August 11, 2025

Project US-EI-5539.3867

Sandra Miller
Seattle Housing Authority
101 Elliott Avenue West, Suite 100, PO Box 79015
Seattle, Washington 98119

sent via email: Sandra.Miller@seattlehousing.org

Subject: Geotechnical Engineering Supplement No. 1 – Temporary Dewatering Settlement Evaluation
Jackson Park Village
14738 30th Avenue NE
Seattle, Washington

Dear Ms. Miller,

WSP USA Inc. (WSP) is submitting this supplemental letter to accompany our Geotechnical Engineering Report Rev. 1, dated August 4, 2025, to provide additional, specific geotechnical analysis of the potential impacts of temporary dewatering. A temporary dewatering plan has been designed to facilitate the construction of the stormwater detention vault, the Littlebrook Creek bypass culvert, and the basement parking below Building A. The recommendations presented herein, along with the attached figures, are intended to supplement our geotechnical engineering recommendations by addressing considerations related to temporary dewatering and potential settlement impacts on adjacent structures.

ANALYSIS OF ADJACENT STRUCTURES

Based on the temporary dewatering design prepared by Richard Martin Groundwater LLC (Richard Martin), dated August 6, 2025 (attached), the estimated groundwater drawdown will extend outside the boundaries of the project site. WSP has reviewed the dewatering layout provided in Attachment 1 and identified three key locations to assess potential impacts on adjacent structures. Through a request for information from SDCI, WSP determined the foundation types of the surrounding buildings, as summarized below and in Table 1.

- The first key location is an 8” Cast Iron Water Main owned by Seattle Public Utilities trending along the approximate centerline of 30th Ave NE. Based on the Boundary and Topographic Survey for the Seattle Housing Authority for Jackson Park House and Village dated 6/4/18, the pipe elevation is at 220.7 ft.
- The second key location is the Jackon Park Apartments located at 14378 30th Ave NE 98125 and owned by the Seattle Housing Authority. As-built plans dated 11/1/1971, provided by SHA show the building is supported on driven timber piles driven to a minimum capacity of 40 tons.
- The final key location is a 2-story apartment building located at 14331 32nd Ave NE, owned by 3030 Lake City LLC. Based on information from Chapman Warren with the City of Seattle who responded to our Request for information on 7/15/2025, the building appeared to be constructed on spread footings.

Table 1: Settlement Points Considered

Point	Latitude, Longitude	Structure Description	Foundation Type
Point 1	47.733139, -122.296538	8" Cast Iron Water Main	Soil supported pipe
Point 2	47.733459, -122.295931	5 Story Apartment Building	Timber Piles
Point 3	47.733051, -122.295150	2 Story Apartment Building	Spread Footings

Soil profiles at the evaluated locations were interpreted based on nearby geotechnical investigations and are presented in Attachments B and C. In general, the soil profiles consisted of granular fill soils, over an estimated 5-foot-thick layer of either peat or clay, over dense silty sand.

SETTLEMENT CALCULATIONS AND POTENTIAL IMPACTS

Temporary lowering the groundwater table by dewatering activities typically leads to an increase in effective stress within the soil. This occurs because, when the water level drops, the soil loses its buoyancy and instead bears its full saturated weight. For loose or soft soil this results in settlement. For settlement analysis, WSP assumed that dewatered Peat and Clay layers would undergo primary consolidation, as detailed in Attachment B. The calculated primary consolidation was added to the immediate settlement estimates of the granular soils which were calculated with the Hough method, as outlined in Attachment C.

Allowable settlement beneath the cast iron water main was determined in accordance with the Seattle Public Utilities "Settlement Monitoring Requirements for Cast Iron Water Mains." For adjacent buildings, an allowable settlement threshold of 1 inch was assumed as per typically accepted engineering standards. The results of these calculations are summarized in Table 2 below.

Table 2: Settlement

Points	Calculated Settlement	Allowable Settlement
Point 1	0.36" (beneath the pipe)	1.2"
Point 2	0.94"	1"
Point 3	0.71"	1"

Differential settlement was evaluated by analyzing opposing corners of each building. The results of this assessment are summarized in Table 3. Allowable differential settlement is assumed to be 0.5" as per typical engineering standards.

Table 3: Differential Settlement

Points	Calculated Differential Settlement	Allowable Differential Settlement
Points 2A and 2B	0.0"	0.5"
Points 3A and 3B	0.15"	0.5"

CONCLUSIONS AND RECOMMENDATIONS

According to the results of our settlement analyses, the settlement induced by temporary dewatering is estimated to be less than 1 inch for nearby structures. As stated previously, a 1-inch threshold is generally regarded as the point beyond which negative impacts may occur. Furthermore, the Richard Martin report recommends implementing drawdown mitigation measures to decrease anticipated groundwater drawdown, thereby further reducing expected settlement. A 24-hour pump test is also advised to refine the current groundwater model, which was developed using conservative assumptions. We concur with the recommendations within the

Richard Martin report, and, by incorporating these recommendations, there will be a minimal risk of detrimental impacts to the adjacent property and structures.

CLOSURE

If you have any questions or need additional information, please do not hesitate to call.

Sincerely,

WSP USA Inc.

Kayla Campbell
Associate Consultant, Geotechnical Engineering

August 11, 2025
Todd D. Wentworth, P.E., L.G.
Principal Geotechnical Engineer

August 11, 2025
William J. Lockard, L.E.G.
Senior Geologist

KC/TDW/WJL:al
https://wsponlinenam.sharepoint.com/sites/us-sha-wo005-jackson/shared documents/project files/6_deliverables/warning – this library for admins only/003/jackson park village supplemental 1.docx

Attachments: Attachment A – Richard Martin Groundwater LLC Dewatering Plan
Attachment B – Settlement Calculations

REFERENCES

American Association of State Highway and Transportation Officials (AASHTO). *AASHTO LRFD Bridge Design Specifications, 9th Edition*. Washington, D.C.: AASHTO, 2020. ISBN: 978-1-56051-738-2. Pub Code: LRFDBDS-9.

Holtz, R.D., Kovacs, W.D., & Sheahan, T.C. (2011). *An Introduction to Geotechnical Engineering* (2nd ed.). Upper Saddle River, NJ: Pearson Education. ISBN: 9780132496346

Kimmerling, R.E. (2002). *Geotechnical Engineering Circular No. 6: Shallow Foundations*. FHWA-SA-02-054. U.S. Department of Transportation, Federal Highway Administration, Office of Bridge Technology, Washington, D.C. Prepared by PanGEO, Inc., Seattle, WA.

National Council of Examiners for Engineering and Surveying (NCEES). *PE Mechanical Reference Handbook*, Version 1.8. NCEES, 2019.

Springer, F. (1972). *Architectural and Structural Plans for 10-Unit Apartment House at 14331 32nd Ave NE, Seattle*. Job No. 3-1-3-72. Prepared for Mr. Perry Martin. Seattle Department of Buildings, Microfilmed at 24X.

ATTACHMENT A

RICHARD MARTIN GROUNDWATER LLC DEWATERING PLAN


100 feet
Point 1
Point 2
Point 2A
Point 2B
Point 3
Point 3A
Point 3B
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
TP-8
TP-9
TP-10
TP-11
TP-12
B-01/MW-01
B-02/MW-02
B-03
B-04
B-05
B-06/MW-03
B-07/MW-04
B-08
B-09
B-10
B-11/MW-05
B-12/MW-06
B-13
A
A'
B
B'
C
C'
0+00
1+00
2+00
3+00
3+50
8
10
12
14
IN THE NORTHEAST 1/4 OF SECTION 21, TOWNSHIP 26 NORTH, RANGE 4 EAST, W.M.
NE 145TH ST
30TH AVE NE
32ND AVE. NE
NE 143RD PLACE
NE 143RD ST.
ARCHITECTURAL SITE PLAN
REFERENCE(S)
BASE MAP TAKEN FROM GGLO OVERALL ARCHITECTURAL SITE PLAN SHEET A-101,
DATED 09-27-2024 DELIVERED IN FORMAT PDF
SITE NOTES
CERTIFICATION:
VICINITY MAP
SITE
LEGEND
PRELIMINARY
(6/4/18)
BUSH, ROED & HITCHINGS, INC.
LAND SURVEYORS & CIVIL ENGINEERS
2009 MINOR AVE. EAST
SEATTLE, Washington
98102-3513
(206) 323-4144
1-800-935-0508
FAX# (206) 323-7135
BOUNDARY & TOPOGRAPHIC SURVEY
SEATTLE HOUSING AUTHORITY
JACKSON PARK HOUSE & VILLAGE
KING COUNTY
WASHINGTON
SEATTLE
MWH
OQR
1" = 20'
6/4/18
2017243.04
1
1

ATTACHMENT B

SETTLEMENT CALCULATIONS

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Date:	8/1/2025

Method: Hough (1959)

Point 1					
Description:	Sanitary sewer line in NE 30th Sreet				
	Elevation		Depth below Ground Surface		
Top of Ground	231	ft	0	ft	
Pipe	220.7	ft	10.3	ft	
Current Water Level	225	ft	6	ft	
Drawdown Water Level	212.5	ft	18.5	ft	
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight
Medium dense, well graded silty Sand	211	ft	20	ft	130
Medium stiff lean Clay	206	ft	25	ft	120
Medium dense Sand w/ some gravel	205	ft	26	ft	130
Very stiff sandy Silt	-		-		130

Soil Type Per Hough (1959) based off figure 10.6.2.4.2b-1:

