

Evaluate the site boring with blow count data to determine if the four boring are representative of overall site conditions and to estimate geotechnical properties.

Boring Surface Elev. +1, ft	ISS-01 Center Northwest Area				ISS-02 Center West Intersection St				ISS-03 Center Northeast Area				ISS-04 Center Parking Lot				GTB-101 Northeast Area East Edge			
	Depth, ft	N _{field}	N ₆₀	N _{1,60}	Depth, ft	N _{field}	N ₆₀	N _{1,60}	Depth, ft	N _{field}	N ₆₀	N _{1,60}	Depth, ft	N _{field}	N ₆₀	N _{1,60}	Depth, ft	N _{field}	N ₆₀	N _{1,60}
	Note: Depth is center of 2 foot sample interval																			
72																				
70																				
68	-1				-1				-1								-1	2	1	2
66	-3				-3				-3								-3	2	1	2
64	-5	8	6	8	-5	14	10	13	-5	39	27	36	-5				-5	6	4	6
62	-7	8	6	7	-7	5	4	4	-7	11	8	9	-7	14	10	13	-7	27	19	23
60	-9	44	31	38	-9	8	6	6	-9	20	14	16	-9	57	40	49	-9	34	24	28
58	-11	42	29	34	-11	27	19	21	-11	19	13	15	-11	24	17	19	-11	24	17	18
56	-13	55	39	42	-13	31	22	23	-13	26	18	19	-13	57	40	49	-13	22	15	16
54	-15	44	31	32	-15	52	36	36	-15	51	36	36	-15	24	17	19	-15	18	13	13
52	-17	26	18	18	-17	52	36	36	-17	40	28	27	-17	50	35	37	-17	19	13	13
50	-19	25	18	17	-19	29	20	20	-19	22	15	14	-19	44	31	31	-19	11	8	7
48	-21	23	16	15	-21	36	25	23	-21	23	16	14	-21	29	20	20	-21	19	13	12
46	-23	22	15	14	-23	40	28	25	-23	16	11	10	-23	52	36	34	-23			
44	-25	9	6	5	-25	48	34	29	-25	24	17	14	-25	32	22	20	-25			
42	-27	16	11	9	-27	20	14	12	-27	13	9	7	-27	24	17	15	-27	22	15	13
40	-29	40	28	23	-29	25	18	14	-29	31	22	17	-29	23	16	14	-29	16	14	
38	-31	10	7	6	-31	50	35	28	-31	39	27	21	-31	21	15	12	-31	19	13	10
36	-33	34	24	18	-33	26	18	14	-33	18	13	9	-33	39	27	22	-33	33	22	
34	-35	12	8	6	-35	24	17	13	-35	23	16	12	-35	32	22	17	-35	35	25	18
32	-37	5	4	3	-37	33	23	17	-37	27	19	14	-37	35	25	18	-37	18	13	9
30	-39	11	8	6					-39	24	17	12	-39	15	11	8	-39			
28	-41	47	33	24					-41	12	8	6	-41	14	10	7	-41	22	15	11
26	-43	36	25	18					-43	32	22	16	-43	22	15	11	-43			
24	-45	23	16	11					-45	18	13	9	-45							
22	-47	24	17	12					-47	24	17	12	-47							
20	-49	30	21	15					-49	4	3	2	-49							
18	-51	46	32	22					-51				-51							
16	-53	16	11	8																
14	-55	24	17	11																
12	-57	25	18	12																
10	-59	9	6	4																
8	-61	18	13	8																
6	-63	24	17	11																
4	-65	42	29	19																
2	-67	48	34	21																
0	-69	13	9	6																
-2	-71																			

Average N	26	18	15	29	20	19	26	18	17	31	24	23	7-20	22	16	17
Std Dev	14	10	10	14	10	9	11	7	7	12	9	10	7-20	6	4	6
Ave +1 Std Dev	40	28	25	43	30	27	37	26	24	44	33	34	7-20	28	20	23
Ave -1 Std Dev	12	8	5	15	11	10	15	11	10	19	15	13	7-20	16	11	11

Color coding on N field data is same as boring log coal tar impacts

- Gravel layer (Red)
- Silty sand layer (Light Blue)
- Fill (Grey)
- Sand (Yellow)
- Groundwater (Dark Blue)
- High range N values (Orange)
- Low range N values (Purple)

Correct Blow counts to N₆₀ (Reference : "Performance and Use of Standard Penetration test in Geotechnical Practice", McGregor & Duncan, VPI, 1980).

