Topographic Map of Permitted Facility

MN0052612: Erie Pier Processing & Reuse Facility
T49N, R14W, Section 8
Duluth, St. Louis County, Minnesota

Map produced by: MPCA Staff, 12/7/2017
Scale: 1:15,783,890

0 0.15 0.3 0.6 Miles

LEGGETTE, BRASHEARS & GRAHAM,INC.
Professional Groundwater & Environmental Engineering Services

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August 4, 2016

Steven Brossart
USACE, Detroit District, Duluth Area Office
600 Lake Ave S
Duluth, MN 55802

Jim Sharrow
Duluth Seaway Port Authority
1200 Port Terminal Drive
Duluth, MN 55802

RE: ERIE PIER NOXIOUS WEED AND INVASIVE PLANT SURVEY

Dear Mr. Brossart and Sharrow:

On behalf of the U.S. Army Corps of Engineers, Detroit District, Duluth Area Office and the Duluth Seaway Port Authority, Leggette, Brashears & Graham, Inc. (LBG) completed a survey for noxious weeds and invasive plant species at the Erie Pier Confined Disposal Facility. This letter report presents the survey results and recommendations for control of the identified noxious weed and invasive plant species.

1 Introduction

Erie Pier is an 89 acre Placement and Reuse Facility for dredge materials from the Duluth-Superior Harbor **Appendix I, Figure 1**. Dredged materials are sorted at Erie Pier and used in various projects in Minnesota and Wisconsin. The dynamic nature of the land disturbance from the placement and reuse of dredge material makes controlling invasive species difficult. The use and transport of dredge materials from Erie Pier can distribute noxious weed and invasive plant seed. The Minnesota Department of Agriculture (MDA) regulates noxious weeds under the Minnesota Noxious Weed Law. Minnesota and Wisconsin regulate non-native plant species through Minnesota Statute 84D and Wisconsin Administrative Code Chapter NR 40. The purpose of the survey was to identify which noxious weeds and invasive plants occur at Erie Pier so that they can be properly managed. The primary goal of invasive species control at Erie Pier should be to prevent the spread of invasive species into new areas.

2 Minnesota Department of Agriculture Noxious Weeds

The survey identified populations of the following plant species that are identified by the Minnesota Department of Agriculture (MDA) as noxious weeds. Noxious weeds are regulated under the Minnesota Noxious Weed Law because they can cause harm to people, animals, food supply, and/or the environment. These species are also identified by the Minnesota Department of Natural Resources

(MNDNR) and the Wisconsin Department of Natural Resources (WDNR) as plants that can be invasive in natural areas. These species are in large enough populations to pose a threat to native plant communities and should be managed to prevent further spread. The survey locations of MDA noxious weeds and MNDNR/WDNR invasive plants are included in **Appendix I, Figure 2**.

2.1 Common Tansy (Tanacetum vulgare)

The survey identified significant populations of common tansy within the survey area, particularly along the slopes of the containment cell berms. Common tansy is highly invasive forming dense colonies that outcompete native species. Common tansy is listed by the MDA as a Prohibited – Control noxious weed. Efforts must be made to prevent the spread, seed maturation, and dispersal of plants into new areas (MDA 2015).

2.1.1 Control Method

Chemical: Spraying with a selective broadleaf herbicide such as metsulfuron-methyl according to manufacturer's instructions. Mowing several weeks prior to treatment can be effective to remove old canes and stimulate vegetative growth. Treatment should be completed in the summer before flowering.

Mechanical: Mow in June prior to flowering. Remow as needed to prevent seed set.

Recommended Control Method at Erie Pier: Mow in June prior to flowering. Remow in August to prevent seed set. Explore herbicide control in stabilized areas that will not be reworked for an extended period of time.

2.2 Canada Thistle (Cirsium arvense)

The survey identified significant populations of Canada thistle within the survey area, particularly along the slopes of the containments cell berms and in large colonies in the north cell. Canada thistle spreads quickly (10-12 feet in one season) replacing native plants and diminishing diversity (MNDNR 2015). Canada thistle is listed by the MDA as a Prohibited – Control noxious weed. Efforts must be made to prevent the spread, seed maturation, and dispersal of plants into new areas (MDA 2015).