1. Well graded fine to medium silty sand, $0.009*N1_{60}$^2+$1.3134*N1_{60}$+28.052
2. Clean well graded fine to coarse sand, $0.0002*N1_{60}$^3-$0.01*N1_{60}$^2+$2.1694*N1_{60}$+27.145
3. Well graded silty sand and gravel, $0.0335*N1_{60}$^2+$0.8276*N1_{60}$+42.86
4. Inorganic Silt, $0.0022*N1_{60}$^2+$1.208*N1_{60}$+17.206

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					Based off figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (blows per foot)	Unit Weight (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (blows per foot)	C_n	$N1_{60}$ (blows per foot)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
2.5	226.5	5	2.5	226.5	3	11	130	0.33	0.33	14.6	1.61	23.5	0.00	5	80.9	0.00	0.00	
5	224	2.5	6.25	222.75	3	6	130	0.75	1.14	8.0	1.33	10.6	0.39	2.5	55.4	0.01	0.10	
7.5	221.5	2.5	8.75	220.25	3	9	130	1.34	2.28	12.0	1.14	13.6	0.93	2.5	60.3	0.01	0.11	
10	219	5	12.5	216.5	3	5	130	2.19	3.90	6.7	0.97	6.5	1.71	5	49.6	0.03	0.30	
15	214	5	17.5	211.5	3	4	130	3.37	6.18	5.3	0.83	4.4	2.80	5	47.2	0.03	0.33	
20	209	5	22.5	206.5	4	7	120	4.67	7.47	9.3	0.72	6.7	2.80	0	25.4	0.00	0.00	Experiences primary
25	204	5	27.5	201.5	4	20	120	6.26	9.06	26.6	0.62	16.5	2.80	5	37.7	0.00	0.00	consolidation
30	199	0	0	0	3	44	130	6.26	9.06	58.5	0.62	36.3	2.80	0	117.1	0.00	0.00	

From Ground Surface to 30 feet deep

Total Settlement =	0.85	inch
(FHWA GEC#6) 2/3 Correction =	0.57	inch
with primary consolidation settlement	**0.71**	inch

Beneath Pipe to 30 feet deep

Total Settlement =	0.33	inch
(FHWA GEC#6) 2/3 Correction =	0.22	inch
with primary consolidation settlement	**0.36**	inch

Project	Jackson Park	Created By:	KKC
		Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

Method: Hough (1959)

Point 2					
Description:	Jackson Village aparments. On timber piles.				
	Elevation		Depth below Ground Surface		
Top of Ground	227	ft	0	ft	
Current Water Level	225	ft	2	ft	
Drawdown Water Level	214.75	ft	12.25	ft	
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight
Medium dense silty Sand (Fill)	223	ft	4	ft	130
Peat	217	ft	10	ft	80
Loose to medium dense silty Sand	212	ft	15	ft	125
Dense, gray silty, gravelly Sand	-		-		130

Soil Type Per Hough (1959):

1. Well graded fine to medium silty sand, $0.009*N1_{60}\hat{}2+1.3134*N1_{60}+28.052$
2. Clean well graded fine to coarse sand, $0.0002*N1_{60}\hat{}3-0.01*N1_{60}\hat{}2+2.1694*N1_{60}+27.145$
3. Well graded silty sand and gravel, $0.0335*N1_{60}\hat{}2+0.8276*N1_{60}+42.86$
4. Inorganic Silt, $0.0022*N1_{60}\hat{}2+1.208*N1_{60}+17.206$

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (bpf)	γ (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (bpf)	C_n	$N1_{60}$ (bpf)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
4	225	4.5	2.5	226.5	3	20	130	0.17	0.33	26.6	1.83	48.6	0.16	4.5	162.3	0.01	0.09	
5	224	2.5	6.25	222.75	4	4	130	0.59	1.14	5.3	1.41	7.5	0.55	2.5	26.4	0.03	0.32	
7.5	221.5	2.5	8.75	220.25	3	4	80	0.75	1.84	5.3	1.33	7.1	1.09	2.5	50.4	0.00	0.00	Experiences primary
10	219	5	12.5	216.5	3	8	80	0.97	2.84	10.6	1.24	13.2	1.87	5	59.7	0.00	0.00	consolidation
15	214	5	17.5	211.5	3	8	80	1.28	3.15	10.6	1.15	12.3	1.87	5	58.0	0.00	0.00	
20	209	5	22.5	206.5	3	30	130	2.80	4.67	39.9	0.89	35.5	1.87	5	114.4	0.01	0.12	
25	204	5	27.5	201.5	3	30	130	4.66	6.53	39.9	0.72	28.7	1.87	5	94.1	0.01	0.09	
30	199	0	0	0	3	30	130	4.66	6.53	39.9	0.72	28.7	1.87	0	94.1	0.00	0.00	

Total Settlement =	0.63	inch
(FHWA GEC#6 2/3 Correction =	0.42	inch
with primary consolidation settlement	**0.94**	inch

Project	Jackson Park	Created By:	KKC
		Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

Method: Hough (1959)

Point 3					
Description:	2 Story Apartment Building to the east				
	Elevation		Depth below Ground Surface		
Top of Ground	227	ft	0	ft	
Current Water Level	225	ft	2	ft	
Drawdown Water Level	214	ft	13	ft	
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight
Fill	224	ft	3	ft	130
Peat	219	ft	8	ft	80
Medium dense silty Sand	215	ft	12	ft	130
Very dense silty Sand w/gravel	-		-		135

Soil Type Per Hough (1959):

1. Well graded fine to medium silty sand, $0.009*N1_{60}$^2+$1.3134*N1_{60}+28.052$
2. Clean well graded fine to coarse sand, $0.0002*N1_{60}$^3-$0.01*N1_{60}$^2+$2.1694*N1_{60}+27.145$
3. Well graded silty sand and gravel, $0.0335*N1_{60}$^2+$0.8276*N1_{60}+42.86$
4. Inorganic Silt, $0.0022*N1_{60}$^2+$1.208*N1_{60}+17.206$

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (bpf)	γ (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (bpf)	C_n	$N1_{60}$ (bpf)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
2.5	226.5	5	2.5	226.5	3	27	130	0.33	0.33	35.9	1.61	57.8	0.00	5	202.6	0.00	0.00	
5	224	2.5	6.25	222.75	4	20	80	0.44	0.83	26.6	1.51	40.2	0.39	2.5	69.3	0.01	0.12	
7.5	221.5	2.5	8.75	220.25	3	14	80	0.59	1.53	18.6	1.41	26.2	0.93	2.5	87.7	0.00	0.00	Experiences primary
10	219	5	12.5	216.5	3	2	130	1.44	3.15	2.7	1.11	3.0	1.71	5	45.6	0.00	0.00	consolidation
15	214	5	17.5	211.5	3	3	130	2.62	4.33	4.0	0.91	3.6	1.71	5	46.3	0.02	0.28	
20	209	5	22.5	206.5	3	25	130	4.14	5.86	33.3	0.76	25.2	1.71	5	85.0	0.01	0.11	
25	204	5	27.5	201.5	3	21	130	6.01	7.72	27.9	0.63	17.7	1.71	5	68.0	0.01	0.10	
30	199	0	0	0	3	11	130	6.01	7.72	14.6	0.63	9.3	1.71	0	53.4	0.00	0.00	

Total Settlement = 0.61 inch

(FHWA GEC#6) 2/3 Correction = 0.40 inch

with primary consolidation settlement **0.71** inch

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

Method: Hough (1959)

Point 2A					
Description:	Jackson Village aparments. On timber piles.				
	Elevation		Depth below Ground Surface		
Top of Ground	227	ft	0	ft	
Current Water Level	225	ft	2	ft	
Drawdown Water Level	216.5	ft	10.5	ft	
	Bottom of Soil Layer Elevatior		Bottom of Soil Depth		Unit Weight
Medium dense silty Sand (Fill)	223	ft	4	ft	130
Peat	217	ft	10	ft	80
Loose to medium dense silty Sand	212	ft	15	ft	125
Dense, gray silty, gravelly Sand	-		-		130

Soil Type Per Hough (1959):

1. Well graded fine to medium silty sand, $0.009*N1_{60}\text{^}2+1.3134*N1_{60}+28.052$
2. Clean well graded fine to coarse sand, $0.0002*N1_{60}\text{^}3-0.01*N1_{60}\text{^}2+2.1694*N1_{60}+27.145$
3. Well graded silty sand and gravel, $0.0335*N1_{60}\text{^}2+0.8276*N1_{60}+42.86$
4. Inorganic Silt, $0.0022*N1_{60}\text{^}2+1.208*N1_{60}+17.206$

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					Based on figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (bpf)	γ (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (bpf)	C_n	$N1_{60}$ (bpf)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
4	225	4.5	2.5	226.5	3	20	130	0.17	0.33	26.6	1.83	48.6	0.16	4.5	162.3	0.01	0.09	
5	224	2.5	6.25	222.75	4	4	130	0.59	1.14	5.3	1.41	7.5	0.55	2.5	26.4	0.03	0.32	
7.5	221.5	2.5	8.75	220.25	3	4	80	0.75	1.84	5.3	1.33	7.1	1.09	2.5	50.4	0.00	0.00	Experiences primary
10	219	5	12.5	216.5	3	8	80	0.97	2.84	10.6	1.24	13.2	1.87	5	59.7	0.00	0.00	consolidation
15	214	5	17.5	211.5	3	8	80	1.28	3.15	10.6	1.15	12.3	1.87	5	58.0	0.00	0.00	
20	209	5	22.5	206.5	3	30	130	2.80	4.67	39.9	0.89	35.5	1.87	5	114.4	0.01	0.12	
25	204	5	27.5	201.5	3	30	130	4.66	6.53	39.9	0.72	28.7	1.87	5	94.1	0.01	0.09	
30	199	0	0	0	3	30	130	4.66	6.53	39.9	0.72	28.7	1.87	0	94.1	0.00	0.00	

