			C17	117/120	83	3	Core blocked at 131.2 ft.			
						4	Shaly partings.			
						3				
						4	0.5-inch-long vertical fracture in shale.			
						3				
						3				Approximate top of Whetstone Gulf Formation - Unit B at depth 137.5 ft (El. 92.1 ft).
						3.5				
						2.5				C17: SILTSTONE WITH INTERBEDDED SHALE, dark gray, soft, laminated, fine grained, well sorted, unweathered, fractures planar, horizontal and smooth, spaced 0.25 to 38 in.
						2.5				
90	140					2.5				
			C18	119/120	98	2	1-inch-long vertical fracture.			C18: SANDSTONE AND SILTSTONE WITH INTERBEDDED SHALE, gray sandstone, dark gray siltstone and shale, medium hard sandstone, soft siltstone and shale, bedded sandstone, laminated siltstone and shale, fine-grained, well-sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 31 in., vertical fracture at 0 in., highly fractured shale layer at 59 in.
						3				
						2				
						1.5				
						3				
						2.5				
						4	Highly fractured siltstone bed.			
						3				
						3				
80	150					3				
			C19	111/120	92	4	Shaly partings.			C19: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, dark gray siltstone and shale, gray sandstone, soft siltstone and shale, medium hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal and smooth, spaced 1 in. to 33 in., 2 in. vertical fracture at 0 in., 3 in. vertical fracture at 36 in., 2 in. vertical fracture at 70 in., 3 in. vertical fracture at 76 in., 2 in. vertical fracture at 83 in.
						4				
						4				
						4				
						4	3-inch-long vertical fracture in siltstone.			
						4				
						4				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 230
Vertical Datum : NGVD 29
Date Start / End: 4/18/2008 - 4/20/2008
Total Depth (ft) : 182.0

Boring No.
B410

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						4	2-inch-long vertical fracture in siltstone.			
						4				
70	160					4	Shaly partings with 1-inch-long vertical fracture.			
			C20	134/120	96	4	4-inch-long vertical fracture.			C20: SANDSTONE WITH SILTSTONE WITH SOME INTERBEDDED SHALE, gray sandstone, dark gray siltstone and shale, medium hard sandstone, soft siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal and smooth, spaced 2-32 in., 4 in. vertical fracture at 0 in., 1 in. vertical fracture at 133 in., fossil layer at 87 in.
						4				
						4				
						4				
						4				
						4				
						4				
						4	Fossils.			
						4				
60	170					4				
							1-inch-long vertical fracture.			
			C21	118/120	93	4				C21: Similar to C20, fractures generally horizontal, planar and smooth, spaced 1 to 14 in., 4 in. vertical fracture at 106 in.
						4	Fossils.			
						4				
						4				
						4				
						4				
						4				
						4				
						4				
50	180					4				
							Irregular fracturing along siltstone lenses			
										Bottom of boring at depth 182 ft (El. 47.6 ft). Borehole grouted to top of lake bed upon completion.
							General Comments about Core Samples:			
							Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone.			
40	190						Vertical fractures occasionally present in sandstone beds.			
							Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport.			
							Fracture surfaces are generally unweathered unless otherwise noted.			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log Signature Page	Boring No. B410

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B411**

Boring Information

Northing : 1283277.4 **Easting :** 542989.4
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 226
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 4/21/2008 - 4/23/2008
Driller Name: J. Stockholm
Logged By : M. MacLeod, H. Shields
Drilling Company : Nothnagle
Total Depth (ft) : 178.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 3 inch NW

Core Barrel Type: NQ2 Wireline
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13.1 ft

Drilling Method: 4 in. ID flush joint casing to top of rock, cored rock to 182 ft. below top of mudline.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
			S1	9/11	74-100/5 in.	NA				Approximate top of Oswego Sandstone at depth 0 ft (El. 226.0 ft).
			C1	23/25	40	2 2	Highly fractured zone. 30° fracture.			S1: MODERATELY WEATHERED OSWEGO SANDSTONE
			C2	53/60	80	3 3 3 3 3	Highly fractured argillaceous sandstone. 30° fracture.			C1: SANDSTONE, greenish gray, hard, massive, fine to medium grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 10 in., 2 in. vertical fracture at 12-14 in., interbedded siltstone at 19 in. C2: SANDSTONE WITH INTERBEDDED SILTSTONE, gray sandstone, dark gray siltstone, hard sandstone, medium hard siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-20 in., 30° fracture at 42 in., siltstone clasts at 12-16 in. and 46-49 in. Approximate top of Oswego Transition Zone at depth 8.3 ft (El. 217.7 ft).
220			C3	120/120	41	3 3 3 3 3 3 3 3 3 3	30° fracture. Shaly partings.			C3: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-10 in., 30° fracture at 49 in., siltstone clasts at 2-3 in., 47-49 in., and 116-117 in.
210	10		C4	122/120	98	3 3 3 3 3 3 3 3 3 3	2-inch-long incipient fracture with calcite infill.			C4: SANDSTONE WITH INTERBEDDED SILTSTONE, gray sandstone, dark gray siltstone, hard sandstone, medium hard siltstone, bedded sandstone, laminated siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-20 in, fossil layer at 98 in., siltstone clasts from 105-107 in. and 112-113 in. Approximate top of Pulaski Formation - Unit A at depth 22.5 ft (El. 203.5 ft).
200	20		C5	112/120	90	3 3 3 3 3	Fossils.			C5: Similar to C4, fractures generally planar, horizontal, and smooth, spaced 2-27 in., fossil layers at 21 in., 59 in., and 80 in., siltstone clasts from 18 in. to 19 in.
	30									

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Form 150.1 rev. 1

NINE MILE POINT SITE CHARACTERIZATION 1 NMP OFFSHORE LOGS.GPJ GEI DATA TEMPLATE.GDT 9/11/08

Final Boring Log

Ground Surface Elev. (ft): 226
Vertical Datum : NGVD 29
Date Start / End: 4/21/2008 - 4/23/2008
Total Depth (ft) : 178.0

Boring No. **B411**

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						3				
						3				
						3				
						3				
						1/4 in.	Fossils.			
190										
							10° fracture.			
			C6	127/120	87	2				C6: Similar to C4, fractures generally planar, horizontal, and smooth, spaced 1-20 in., 10° fracture at 0 in., sandstone clasts at 1-5 in. and 25-26 in., siltstone clasts at 67-68 in.
						2				
	40					2	Shaly partings.			
						2				
						2				
						2				
						2				
						2				
						2				
						2				
180										
			C7	1212/120	99	2	Shaly partings.			C7: Similar to C4, fractures generally planar, horizontal, and smooth, spaced 1-15 in., sandstone clasts at 43-48 in., siltstone clasts at 72-74 in., sandstone bedding thicker with depth.
						2				
	50					2				
						2				
						2				
						2				
						2				
						2				Approximate top of Pulaski Formation - Unit B at depth 55.1 ft (El. 170.9 ft).
						2				
170										
			C8	120/120	95	2				C8: SANDSTONE AND INTERBEDDED SILTSTONE, gray sandstone, dark gray siltstone, hard sandstone, medium hard siltstone, bedded sandstone, laminated siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 2-29 in., sandstone clasts at 86-86 in., siltstone clasts at 26-27 in. and 45-46 in., bedding thickness increases with depth, sandstone beds thicker and more numerous.
						2				
	60					2				
						2				
						2				
						2				
						2				
						2	Shaly partings.			
						2	Fossils.			
160										
			C9	115/120	68	2	45° fracture.			C9: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-22 in., 45° fracture at 9 in., 45° fracture at 54 in., 45° fracture at 55 in., 45° fracture at 57 in., 45° fracture at 61 in., 45° fracture at 105 in., siltstone clasts from 9-13 in., mottling at 55-57 in., 5 in. incipient fracture at 39 in.
						2				
	70					2				
						2				
						2	5-inch-long incipient fracture with calcite.			
						2	45° fractures.			Approximate top of Pulaski Formation - Unit C at depth 72.8 ft (El. 153.2 ft).
						2	Highly fractured silty shale.			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 226
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Date Start / End: 4/21/2008 - 4/23/2008
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Boring No. B411

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Soil-Sample Description Rock-Lithological Description
						2		
						2		
150						2	45° fracture.	
			C10	113/120	82	2		C10: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 12 in., 45° fracture at 103 in., 2 in. clay seam at 20 in., sandstone clasts from 92-97 in.
						2		
	80					3	Highly fractured siltstone and argillaceous sandstone.	
						3.5		
						3	2-inch-long clay seam.	
						NM	Highly fractured siltstone and argillaceous sandstone.	
						NM		
						NM		
						NM		
140						6		
							45° fracture. Highly fractured zone.	
			C11	125/120	75	4		C11: Similar to C10 with increased siltstone and sandstone bedding thickness, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 17 in., 45° fracture at 104 in., 30° fracture at 107 in., highly fractured shale zones from 36-37 in., 55-56 in., and 92-93 in.
						4		
	90					4		
						3.5		
						3.5	Highly fractured zone. 45° fracture.	
						3	Fossils.	
						3	Shaly partings.	
						3	Highly fractured zone.	
						3		
130						3	Highly fractured zone. 45° fracture. 45° fracture. 30° fracture.	
			C12	121/120	83	3		C12: Similar to C10, fractures generally planar, horizontal, and smooth, spaced from 1-20 in., 45° fracture at 62 in., 30° fracture at 77 in., 45° fracture at 113 in., siltstone clasts from 75-76 in., 85-87 in., and 111-113 in., siltstone clasts from 85-87 in.
						3	Fossils.	
	100					3		
						3		
						3		
						3		
						3	45° fracture.	
						3		Approximate top of Whetstone Gulf Formation - Unit A at depth 105.0 ft (El. 121.0 ft).
						3		
120						3	30° fracture.	
							45° fracture.	C13: SILTSTONE AND INTERBEDDED SANDSTONE AND SHALE, dark gray siltstone, gray sandstone, dark gray shale, medium hard siltstone, hard sandstone, medium hard shale, laminated siltstone, bedded sandstone, laminated shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-11 in., 1 in. vertical fracture at 8 in., dolomite clasts from 56-59 in., siltstone clasts from 57-61 in.
			C13	61/60	87	3		
						3		
	110					3		
						3		
						3		
			C14	61/60	94	4		
						3		
						3		