$N_{60} = N_{field} C_E$ (ref. page 26)
 $N_{1,60} = N_{field} C_E C_N$ (ref. page 26)

where:
 N_{field} = field blow count n-value
 N₆₀ = blow counts corrected for theoretical 60% of hammer energy
 C_E = energy correction factor
 C_N = overburden correction factor

The drill rig hammer was reported by Field Geologist to be a safety hammer lifted by a wire inch cable.

The wire cable will reduce energy to hammer. Use $C_E = 0.7$ (see ref. Table 10)

C_N : use correction equation by Peck et al. (see ref. Table 8)

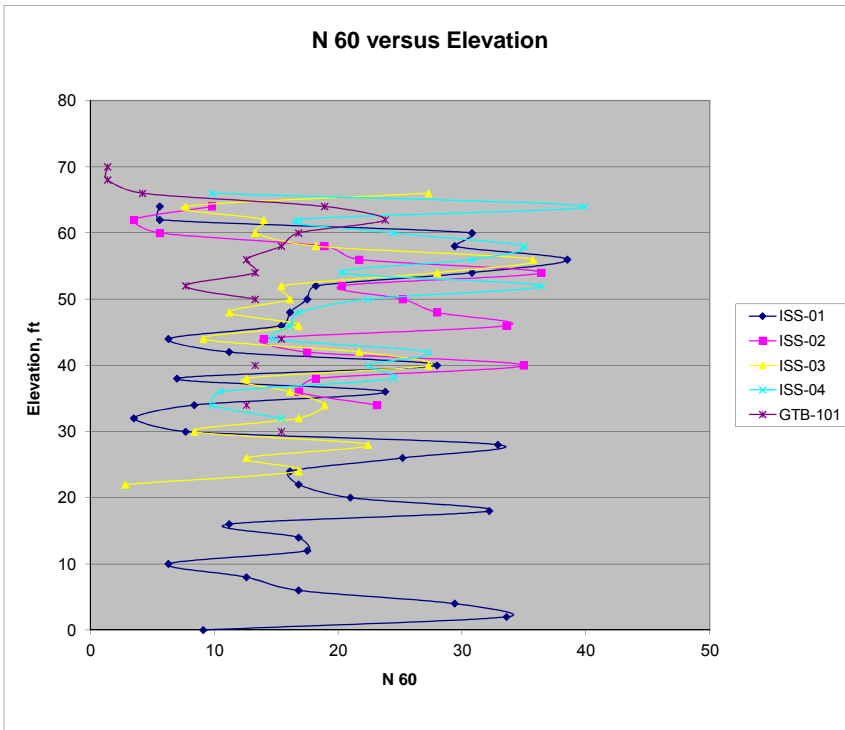
$$C_N = 0.77 \log_{10} (20/\sigma'_v)$$

where:

σ'_v = vertical effective stress in tsf

Assume soil dry weight = 115 pcf = 0.06 tcf
 Assume soil moist unit weight = 125 pcf = 0.06 tcf
 Assume saturated soil unit weight = 0.03 tcf
 Assume groundwater at elevation 42 ft

Elevation, ft	σ'_v , tsf	C_N	σ'_v , psi
0			
-2	0.1	1.7	1.7
-4	0.3	1.5	3.5
-6	0.4	1.3	5.2
-8	0.5	1.2	6.9
-10	0.6	1.2	8.7
-12	0.8	1.1	10.4
-14	0.9	1.0	12.2
-16	1.0	1.0	13.9
-18	1.1	1.0	15.6
-20	1.3	0.9	17.4
-22	1.4	0.9	19.1
-24	1.5	0.9	20.8
-26	1.6	0.8	22.6
-28	1.8	0.8	24.3
-30	1.9	0.8	26.0
-32	2.0	0.8	27.8
-34	2.1	0.7	29.5
-36	2.2	0.7	30.2
-38	2.2	0.7	31.0
-40	2.3	0.7	31.7
-42	2.3	0.7	32.4
-44	2.4	0.7	33.2
-46	2.4	0.7	33.9
-48	2.5	0.7	34.6
-50	2.5	0.7	35.4
-52	2.6	0.7	36.1
-54	2.7	0.7	36.8
-56	2.7	0.7	37.6
-58	2.8	0.7	38.3
-60	2.8	0.7	39.0
-62	2.9	0.7	39.7
-64	2.9	0.6	40.5
-66	3.0	0.6	41.2
-68	3.0	0.6	41.9
-70	3.1	0.6	42.7
-72	3.1	0.6	43.4
-74	3.2	0.6	44.1
-76	3.2	0.6	44.9
-78	3.3	0.6	45.6
-80	3.3	0.6	46.3