Total Settlement =	0.63	inch
(FHWA GEC#6 2/3 Correction =	0.42	inch
with primary consolidation settlement	**0.94**	inch

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

Method: Hough (1959)

Point 2B					
Description:	Jackson Village aparments. On timber piles.				
	Elevation		Depth below Ground Surface		
Top of Ground	227	ft	0	ft	
Current Water Level	225	ft	2	ft	
Drawdown Water Level	214	ft	13	ft	
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight
Medium dense silty Sand (Fill)	223	ft	4	ft	130
Peat	217	ft	10	ft	80
Loose to medium dense silty Sand	212	ft	15	ft	125
Dense, gray silty, gravelly Sand	-		-		130

Soil Type Per Hough (1959):

1. Well graded fine to medium silty sand, $0.009*N1_{60}^2+1.3134*N1_{60}+28.052$
2. Clean well graded fine to coarse sand, $0.0002*N1_{60}^3-0.01*N1_{60}^2+2.1694*N1_{60}+27.145$
3. Well graded silty sand and gravel, $0.0335*N1_{60}^2+0.8276*N1_{60}+42.86$
4. Inorganic Silt, $0.0022*N1_{60}^2+1.208*N1_{60}+17.206$

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (bpf)	γ (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (bpf)	C_n	$N1_{60}$ (bpf)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
4	225	4.5	2.5	226.5	3	20	130	0.17	0.33	26.6	1.83	48.6	0.16	4.5	162.3	0.01	0.09	
5	224	2.5	6.25	222.75	4	4	130	0.59	1.14	5.3	1.41	7.5	0.55	2.5	26.4	0.03	0.32	
7.5	221.5	2.5	8.75	220.25	3	4	80	0.75	1.84	5.3	1.33	7.1	1.09	2.5	50.4	0.00	0.00	Experiences primary
10	219	5	12.5	216.5	3	8	80	0.97	2.84	10.6	1.24	13.2	1.87	5	59.7	0.00	0.00	consolidation
15	214	5	17.5	211.5	3	8	80	1.28	3.15	10.6	1.15	12.3	1.87	5	58.0	0.00	0.00	
20	209	5	22.5	206.5	3	30	130	2.80	4.67	39.9	0.89	35.5	1.87	5	114.4	0.01	0.12	
25	204	5	27.5	201.5	3	30	130	4.66	6.53	39.9	0.72	28.7	1.87	5	94.1	0.01	0.09	
30	199	0	0	0	3	30	130	4.66	6.53	39.9	0.72	28.7	1.87	0	94.1	0.00	0.00	

Total Settlement =	0.63	inch
(FHWA GEC#6) 2/3 Correction =	0.42	inch
with primary consolidation settlement	**0.94**	inch

Building Differential Point 2A -2B **0.00**

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

Method: Hough (1959)

Point 3A					
Description:	2 Story Apartment Building to the east				
	Elevation		Depth below Ground Surface		
Top of Ground	227	ft	0	ft	
Current Water Level	225	ft	2	ft	
Drawdown Water Level	213	ft	14	ft	
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight
Fill	224	ft	3	ft	130
Peat	219	ft	8	ft	80
Medium dense silty Sand	215	ft	12	ft	130
Very dense silty Sand w/gravel	-		-		135

Soil Type Per Hough (1959):

1. Well graded fine to medium silty sand, 0.009*$N1_{60}$^2+1.3134*$N1_{60}$+28.052
2. Clean well graded fine to coarse sand, 0.0002*$N1_{60}$^3-0.01*$N1_{60}$^2+2.1694*$N1_{60}$+27.145
3. Well graded silty sand and gravel, 0.0335*$N1_{60}$^2+0.8276*$N1_{60}$+42.86
4. Inorganic Silt, 0.0022*$N1_{60}$^2+1.208*$N1_{60}$+17.206

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (bpf)	γ (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (bpf)	C_n	$N1_{60}$ (bpf)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
2.5	226.5	5	2.5	226.5	3	27	130	0.33	0.33	35.9	1.61	57.8	0.00	5	202.6	0.00	0.00	
5	224	2.5	6.25	222.75	4	20	80	0.44	0.83	26.6	1.51	40.2	0.39	2.5	69.3	0.01	0.12	
7.5	221.5	2.5	8.75	220.25	3	14	80	0.59	1.53	18.6	1.41	26.2	0.93	2.5	87.7	0.00	0.00	Experiences primary
10	219	5	12.5	216.5	3	2	130	1.44	3.15	2.7	1.11	3.0	1.71	5	45.6	0.00	0.00	consolidation
15	214	5	17.5	211.5	3	3	130	2.62	5.43	4.0	0.91	3.6	2.80	5	46.3	0.03	0.41	
20	209	5	22.5	206.5	3	25	130	4.14	6.95	33.3	0.76	25.2	2.80	5	85.0	0.01	0.16	
25	204	5	27.5	201.5	3	21	130	6.01	8.81	27.9	0.63	17.7	2.80	5	68.0	0.01	0.15	
30	199	0	0	0	3	11	130	6.01	8.81	14.6	0.63	9.3	2.80	0	53.4	0.00	0.00	

Total Settlement =	0.83	inch
(FHWA GEC#6) 2/3 Correction =	0.56	inch
with primary consolidation settlement	**0.87**	inch

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

Method: Hough (1959)

Point 3B						
Description:	2 Story Apartment Building to the east					
	Elevation		Depth below Ground Surface			
Top of Ground	227	ft	0	ft		
Current Water Level	225	ft	2	ft		
Drawdown Water Level	214	ft	13	ft		
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	
Fill	224	ft	3	ft	130	
Peat	219	ft	8	ft	80	
Medium dense silty Sand	215	ft	12	ft	130	
Very dense silty Sand w/gravel	-		-		135	

Soil Type Per Hough (1959):

1 Well graded fine to medium silty sand, $0.009*N1_{60}^2+1.3134*N1_{60}+28.052$

2 Clean well graded fine to coarse sand, $0.0002*N1_{60}^3-0.01*N1_{60}^2+2.1694*N1_{60}+27.145$

3 Well graded silty sand and gravel, $0.0335*N1_{60}^2+0.8276*N1_{60}+42.86$

4 Inorganic Silt, $0.0022*N1_{60}^2+1.208*N1_{60}+17.206$

Input Parameters:

C_E	1.33

AASHTO LRFD 9th Edition					Based off figure 10.6.2.4.2b-1					SPT Corrections					figure 10.6.2.4.2b-1	Equ. 10.6.2.4.2b-2	Equ. 10.6.2.4.2b-2	
Depth (ft)	Elevation	Sublayer Thickness (ft)	Mid-point Depth (ft)	Mid-point Elevation (ft)	Soil Type	N (bpf)	γ (pcf)	Initial σ_v' (ksf)	After Dewatering σ_v' (ksf)	N_{60} (bpf)	C_n	$N1_{60}$ (bpf)	$\Delta\sigma'_v$ (ksf)	H_c (ft)	C'	ΔH (ft)	ΔH (inch)	
2.5	226.5	5	2.5	226.5	3	27	130	0.33	0.33	35.9	1.61	57.8	0.00	5	202.6	0.00	0.00	
5	224	2.5	6.25	222.75	4	20	80	0.44	0.83	26.6	1.51	40.2	0.39	2.5	69.3	0.01	0.12	
7.5	221.5	2.5	8.75	220.25	3	14	80	0.59	1.53	18.6	1.41	26.2	0.93	2.5	87.7	0.00	0.00	Experiences primary
10	219	5	12.5	216.5	3	2	130	1.44	3.15	2.7	1.11	3.0	1.71	5	45.6	0.00	0.00	consolidation
15	214	5	17.5	211.5	3	3	130	2.62	4.33	4.0	0.91	3.6	1.71	5	46.3	0.02	0.28	
20	209	5	22.5	206.5	3	25	130	4.14	5.86	33.3	0.76	25.2	1.71	5	85.0	0.01	0.11	
25	204	5	27.5	201.5	3	21	130	6.01	7.72	27.9	0.63	17.7	1.71	5	68.0	0.01	0.10	
30	199	0	0	0	3	11	130	6.01	7.72	14.6	0.63	9.3	1.71	0	53.4	0.00	0.00	

Total Settlement =	0.61	inch
(FHWA GEC#6) 2/3 Correction =	0.40	inch
with primary consolidation settlement	**0.71**	inch
Building Differential Point 3A - 3B	**-0.152773205**	inch

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Hough Settlement Calculations due to dewatering	Updated:	8/1/2025

References:

10.6.2.4.2b—Hough Method

Estimation of spread footing settlement on cohesionless soils by the empirical Hough method shall be determined using Eqs. 10.6.2.4.2b-1 and 10.6.2.4.2b-2. *SPT* blow counts shall be corrected as specified in Article 10.4.6.2.4 for depth, i.e. overburden stress, and *SPT* hammer efficiency, before correlating the *SPT* blow counts to the bearing capacity index, C'.

$$S_e = \sum_{i=1}^{n} \Delta H_i \qquad (10.6.2.4.2b\text{-}1)$$

in which:

$$\Delta H_i = H_c \frac{1}{C'} \log\left(\frac{\sigma'_o + \Delta\sigma_v}{\sigma'_o}\right) \qquad (10.6.2.4.2b\text{-}2)$$

where:

n = number of soil layers within zone of stress influence of the footing
ΔH_i = elastic settlement of layer i (ft)
H_c = initial height of layer i (ft)
C' = bearing capacity index from Figure 10.6.2.4.2b-1 (dim)
σ'_o = initial vertical effective stress at the midpoint of layer i (ksf)
$\Delta\sigma_v$ = increase in vertical stress at the midpoint of layer i (ksf)

C10.6.2.4.2b

The Hough method was developed for normally consolidated cohesionless soils.