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 226
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Total Depth (ft) : 178.0

Boring No. **B411**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
110						2 2.5			C14: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone, dark gray shale, hard sandstone, medium hard siltstone, medium hard shale, bedded sandstone, laminated siltstone, laminated shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1-49 in., fossil layers from 8-9 in., 20-22 in., and 28-31 in., siltstone clasts at 21 in., 24 in., 28 in., and 31 in., 41 in. sandstone interbed at 20 in.
			C15	118/120	84	4 2.5 3.5 3 2 2.5 2.5 2.5 3.5 5	Shaly partings.		C15: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, soft siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, smooth, and horizontal, spaced 6-36 in., vertical fracture at 75-76 in., siltstone clasts at 24 in. and 67 in., some cross bedding at 64 in., top 4 ft. of core is sandstone.
120									
100									
			C16	120/120	90	4.5 3.5 3 2.5 3 4.5 3 2.5 2.5 2.5	10° fracture. Shaly partings. 10° fracture. Shaly partings.		C16: SHALE AND SILTSTONE WITH SOME INTERBEDDED SANDSTONE, siltstone and shale are dark gray, soft, fine grained, well sorted, laminated, sandstone gray, medium hardness, fine grained, well sorted, bedded, unweathered, fractures generally horizontal, planar, and smooth, spaced 1-23 in., 10° fractures at 19 in. and 60 in., 45° fracture at 115 in., 20° fracture at 119 in., cross bedding at 110-115 in.
130									
90							45° fracture. Shaly partings.		Approximate top of Whetstone Gulf Formation - Unit B at depth 138.0 ft (El. 88.0 ft).
			C17	122/120	92	3 2 3 4 3 2.5 3 2.5 3.5 2.5	20° fracture. Irregular fracture in sandstone.		C17: SHALE AND SILTSTONE WITH SOME INTERBEDDED SANDSTONE, similar to C16, except sandstone layers thicker (4-8 in.), fractures generally horizontal, planar, and smooth, spaced 1.5-23 in., unweathered, soft sediment deformation at 10.5 in., fossils at 30 in. and 33 in., mottling at 39 in., 41 in., 83-85 in., and 99 in.
140									
80									
			C18	120/120	95	2 3 2.5 2 2 2 1.5 1.5 1.5 2			C18: SANDSTONE WITH SOME SILTSTONE AND SHALE, core predominantly sandstone with few layers of siltstone and shale, sandstone 3-4 ft. thick, sandstone gray, medium hardness, bedded, medium grained, well sorted, siltstone and shale dark gray, soft, laminated, fine grained, well sorted, unweathered, fractures generally horizontal, planar, and smooth, spaced 1-44 in., mottling at 19-21 in., siltstone clasts at 80 in., 82 in., and 85 in.
150									
70									

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 226
Vertical Datum : NGVD 29
Date Start / End: 4/21/2008 - 4/23/2008
Total Depth (ft) : 178.0

Boring No. **B411**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
			C19	122/120	75	2				C19: SANDSTONE WITH SOME SILTSTONE AND SHALE, gray sandstone, dark gray siltstone, dark gray shale, hard sandstone, medium hard siltstone, medium hard shale, bedded sandstone, laminated siltstone, laminated shale, fine grained, well sorted, unweathered, fractures are generally planar, horizontal, and smooth, spaced 1-53 in., 45° fracture at 30 in., 45° fracture at 112 in., 30° fracture at 114 in., 30° fracture at 121 in., sandstone clasts from 14-15 in., 58-61 in., and 101-103 in., siltstone clasts from 10-11 in., 13-15 in., 29-30 in., 53-54 in., and 57-60 in., siltstone lenses at 42 in., 43 in., 53 in., and 58-60 in., fossil layers from 30-31 in., 37-43 in., 49-51 in., 92-95 in., and 110-112 in., cross bedding from 118-122 in.
						2				
	160					2				
						2.5	45° fracture.			
						2.5				
						2				
						2				
						2				
						3.5				
						2.5				
	60									
							30° fractures.			
			C20	119/120	83	1.5				C20: SANDSTONE AND INTERBEDDED SILTSTONE WITH SHALE, gray sandstone, dark gray siltstone and shale, hard sandstone, medium hard siltstone and shale, bedded sandstone, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, 30° fracture at 25 in., 30° fracture at 38 in., 45° fracture at 95 in., siltstone clasts from 26-27 in. and 50-51 in., fossil layer from 11-12 in., cross bedding from 0-2 in., 40 in. sandstone interbed at 17 in.
						4	Fossils.			
	170					2.5	30° fracture.			
						2				
						2	30° fracture.			
						3				
						3				
						3				
						3.5				
						4				
	50									
							45° fracture. Shaly partings.			
										Bottom of boring at depth 178 ft (El. 48.0 ft). Borehole grouted to top of lake bed upon completion.
	180									
							General Comments about Core Samples:			
							Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone.			
							Vertical fractures occasionally present in sandstone beds.			
	40									
							Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport.			
	190									
							Fracture surfaces are generally unweathered unless otherwise noted.			
	30									

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log Signature Page	Boring No. B411

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B412**

Boring Information

Northing : 1283391.2 **Easting :** 543005.4
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 222
Vertical Datum : NGVD 29
Rig Type/I.D: Mobile B57 / Barge 2

Date Start - End: 4/19/2008 - 4/22/2008
Driller Name: J. Weeks
Logged By : T. Daigle
Drilling Company : Boart Longyear
Total Depth (ft) : 178.7

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 2 5/8 inch NW

Core Barrel Type: NQ2
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13.4 ft

Drilling Method: Casing set to 0 ft. below mudline, rollerbit to clean out casing, wireline coring 0.5 ft to 178.7 ft.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Soil-Sample Description Rock-Lithological Description
								Approximate top of Oswego Sandstone at depth 0.0 ft (El. 222.0 ft).
220			C1	14/34	35	1.3 1 5		C1: SANDSTONE, greenish gray, hard, bedded, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth spaced 1-8 in.
								Approximate top of Oswego Transition Zone at depth 2.2 ft (El. 219.8 ft).
			C2	12/18	28	2	Highly fractured sandstone.	C2: Similar to C1, highly fractured zone from 0-6 in. likely due to core barrel blockage, some oxidation in fractured zone.
			C3	96/102	42	4 3 3.5 3 4 3 2.5 2.5	3-inch-long incipient fracture (calcite infill). Highly fractured sandstone. 5-inch-long vertical fracture (oxidation on surface). 1-inch-long irregular fracture. 75° fracture. Highly fractured argillaceous sandstone. 9-inch-long vertical fracture.	C3: SANDSTONE WITH INTERBEDDED SILTSTONE, light gray sandstone, dark gray siltstone, hard to medium hard sandstone, soft siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth spaced 1-9 in., highly fractured zone 0-3 in., 9-14 in., 57-60 in., some fractures contain oxidation.
10								
210								
			C4	119/120	83	2.5 2.5 2.5 2.5 2.5 2.5 2 2.5 2.5 2.5	9-inch-long vertical fracture with calcite. 6-inch-thick siltstone layer.	C4: Similar to C3, few fossils from 95-103 in., fractures generally planar, horizontal, and smooth spaced 1-29 in., some fractures show weathering, 9 in. vertical fracture at 31 in. with calcite infill.
								Approximate top of Pulaski Formation - Unit A at depth 18.3 ft (El. 203.7 ft).
20								
200								
			C5	122/120	73	2.5 3.5 3 2.5 2.5 2 2.5 2.5 3 2.5	3-inch-long vertical fracture. Shaly partings.	C5: INTERBEDDED SANDSTONE AND SILTSTONE, light gray sandstone, dark gray siltstone, hard to medium hard sandstone, soft siltstone, fine grained, well sorted, unweathered, fossil fragment layer from 93-104 in., siltstone bedding is irregular and wavy, siltstone lenses in sandstone, fractures generally planar, horizontal, and smooth spaced 1-13 in., 3 in. vertical fracture at 16 in., 2 in. vertical fracture at 91 in.
30								

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 222
Vertical Datum : NGVD 29
Date Start / End: 4/19/2008 - 4/22/2008
Total Depth (ft) : 178.7