2.2.1 Control Method

Chemical: Spraying with a selective broadleaf herbicide such as metsulfuron-methyl according to manufacturer's instructions. Treat in early summer before flowering and/or to rosettes in the fall.

Mechanical: Repeated mowing close to the ground can reduce an infestation within a few years. Mow in June prior to flowering. Remow as needed to prevent seed set typically in August.

Recommended Control Method at Erie Pier: Mow in June prior to flowering. Remow as needed to prevent seed set typically in August. Consider herbicide control of the large colonies in the northcentral portion of the property with replacement seeding of native grasses.

2.3 Purple Loosestrife (Lythrum salicaria)

The survey identified several populations of purple loosestrife within the survey area primarily along the water's edge within the containment cells. The purple loosestrife at Erie Pier were observed to be stressed due to predation from biological control insects. Purple loosestrife invades marshes and lakeshores, forming dense colonies replacing wetland plants and degrading wildlife habitat. Purple loosestrife is listed by the MDA as a Prohibited – Control noxious weed. Efforts must be made to prevent the spread, seed maturation, and dispersal of plants into new areas (MDA 2015).

2.3.1 Control Method

Chemical: Spraying with a herbicide such as glyphosate formulated for use over water. Hand spray a 30% a.i. glyphosate to freshly cut stems after removing flowers. Cut and bag any flower heads. Hand spraying individual plants with 1.5-3% a.i. glyphosate or hand wiping plants with 5% a.i. glyphosate is also effective. Treatment should be completed in the summer before flowering.

Mechanical: Hand pulling being careful not to leave any roots behind.

Biological: Biological control is currently considered the best option for large-scale control.

Recommended Control Method at Erie Pier: Continue contracting herbicide control while exploring biological control. Biological control of purple loosestrife from insects was observed to be taking place at Erie Pier. The MDNR is actively controlling purple loosestrife throughout the St. Louis River corridor. Additional insects may be available to be released at Erie Pier.

2.4 Spotted Knapweed (Centaurea stoebe spp. micranthos)

The survey identified populations of spotted knapweed within the survey area, particularly along the outside edge of the Erie Pier perimeter access road. Spotted knapweed is highly invasive replacing native plants and diminishing diversity. Spotted knapweed is listed by the MDA as a Prohibited – Control noxious weed. Efforts must be made to prevent the spread, seed maturation, and dispersal of plants into new areas (MDA 2015).

2.4.1 Control Method

Chemical: Spraying with a herbicide such as glyphosate formulated for use over water. Treat in early spring before flowering or in the fall.

Mechanical: Hand-pulling alone can be effective in sandier soils. Dig out and remove as much of the long tap root as possible. Mowing before flowering can reduce seed production. However, because the plants continue to bloom throughout the summer/early fall, repeated mowing throughout the season is required to keep the plants from re-sprouting and producing seeds

Biological: Biological control is an option for reducing large infestations.

Recommended Control Method at Erie Pier: The populations of spotted knapweed were limited to the outside edge of the Erie Pier perimeter access road. The spotted knapweed could be controlled with a herbicide application in conjunction with the purple loosestrife. Hand pulling is feasible with the limited size of the population. Explore the option of biological control for long-term management.

2.5 Common Reed (Phragmites australis, spp. australis)

The survey identified a couple significant populations of common reed within the survey area. Non-native common reed can become very dense eliminating native wetland plant communities. Common reed is listed by the MDA as a Restricted noxious weed. The importation, sale, and transportation of their propagating parts in the state is prohibited. Plants designated as Restricted noxious weeds may be reclassified if effective means of control are developed (MDA 2015).

2.5.1 Control Method

Chemical: Spraying with a herbicide such as glyphosate formulated for use over water. Treat in early spring before flowering or in the fall.

Mechanical: Mechanical control methods have not been very effective in controlling common reed. Mowing may reduce the population. Digging the massive root system is also difficult. Flooding may be effective where feasible.

