

APPENDIX F

**LAKE SEDIMENT PHYSICAL CHARACTERISTICS & GEOTECHNICAL
PROPERTIES**

**APPENDIX F
ONONDAGA LAKE SEDIMENT PHYSICAL CHARACTERISTICS AND GEOTECHNICAL PROPERTIES**

Remediation Area	Parameter	Water Content	Percent Gravel	Percent Coarse Gravel	Percent Fine Gravel	Percent Sand	Percent Coarse Sand	Percent Medium Sand	Percent Fine Sand	Particles < 0.150 mm (Sieve #100)	Particles < 0.040 mm	Percent Fines (<0.075 mm)	Percent Silt	Percent Clay	D85	D50	D15	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Bulk Density	Dry Density
		%	%	%	%	%	%	%	%	%	%	%	%	%	mm	mm	mm	%	%	%		pcf	pcf
A Dredge Prism	Volume-DD-Weighted Average (1) (2)	77.2	0.3	0.0	0.3	23.0	0.9	4.0	18.1	86.0	66.3	76.7	58.7	18.0	0.163	0.020	0.005	48	34	14	2.68	96.6	54.5
C Dredge Prism	Volume-DD-Weighted Average (1)	76.0	15.6	0.0	15.3	30.2	4.9	6.9	18.5	62.7	51.0	54.2	32.6	21.7	5.338	0.052	0.003	43	32	10	2.74	97.4	55.3
D Dredge Prism - SMU 2	Volume-DD-Weighted Average (1)	132.9	0.1	0.0	0.1	5.9	0.3	0.7	5.0	96.0	88.8	94.0	73.0	21.0	0.035	0.014	0.007	88	48	40	2.47	84.1	36.3
D Dredge Prism - West	Volume-DD-Weighted Average (1)	127.9	0.6	0.0	0.6	9.2	1.4	3.2	4.5	91.5	87.4	90.3	56.8	33.5	0.163	0.009	0.002	82	52	29	2.52	85.0	37.3
D Dredge Prism - Center	Volume-DD-Weighted Average (1)	115.7	0.5	0.0	0.5	16.3	3.2	4.3	8.8	86.1	78.9	83.2	53.1	30.0	0.224	0.014	0.003	82	52	29	2.55	86.8	40.2
D Dredge Prism - East	Volume-DD-Weighted Average (1)	128.7	0.6	0.0	0.5	6.6	0.9	1.7	4.2	94.7	89.6	92.8	66.9	25.7	0.281	0.014	0.004	72	45	27	2.54	85.1	37.5
D Dredge Prism	Average (3)	126.3	0.4	0.0	0.4	9.5	1.5	2.5	5.6	92.1	86.2	90.1	62.5	27.5	0.176	0.013	0.004	81	49	31	2.52	85.2	37.8
E Dredge Prism	Volume-DD-Weighted Average (1)	61.9	0.4	0.0	0.3	56.3	1.3	7.3	47.7	62.9	33.0	43.3	31.8	11.5	0.340	0.107	0.024	46	32	14	2.58	100.6	62.1

Notes:

- Calculations are based on available PDI geotechnical data within the dredge prism. DD indicates dry density. Bulk density and dry density values are based on volume-weighted average calculations.
- Since only one sample location is available for volume-DD-weighted average for the specific gravity of Remediation Area A, volume-weighted average specific gravity from seven sample locations is presented in this summary.
- Average values shown are the arithmetic means of the volume-DD-weighted averages of the four sub-areas in Remediation Area D (i.e., D-SMU2, D-West, D-Center, D-East).
- Remediation Area B only has two available sample locations within the dredge prism for calculations; therefore, Remediation Area B is not included in this summary. Design parameters can be assumed to be the same as Remediation Area A.