Boring No.
B412

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
							Fossils.			
			C6	120/120	92	2 2 2.5 2.5 2 2.5 2 2 2.5 2				C6: SANDSTONE AND ARGILLACEOUS SANDSTONE WITH INTERBEDDED SILTSTONE, gray to dark gray sandstone, dark gray siltstone, hard to medium hard sandstone and siltstone, fine grained, well sorted, unweathered, fractures generally planar, and horizontal spaced 1-30 in.
180	40									
			C7	65/67	42	2 5.5 6.5 3 2	10-inch-long incipient fracture (calcite infill). Core stuck in barrel. Some fractures may be due to hammering core barrel. Sand from lake bottom was binding the core in the barrel.			C7: Similar to C6, fractures generally planar and horizontal spaced 1-5 in., 10 in. vertical fracture at 25 in. with calcite infill.
	50		C8	57/58	61	1 1.5 3 2 2	6-inch vertical fracture. Weathered clay seam (1-inch-thick containing shale fragments).			C8: Similar to C6, fossil fragment layer at 56 in., 2 in. moderately weathered siltstone layer at 19 in. and 23 in., siltstone weathered to soft clay, 1 in. weathered siltstone layer at 44 in., 1 in. fossil fragment layer at 56 in., fractures generally planar and horizontal spaced 1-8 in.
170										
			C9	120/120	92	2 2 2.5 2 2.5 2.5 2 2.5 2.5 2.5	2-inch-long incipient fracture (calcite infill).			C9: Similar to C6, soft sediment deformation from 66-73 in., 2 in. fossil fragment layer at 103 in., fractures generally planar and horizontal spaced 1-18 in., incipient fracture from 2-4 in.
	60									Approximate top of Pulaski Formation - Unit B at depth 60.3 ft (El. 161.7 ft).
160							Fossils.			
			C10	120/120	68	2.5 4 4 4 2.5 3 2.5 2.5 2.5 3	Shaly partings. 20-inch-long vertical fracture. Shaly partings. Fossils. Highly fractured zone. 5-inch-long incipient fracture (calcite infill).			C10: SANDSTONE WITH INTERBEDDED SHALE AND SILTSTONE, gray sandstone, dark gray siltstone and shale, sandstone is hard, siltstone and shale are soft and have well defined bedding, sandstone has moderately defined bedding, unweathered, 11 in. fossil fragment layer at 2 in., fractures generally planar and horizontal spaced 1-20 in., highly fractured zone 20-26 in., 20 in. vertical fracture at 0 in., incipient fracture at 81-86 in.
	70									Approximate top of Pulaski Formation - Unit C at depth 71.0 ft (El. 151.0 ft).
150										

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 222
Vertical Datum : NGVD 29
Date Start / End: 4/19/2008 - 4/22/2008
Total Depth (ft) : 178.7

Boring No. **B412**

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Soil-Sample Description Rock-Lithological Description
			C11	119/120	71	3	4-inch-long vertical fracture.	C11: SILTSTONE WITH INTERBEDDED SANDSTONE, thick, massive sandstone bed from 100-120 in., gray, hard sandstone, dark gray, soft siltstone, unweathered, weathered shale to soft clay at 14-16 in., fractures generally planar and horizontal spaced 1-24 in., 4 in. vertical fracture at 9 in., 1 in. vertical fracture at 103 in., highly fractured zone from 9-16 in., and 103-106 in.
						2.5		
						2.5	1-inch-thick clay seam (contains shale fragments).	
						3		
						3		
						3		
						3.5		
	80					3		
						4		
						3.5		
140							1-inch-long vertical fracture Highly fractured siltstone.	
			C12	122/120	73	2.5		C12: SILTSTONE AND SHALE WITH INTERBEDDED SANDSTONE, gray, hard sandstone, dark gray, soft siltstone and shale, fine grained, well sorted, unweathered, poorly defined bedding, 1 in. fossil fragment layer at 52 in., fractures generally planar and horizontal spaced 1-26 in.
						3		
						3	5-inch-long incipient fracture (with calcite).	
						4		
						4		
						2.5	Highly fractured siltstone.	
						2.5	60° fracture.	
	90					3	10° fracture.	
						2.5		
						2.5	40° fracture.	
130								
			C13	119/120	76	2.5		C13: SANDSTONE AND SILTSTONE, gray, hard sandstone, dark gray, soft siltstone, unweathered, 1 in. fossil fragment layer at 19 in. and 115 in., 2 in. fossil fragment layer at 78 in., fractures generally planar and horizontal spaced 1-28 in., 16 in. incipient vertical fracture at 102 in.
						2.5		
						4		
						2		
						2		
						2		
						2		
	100					2.5		
						2		
						2.5		
120								Approximate top of Whetstone Gulf Formation - Unit A at depth 103.7 ft (El. 118.3 ft).
			C14	120/120	92	3	Shaly partings.	C14: SILTSTONE AND SHALE WITH INTERBEDDED SANDSTONE, dark gray, soft siltstone and shale, gray, hard sandstone, unweathered, 4 in. fossil fragment layer at 91 in. and 108 in., soft sediment deformation at 116-129 in., fractures generally planar and horizontal spaced 1-23 in.
						3		
						3.5		
						3		
						2.5		
						2		
						2.5		
	110					2.5		
						2		
						2	Fossils.	
110								
			C15	123/120	89	1.5	15° fracture.	C15: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray, hard sandstone, dark gray, soft siltstone and shale, fine grained, well sorted, unweathered, soft sediment deformation
						2	20° fracture.	

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 222
Vertical Datum : NGVD 29
Date Start / End: 4/19/2008 - 4/22/2008
Total Depth (ft) : 178.7

Boring No.
B412

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						2 3 2.5 2 2 2.5 3 4	12-inch-long incipient fracture (calcite infill).			from 9-11 in., 21-22 in., 75-75 in., and 88-93 in., fractures generally planar and horizontal spaced 1-18 in., non-planar fracture at 90 in., 12 in. incipient vertical fracture at 54 in.
100	120									
			C16	119/120	68	2.5 3.5 4 3.5 4 2.5 3 3 2.5 3	40° fracture.			C16: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, dark gray, soft siltstone and shale, gray, hard sandstone, fine grained, well sorted, unweathered, fractures generally planar and horizontal spaced 1-16 in., highly fractured zone from 54-59 in.
90	130									
			C17	121/120	95	2.5 2 2 4 2.5 3 3 3 3.5 3.5	Shaly partings.			C17: Similar to C16, slightly thicker sandstone beds, soft sediment deformation from 94-115 in., fractures generally planar and horizontal spaced 1-18 in. Approximate top of Whetstone Gulf Formation - Unit B at depth 139.0 ft (El. 83.0 ft).
80	140									
			C18	117/120	93	2.5 3 4 4 3 2.5 2 2.5 3 2.5	Shaly partings. 8-foot-thick sandstone bed.			C18: SANDSTONE AND SILTSTONE, thickly bedded, gray, hard sandstone, dark gray, soft siltstone, fine grained, well sorted, unweathered, soft sediment deformation from 33-40 in., fractures generally planar and horizontal spaced 1-54 in.
70	150									
			C19	122/120	80	2.5 4 4 4 4				C19: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray, hard sandstone, dark gray, soft siltstone and shale, shale weathered to soft, gray clay at 65-69 in., 78-82 in., and 114-115 in., fossil fragments in sandstone at 54-56 in. and 73-76 in., fine grained, well sorted, unweathered, fractures generally planar and horizontal spaced 1-25 in.

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 222
Vertical Datum : NGVD 29
Date Start / End: 4/19/2008 - 4/22/2008
Total Depth (ft) : 178.7

Boring No.
B412

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						5 4 4.5 4 3.5	4-inch-thick clay seam in shale layers. 4-inch-thick clay seam.			
60	160									
			C20	61/60	88	5.5 4.5 4.5 6.5 7.5	1-inch-thick clay seam in highly fractured silty shale. Shaly partings.			C20: Similar to C19, weathered shale to soft clay at 15-18 in., 45-48 in., and 59-60 in., fossil fragments from 9-15 in., and 42-45 in., fractures generally planar and horizontal and abundant around clay seams, fractures spaced 1-22 in.
			C21	56/60	69	5.5 4.5 7 5.5 4.5	2-inch-thick clay seam. 2-inch-thick clay seam.			C21: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, thin interbeds of gray, hard sandstone, dark gray, soft siltstone and shale, weathered shale to soft clay at 2-4 in. and 20-22 in., fractures generally planar and horizontal spaced 1-9 in, unweathered.
50	170									
			C22	58/60	68	5 6 6 3.5 2				C22: Similar to C21, fractures generally planar and horizontal spaced 1-13 in.
40	180						General Comments about Core Samples: Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone. Vertical fractures occasionally present in sandstone beds.			Bottom of boring at depth 178.7 ft (El. 43.3 ft). Borehole grouted to top of lake bed upon completion.
30	190						Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport. Fracture surfaces are generally unweathered unless otherwise noted.			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log Signature Page	Boring No. B412

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B413**

Boring Information

Northing : 1283462.7 **Easting :** 542911.4
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 217.3
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 5/3/2008 - 5/5/2008
Driller Name: N. Short
Logged By : T. Daigle
Drilling Company : Nothnagle
Total Depth (ft) : 160.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 3 inch NW