Recommended Control Method at Erie Pier: The populations of common reed were limited to a few areas. Common reed is being controlled throughout the St. Louis River corridor including Erie Pier under the direction of the MDNR and the St. Louis River Alliance. Continue working with the St. Louis River Alliance to control the nonnative phragmites at Erie Pier.

3 MNDNR and WDNR Invasive Plants

3.1 Reed Canary Grass (Phalaris arundinacea)

The survey identified populations of reed canary grass within the survey area, particularly along the slopes of the containments cell berms. Reed canary grass invades wetlands where it outcompetes native vegetation and forms dense monotypic plant communities. Stands of reed canary grass are hard to eradicate because of the large seed bank they create. Reed canary grass has a reputation for being hard to control because it is perennial, rhizomatous, and effectively excludes other vegetation. Effective control methods typically require multiple treatments, successful replacement, and maintenance.

3.1.1 Control Method

Chemical: Spraying with a herbicide such as glyphosate formulated for use over water. Treat in early spring before most native species begin to grow. Repeated sprayings in the spring and fall can help control reed canary grass.

Mechanical: Burning is an effective mechanical treatment for cool season grasses. In areas where burning isn't feasible, mowing mid-June and October will reduce seed and favor the growth of native warm season grasses.

Recommended Control Method at Erie Pier: Mow in June prior to flowering and remow in October.

3.1 Smooth Brome (Bromus inermis)

The survey identified populations of smooth brome within the survey area, particularly along the slopes of the containments cell berms. Smooth brome is a cool season grass that begins growing in early spring and forms a dense sod outcompeting later growing native warm season grasses. Smooth brome can be hard to control because it is perennial, rhizomatous, and effectively excludes other vegetation. Effective control methods typically require multiple treatments, successful replacement, and maintenance.

3.1.1 Control Method

Chemical: Spraying with a grass specific herbicide such as sethoxydim in early spring before most native species begin to grow or in fall when native species are dormant.

Mechanical: Burning is an effective mechanical treatment for cool season grasses. In areas where burning isn't feasible, mowing mid-June and October will reduce seed and favor the growth of native warm season grasses.

Recommended Control Method at Erie Pier: Mow in June prior to flowering and remow in October.

3.2 Bird's-Foot Trefoil (Lotus corniculatus)

The survey identified populations of bird's-foot trefoil within the survey area, particularly in the disturbed soils along the access road margins. Bird's-foot trefoil was widely planted along roadsides for erosion control and creates a dense mat of vegetation that crowds out native species.

3.2.1 Control Method

Chemical: Spraying with a selective broadleaf herbicide such as triclopyr or clopyralid plus a surfactant, in the summer before seed production. In small colonies, individual stems can be traced back to the center of the colony and main tap root. A few spritzes in the center will eliminate the whole plant.

Mechanical: Mowing mid-June can reduce seed production. Frequent mowing at a height of less than 2" for several years helps control this plant, but also sets back native species.

Recommended Control Method at Erie Pier: Mow in June. If mowing proves to be ineffective consider herbicide treatment along road margins.

3.3 Crown Vetch (Coronilla varia)

The survey identified populations of crown vetch within the survey area scattered within the containment berms. Crown vetch behaves very similar to bird's-foot trefoil and was also widely planted along roadsides for erosion control and creates a dense mat of vegetation that crowds out native species. Likewise, the control method is the same as for bird's-foot trefoil.

3.3.1 Control Method

Chemical: Spraying with a selective broadleaf herbicide such as triclopyr or clopyralid plus a surfactant, in the summer before seed production. In small colonies, individual stems can be traced back to the center of the colony and main tap root. A few spritzes in the center will eliminate the whole plant.

Mechanical: Mowing in June and late August for several successive years to reduce seed and encourage native species.

Recommended Control Method at Erie Pier: Mow in June and remow in August.

3.4 White and Yellow sweet clover (Melilotus albus, M. officinalis)

The survey identified significant populations of common white and yellow sweet clover within the area, particularly within the access roads surrounding and on top of the containment berms as well as in open sparsely vegetated areas. Sweet clover was planted for forage and and invades natural areas by overtopping and shading out native plants (MNDNR 2015).