The Hough method has several advantages over other methods used to estimate settlement in cohesionless soil deposits, including express consideration of soil layering and the zone of stress influence beneath a footing of finite size.

The subsurface soil profile should be subdivided into layers based on stratigraphy to a depth of about three times the footing width. The maximum layer thickness should be about 10.0 ft.

While Hough (1959) did not specifically state that the *SPT N*-values should be corrected for hammer energy in addition to overburden pressure, due to the vintage of the original work, hammers that typically have an efficiency of approximately 60 percent were in general used to develop the empirical correlations contained in the method. If using *SPT* hammers with efficiencies that differ significantly from this 60 percent value, the *N* values should also be corrected for hammer energy, in effect requiring that $N1_{60}$ be used (Samtani and Nowatzki, 2006).

Studies conducted by Gifford et al. (1987) and Samtani and Nowatzki (2006) indicate that Hough's procedure may be more conservative, but with less prediction variability, than the Schmertmann Method. However, this difference is mostly taken into account through the load factor, γ_{SE}, since it has been calibrated using reliability theory (Kulicki et al. 2015) (Samtani and Kulicki, 2018) (Samtani and Allen (2018).

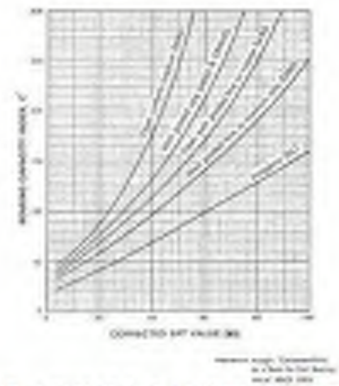

Figure 10.6.2.4.2b-1—Bearing Capacity Index versus Corrected *SPT* (Hough, 1959, as modified in Samtani and Nowatzki, 2006)

The Hough method is applicable to cohesionless soil deposits. The "Inorganic Silt" curve should generally not be applied to soils that exhibit plasticity because N-values in such soils are unreliable (Samtani and Nowatzki, 2006). The settlement characteristics of cohesive soils that exhibit plasticity should be investigated using undisturbed samples and laboratory consolidation tests as prescribed in Article 10.6.2.4.3.

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- The Hough method was found to over-predict settlement by an average factor of about 1.8 for the five footings (the standard deviation, s_u, was 0.53). In no case, however, did the Hough method under-predict the observed settlement.

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Settlement Calculations due to dewatering	Updated:	8/1/2025

Settlement due to Dewatering Point 1

Uses FHWA NHI-06-088

Point 1						
Description:	Sanitary sewer line in NE 30th Sreet					
	Elevation		Depth below Ground Surface			
Top of Ground	231	ft	0	ft		
Pipe	220.7	ft	10.3	ft		
Previous Water Level	225	ft	6	ft		
Drawdown Water Level	212.5	ft	18.5	ft		
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o
Medium dense, well graded silty SAND	211	ft	20	ft	130	0.6
Medium stiff lean CLAY	206	ft	25	ft	120	1.64
Medium dense SAND w/ some gravel	205	ft	26	ft	130	0.4
Very stiff sandy SILT	-		-		130	0.4


Table 5-4
Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)

									Per Layer		Sum		Sum beneath pipe (in)
Eleavations	USCS	Unit Weight	Estimated e_o[1]	Cc	Cr	H_o (feet)	p_o[2]	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)	
231	SM	130	0.6	0.099		0	0	0					
230	SM	130	0.6	0.099		1	130	130	0.00	0.00	0.00	0.00	
229	SM	110	0.6	0.099		1	240	240	0.00	0.00	0.00	0.00	
228	SM	110	0.6	0.099		1	350	350	0.00	0.00	0.00	0.00	
227	SM	110	0.6	0.099		1	460	460	0.00	0.00	0.00	0.00	
226	SM	125	0.6	0.099		1	585	585	0.00	0.00	0.00	0.00	
225	SM	125	0.6	0.099		1	710	710	0.00	0.00	0.00	0.00	
224	SM	125	0.6	0.099		1	772.6	835	0.00	0.00	0.00	0.00	
223	SM	125	0.6	0.099		1	835.2	960	0.00	0.00	0.00	0.00	
222	SM	125	0.6	0.099		1	897.8	1085	0.00	0.00	0.00	0.00	
221	SM	125	0.6	0.099		1	960.4	1210	0.00	0.00	0.00	0.00	
220	SM	125	0.6	0.099		1	1023	1335	0.00	0.00	0.00	0.00	0.00
219	SM	125	0.6	0.099		1	1085.6	1460	0.00	0.00	0.00	0.00	0.00
218	SM	125	0.6	0.099		1	1148.2	1585	0.00	0.00	0.00	0.00	0.00
217	SM	125	0.6	0.099		1	1210.8	1710	0.00	0.00	0.00	0.00	0.00
216	SM	125	0.6	0.099		1	1273.4	1835	0.00	0.00	0.00	0.00	0.00
215	SM	125	0.6	0.099		1	1336	1960	0.00	0.00	0.00	0.00	0.00
214	SM	125	0.6	0.099		1	1398.6	2085	0.00	0.00	0.00	0.00	0.00
213	SM	125	0.6	0.099		1	1461.2	2210	0.00	0.00	0.00	0.00	0.00
212	SM	125	0.6	0.099		1	1523.8	2272.6	0.00	0.00	0.00	0.00	0.00
211	SM	125	0.6	0.099		1	1586.4	2335.2	0.00	0.00	0.00	0.00	0.00
210	CL	125	1.64	0.411	0.0411	1	1649	2397.8	0.00	0.03	0.00	0.03	0.03
209	CL	125	1.64	0.411	0.0411	1	1711.6	2460.4	0.00	0.03	0.00	0.06	0.06
208	CL	125	1.64	0.411	0.0411	1	1774.2	2523	0.00	0.03	0.01	0.09	0.09
207	CL	125	1.64	0.411	0.0411	1	1836.8	2585.6	0.00	0.03	0.01	0.12	0.12
206	CL	125	1.64	0.411	0.0411	1	1899.4	2648.2	0.00	0.03	0.01	0.14	0.14
205	SP	125	0.4	0.039		1	1962	2710.8	0.00	0.00	0.01	0.14	0.14

1) Estimated using medium stiff density and realtive density of 40% and table 5-4.
2) Preconsolidation pressures and groundwater based off of dewatering during pipe installation .

Holts and Kovacs

Often, C_r is assumed to be 5% to 10% of C_c. Typical values of C_r range from 0.015 to 0.035 (Leonards, 1976). The lower values are for clays of lower plasticity and low OCR. Values of C_r outside the range of 0.005 to 0.05 should be considered questionable.

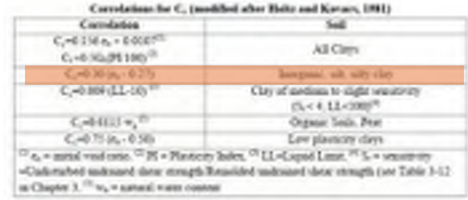
Table 5-5
Correlations for C_c (modified after Holtz and Kovacs, 1981)

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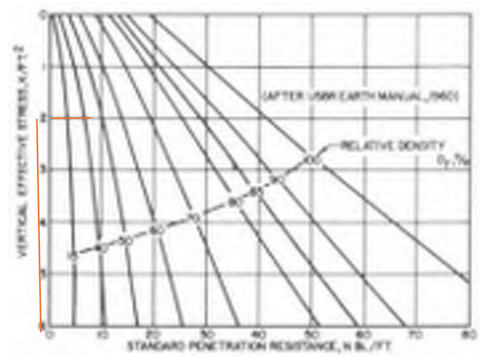


1 k/ft² = 1 ksf = 47.88 kPa
1 ft = 0.3 m

Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Settlement Calculations due to dewatering	Updated:	8/1/2025

Settlement due to Dewatering Point 2

Uses FHWA NHI-06-088

Point 2					
Description:	Jackson Village aparments. On timber piles.				
	Elevation		Depth below Ground Surface		
Top of Ground	227	ft	0	ft	
Current Water Level	225	ft	2	ft	
Drawdown Water Level	214.75	ft	12.25	ft	

	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o
Medium dense silty SAND (FILL)	223	ft	4	ft	130	0.7
Peat	217	ft	10	ft	80	1
Loose to MD silty SAND	212	ft	15	ft	125	0.7
Dense, gray silty, gravelly SAND	-		-		130	0.4