Core Barrel Type: NQ2
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13 ft

Drilling Method: Casing set 1.5 ft below mudline, rollerbit to clean out casing, wireline coring 1.5 ft to 160 ft.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
		X	S1	14/15	75-45-100/3 in.	NA				S1: (0-5 in.): NARROWLY GRADED GRAVEL (GP); ~95% gravel to 0.5 in, ~5% medium to coarse sand, few zebra mussels.
			C1	10/14	29	NM	3-inch-long vertical fracture.			(5-14 in.): NARROWLY GRADED GRAVEL WITH SILT (GP-GM); ~80% gravel to 0.5 in, ~10% sand fine - coarse, ~10% fines. LAKE SEDIMENT
			C2	60/64	38	NM	Highly fractured siltstone (some oxidation on fractures).			Approximate top of Oswego Transition Zone at depth 1.3 ft (El. 216.0 ft).
						NM	Highly fractured sandstone and siltstone.			C1: SANDSTONE, gray, hard, fine grained, well sorted, unweathered, fractures generally non-planar and spaced 1-4 in., 3 in. vertical fracture at 0 in., highly fractured zone at 7-10 in., some oxidation in highly fractured zone.
						2.5				
						2	45° fracture.			
210						NM	6-inch-long vertical fracture.			
			C3	112/114	72	NM				
						NM				Approximate top of Pulaski Formation - Unit A at depth 10.7 ft (El. 206.6 ft).
	10					NM	1-inch-long vertical fracture.			
						NM	4-inch-long siltstone layer.			
						NM	80° fracture.			
						2.5	Shaly partings.			C2: SANDSTONE AND ARGILLACEOUS SANDSTONE, gray, hard sandstone, dark gray, hard argillaceous sandstone, fine grained, well sorted, unweathered, fractures generally planar and horizontal spaced 1-8 in., 1 in. vertical fracture at 29 in., 6 in. vertical fracture at 36 in., highly fractured zone at 0-14 in. and 23-30 in., some oxidation in highly fractured zones.
						2.5				
						2.5				
						2.5				
200										C3: SANDSTONE AND ARGILLACEOUS SANDSTONE WITH INTERBEDDED SILTSTONE, few shale layers, gray to dark gray, hard sandstone and argillaceous sandstone, dark gray siltstone and shale, soft, fine grained, well sorted, unweathered, fossil fragments at 80-82 in and 88-89 in., fractures generally horizontal, planar and smooth, spaced 1-23 in., 3 in. vertical fracture at 100 in., shaley partings at 45-49 in.
			C4	109/122	82	2.5	Shaly partings.			
						2.5				
						2.5				
	20					2.5				
						2.5	Fossils.			C4: Similar to C3, soft sediment deformation at 16-21 in, fossil fragments at 77-78 in and 84-87 in., fractures generally planar and horizontal spaced 1-27 in., 9 in. incipient vertical fracture at 22 in.
						2.5	Shaly partings.			
						2.5				
						2.5				
						2.5				
						2.5	Shaly partings.			
							Fossils.			
190										
			C5	120/109	100	2				C5: SANDSTONE AND ARGILLACEOUS SANDSTONE, few siltstone layers, gray to dark gray sandstone and argillaceous sandstone, hard, unweathered, fractures generally planar and horizontal, spaced 1-25 in., high angle fracture likely from drilling at 0-2 in.
						2				
	30					1.5				
						2				
						2				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 217
Vertical Datum : NGVD 29
Date Start / End: 5/3/2008 - 5/5/2008
Total Depth (ft) : 160.0

Boring No.
B413

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Soil-Sample Description Rock-Lithological Description
						2 2 2.5 3		C6: Similar to C5, fractures generally planar and horizontal, spaced 6-8 in., 2 in. incipient vertical fracture at 6 in.
180			C6	13/14	93	NM	Thin green veins. 2-inch-long incipient fracture with calcite infill.	
			C7	118/120	90	2.5 2.5 2.5 2.5 2.5 2.5 2.5 2 2.5 2.5	20° fracture.	Approximate top of Pulaski Formation - Unit B at depth 40.3 ft (El. 177 ft). C7: Similar to C3, soft sediment deformation at 25-27 in., 35-37 in., 43-45 in., and 73-76 in., fractures generally planar and horizontal, spaced 1-17 in.
170	40							
			C8	122/119	95	2 2 2 2 2 2 2.5 2.5 2.5 3	Fossils.	C8: Similar to C3, increasing sandstone toward bottom of core, fractures generally planar and horizontal, spaced 1-18 in. Approximate top of Pulaski Formation - Unit C at depth 56 ft (El. 161.3 ft).
160	50						Shaly partings.	
			C9	118/121	79	2.5 2.5 2.5 2.5 2.5 1.5 1.5 3.5 2 4	15-inch-long incipient fracture with calcite infill. 20° fracture. Wavy bedding, soft sediment deformation. Shaly partings. 40° fracture.	C9: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray, hard sandstone with frequent crossbedding, dark gray, soft siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar and horizontal, spaced 1-21 in, 15 in. incipient vertical fracture at 45 in., 2 in. incipient vertical fracture at 101 in., soft sediment deformation at 62-68 in.
150	60							
			C10	119/120	50	NM NM NM 4 NM 4.5 3	Encountered natural gas at 68 ft. (9% LEL). 3-inch-long 75° fracture 2-inch-long 75° fracture Shaly partings. Shaly partings.	C10: SILTSTONE AND SHALE WITH INTERBEDDED SANDSTONE, dark gray, soft siltstone and very soft shale, gray, hard sandstone, fine grained, well sorted, unweathered, soft sediment deformation at 97-98 in. and 105-107 in., core is mostly siltstone and shale, thickest sandstone bed is 8 in., fractures generally planar and horizontal, spaced 1-8 in., highly fractured zone at 0-2 in., 33-42 in., and 55-65 in., shaley partings in highly fractured zones.
	70							

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 217
Vertical Datum : NGVD 29
Date Start / End: 5/3/2008 - 5/5/2008
Total Depth (ft) : 160.0

Boring No. **B413**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
						3.5			
						3.5			
						2.5			
140									
			C11	121/120	86	NM			C11: Similar to C10, sandstone beds increasing and thicker towards bottom of core run, fossil fragments 45-46 in, fractures generally planar and horizontal, spaced 1 - 33 in., shaley partings 118-119 in.
	80					NM			
						NM			
						NM			
						2			
						2			
						2			
						2			
						2			
						2.5			
130									
			C12	120/120	69	2.5	Shaly partings.		C12: Similar to C10, sandstone is light gray, siltstone and shale are dark gray, soft sediment deformation at 40-43 in. and 101-102 in., fractures generally planar and horizontal spaced 1-12 in., highly fractured zone at 66-72 in.
						2.5	20° fracture.		
	90					2.5			
						2.5			
						2.5	Shaly partings.		
						NM			
						2	Shaly partings.		
						1.5			
						2.5			
						2.5			Approximate top of Whetstone Gulf Formation - Unit A at depth 96.5 ft (El. 120.8 ft).
120									
							Shaly partings.		
			C13	112/120	81	2.5			C13: Similar to C10, thicker sandstone beds near bottom of core run, fossil fragments at 1-3 in., 46-48 in. and 51-52 in., fractures generally planar and horizontal, spaced 1-20 in., highly fractured zone at 72-78 in.
						2.5			
	100					2.5			
						2.5			
						2.5			
						2			
						4			
						1.5	Fossils.		
						1.5			
						2			
							Shaly partings. Fossils.		
110									
			C14	122/114	100	1.5			C14: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, predominantly light gray to gray, massive, hard sandstone, interbeds of dark gray, soft siltstone and shale, thickest sandstone bed is 59 in., fine-grained, well-sorted, unweathered, fractures generally planar and horizontal, spaced 5 - 46 in.
						1.5			
	110					1.5	Fossils.		
						1.5			
						1.5			
						2			
						2			
						2			
						2			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 217
Vertical Datum : NGVD 29
Date Start / End: 5/3/2008 - 5/5/2008
Total Depth (ft) : 160.0

Boring No.
B413

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
100										
			C15	117/122	93	NM	Shaly partings. 20° fracture.			C15: SILTSTONE WITH INTERBEDDED SHALE AND SANDSTONE, predominantly dark gray, soft siltstone and shale, with interbeds of gray, hard sandstone, fine-grained, well-sorted, unweathered, soft sediment deformation at 107-111 in., fractures generally planar and horizontal, spaced 1-21 in., highly fractured zone at 49-57 in. and 85-90 in.
	120						Shaly partings 20° fracture.			
							40° fractures.			C16: Similar to C15, thick, fossiliferous sandstone bed from 31-57 in., soft sediment deformation at 47-52 in. and 105-115 in., fractures generally planar and horizontal, spaced 1-28 in., 2 in. vertical fracture at 117 in.
90										
			C16	119/118	87	NM	Shaly partings.			Approximate top of Whetstone Gulf Formation - Unit B at depth 130 ft (El. 87.3 ft).
						NM				
	130					NM				
						NM				
						NM				
						3				
						3	Fossils, dolomite vugs, siltstone clasts.			
						3.5	Shaly partings.			
						3	Shaly partings.			
80										
			C17	101/120	78	2.5	Shaly partings.			C17: Similar to C15, soft sediment deformation 45-57 in., fractures generally planar and horizontal, spaced 1-17 in., 2 in. vertical fracture at 0 in., 3 in. vertical fracture at 40 in., 2 in. vertical fracture at 70 in., 4 in. incipient vertical fracture at 84 in.
						2.5				
						3				
	140					3				
						4	Shaly partings.			
						2	15° fracture.			
						2				
						3.5				
						1.5	Shaly partings.			
						NM				
							4-inch-long incipient fracture with calcite infill.			
70										
			C18	80/66	100	2				C18: SANDSTONE WITH INTERBEDDED SILTSTONE AND SHALE, gray, hard sandstone, dark gray, soft siltstone and shale, predominantly sandstone with few interbeds of siltstone and shale, unweathered, soft sediment deformation and clasts of siltstone in sandstone at 43-47 in., fractures generally planar and horizontal, spaced 3-41 in.
						1.5				
						2				
	150					3				
						3	Fossils.			
			C19	86/84	83	4				C19: Similar to C18, greater portion of siltstone and shale, soft sediment deformation at 60-64 in., fossil fragments at 5-7 in. and 56-57 in., fractures generally planar and horizontal, spaced 1-48 in.
						2	Fossils.			
						2				
						2				
						4.5	Shaly partings.			
60										

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 217
Vertical Datum : NGVD 29
Date Start / End: 5/3/2008 - 5/5/2008
Total Depth (ft) : 160.0

Boring No.
B413

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						3 2	20° fractures.			
	160									Bottom of boring at depth 160 ft (El. 57.3 ft). Borehole grouted to top of lake bed upon completion.
							General Comments about Core Samples:			
							Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone.			
50							Vertical fractures occasionally present in sandstone beds.			
	170									
							Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport.			
							Fracture surfaces are generally unweathered unless otherwise noted.			
40										
	180									
30										
	190									
20										