3.4.1 Control Method

Chemical: Sweet clover can normally be managed by using mechanical methods and should not require the use of chemicals.

Mechanical: Burning is the most effective mechanical treatment for sweet clover. In areas where burning isn't feasible, mowing in June for several successive years to reduce seed and encourage native species can be effective.

Recommended Control Method at Erie Pier: Mow in June prior to flowering. Remow as needed to prevent seed set.

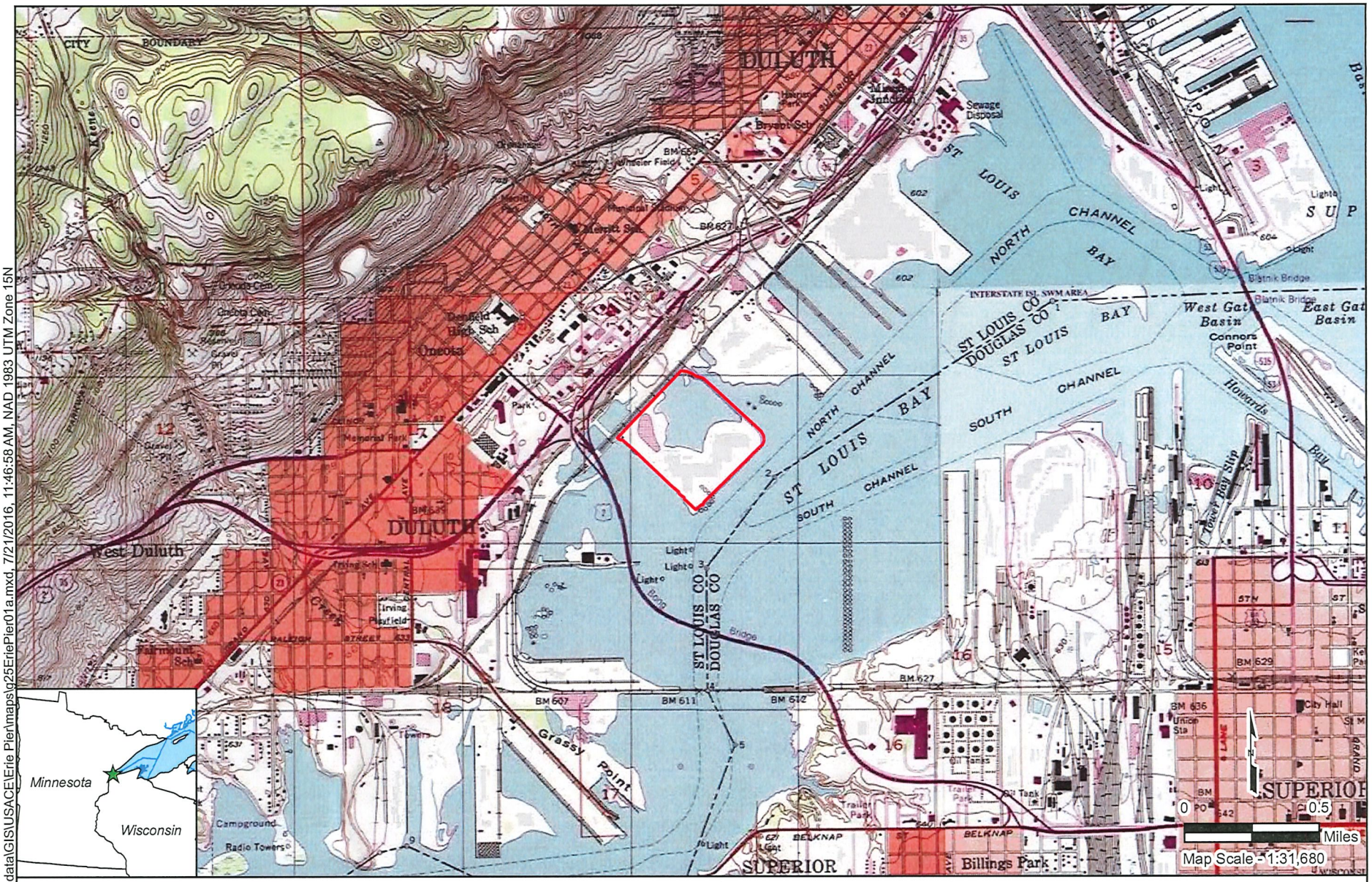
4 Recommendation Summary

The primary goal of invasive species control at Erie Pier should be to prevent the spread of invasive species into new areas. The spread of invasive plants from Erie Pier can occur from transport via wind, water, animals, vehicles, and material hauling. Efforts must be made to prevent the spread, seed maturation, and dispersal of the MDA noxious weeds into new areas by Minnesota state law. The dynamic nature of the land disturbance from the placement and reuse of dredge material makes controlling invasive species difficult. For example, it is difficult to establish a stable native plant community when the land is continually being disturbed. Considering the dynamic nature of the site, mowing of the tansy, Canada thistle, reed canary grass, smooth brome, bird's-foot trefoil, crown vetch, and sweet clover in June before they flower with an additional mowing in August will prevent the production of seeds and will go a long way in preventing the spread of invasive species. Areas that cannot be mowed should be considered for chemical treatment. The large colonies of Canada thistle in the northcentral portion of the property should be considered for chemical treatment with replacement seeding of native grasses. Continue chemical treatment of purple loosestrife and