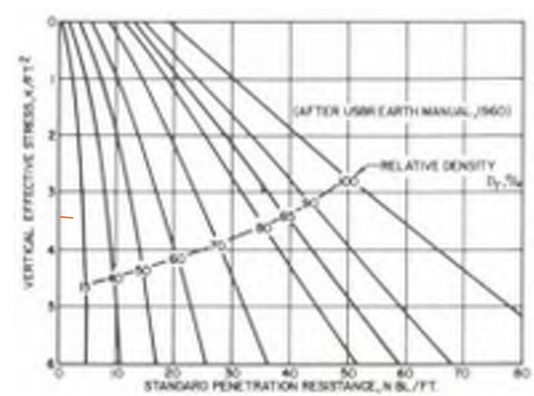
									Per Layer		Sum	
Eleavations	USCS	Unit Weight	Estimated e_o [1]	Wn [2]	Cc	H_o (feet)	p_o	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)
227	SM	130	0.7	1	0.129	0	0	0				
226	SM	130	0.7	1	0.129	1	130	130	0.00	0.00	0.00	0.00
225	SM	130	0.7	1	0.129	1	260	260	0.00	0.00	0.00	0.00
224	SM	130	0.7	1	0.129	1	327.6	390	0.00	0.00	0.00	0.00
223	SM	130	0.7	1	0.129	1	395.2	520	0.00	0.00	0.00	0.00
222	PEAT	80	2.755	1	0.115	1	412.8	600	0.00	0.06	0.00	0.06
221	PEAT	80	2.755	1	0.115	1	430.4	680	0.01	0.07	0.01	0.13
220	PEAT	80	2.755	1	0.115	1	448	760	0.01	0.08	0.02	0.22
219	PEAT	80	2.755	1	0.115	1	465.6	840	0.01	0.09	0.03	0.31
218	PEAT	80	2.755	1	0.115	1	483.2	920	0.01	0.10	0.03	0.41
217	PEAT	80	2.755	1	0.115	1	500.8	1000	0.01	0.11	0.04	0.52
216	SM	125	0.4	1	0.039	1	563.4	1125	0.00	0.00	0.04	0.52
215	SM	125	0.4	1	0.039	1	626	1250	0.00	0.00	0.04	0.52
214	SM	125	0.4	1	0.039	1	688.6	1312.6	0.00	0.00	0.04	0.52
213	SM	125	0.4	1	0.039	1	751.2	1375.2	0.00	0.00	0.04	0.52
212	SM	125	0.4	1	0.039	1	813.8	1437.8	0.00	0.00	0.04	0.52
211	SM	125	0.4	1	0.039	1	876.4	1500.4	0.00	0.00	0.04	0.52
210	SM	125	0.4	1	0.039	1	939	1563	0.00	0.00	0.04	0.52
209	SM	125	0.4	1	0.039	1	1001.6	1625.6	0.00	0.00	0.04	0.52
208	SM	125	0.4	1	0.039	1	1064.2	1688.2	0.00	0.00	0.04	0.52
207	SM	125	0.4	1	0.039	1	1126.8	1750.8	0.00	0.00	0.04	0.52
206	SM	125	0.4	1	0.039	1	1189.4	1813.4	0.00	0.00	0.04	0.52
205	SM	125	0.4	1	0.039	1	1252	1876	0.00	0.00	0.04	0.52
204	SM	125	0.4	1	0.039	1	1314.6	1938.6	0.00	0.00	0.04	0.52
203	SM	125	0.4	1	0.039	1	1377.2	2001.2	0.00	0.00	0.04	0.52
202	SM	125	0.4	1	0.039	1	1439.8	2063.8	0.00	0.00	0.04	0.52
201	SM	125	0.4	1	0.039	1	1502.4	2126.4	0.00	0.00	0.04	0.52
200	SM	125	0.4	1	0.039	1	1565	2189	0.00	0.00	0.04	0.52
199	SM	125	0.4	1	0.039	1	1627.6	2251.6	0.00	0.00	0.04	0.52
198	SM	125	0.4	1	0.039	1	1690.2	2314.2	0.00	0.00	0.04	0.52
197	SM	125	0.4	1	0.039	1	1752.8	2376.8	0.00	0.00	0.04	0.52
196	SM	125	0.4	1	0.039	1	1815.4	2439.4	0.00	0.00	0.04	0.52

1) Estimated using medium stiff density and realtive density of 40% and table 5-4.
2) Assumes material is saturated.


Table 5-4
Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)


Table 5-5
Correlations for C_c (modified after Holtz and Kovacs, 1981)

FHWA Circular #6



1 k/ft² = 1 ksf = 47.88 kPa
1 ft. = 0.3 m

Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

	Created By:	KKC
Project Jackson Park	Date:	6/2/2025
Project No. US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject Settlement Calculations due to dewatering	Updated:	8/1/2025

Settlement due to Dewatering Point 3

Uses FHWA NHI-06-088

Point 3				
Description:	2 Story Apartment Building to the east			
	Elevation		Depth below Ground Surface	
Top of Ground	227	ft	0	ft
Current Water Level	225	ft	2	ft
Drawdown Water Level	214	ft	13	ft

	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o
Fill	224	ft	3	ft	130	0.4
Peat	219	ft	8	ft	80	1
MD silty SAND	215	ft	12	ft	130	0.4
VD silty Sand w/gravel	-		-		135	

									Per Layer		Sum	
Eleavations	USCS	Unit Weight	Estimated e_o[1]	Wn[2]	Cc	H_o (feet)	p_o	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)
227	SM	130	0.4	1	0.09085	0	0	0				
226	SM	130	0.4	1	0.09085	1	130	130	0.00	0.00	0	0
225	SM	130	0.4	1	0.09085	1	260	260	0.00	0.00	0.00	0.00
224	SM	130	0.4	1	0.09085	1	327.6	390	0.00	0.00	0.00	0.00
223	PEAT	80	2.755	1	0.09085	1	345.2	470	0.00	0.04	0.00	0.04
222	PEAT	80	2.755	1	0.09085	1	362.8	550	0.00	0.05	0.01	0.09
221	PEAT	80	2.755	1	0.09085	1	380.4	630	0.01	0.06	0.01	0.15
220	PEAT	80	2.755	1	0.09085	1	398	710	0.01	0.07	0.02	0.23
219	PEAT	80	2.755	1	0.09085	1	415.6	790	0.01	0.08	0.03	0.31
218	SM	130	0.4	1	0.09085	1	483.2	920	0.00	0.00	0.03	0.31
217	SM	130	0.4	1	0.09085	1	550.8	1050	0.00	0.00	0.03	0.31
216	SM	130	0.4	1	0.09085	1	618.4	1180	0.00	0.00	0.03	0.31
215	SM	130	0.4	1	0.09085	1	686	1310	0.00	0.00	0.03	0.31
214	SM	130	0.4	1	0.09085	1	753.6	1440	0.00	0.00	0.03	0.31
213	SM	130	0.4	1	0.09085	1	821.2	1507.6	0.00	0.00	0.03	0.31
212	SM	130	0.4	1	0.09085	1	888.8	1575.2	0.00	0.00	0.03	0.31
211	SM	130	0.4	1	0.09085	1	956.4	1642.8	0.00	0.00	0.03	0.31
210	SM	130	0.4	1	0.09085	1	1024	1710.4	0.00	0.00	0.03	0.31
209	SM	130	0.4	1	0.09085	1	1091.6	1778	0.00	0.00	0.03	0.31
208	SM	130	0.4	1	0.09085	1	1159.2	1845.6	0.00	0.00	0.03	0.31
207	SM	130	0.4	1	0.09085	1	1226.8	1913.2	0.00	0.00	0.03	0.31
206	SM	130	0.4	1	0.09085	1	1294.4	1980.8	0.00	0.00	0.03	0.31
205	SM	130	0.4	1	0.09085	1	1362	2048.4	0.00	0.00	0.03	0.31
204	SM	130	0.4	1	0.09085	1	1429.6	2116	0.00	0.00	0.03	0.31
203	SM	130	0.4	1	0.09085	1	1497.2	2183.6	0.00	0.00	0.03	0.31
202	SM	130	0.4	1	0.09085	1	1564.8	2251.2	0.00	0.00	0.03	0.31

1) Estimated using medium stiff density and realtive density of 40% and table 5-4.
2) Assumes material is saturated.

Table 5-4
Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)

Table 5-5
Correlations for C_c (modified after Holtz and Kovacs, 1981)

Correlation	Soil
C_c=0.156 e_o + 0.0107	All Clays
C_c=0.5Gs(PI/100)	
C_c=0.30 (e_o - 0.27)	Inorganic, silt, silty clay
C_c=0.009 (LL-10)	Clay of medium to slight sensitivity (S_t < 4, LL<100)
C_c=0.0115 w_n	Organic Soils, Peat
C_c=0.75 (e_o - 0.50)	Low plasticity clays

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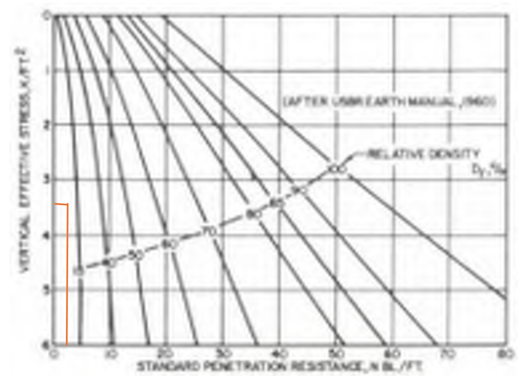


1 k/ft² = 1 ksf = 47.88 kPa
1 ft. = 0.3 m

Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Settlement Calculations due to dewatering	Updated:	8/1/2025