**APPENDIX F
WEIGHTED AVERAGE CALCULATION EQUATIONS**

PDI Data Set

1. Density Group

1.1 Basic Density Parameters

Bulk density (includes "calculated bulk density" and "bulk density")

Dry density (includes "calculated dry density" and "calculated dry density from bulk density")

1.2 Weighted Density Parameters

Weighted Density Parameters	Equations	Notes	Applications
Length-weighted average bulk density (BD _{LWA})	$BD_{LWA} = \text{SUM} (BD(i) * \text{Length}(i)) / \text{SUM} (\text{Length}(i))$	i: sample sections of each core location	One average for each core location where density is available
Volume-weighted average bulk density (BD _{VWA})	$BD_{VWA} = \text{SUM} (BD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (\text{Volume}(j))$	j: core location	One average for each Remediation Area
		Volume (j): area influenced by core location j (Thiessen polygon)*average dredge depth of the polygon	
Length-weighted average dry density (DD _{LWA})	$DD_{LWA} = \text{SUM} (DD(i) * \text{Length}(i)) / \text{SUM} (\text{Length}(i))$	i: sample section of each core location	One average for each core location where density is available
Volume-weighted average dry density (DD _{VWA})	$DD_{VWA} = \text{SUM} (DD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (\text{Volume}(j))$	j: core location	One average for each Remediation Area
		Volume (j): area influenced by core location j (Thiessen polygon)*average dredge depth of the polygon	

2. Grain Size Group

2.1 Basic Grain Size Parameters

Particles<0.150mm

Particles<0.074 mm

Particles<0.04 mm

D85

D50

D15

Percent gravel

Percent coarse gravel

Percent fine gravel

Percent sand

Percent coarse sand

Percent medium sand

Percent fine sand

Percent fines

Percent silt

Percent clay

2.2 Weighted Grain Size Parameters (for each basic grain size parameter)

Weighted Grain Size Parameters	Equation	Notes	Application
Length-weighted average (LWA)	$\text{Particle}\%_{LWA} = \text{SUM} (\text{Particle}\% (i) * \text{Length}(i)) / \text{SUM} (\text{Length}(i))$	i: sample sections of each core location	One average for each core location where grain size is available
Volume-weighted average (VWA)	$\text{Particle}\%_{VWA} = \text{SUM} (\text{Particle}\%_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (\text{Volume}(j))$	j: core location	One average for each Remediation Area
		Volume (j): area influenced by core location j (Thiessen polygon)*average dredge depth of the polygon	
Length and bulk density-weighted average (LBDWA)	$\text{Particle}\%_{LBDWA} = \text{SUM} (\text{Particle}\% (i) * \text{Length}(i)*BD(i)) / \text{SUM} (\text{Length}(i)*BD(i))$	BD(i): Bulk density of each sample section in a core location	One average for each core location where grain size and density are available
Volume and bulk density-weighted average (VBDWA)	$\text{Particle}\%_{VBDWA} = \text{SUM} (\text{Particle}\%_{LWA}(j) * BD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (BD_{LWA}(j) * \text{Volume}(j))$	j: core location	One average for each Remediation Area
		BD _{LWA} (j): length-weighted average bulk density of core location j from Step 1.2	
Length and dry density-weighted average (LDDWA)	$\text{Particle}\%_{LDDWA} = \text{SUM} (\text{Particle}\% (i) * \text{Length}(i)*DD(i)) / \text{SUM} (\text{Length}(i)*DD(i))$	DD(i): Dry density of each sample section in a core location	One average for each core location where grain size and density are available
Volume and dry density-weighted average (VDDWA)	$\text{Particle}\%_{VDDWA} = \text{SUM} (\text{Particle}\%_{LWA}(j) * DD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (DD_{LWA}(j) * \text{Volume}(j))$	j: core location	One average for each Remediation Area
		DD _{LWA} (j): length-weighted average dry density of core location j from Step 1.2	

3. Water Content (percent moisture), Atterberg limits, and Specific Gravity Group

3.1 Parameters

Water content (percent moisture)
Liquid limit
Plastic limit
Plasticity index
Specific gravity