Phragmites until eradicated. The spotted knapweed should be included in the chemical treatment with the loosestrife or hand-pulled. For long-term management, explore the biological control of loosestrife and spotted knapweed. Interseeding of native plant species should be considered as invasive species are controlled to increase the competition from native plants. Annual monitoring should be completed to evaluate the effectiveness of the invasive species control. Adaptive management over time should be practiced as site conditions change. Keep in mind that there is an existing seed bank that will take quite a few years to deplete requiring monitoring and control at sites where the dredge material is reused. The table below outlines the suggested timing of the control methods with the preferred treatment outlined in red.

Suggested Timing of Control Methods

Plant Species	Mowing times for optimal control.						Other treatment methods.		
	May	June	July	Aug	Sept	Oct	May	June	July
Common Tansy (Tanacetum vulgare)		**						Chemical	
Canada Thistle (Cirsium arvense)		**						Chemical	
Purple Loosestrife (Lythrum salicaria)							Biological	Chemical	Biological
Spotted Knapweed (Centaurea stoebe spp. micranthos)							Biological	Chemical	Biological
Common Reed (Phragmites australis, spp. australis)								Chemical	
Reed Canary Grass (Phalaris arundinacea)		**							
Smooth Brome (Bromus inermis)		**							
Bird's-Foot Trefoil (Lotus corniculatus)		**							
Crown Vetch (Coronilla varia)		**						Chemical	
White and Yellow sweet clover (Melilotus albus, M. officinalis)		**							

** If these species are not mowed in June prior to flowing, do not mow them later in the season. Mowing once flowers mature and/or seed has set will spread these species. Red outline denoted the preferred treatment method.