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Form 150.2 rev. 1

NINE MILE POINT SITE CHARACTERIZATION 1 NMP OFFSHORE LOGS.GPJ GEI DATA TEMPLATE.GDT 9/11/08

Final Boring Log Signature Page	Boring No. B413

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B414**

Boring Information

Northing : 1283574.6 **Easting :** 542924.3
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 214.1
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 5/25/2008 - 5/30/2008
Driller Name: J. Stockholm
Logged By : J. Scully
Drilling Company : Nothnagle
Total Depth (ft) : 162.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 2 5/8 inch NW

Core Barrel Type: NQ2
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13 ft

Drilling Method: Casing set 2 ft below mudline, rollerbit to clean out casing, wireline coring 2 ft to 162 ft.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
			S1	17/21	NM	NA	Top of rock at 1.8 ft.			S1 (0-4 in.): NARROWLY GRADED GRAVEL WITH SAND (GP): ~80% gravel up to 1/2 in., ~20% coarse sand, gray, some shells.
			C1	44/48	44	1.5 2 2 2	11-inch-long vertical fracture.			(4-17 in.): SANDY SILT (ML): ~70% non-plastic fines, ~30% fine to coarse sand, gray. LAKE SEDIMENT Approximate top of Oswego Transition Zone at depth 1.5 ft (El. 212.6 ft).
210										C1: SANDSTONE WITH INTERBEDDED SILTSTONE, gray sandstone, dark gray siltstone, medium sandstone hardness, soft siltstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth spaced <0.5 in. to 10 in., 11 in. vertical fracture at 2 in.
			C2	55/60	65	1.5 1.5 3 2.5 2.5	Shaly partings.			C2: Similar to C1, unweathered, fractures spaced <0.5 in. to 17 in., trace fossils at 54-55 in. Approximate top of Pulaski Formation - Unit A at depth 8.0 ft (El. 206.1 ft).
	10									
			C3	119/120	70	2 2 2.5 2.5 2 1.5 1.5 1.5 1.5 2	Fossils. Highly fractured. Highly fractured. 6-inch-long vertical fracture.			C3: ARGILLACEOUS SANDSTONE WITH INTERBEDDED SILTSTONE, gray sandstone, dark gray siltstone, medium hardness sandstone, soft siltstone, fine grained, well sorted, unweathered, fossils at 0-13 in. and 107-109 in., fractures generally planar, horizontal, and smooth spaced <0.5 in. to 14 in., 6 in. vertical fracture at 38 in., highly fractured zone 18-23 in., 25-27 in., and 89-90 in.
200										
	20						Highly fractured. Fossils.			
			C4	122/120	97	2 1.5 1.5 1.5 1.5 2 2 1.5 1.5 2				C4: Similar to C3, unweathered, fractures spaced 0.5 in. to 37 in.
190										
	30									
			C5	120/120	88	2				C5: Similar to C3, unweathered, trace green minerals at 30-34 in.,

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
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GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 214
Vertical Datum : NGVD 29
Date Start / End: 5/25/2008 - 5/30/2008
Total Depth (ft) : 162.0

Boring No. **B414**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						2				fractures spaced 0.5 in. to 23 in., 3 in. vertical fracture at 47 in.
						1.5	Trace green mineral.			
180						2	3-inch-long vertical fracture.			
						1.5				
						1.5				
						2				
						1.5				
						2				
						1.5				
	40						Fossils.			
			C6	122/120	91	2				C6: ARGILLACEOUS SANDSTONE WITH INTERBEDDED SILTSTONE, gray, medium hardness sandstone, soft siltstone, fine grained, well sorted, unweathered, soft sediment deformation 25-28 in., fractures generally planar, horizontal, and smooth spaced <0.5 in. to 15 in.
						1.5				
						1.5				
170						1.5				
						2				Approximate top of Pulaski Formation - Unit B at depth 45.5 ft (El. 168.6 ft).
						1.5				
						1.5				
						2				
						1.5				
						2				
	50						Fossils.			
			C7	121/120	83	1.5	Natural gas encountered.			C7: Similar to C6, includes some interbedded shale, soft, dark gray shale, unweathered, fractures spaced 1 in. to 27 in., 70° fracture at 69-73 in.
						2				
						1.5				
160						1.5				
						2				
						2				
						1.5				Approximate top of Pulaski Formation - Unit C at depth 57.1 ft (El. 157.0 ft).
						1.5	70° fracture.			
						2.5	Irregular fracture in siltstone.			
						2				
	60									
			C8	117/120	72	1.5	4-inch-long incipient fracture with calcite infill.			C8: SILTSTONE AND ARGILLACEOUS SANDSTONE WITH INTERBEDDED SHALE, gray, medium hardness sandstone, dark gray to black, soft siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced <0.5 in. to 20 in., highly fractured zone 25-27 in., 30-31 in., and 49-52 in., 2 in. vertical fracture at 92 in.
						1.5				
						2.5				
150						2.5	Highly fractured silty shale.			
						3.5				
						3				
						2.5				
						3.5				
						3				
						2.5	2-inch-long vertical fracture.			
	70						Shaly partings.			
			C9	115/120	65	3.5	Highly fractured silty shale. 45° fracture.			C9: Similar to C8, unweathered, fractures spaced <0.5 in. to 22 in., highly fractured zone 2-10 in., 45° fracture at 5 in., incipient vertical fracture 61-76 in.
						3				
						3.5				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 214
Vertical Datum : NGVD 29
Date Start / End: 5/25/2008 - 5/30/2008
Total Depth (ft) : 162.0

Boring No. **B414**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
140						3.5			
						3.5			
						2.5			
						2	15-inch-long incipient fracture with calcite infill.		
						2			
						2	Fossils.		
						2			
	80								
			C10	116/120	90	1.5			C10: Similar to C8, unweathered, trace fossils at 60 in., soft sediment deformation 60-63 in., fractures spaced 0.5 in. to 23 in.
						1.5			
						2			
130						2.5			
						1.5			
						2			
						2	Trace fossils.		
						2	Soft sediment deformation.		
						1.5			
						2			
	90								
			C11	121/120	67	2			C11: Similar to C8, unweathered, fossils at 111-112 in., fractures spaced <0.5 in. to 15 in., 30° Inclined fracture at 23 in. and 26 in., 45° fracture at 70 in.
						2.5			Approximate top of Whetstone Gulf Formation - Unit A at depth 92.8 ft (El. 121.3 ft).
						2.5	Highly fractured siltstone.		
120						2	30° fracture.		
						2	30° fracture.		
						2.5			
						3			
						2.5	45° fracture.		
						2.5			
						3			
	100								
			C12	123/120	98	2	Fossils.		C12: SANDSTONE WITH INTERBEDDED SILTSTONE, few siltstone layers, gray, hard sandstone, dark gray, soft siltstone, fine grained, well sorted, unweathered, fossils at 31-33 in., massive sandstone bed, fractures generally planar, horizontal, and smooth spaced 0.5 in. to 82.5 in., 1 in. vertical fracture at 0 in.
						2	Vertical fracture.		
						2			
110						2			
						2			
						2	Fossils.		
						2			
						2			
						2			
	110								
			C13	116/120	70	1.5			C13: SILTSTONE AND SANDSTONE WITH INTERBEDDED SHALE, gray, hard sandstone, dark gray to black, soft siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth spaced 0.5 in. to 17 in., 45° fracture at 110 in. and 116 in., highly fractured zone at 27-35 in.
						2.5			
						2			
100						2.5			
						2.5	Highly fractured with shaly partings.		
						3			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 214
Vertical Datum : NGVD 29
Date Start / End: 5/25/2008 - 5/30/2008
Total Depth (ft) : 162.0

Boring No.
B414

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Soil-Sample Description Rock-Lithological Description
						3		
						3.5		
						3		
						2.5		
	120							
			C14	116/120	90	2	45° fracture.	C14: Similar to C13, unweathered, fossils at 81-82 in. and 88-90 in., fractures spaced 0.5 in. to 18 in., highly fractured zone 0-2 in., and 13-14 in., 2 in. vertical fracture at 2 in.
						2	45° fracture.	
						3	Vertical fracture.	
						2.5	Highly fractured.	
	90					2.5		
						2.5		
						2		
						2.5		Approximate top of Whetstone Gulf Formation - Unit B at depth 128.2 ft (El. 85.9 ft).
						3		
						2		
	130							
			C15	133/120	98	2		C15: SILTSTONE WITH INTERBEDDED SANDSTONE AND SHALE, gray sandstone, dark gray to black siltstone and shale, hard sandstone, soft siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth spaced 1 in. to 26 in., 3 in. vertical fracture at 32 in., 70° fracture at 40 in. and 130 in., 45° fracture at 126 in., some vertical fractures and a 70° fracture may have been caused by drilling when the sample barrel was full.
						2.5		
						2		
	80					3		
						2.5		
						2.5	70° fracture.	
						2		
						2		
						1.5		
						1.5	Fracture in siltstone with minor polishing.	
	140							
			C16	119/120	83	NM	Slickensides on moderately dipping fracture in siltstone, some polishing, dip-slip motion, no visible offset of bedding.	C16: Similar to C15, unweathered, fossils and soft sediment deformation at 14-18 in., 32-34 in., and 91-92 in., fractures spaced 1 in. to 27 in.
						NM		
						NM		
	70					NM	45° fracture.	
						NM	70° fracture.	
						NM	Fossils.	
						NM	Soft sediment deformation.	
						NM	Fossils.	
						NM	Soft sediment deformation.	
						NM		
	150						Fossils.	
			C17	60/60	86	NM	Fossils.	C17: Similar to C15, unweathered, soft sediment deformation 30-31 in., fossils at 4-5 in., and 27-28 in., fractures spaced 0.5 in. to 21 in.
						2.5		
						2.5	Fossils.	
	60					1.5	Soft sediment deformation.	
						1.5		
			C18	70/72	94	NM		C18: SILTSTONE AND SANDSTONE WITH INTERBEDDED SHALE, gray sandstone, dark gray to black siltstone and shale,
						2		