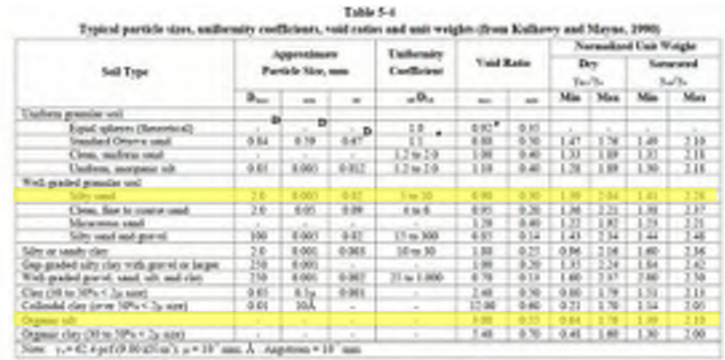
Settlement due to Dewatering Point 2

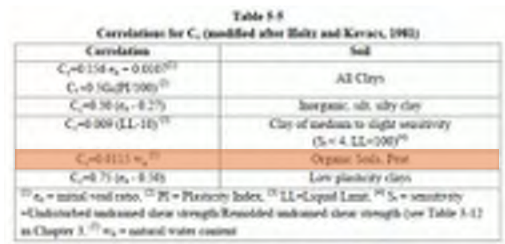
Uses FHWA NHI-06-088

Point 2A						
Description:	Jackson Village aparments. On timber piles.					
	Elevation		Depth below Ground Surface			
Top of Ground	227	ft	0	ft		
Current Water Level	225	ft	2	ft		
Drawdown Water Level	216.5	ft	10.5	ft		
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o
Medium dense silty SAND (FILL)	223	ft	4	ft	130	0.7
Peat	217	ft	10	ft	80	1
Loose to MD silty SAND	212	ft	15	ft	125	0.7
Dense, gray silty, gravelly SAND	-		-		130	0.4

									Per Layer		Sum	
Eleavations	USCS	Unit Weight	Estimated e_o [1]	Wn [2]	Cc	H_o (feet)	p_o	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)
227	SM	130	0.7	1	0.129	0	0	0				
226	SM	130	0.7	1	0.129	1	130	130	0.00	0.00	0.00	0.00
225	SM	130	0.7	1	0.129	1	260	260	0.00	0.00	0.00	0.00
224	SM	130	0.7	1	0.129	1	327.6	390	0.00	0.00	0.00	0.00
223	SM	130	0.7	1	0.129	1	395.2	520	0.00	0.00	0.00	0.00
222	PEAT	80	2.755	1	0.115	1	412.8	600	0.00	0.06	0.00	0.06
221	PEAT	80	2.755	1	0.115	1	430.4	680	0.01	0.07	0.01	0.13
220	PEAT	80	2.755	1	0.115	1	448	760	0.01	0.08	0.02	0.22
219	PEAT	80	2.755	1	0.115	1	465.6	840	0.01	0.09	0.03	0.31
218	PEAT	80	2.755	1	0.115	1	483.2	920	0.01	0.10	0.03	0.41
217	PEAT	80	2.755	1	0.115	1	500.8	1000	0.01	0.11	0.04	0.52
216	SM	125	0.4	1	0.039	1	563.4	1062.6	0.00	0.00	0.04	0.52
215	SM	125	0.4	1	0.039	1	626	1125.2	0.00	0.00	0.04	0.52
214	SM	125	0.4	1	0.039	1	688.6	1187.8	0.00	0.00	0.04	0.52
213	SM	125	0.4	1	0.039	1	751.2	1250.4	0.00	0.00	0.04	0.52
212	SM	125	0.4	1	0.039	1	813.8	1313	0.00	0.00	0.04	0.52
211	SM	125	0.4	1	0.039	1	876.4	1375.6	0.00	0.00	0.04	0.52
210	SM	125	0.4	1	0.039	1	939	1438.2	0.00	0.00	0.04	0.52
209	SM	125	0.4	1	0.039	1	1001.6	1500.8	0.00	0.00	0.04	0.52
208	SM	125	0.4	1	0.039	1	1064.2	1563.4	0.00	0.00	0.04	0.52
207	SM	125	0.4	1	0.039	1	1126.8	1626	0.00	0.00	0.04	0.52
206	SM	125	0.4	1	0.039	1	1189.4	1688.6	0.00	0.00	0.04	0.52
205	SM	125	0.4	1	0.039	1	1252	1751.2	0.00	0.00	0.04	0.52
204	SM	125	0.4	1	0.039	1	1314.6	1813.8	0.00	0.00	0.04	0.52
203	SM	125	0.4	1	0.039	1	1377.2	1876.4	0.00	0.00	0.04	0.52
202	SM	125	0.4	1	0.039	1	1439.8	1939	0.00	0.00	0.04	0.52
201	SM	125	0.4	1	0.039	1	1502.4	2001.6	0.00	0.00	0.04	0.52
200	SM	125	0.4	1	0.039	1	1565	2064.2	0.00	0.00	0.04	0.52
199	SM	125	0.4	1	0.039	1	1627.6	2126.8	0.00	0.00	0.04	0.52
198	SM	125	0.4	1	0.039	1	1690.2	2189.4	0.00	0.00	0.04	0.52
197	SM	125	0.4	1	0.039	1	1752.8	2252	0.00	0.00	0.04	0.52
196	SM	125	0.4	1	0.039	1	1815.4	2314.6	0.00	0.00	0.04	0.52

1) Assumes material is saturated.





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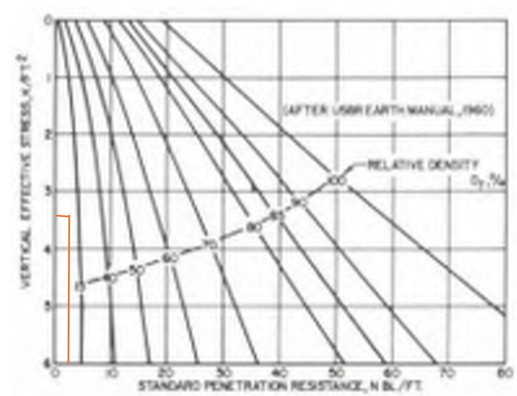

1 k/ft² = 1 ksf = 47.88 kPa
1 ft. = 0.3 m

Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Settlement Calculations due to dewatering	Updated:	8/1/2025

Settlement due to Dewatering Point 2

Uses FHWA NHI-06-088

Point 2B							
Description:	Jackson Village aparments. On timber piles.						
	Elevation		Depth below Ground Surface				
Top of Ground	227	ft	0	ft			
Current Water Level	225	ft	2	ft			
Drawdown Water Level	214	ft	13	ft			
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o	
Medium dense silty SAND (FILL)	223	ft	4	ft	130	0.7	
Peat	217	ft	10	ft	80	1	
Loose to MD silty SAND	212	ft	15	ft	125	0.7	
Dense, gray silty, gravelly SAND	-		-		130	0.4	

									Per Layer		Sum	
Eleavations	USCS	Unit Weight	Estimated e_o [1]	Wn [2]	Cc	H_o (feet)	p_o	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)
227	SM	130	0.7	1	0.129	0	0	0				
226	SM	130	0.7	1	0.129	1	130	130	0.00	0.00	0.00	0.00
225	SM	130	0.7	1	0.129	1	260	260	0.00	0.00	0.00	0.00
224	SM	130	0.7	1	0.129	1	327.6	390	0.00	0.00	0.00	0.00
223	SM	130	0.7	1	0.129	1	395.2	520	0.00	0.00	0.00	0.00
222	PEAT	80	2.755	1	0.115	1	412.8	600	0.00	0.06	0.00	0.06
221	PEAT	80	2.755	1	0.115	1	430.4	680	0.01	0.07	0.01	0.13
220	PEAT	80	2.755	1	0.115	1	448	760	0.01	0.08	0.02	0.22
219	PEAT	80	2.755	1	0.115	1	465.6	840	0.01	0.09	0.03	0.31
218	PEAT	80	2.755	1	0.115	1	483.2	920	0.01	0.10	0.03	0.41
217	PEAT	80	2.755	1	0.115	1	500.8	1000	0.01	0.11	0.04	0.52
216	SM	125	0.4	1	0.039	1	563.4	1125	0.00	0.00	0.04	0.52
215	SM	125	0.4	1	0.039	1	626	1250	0.00	0.00	0.04	0.52
214	SM	125	0.4	1	0.039	1	688.6	1375	0.00	0.00	0.04	0.52
213	SM	125	0.4	1	0.039	1	751.2	1437.6	0.00	0.00	0.04	0.52
212	SM	125	0.4	1	0.039	1	813.8	1500.2	0.00	0.00	0.04	0.52
211	SM	125	0.4	1	0.039	1	876.4	1562.8	0.00	0.00	0.04	0.52
210	SM	125	0.4	1	0.039	1	939	1625.4	0.00	0.00	0.04	0.52
209	SM	125	0.4	1	0.039	1	1001.6	1688	0.00	0.00	0.04	0.52
208	SM	125	0.4	1	0.039	1	1064.2	1750.6	0.00	0.00	0.04	0.52
207	SM	125	0.4	1	0.039	1	1126.8	1813.2	0.00	0.00	0.04	0.52
206	SM	125	0.4	1	0.039	1	1189.4	1875.8	0.00	0.00	0.04	0.52
205	SM	125	0.4	1	0.039	1	1252	1938.4	0.00	0.00	0.04	0.52
204	SM	125	0.4	1	0.039	1	1314.6	2001	0.00	0.00	0.04	0.52
203	SM	125	0.4	1	0.039	1	1377.2	2063.6	0.00	0.00	0.04	0.52
202	SM	125	0.4	1	0.039	1	1439.8	2126.2	0.00	0.00	0.04	0.52
201	SM	125	0.4	1	0.039	1	1502.4	2188.8	0.00	0.00	0.04	0.52
200	SM	125	0.4	1	0.039	1	1565	2251.4	0.00	0.00	0.04	0.52
199	SM	125	0.4	1	0.039	1	1627.6	2314	0.00	0.00	0.04	0.52
198	SM	125	0.4	1	0.039	1	1690.2	2376.6	0.00	0.00	0.04	0.52
197	SM	125	0.4	1	0.039	1	1752.8	2439.2	0.00	0.00	0.04	0.52
196	SM	125	0.4	1	0.039	1	1815.4	2501.8	0.00	0.00	0.04	0.52

1) Assumes material is saturated.