3.2 Weighted Water Content Parameters

Weighted Water Content Parameters	Equation	Notes	Application
Length-weighted average water content (WC _{LWA})	$WC_{LWA} = \text{SUM} (WC (i) * \text{Length}(i)) / \text{SUM} (\text{Length}(i))$	i: sample sections of each core location	One average for each core location where grain size is available
Volume-weighted average water content (WC _{VWA})	$WC_{VWA} = \text{SUM}(WC_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (\text{Volume}(j))$	j: core location Volume (j): area influenced by core location j (Thiessen polygon)*average dredge depth of the polygon	One average for each Remediation Area
Length and bulk density-weighted average water content (WC _{LBDWA})	$WC_{LBDWA} = \text{SUM} (WC(i) * \text{Length}(i)*BD(i)) / \text{SUM} (\text{Length}(i)*BD(i))$	BD(i): Bulk density of each sample section in a core location	One average for each core location where grain size and density are available
Volume and bulk density-weighted average water content (WC _{VBDWA})	$WC_{VBDWA} = \text{SUM}(WC_{LWA}(j) * BD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (BD_{LWA}(j) * \text{Volume}(j))$	j: core location BD _{LWA} (j): length-weighted average bulk density of core location j from Step 1.2	One average for each Remediation Area
Length and dry density-weighted average water content (WC _{LDDWA})	$WC_{LDDWA} = \text{SUM} (WC (i) * \text{Length}(i)*DD(i)) / \text{SUM} (\text{Length}(i)*DD(i))$	DD(i): Dry density of each sample section in a core location	One average for each core location where grain size and density are available
Volume and dry density-weighted average water content (WC _{VDDWA})	$WC_{VDDWA} = \text{SUM}(WC_{LWA}(j) * DD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (DD_{LWA}(j) * \text{Volume}(j))$	j: core location DD _{LWA} (j): length-weighted average dry density of core location j from Step 1.2	One average for each Remediation Area

3.3 Weighted Specific Gravity Parameters

Weighted Specific Gravity Parameters	Equation	Notes	Application
Length-weighted average specific gravity (SG _{LWA})	$SG_{LWA} = \text{SUM} (SG (i) * \text{Length}(i)) / \text{SUM} (\text{Length}(i))$	i: sample sections of each core location	One average for each core location where grain size is available
Volume-weighted average specific gravity (SG _{VWA})	$SG_{VWA} = \text{SUM}(SG_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (\text{Volume}(j))$	j: core location Volume (j): area influenced by core location j (Thiessen polygon)*average dredge depth of the polygon	One average for each Remediation Area
Length and bulk density-weighted average specific gravity (SG _{LBDWA})	$SG_{LBDWA} = \text{SUM} (SG(i) * \text{Length}(i)*BD(i)) / \text{SUM} (\text{Length}(i)*BD(i))$	BD(i): Bulk density of each sample section in a core location	One average for each core location where grain size and density are available
Volume and bulk density-weighted average specific gravity (SG _{VBDWA})	$SG_{VBDWA} = \text{SUM}(SG_{LWA}(j) * BD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (BD_{LWA}(j) * \text{Volume}(j))$	j: core location BD _{LWA} (j): length-weighted average bulk density of core location j from Step 1.2	One average for each Remediation Area
Length and dry density-weighted average specific gravity (SG _{LDDWA})	$SG_{LDDWA} = \text{SUM} (SG (i) * \text{Length}(i)*DD(i)) / \text{SUM} (\text{Length}(i)*DD(i))$	DD(i): Dry density of each sample section in a core location	One average for each core location where grain size and density are available
Volume and dry density-weighted average specific gravity (SG _{VDDWA})	$SG_{VDDWA} = \text{SUM}(SG_{LWA}(j) * DD_{LWA}(j) * \text{Volume}(j)) / \text{SUM} (DD_{LWA}(j) * \text{Volume}(j))$	j: core location DD _{LWA} (j): length-weighted average dry density of core location j from Step 1.2	One average for each Remediation Area