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 214
Vertical Datum : NGVD 29
Date Start / End: 5/25/2008 - 5/30/2008
Total Depth (ft) : 162.0

Boring No.
B414

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						2.5 2.5 4 3	Soft sediment deformation. Highly fractured with shaly partings.			hard sandstone, soft siltstone and shale, fine grained, well sorted, unweathered, soft sediment deformation at 16-21 in., fractures generally planar, horizontal, and smooth spaced 1 in. to 18 in.
	160									Bottom of boring at depth 162 ft (El. 52.1 ft). Borehole grouted to top of lake bed upon completion.
50							General Comments about Core Samples: Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone. Vertical fractures occasionally present in sandstone beds. Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport. Fracture surfaces are generally unweathered unless otherwise noted.			
	170									
40										
	180									
30										
	190									
20										

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Form 150.2 rev. 1

NINE MILE POINT SITE CHARACTERIZATION 1 NMP OFFSHORE LOGS.GPJ GEI DATA TEMPLATE.GDT 9/11/08

Final Boring Log Signature Page	Boring No. B414

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B415**

Boring Information

Northing : 1283648.5 **Easting :** 542844.7
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 210.7
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 5/16/2008 - 5/24/2008
Driller Name: J. Stockholm
Logged By : M. MacLeod
Drilling Company : Nothnagle
Total Depth (ft) : 159.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 3 inch NW

Core Barrel Type: NQ2
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13.1 ft

Drilling Method: Sediment 0 to 1.2 ft, top of rock at 1.2 ft. Set casing 2 ft below mudline, wireline coring 2 ft to 159 ft.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
210			S1	9/14	24-80-100/2 in.	NA				S1: SILTY SAND WITH GRAVEL (SM), ~55% widely graded sand, ~25% widely graded gravel up to 1 in., ~20% slightly plastic fines, gray-brown, zebra mussels at top of sample. LAKE SEDIMENT. Approximate top of Oswego Transition Zone at depth 2.0 ft (El. 208.7 ft).
			C1	11/12	0	3.5	3-inch-long vertical fracture.			C1: SANDSTONE, greenish gray, hard, massive, fine grained, well sorted, fractures generally horizontal and smooth, spaced 0.5 to 2 in., unweathered.
			C2	47/60	40	3.5 3 3.5 4 3.5	5-inch-long vertical fracture. Highly fractured zone. Highly fractured siltstone.			C2: SANDSTONE AND ARGILLACEOUS SANDSTONE, gray, hard, massive, fine grained, well sorted, fractures generally planar, horizontal and smooth, spaced <0.25-9 in., unweathered, chipping at 22.5-23.5 in., trace fossils at 45-47 in. Approximate top of Pulaski Formation - Unit A at depth 4.1 ft (El. 206.6 ft).
			C3	120/120	67	2 3.5 2.5 2 2.5 2 1.5 2 2 2.5	Highly fratured zone. 1.5-inch-long vertical fracture. Highly fractured zone. Highly fractured zone. Fossils. 4-inch-long vertical fracture with calcite infill.			C3: SANDSTONE AND ARGILLACEOUS SANDSTONE WITH SILTSTONE AND SHALE, gray, hard, bedded sandstone and argillaceous sandstone, dark gray, medium hard, laminated siltstone and shale, fine grained, well sorted, fractures generally planar, horizontal and smooth, spaced <0.25 - 17 in., unweathered, chipping at 3-6 in. and 82-86 in., fossils at 88.5-91 in. and 107-112.5 in., calcite clasts at 59 in. and 99 in., mottling throughout.
200	10									
			C4	119/120	86	2.5 2.5 2 2 2.5 2.5 2.5 2 1.5 2	Shaly partings.			C4: Similar to C3, fractures generally planar, horizontal and smooth, spaced 0.5-24 in., unweathered, mottling throughout.
190	20									
			C5	123/120	82	2.5 2.5 3.5 3.5 3	Thin green veins. 2-inch-long incipient fracture			C5: Similar to C3, except with more shale, fractures generally planar, horizontal, and smooth, spaced <0.25-14.5 in., unweathered, highly fractured shale zones at 41 in. and 75.5 in., green mineral layer at 17.5 in., mottling throughout. Approximate top of Pulaski Formation - Unit B at depth 31.7 ft (El. 179.0 ft).
180	30									

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 211
Vertical Datum : NGVD 29
Date Start / End: 5/16/2008 - 5/24/2008
Total Depth (ft) : 159.0

Boring No. **B415**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						2.5	with calcite infill.			
						2	Highly fractured zone.			
						2	4-inch-long vertical fracture with calcite infill.			
						2	Highly fractured zone.			
						2	17-inch-long incipient fracture with calcite infill.			
			C6	122/120	96	3.5				C6: SANDSTONE TO GRAYWACKE WITH SILTSTONE AND SHALE, gray, hard, bedded sandstone and graywacke, dark gray, medium hard, laminated siltstone and shale, fine grained, well sorted, fractures generally horizontal, planar, and smooth, spaced 1.5-25 in., unweathered, fossils at 19.5-20 in. and 20.5-23 in., mottling and irregular bedding throughout.
						3.5				
	40					3.5				
170						0.5				
						3				
						3.5				
						3.5				
						3.5				
						3				
						3.5				
			C7	117/120	65	2	Shaly partings.			C7: Similar to C6, except less graywacke, fractures generally horizontal, planar and smooth, spaced <0.5-17.5 in., unweathered, fossiliferous layer at 32-49 in., mottling and irregular bedding throughout.
						2				
	50					2				
160						1.5	Fossils.			Approximate top of Pulaski Formation - Unit C at depth 52.1 ft (El. 158.6 ft).
						2				
						2.5				
						2				
						2				
						2				
						2				
							Moderately dipping fractures with slickensides in siltstone, polished, dip-slip motion.			
			C8	117/120	62	3	Highly fractured zone.			C8: Similar to C6, fractures generally generally horizontal, planar and smooth, spaced <0.25-19 in., unweathered, shaley partings throughout.
						4.5				
	60					3.5	Highly fractured zone.			
150						3	30° fracture.			
						3	1.5-inch-long vertical fracture.			
						3.5				
						3.5				
						2.5	Highly fractured zone.			
						3.5	30° fracture.			
						4.5				
							2-inch-long vertical fracture.			
			C9	124/120	74	5	7-inch-long incipient fracture with calcite infill.			C9: Similar to C8, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 18.5 in., 2 in. vertical fracture from 0-2 in., , 45° fracture from 36-38 in., 7 in. incipient fracture from 10-17 in, shaley partings throughout, 5 in. fossil layer from 88-93 in., cross bedding from 14.5-16.5 in., 47.5-50 in., and 52-56 in., mottling from 6-8.5 in., 2.5-31.5 in., 37-40.5 in., and 79-81 in.
						2.5				
	70					3				
140						2	Irregular fracture around siltstone clasts.			
						1.5	45° fracture.			
						2				
						2.5				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 211
Vertical Datum : NGVD 29
Date Start / End: 5/16/2008 - 5/24/2008
Total Depth (ft) : 159.0

Boring No.
B415

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
						2			
						1.5	Shaly partings.		
						2.5	Fossils.		
			C10	124/120	74	2			C10: Similar to C8, fractures generally planar, horizontal, and smooth, spaced 0.5-16.5 in., 45° fracture at 74 in., 6 in. incipient fracture at 42 in., cross bedding from 7-10.5 in., mottling from 28.5-30.5 in., 47-48 in., 75-79.5 in., 104.5-105 in., and 107-108 in.
						1.5			
	80					1.5			
130						1.5			
						2	6-inch-long incipient fracture with calcite infill.		
						2.5			
						2			
						1.5	45° fracture.		
						2	Fracture in siltstone with slickensides, polished, dip-slip motion, no visible offset of bedding.		
						2			
			C11	116/120	69	2			C11: SILTSTONE WITH SOME SHALE AND INTERBEDDED SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5-16 in., 30° fracture at 19.5 in., 1.5 in. vertical fracture from 94-95.5 in., 4 in. trace fossil layer from 100.5-104.5 in., siltstone clasts from 9-15 in., mottling from 31-32 in., 45.5-47.5 in., and 77-78.5 in., irregular bedding from 15-17.5 in. Approximate top of Whetstone Gulf Formation - Unit A at depth 89.3 ft (El. 121.4 ft).
						1.5	30° fracture.		
	90					2.5			
120						3.5			
						3			
						2.5			
						2.5			
						3			
						2.5			
						3			
							1.5-inch-long vertical fracture.		
							Fossils.		
			C12	117/120	79	3			C12: SANDSTONE TO GRAYWACKE WITH SOME INTERBEDDED SILTSTONE AND SHALE, gray sandstone and graywacke, dark gray siltstone and shale, hard sandstone and graywacke, medium hard siltstone and shale, bedded sandstone and graywacke, laminated siltstone and shale, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 21 in., 1.5 in. vertical fracture from 11-12.5 in., 0.5 in. vertical fracture from 76.5-77 in., 30° fracture at 77 in., mottling from 41-43 in. and 114.5-116.5 in., cross bedding from 20-22 in. and 99-100 in. (irregular), longer sandstone interbeds.
						2	Highly fractured silty shale.		
	100					1.5			
110						1.5			
						1.5			
						1.5			
						2			
						1.5	30° fracture.		
						1.5			
						1.5			
			C13	118/120	64	1.5			C13: SILTSTONE AND SILTY SHALE WITH SANDSTONE, dark gray siltstone and silty shale, gray sandstone, medium hard siltstone and silty shale, hard sandstone, laminated siltstone and silty shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 24.5 in., 5 in. vertical fracture from 53-58 in., 3.5 in. vertical fracture from 81.5-85 in., shaley partings throughout, trace fossil layer from 110-115.5 in., cross bedding from 98-104 in., mottling from 11.5-12.5 in., siltstone clasts at 109 in., 110 in., and 115 in., long, well bedded siltstone and silty shale interbed.
						2			
	110					3			
100						2.5			
						2.5			
						2	Highly fractured zone.		
						2.5	5-inch-long vertical fracture.		
						2.5			
						1.5	Highly fractured zone.		