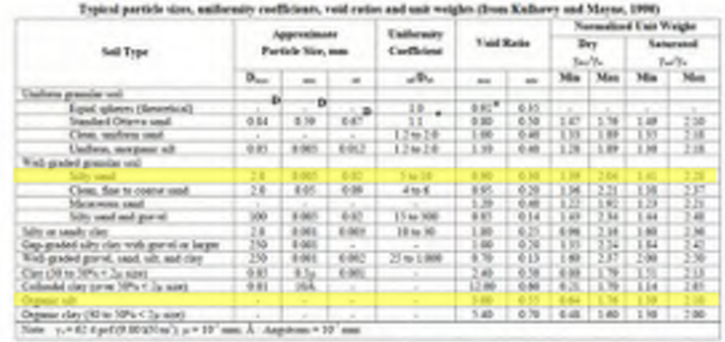
Table 5-4
Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)

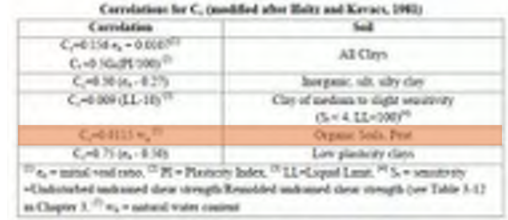
Table 5-5
Correlations for C_c (modified after Holtz and Kovacs, 1981)

Correlation	Soil
[illegible]	All Clays
[illegible]	Inorganic silt, silty clay
[illegible]	[illegible]
[illegible]	Organic Soils, Peat
[illegible]	Low plasticity clays

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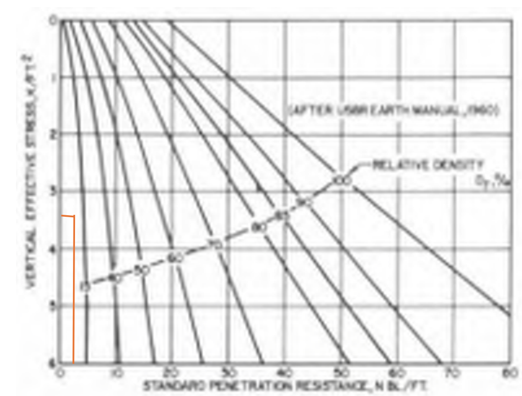


1 k/ft² = 1 ksf = 47.88 kPa
1 ft. = 0.3 m

Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Settlement Calculations due to dewatering	Updated:	8/1/2025

Settlement due to Dewatering Point 3

Uses FHWA NHI-06-088

Point 3A							
Description:	2 Story Apartment Building to the east						
	Elevation		Depth below Ground Surface				
Top of Ground	227	ft	0	ft			
Current Water Level	225	ft	2	ft			
Drawdown Water Level	213	ft	14	ft			
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o	
Fill	224	ft	3	ft	130	0.4	
Peat	219	ft	8	ft	80	1	
MD silty SAND	215	ft	12	ft	130	0.4	
VD silty Sand w/gravel	-		-		135		

									Per Layer		Sum	
Eleavations	USCS	Unit Weight	Estimated e_o[1]	Wn[2]	Cc	H_o (feet)	p_o	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)
227	SM	130	0.4	1	0.09085	0	0	0				
226	SM	130	0.4	1	0.09085	1	130	130	0.00	0.00	0	0
225	SM	130	0.4	1	0.09085	1	260	260	0.00	0.00	0.00	0.00
224	SM	130	0.4	1	0.09085	1	327.6	390	0.00	0.00	0.00	0.00
223	PEAT	80	2.755	1	0.09085	1	345.2	470	0.00	0.04	0.00	0.04
222	PEAT	80	2.755	1	0.09085	1	362.8	550	0.00	0.05	0.01	0.09
221	PEAT	80	2.755	1	0.09085	1	380.4	630	0.01	0.06	0.01	0.15
220	PEAT	80	2.755	1	0.09085	1	398	710	0.01	0.07	0.02	0.23
219	PEAT	80	2.755	1	0.09085	1	415.6	790	0.01	0.08	0.03	0.31
218	SM	130	0.4	1	0.09085	1	483.2	920	0.00	0.00	0.03	0.31
217	SM	130	0.4	1	0.09085	1	550.8	1050	0.00	0.00	0.03	0.31
216	SM	130	0.4	1	0.09085	1	618.4	1180	0.00	0.00	0.03	0.31
215	SM	130	0.4	1	0.09085	1	686	1310	0.00	0.00	0.03	0.31
214	SM	130	0.4	1	0.09085	1	753.6	1440	0.00	0.00	0.03	0.31
213	SM	130	0.4	1	0.09085	1	821.2	1570	0.00	0.00	0.03	0.31
212	SM	130	0.4	1	0.09085	1	888.8	1637.6	0.00	0.00	0.03	0.31
211	SM	130	0.4	1	0.09085	1	956.4	1705.2	0.00	0.00	0.03	0.31
210	SM	130	0.4	1	0.09085	1	1024	1772.8	0.00	0.00	0.03	0.31
209	SM	130	0.4	1	0.09085	1	1091.6	1840.4	0.00	0.00	0.03	0.31
208	SM	130	0.4	1	0.09085	1	1159.2	1908	0.00	0.00	0.03	0.31
207	SM	130	0.4	1	0.09085	1	1226.8	1975.6	0.00	0.00	0.03	0.31
206	SM	130	0.4	1	0.09085	1	1294.4	2043.2	0.00	0.00	0.03	0.31
205	SM	130	0.4	1	0.09085	1	1362	2110.8	0.00	0.00	0.03	0.31
204	SM	130	0.4	1	0.09085	1	1429.6	2178.4	0.00	0.00	0.03	0.31
203	SM	130	0.4	1	0.09085	1	1497.2	2246	0.00	0.00	0.03	0.31
202	SM	130	0.4	1	0.09085	1	1564.8	2313.6	0.00	0.00	0.03	0.31

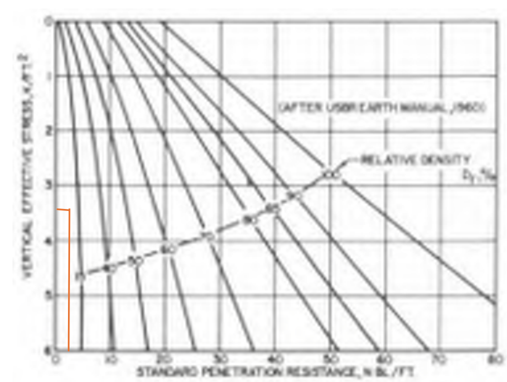
1) Estimated using medium stiff density and realtive density of 40% and table 5-4.
2) Assumes material is saturated.

Table 5-4
Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)

Table 5-5
Correlations for C_c (modified after Holtz and Kovacs, 1981)

Correlation	Soil
C_c=0.156 e_o + 0.0107	All Clays
C_c=0.5G_s(PI/100)	
C_c=0.30(e_o - 0.27)	Inorganic, silt, silty clay
C_c=0.009 (LL-10)	Clay of medium to slight sensitivity (S_t < 4, LL<100)
C_c=0.0115 w_n	Organic Soils, Peat
C_c=0.75(e_o - 0.50)	Low plasticity clays

FHWA Circular #6



1 k/ft² = 1 ksf = 47.88 kPa
1 ft. = 0.3 m

Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
Project No.	US-EI-5539.3867-US-SHA Jackson Park Village	Reviewed by:	TDW
Subject	Settlement Calculations due to dewatering	Updated:	8/1/2025

Settlement due to Dewatering Point 3

Uses FHWA NHI-06-088

Point 3B							
Description:	2 Story Apartment Building to the east						
	Elevation		Depth below Ground Surface				
Top of Ground	227	ft	0	ft			
Current Water Level	225	ft	2	ft			
Drawdown Water Level	214	ft	13	ft			
	Bottom of Soil Layer Elevation		Bottom of Soil Depth		Unit Weight	Estimated e_o	
Fill	224	ft	3	ft	130	0.4	
Peat	219	ft	8	ft	80	1	
MD silty SAND	215	ft	12	ft	130	0.4	
VD silty Sand w/gravel	-		-		135		