Geotechnical Data

Comment: The N values were obtained with a safety hammer and cable winch. This is a non-standard method that typically leads to somewhat irregular blow counts due to the spooling and drag caused by the cable on the drum and over sheaves. Therefore high and low values might not be properly corrected for by a single energy correction factor C_E

The surficial soils are coarse to fine outwash sands with low percentage of fines (few %) to gravel and sand.

The following table is derived from various data and correlations (see ref.)

	Boring														Comment
	ISS-01	ISS-02	ISS-03	ISS-04	GTB-101	GTB-101	HIMW-01	HIMW-02	HIMW-02	HIMW-03	HIMW-06	HIMW-06	HIMW-08	HIMW-11	
Location	MGP NW	MGP W	MGP NE	P-Lot CRT	MGP NE	MGP NE	MGP NW	MGP NE	MGP NE	off-site NW	MGP W	MGP W	off-site S	MGP NE	
Sample Depth, ft bgs	25-70	10-35	10-50	20-40	7-20	20-40	36-38	26-28	32-34	23-33	24-26	28-30	25-35	26-28	
Description	Composite Samples						gravelly fine-coarse sand, wet	med-very coarse sand, trc silt	med-coarse sand	fine-med sand, fine-coarse sand, some fine gravel	med-coarse sand, w/fine gravel	silty fine sand	clayey, f-m sand, silty f sand, med-v. coarse sand	fine-coarse sand, w/fine gravel	
Gravel (% by weight)	4.0	8.3	11.9	6.5	20.5	32.8									Gravel % is from split spoon sample
Sand (% by weight)	92.3	88.4	85.2	89.5	77.3	66.1									
Fines (% by weight)	3.7	3.3	2.9	4.0	2.2	1.1	1	5	23?		3	22		6	HIMW-2 (32'-34') d ₁₀ likely 2.3 not 23
d ₁₀ , mm	0.16	0.23	0.21	0.18	0.23	0.30	0.38	0.20	0.25		0.23	0.05		0.17	
Coeff. Of Curvature, C _c	0.9	0.9	0.7	0.9	0.7	0.5									
Coeff. Of Uniformity, C _u	4.2	3.5	4.9	3.9	6.4	9.9									
USCS Classification	SP	SP	SP	SP	SP	SP									
Liquid Limit	NP	NP	NP	NP	NP	NP									
Plastic Limit	NP	NP	NP	NP	NP	NP									NP= non-plastic
Tot. Organic Content (% by weight)							0.8	0.3	0.1		0.6	0.5		0.6	Data:RI Table 3-1
Nat. Moisture Content (% by weight)	15.2	5.7	9.8	10.3	5.1	7.4	9.8	2.9	14.8		4.0	1.6		5.0	Groundwater at approx. 30 ft bgs
pH, su	5.8	6.8	7.7												
Specific Gravity							2.64	2.64	2.71		2.66	2.65		2.72	
Dry Density, pcf	114.8	114.7	117.4	114.0											Single point, as received moisture, ASTM D-698
Moist Density, pcf	128.3	121.0	129.1	125.7											Single point, as received moisture, ASTM D-698
N Values															
Average N ₆₀	18	20	18	24	16	17									
Average N ₆₀ +1 std. dev.	28	30	26	33	20	23									
Average N ₆₀ -1 std. dev.	8	11	11	15	11	11									
Density Description	MD	MD	MD	MD	MD	MD	MD								MD=medium dense
Approx. Relative Density, D _r	50	50	50	60	50	50									ref. Fig. 28 and 29, assume 20 psi σ' _v , at Average N ₆₀
Friction Angle, Φ	35	36	35	37	34	34									re. Table 22 Dunham #2 equation using average N ₆₀
Permeability, k															
Test Interval, ft bgs							26-34	28-38		23-33			25-35		
k, cm/sec							2.52E-02	3.01E-02		1.50E-02			1.25E-02		

Notes:

- mm = millimeter(s)
- pcf = lbs/ft³
- psi = lbs/ft²
- su = standard units
- tcf = tons/ft³