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 211
Vertical Datum : NGVD 29
Date Start / End: 5/16/2008 - 5/24/2008
Total Depth (ft) : 159.0

Boring No.
B415

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
						2.5	3.5-inch-long vertical fracture. Fossils. Highly fractured zone.		Approximate top of Whetstone Gulf Formation - Unit B at depth 117.8 ft (El. 92.9 ft).
			C14	121/120	88	2.5	Shaly partings.		C14: Similar to C13, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 37.5 in., 1.5 in. vertical fracture from 42.5-44 in., 30° fracture at 50 in., 1.5 in. incipient vertical fracture from 44-45.5 in., 3 in. incipient vertical fractures from 0-3 in. and 46.5-49.5 in., 2 in. vertical fracture from 113-115 in., silty shale highly fractured zone from 95.5-96.5 in.
						2.5			
	120					2			
90						2.5			
						2.5	3-inch-long incipient fracture in siltstone.		
						2.5	30° fracture.		
						2	Vertical fracture.		
						2	Shaly partings.		
						2.5			
						3			
							Highly fractured zone.		
							Fossils.		
			C15	120/120	83	2	Vertical fracture.		C15: SILTSTONE AND SHALE WITH INTERBEDDED SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced from highly fractured to 19 in., 60° fracture at 79 in., 75° fracture at 82.5 in., 75° fracture at 85 in., 3 in. vertical fracture from 117-120 in., highly fractured from 79.5-85.5 in. and 88.5-92.5 in., mottling from 4.5-10 in., 13.5-16.5 in., 20-23 in., 28.5-29.5 in., and 70.5-80 in.
						2			
	130					2.5			
80						2.5			
						2.5			
						2.5			
						3			
						2	60° fracture.		
						2.5	75° fracture in siltstone with slickensides, some polishing, dip-slip motion.		
						2.5	75° fracture.		
							Highly fractured siltstone.		
							Shaly partings.		
			C16	120/120	91	2.5	45° fracture.		C16: SILTSTONE AND SILTY SHALE WITH INTERBEDDED SANDSTONE, dark gray siltstone and silty shale, gray sandstone, medium hard siltstone and silty shale, hard sandstone, laminated siltstone and silty shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 0.5-22.5 in., 45° fracture at 0.5 in., 4 in. incipient vertical fracture from 1-5 in., fossil layer from 96-71.5 in. and 75.5-85.5 in., mottling from 42-42.5 in., 49-49.5 in., 89.5-91 in., and 92-92.5 in., some irregular bedding, siltstone and sandstone lenses throughout.
						2.5	3-inch-long vertical fracture.		
	140					2.5			
70						2.5			
						2.5			
						2.5			
						2.5			
						2.5	Fossils.		
						2.5			
						3			
			C17	61/60	83	2	30° fracture.		C17: SANDSTONE WITH INTERBEDDED SILTSTONE AND SILTY SHALE, gray sandstone, dark gray siltstone and silty shale, hard sandstone, medium hard siltstone and silty shale, bedded sandstone, laminated siltstone and silty shale, fine grained, well sorted, fractures generally horizontal, planar and smooth, spaced from1 in. to 21 in., unweathered, fossil layers from 13.5-16 in. and 26.5-29 in., siltstone clasts at 27 in., mottling at 29-30 in. and 39-41 in., thicker sandstone interbeds.
						1.5	Fracture in siltstone with slickensides, polished, dip-slip motion.		
	150					1.5			
60						1.5	Fossils.		
						2	30° fracture.		
			C18	77/72	92	2	Vertical fracture.		C18: SILTSTONE AND SILTY SHALE WITH INTERBEDDED SANDSTONE, dark gray siltstone and silty shale, gray sandstone, medium hard siltstone, laminated siltstone and silty shale, bedded sandstone, fine grained, well sorted, fractures generally planar, horizontal and smoother, spaced from highly fractured to 24 in., unweathered, vertical chipping at 38 in. and 40 in., highly fractured zone at 24 in., longer siltstone interbeds.
						2.5			
						3			
						3			
						3	Highly fractured zone.		

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 211
Vertical Datum : NGVD 29
Date Start / End: 5/16/2008 - 5/24/2008
Total Depth (ft) : 159.0

Boring No.
B415

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						3.5				
	160									Bottom of boring at depth 159 ft (El. 51.7 ft). Borehole grouted to top of lake bed upon completion.
50							General Comments about Core Samples:			
							Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone.			
							Vertical fractures occasionally present in sandstone beds.			
	170									
40							Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport.			
							Fracture surfaces are generally unweathered unless otherwise noted.			
	180									
30										
	190									
20										

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log Signature Page	Boring No. B415

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1

Final Boring Log

Boring No. **B416**

Boring Information

Northing : 1283761.3 **Easting :** 542848.9
Horizontal Datum : NAD 27
Ground Surface Elev. (ft): 207.5
Vertical Datum : NGVD 29
Rig Type/I.D: CME 75 / Barge 1

Date Start - End: 5/13/2008 - 5/16/2008
Driller Name: N. Short
Logged By : H. Shields, M. MacLeod
Drilling Company : Nothnagle
Total Depth (ft) : 155.0

Drilling Information

Hammer Ident: NA
Auger I.D: NM
Auger Head Length: NM

Casing I.D: 4 inch
Drill Rod O.D: 3 inch NW

Core Barrel Type: NQ2
Core Barrel I.D/O.D: 2 inch / 3 inch
Core Barrel Length: 13.1 ft

Drilling Method: Casing set 1.0 ft below mudline, rollerbit to clean out casing, wireline coring 1.5 ft to 155 ft.

ABBREVIATIONS:

Blows per 6 in.: 140 lb hammer falling 30 inches to drive a 2 inch O.D. split spoon sampler.

Pen. = Penetration Length
Rec. = Recovery Length
RQD = Length of Sound Cores>4 in / Pen.,%
HSA = Hollow-Stem Auger

WOR = Weight of Rods
WOH = Weight of Hammer
S = Split Spoon Sample
C = Core Sample

NA, NM = Not Applicable, Not Measured
LL = Liquid Limit
PI = Plasticity Index
NV, NP = No value, Non-plastic

Elev. (ft)	Depth (ft)	Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
			S1	7/8	26-100/2 in.	NA				S1: SILTY SAND WITH GRAVEL (SM), ~60% widely graded sand, ~20% slightly plastic fines, ~20% widely graded gravel up to 0.5 in., gray-brown, zebra mussels at top of sample. LAKE SEDIMENT. Approximate top of Pulaski Formation - Unit A at depth 0.7 ft (El. 206.8 ft).
			C1	28/30	53	2 2	Rollerbit 1-1.5 ft. 1-inch-long incipient fractures (calcite infill).			C1: SILTSTONE AND SANDSTONE, dark gray, soft, laminated, fine grained, well sorted, siltstone with some thin interbeds of gray, medium hardness, medium grained, well sorted sandstone, slightly weathered throughout, some oxidation on fracture surfaces, fractures generally horizontal and planar, spaced 0.5 in. to 6.5 in., fossils at 10-13 in., incipient fracture at 0-1.5 in. and 17-18 in.
			C2	62/60	55	2 2 2 2 2	Highly fractured zone. Highly fractured zone.			C2: SANDSTONE WITH SILTSTONE, light gray, hard, medium grained, well sorted, bedded sandstone with interbedded dark gray, soft, laminated, fine grained, well sorted siltstone, unweathered, fractures generally horizontal and planar, spaced 0.25 in. to 9 in., siltstone lenses at 48 in. and 60 in., fossil fragments at 59 in.
200	10		C3	121/120	85	2 2 2 2 3 2 2 2 2 2	Highly fractured zone. Shaly partings. Shaly partings. Fossils. Fossils. Shaly partings.			C3: Similar to C2, mottling throughout, unweathered, fractures generally horizontal and planar, spaced 0.25 in. to 24 in.
190	20		C4	123/120	97	2 2 2 2 2 2 2 2 2 2	2-inch-long incipient fracture (calcite infill). 10° fracture.			C4: Similar to C2, mottling throughout, unweathered, fractures generally horizontal and planar, spaced 1 in. to 19 in., incipient vertical fracture at 52 in. to 54 in.
180	30		C5	120/120	88	2 2 2	Shaly partings. Thin clay coating in fracture. Shaly partings.			C5: Similar to C2, except C5 is mostly siltstone, mottling throughout, unweathered, fractures generally horizontal and planar, spaced 1 in. to 18 in., fossils at 73 in. to 75 in.