									Per Layer		Sum	
Eleavations	USCS	Unit Weight	Estimated e_o [1]	Wn [2]	Cc	H_o (feet)	p_o	p_f	S_c (feet)	S_c (in)	S_c (feet)	S_c (in)
227	SM	130	0.4	1	0.09085	0	0	0				
226	SM	130	0.4	1	0.09085	1	130	130	0.00	0.00	0	0
225	SM	130	0.4	1	0.09085	1	260	260	0.00	0.00	0.00	0.00
224	SM	130	0.4	1	0.09085	1	327.6	390	0.00	0.00	0.00	0.00
223	PEAT	80	2.755	1	0.09085	1	345.2	470	0.00	0.04	0.00	0.04
222	PEAT	80	2.755	1	0.09085	1	362.8	550	0.00	0.05	0.01	0.09
221	PEAT	80	2.755	1	0.09085	1	380.4	630	0.01	0.06	0.01	0.15
220	PEAT	80	2.755	1	0.09085	1	398	710	0.01	0.07	0.02	0.23
219	PEAT	80	2.755	1	0.09085	1	415.6	790	0.01	0.08	0.03	0.31
218	SM	130	0.4	1	0.09085	1	483.2	920	0.00	0.00	0.03	0.31
217	SM	130	0.4	1	0.09085	1	550.8	1050	0.00	0.00	0.03	0.31
216	SM	130	0.4	1	0.09085	1	618.4	1180	0.00	0.00	0.03	0.31
215	SM	130	0.4	1	0.09085	1	686	1310	0.00	0.00	0.03	0.31
214	SM	130	0.4	1	0.09085	1	753.6	1440	0.00	0.00	0.03	0.31
213	SM	130	0.4	1	0.09085	1	821.2	1507.6	0.00	0.00	0.03	0.31
212	SM	130	0.4	1	0.09085	1	888.8	1575.2	0.00	0.00	0.03	0.31
211	SM	130	0.4	1	0.09085	1	956.4	1642.8	0.00	0.00	0.03	0.31
210	SM	130	0.4	1	0.09085	1	1024	1710.4	0.00	0.00	0.03	0.31
209	SM	130	0.4	1	0.09085	1	1091.6	1778	0.00	0.00	0.03	0.31
208	SM	130	0.4	1	0.09085	1	1159.2	1845.6	0.00	0.00	0.03	0.31
207	SM	130	0.4	1	0.09085	1	1226.8	1913.2	0.00	0.00	0.03	0.31
206	SM	130	0.4	1	0.09085	1	1294.4	1980.8	0.00	0.00	0.03	0.31
205	SM	130	0.4	1	0.09085	1	1362	2048.4	0.00	0.00	0.03	0.31
204	SM	130	0.4	1	0.09085	1	1429.6	2116	0.00	0.00	0.03	0.31
203	SM	130	0.4	1	0.09085	1	1497.2	2183.6	0.00	0.00	0.03	0.31
202	SM	130	0.4	1	0.09085	1	1564.8	2251.2	0.00	0.00	0.03	0.31

1) Estimated using medium stiff density and realtive density of 40% and table 5-4.

2) Assumes material is saturated.

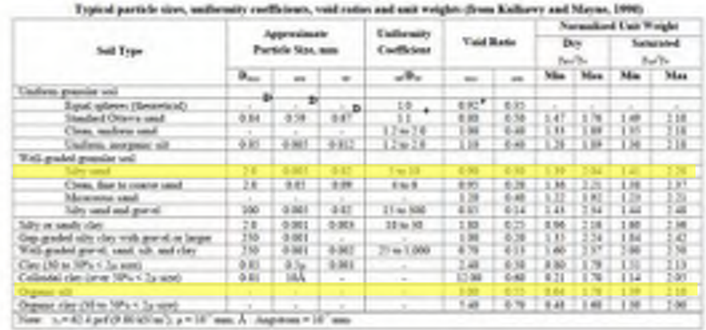


Table 5-4

Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)

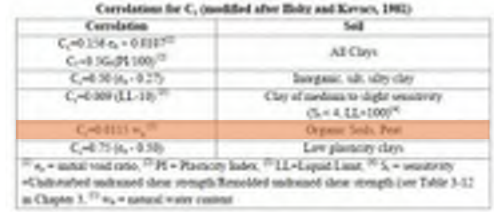


Table 5-5

Correlations for C_c (modified after Holtz and Kovacs, 1981)

Correlation	Soil
[illegible]	All Clays
[illegible]	Inorganic, silt, silty clay
[illegible]	Clay of medium to slight sensitivity
[illegible]	Organic Soils, Peat
[illegible]	Low plasticity clays

FHWA Circular #6

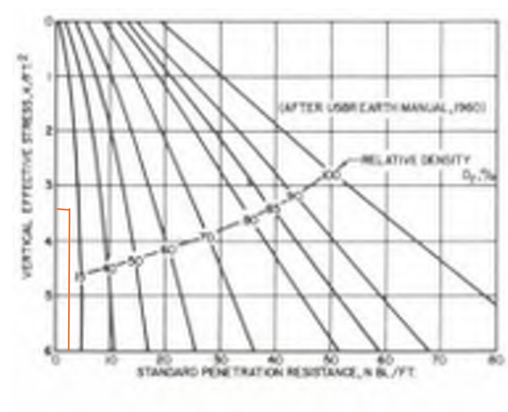


Figure 4-1: Correlation Between Relative Density and SPT Resistance (NAVFAC, 1986a, after Gibbs & Holtz)

		Date:	
		Reviewed by:	
		Created By:	KKC
Project	Jackson Park	Date:	6/2/2025
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$$S_c = \sum_{1}^{n} \frac{C_c}{1+e_o} H_o \log_{10}\left(\frac{p_f}{p_o}\right)$$

$$S_c = \sum_{1}^{n} C_{ce} H_o \log_{10}\left(\frac{p_f}{p_o}\right)$$

$$C_{ce} = \frac{C_c}{1+e_o}$$

Equation variables are defined in the following section.

C_c = compression index

C_{ce} = modified compression index

C_r = recompression index

C_{re} = modified recompression index

e_o = initial void ratio

H_o = thickness of compressible layer

p_o = initial overburden pressure (= p_c for normally consolidated soils)

p_c = preconsolidation pressure

p_f = final overburden pressure = $p_o + \Delta p$

S_c = consolidation settlement

Δp = increase in effective stress

Table 5-4
Typical particle sizes, uniformity coefficients, void ratios and unit weights (from Kulhawy and Mayne, 1990)

Soil Type	Approximate Particle Size, mm			Uniformity Coefficient	Void Ratio		Normalized Unit Weight: Dry γ_{dm}/γ_w		Normalized Unit Weight: Saturated γ_{sat}/γ_w	
	D_{max}	D_{min}	D_{10}	D_{60}/D_{10}	e_{max}	e_{min}	Min	Max	Min	Max
Uniform granular soil										
Equal spheres (theoretical)	-	-	-	1.0	0.92	0.35	-	-	-	-
Standard Ottawa sand	0.84	0.59	0.67	1.1	0.80	0.50	1.47	1.76	1.49	2.10
Clean, uniform sand	-	-	-	1.2 to 2.0	1.00	0.40	1.33	1.89	1.35	2.18
Uniform, inorganic silt	0.05	0.005	0.012	1.2 to 2.0	1.10	0.40	1.28	1.89	1.30	2.18
Well-graded granular soil										
Silty sand	2.0	0.005	0.02	5 to 10	0.90	0.30	1.39	2.04	1.41	2.28
Clean, fine to coarse sand	2.0	0.05	0.09	4 to 6	0.95	0.20	1.36	2.21	1.38	2.37
Micaceous sand	-	-	-	-	1.20	0.40	1.22	1.92	1.23	2.21
Silty sand and gravel	100	0.005	0.02	15 to 300	0.85	0.14	1.43	2.34	1.44	2.48
Silty or sandy clay	2.0	0.001	0.003	10 to 30	1.80	0.25	0.96	2.16	1.60	2.36
Gap-graded silty clay with gravel or larger	250	0.001	-	-	1.00	0.20	1.35	2.24	1.84	2.42
Well-graded gravel, sand, silt, and clay	250	0.001	0.002	25 to 1,000	0.70	0.13	1.60	2.37	2.00	2.50
Clay (30 to 50% < 2μ size)	0.05	0.5μ	0.001	-	2.40	0.50	0.80	1.79	1.51	2.13
Colloidal clay (over 50% < 2μ size)	0.01	10Å	-	-	12.00	0.60	0.21	1.70	1.14	2.05
Organic silt	-	-	-	-	3.00	0.55	0.64	1.76	1.39	2.10
Organic clay (30 to 50% < 2μ size)	-	-	-	-	5.40	0.70	0.48	1.60	1.30	2.00

Note: γ_w = 62.4 pcf (9.80 kN/m³); μ = 10^{-3} mm; Å : Angstrom = 10^{-7} mm

5.4.6.1 Compression Index, C_c

Over 70 different equations have been published for correlating C_c with the index properties of clays. Table 5-5 lists some of the more useful correlations. Figure 5-9 shows correlations between natural water content and C_c for fine-grained soils, peats and shales. **Note that the coordinates in Figure 5-9 are both logarithmic so that values of C_c can vary by as much as a factor of 5 with respect to the average trend line in these empirical correlations. Values of C_c obtained from Table 5-5 or Figure 5-9 should not be used for final design.**

Table 5-5
Correlations for C_c (modified after Holtz and Kovacs, 1981)

Correlation	Soil
C_c=0.156 e_o + 0.0107[1] C_c=0.5G_s(PI/100)[2]	All Clays
C_c=0.30 (e_o - 0.27)	Inorganic, silt, silty clay
C_c=0.009 (LL-10)[3]	Clay of medium to slight sensitivity (S_t < 4, LL<100)[4]
C_c=0.0115 w_n[5]	Organic Soils, Peat
C_c=0.75 (e_o - 0.50)	Low plasticity clays

[1] e_o = initial void ratio, [2] PI = Plasticity Index, [3] LL=Liquid Limit, [4] S_t = sensitivity =Undisturbed undrained shear strength/Remolded undrained shear strength (see Table 3-12 in Chapter 3, [5] w_n = natural water content