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 208
Vertical Datum : NGVD 29
Date Start / End: 5/13/2008 - 5/16/2008
Total Depth (ft) : 155.0

Boring No. **B416**

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
						2				
						2				
						2				
						2	Fossils.			
						2				
						2				
						2				
170										
	40		C6	120/120	97	2				C6: SILTSTONE WITH SANDSTONE, dark gray, soft, laminated, fine grained, well sorted siltstone with interbedded light gray, medium hardness, bedded, medium grained, well sorted sandstone, unweathered, fractures spaced 0.25 in. to 27 in., mottling throughout.
						3				Approximate top of Pulaski Formation - Unit B at depth 42.5 ft (El. 165.0 ft).
						2.5				
						3.5				
						3				
						3				
						3				
						3				
						2				
						4				
160										
	50		C7	119/120	54	4	Highly fractured zone.			C7: SILTSTONE WITH SANDSTONE, similar to C6, except less sandstone and less mottling, unweathered, fractures generally horizontal and smooth, spaced 0.25 in. to 10 in., 20° fractures at 40.5 in. and 41.5 in., irregular fractures at 44.5 in. to 46.5 in., 48 in., 49.5 in., and 51 in., 60° fracture at 75.5 to 78.5 in., incipient fracture at 96-97 in.
						4				
						5				
						2				
						3	20° fractures.			
						5				
						3.5	Irregular fractures.			
						5				
						4	60° fractures with slickensides.			
						5				Approximate top of Pulaski Formation - Unit C at depth 57.8 ft (El. 149.7 ft).
150										
							Highly fractured zone.			
	60		C8	118/120	76	3	Highly fractured zone.			C8: Similar to C6, except less sandstone and less mottling, unweathered, fractures generally horizontal and planar, spaced 0.5 in. to 22 in., vertical fractures at 95 in. to 98 in. and 103 in. to 106 in.
						2				
						2				
						4				
						6				
						3				
						3				
						3				
						3				
						3				
140							3-inch-long vertical fracture.			
							3-inch-long vertical fracture.			
	70		C9	122/114	100	2				C9: SILTSTONE WITH INTERBEDDED SANDSTONE, dark gray, siltstone, gray sandstone, medium hard siltstone, hard sandstone, laminated siltstone, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal, and smooth, spaced 1.5 in. to 26 in., 30° fracture at 19 in., 60° fracture at 64 in., 2 in. vertical fracture at 94 in., striations in 60° fracture at 64 in., chipping from 0 in. to 1.5 in. and 89 in. to 91.5 in., fossil layer from 19 in. to 24.5 in., dolomite clasts from 16.5 in.
						3				
						3	30° fracture.			
						3	Fossils			
						3				
						2				

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 208
Vertical Datum : NGVD 29
Date Start / End: 5/13/2008 - 5/16/2008
Total Depth (ft) : 155.0

Boring No.
B416

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures / Graphic Log	Soil-Sample Description Rock-Lithological Description
						3			to 18 in., mottling from 10.5 in. to 12 in. and 14 in. to 15 in.
						6	60° fracture.		
						3	25° fracture with slickensides.		
						4			
130									
		C10	117/120	74		3			C10: Similar to C9, except increased mottling and smaller fossil layers, unweathered, fractures generally planar, horizontal and smooth, spaced 0.5 in. to 23 in., 45° fracture at 8 in., fossil layers from 3.5 in. to 4.5 in., 81 in. to 83 in., and 86 in. to 90 in., irregular bedding from 4 in. to 13 in.
	80					2	45° fracture.		
						2			
						4			
						3			
						5			
						3			
						5			
						6			
						4			
120							Shaly partings.		
		C11	107/118	89		3			C11: SILTSTONE AND SHALE WITH INTERBEDDED SANDSTONE, dark gray siltstone and shale, gray sandstone, medium hard siltstone and shale, hard sandstone, laminated siltstone and shale, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal and smooth, spaced from highly fractured to 27.5 in., fossil layers at 11.5 in. to 12 in., 18.5 in. to 19.5 in., 41 in. to 51 in., and 52.5 in. to 54.5 in., mottling throughout.
	90					3			
						2.5			
						2			
						2			
						3			
						2			
						2			Approximate top of Whetstone Gulf Formation - Unit A at depth 95.8 ft (El. 111.7 ft).
						2	Highly fractured zone.		
						2			
110									
		C12	82/68	100		2			C12: SANDSTONE, light gray, medium hardness, bedded, medium grained, well sorted sandstone, unweathered, possible marker bed, siltstone clasts and lenses at 46 in., 62 in., and 66 in., fractures generally horizontal, planar and smooth, spaced 7 in. to 36.5 in.
	100					2			
						2			
						2			
						2			
		C13	57/60	60		5	Highly fractured zone.		C13: SILTSTONE, dark gray, soft, laminated, fine grained, well sorted siltstone, unweathered, fractures generally horizontal, planar, and smooth, spaced 0.25 in. to 19.5 in., 30° fracture at 37 in., top 3 in. of core is re-cored sandstone from run C12.
						6			
						6	Shaly partings.		
						7			
100						7	20° fracture.		
		C14	120/120	94		4	7-ft-thick sandstone bed.		C14: Similar to C13, occasional sandstone interbeds (light gray, medium hardness, bedded sandstone), unweathered, fractures generally horizontal, planar and smooth, spaced 1 in. to 11 in.
	110					4			
						5			
						4			
						5			
						3.5			
						3.5			
						4			

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
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						5			
90									
	120		C15	122/120	95	2 4 4 3.5 3.5 3 4 5 5 5	Highly fractured zone. Shaly partings. 45° fracture.		C15: SILTY SHALE AND SILTSTONE WITH SANDSTONE, dark gray silty shale and siltstone, gray sandstone, medium hard silty shale and siltstone, hard sandstone, laminated silty shale and siltstone, bedded sandstone, fine grained, well sorted, unweathered, fractures generally horizontal, planar and smooth, spaced from highly fractured to 22 in., 45° fracture at 93 in., mottling from 0 in. to 4 in., 15 in. to 17 in., and 70 in. to 74 in., siltstone clasts from 53 in. to 63 in.
80									Approximate top of Whetstone Gulf Formation - Unit B at depth 130.0 ft (El. 77.5 ft).
	130		C16	109/120	86	3 3 2 3 2 5 4.5 3 2.5 3.5			C16: SANDSTONE WITH SILTY SHALE AND SILTSTONE, gray sandstone, dark gray silty shale and siltstone, hard sandstone, medium hard silty shale and siltstone, bedded sandstone, laminated silty shale and siltstone, fine grained, well sorted, unweathered, fractures generally horizontal, planar and smooth, spaced 1 in. to 27 in., mottling from 0 in. to 3 in., 32.5 in. to 33 in., 87 in. to 88 in., 95 in. to 96.5 in., and 98 in. to 99 in., siltstone clast at 104 in., cross bedding at 11 in. to 14 in., 17.5 in., and 79 in., longer sandstone interbeds.
70									
	140		C17	122/109	100	4 4 4 3 2 2 3 5 2	Irregular fractures in sandstone. 1-inch-long vertical fracture. 1-inch-long vertical fracture.		C17: Similar to C16, unweathered, fractures generally horizontal, planar and smooth, spaced 0.5 in. to 21 in., fractures at 11 in. and 13 in. are mechanical breaks noted by driller during drilling, vertical fractures from 48 in. to 49 in and 93 in. to 94 in., fossils at 65 in. to 69 in., 70 in. to 72 in., 83 in. to 84 in., and 112 in. to 115 in.
60									
	150		C18	77/83	76	3 3 2 4 5 4	Highly fractured zone.		C18: SILTY SHALE AND SILTSTONE WITH SANDSTONE, dark gray silty shale and siltstone, gray sandstone, medium hard silty shale and siltstone, hard sandstone, laminated silty shale and siltstone, bedded sandstone, fine grained, well sorted, unweathered, fractures generally planar, horizontal and smooth, spaced from highly fractured to 12 in., irregular bedding from 59 in. to 67 in., sandstone clasts at 62.5 in. and 67 in.
							Shaly partings.		Bottom of boring at depth 155 ft (El. 52.5 ft). Borehole grouted to top of lake bed upon completion.

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log

Ground Surface Elev. (ft): 208
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Boring No.
B416

Elev. (ft)	Depth (ft)	Sample Information: Type	Sample No.	Rec./ Pen. (in)	Blows per 6 in. or RQD	Coring Time (min/ft)	Drilling Remarks and Engineering Geology Description of Rock Cores and Fractures	Fractures	Graphic Log	Soil-Sample Description Rock-Lithological Description
	160						General Comments about Core Samples:			
							Bedding-parallel fractures are most frequent in shale and siltstone and less common in sandstone.			
							Fracture surfaces are generally unweathered unless otherwise noted.			
40							Vertical fractures occasionally present in sandstone beds.			
	170									
							Hand pressure produces bedding-parallel fractures in siltstone of Pulaski Formation during handling and transport.			
30										
	180									
20										
	190									
10										

Notes: Engineering geology description of rock cores and fractures by Chad Conti.

Project Name: Nine Mile Point Unit 3 Site Characterization
City/State: Oswego, New York
GEI Project Number: 07223

GEI Consultants

Final Boring Log Signature Page	Boring No. B416

Project: Nine Mile Point Site Characterization — GEI Project No. 07223

Location: Oswego, New York

Final Log Prepared by: _____ Date: 9/11/08

Per GEI Procedure 150 rev. 1 using computer IBM Thinkpad - Product 64576PU

Final Log Checked by:

Soil Descriptions Checked by: _____ Date: 9/11/08

Rock Descriptions Checked by: _____ Date: 9/11/08

Drilling and Sample Information Checked by: _____ Date: 9/11/08

Notes:

A. Cummings performed a sofware funtionality check: Input from software database equals output on Final Log.

Form 150.3 rev. 1