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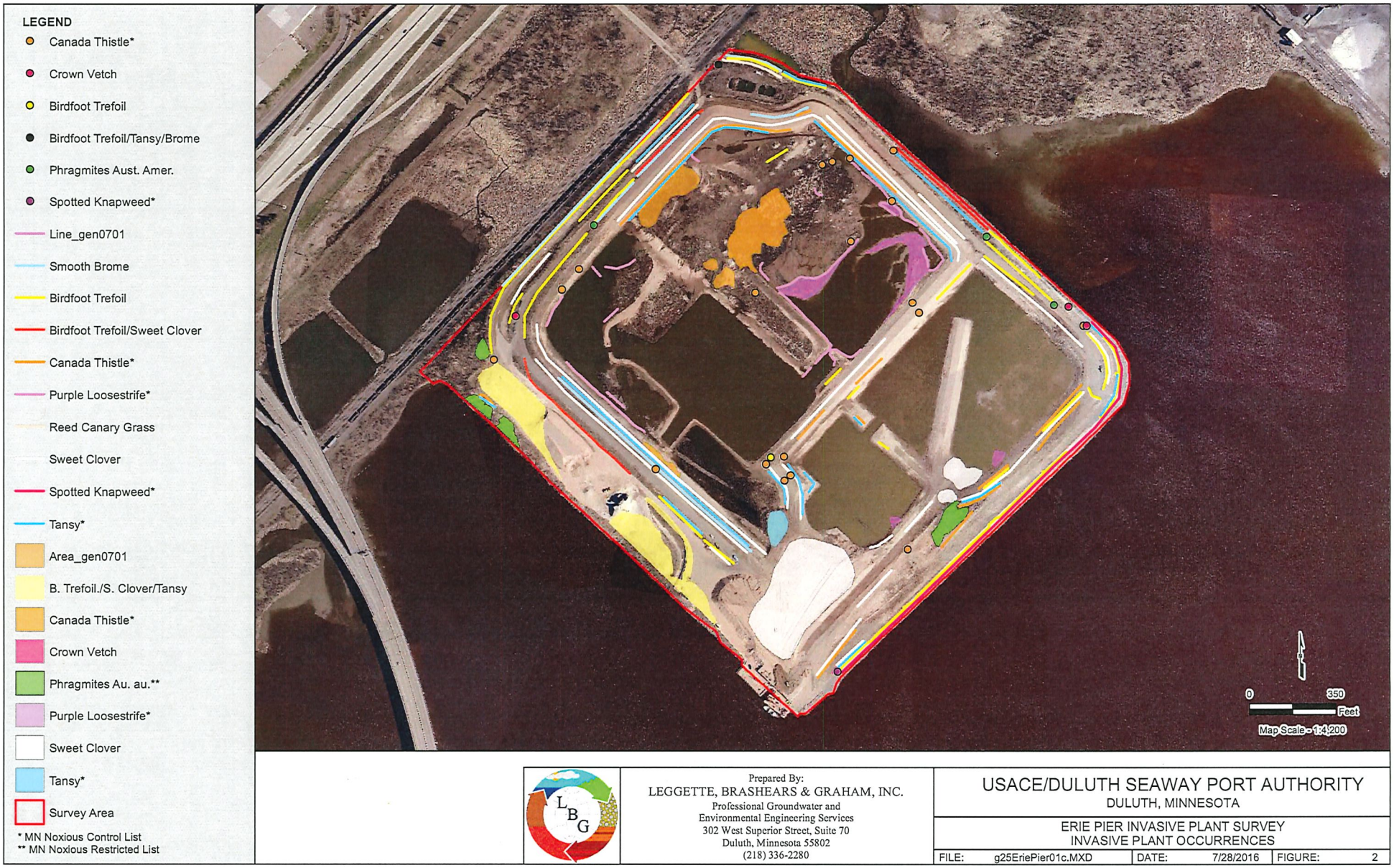
USACE/DULUTH SEAWAY PORT AUTHORITY

DULUTH, MINNESOTA

SITE LOCATION

FILE:	g25EriePier01a.MXD	DATE:	7/21/2016	FIGURE:	1



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USACE/DULUTH SEAWAY PORT AUTHORITY

DULUTH, MINNESOTA

ERIE PIER INVASIVE PLANT SURVEY
INVASIVE PLANT OCCURRENCES

FILE:	g25EriePier01c.MXD	DATE:	7/28/2016	FIGURE:	2

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18 February 2022

TECHNICAL MEMORANDUM

TO: Mark Loomis, U.S. Environmental Protection Agency
Mark Rupnow, U.S. Steel

FROM: Caryn Kiehl-Simpson and Michael Ciarlo

SUBJECT: Technical Memorandum for Erie Pier Sampling Results
St. Louis River Area of Concern, Duluth, Minnesota
EA Project No. 1583408

In early December 2021, discussions between the Duluth Seaway Port Authority (Port), U.S. Army Corps of Engineers (USACE), EPA, U.S. Steel (USS), and EA Engineering, Science and Technology, Inc., PBC (EA) identified material immediately available for potential use in caps and covers at the Spirit Lake site. Specifically, the material is being considered for use in the subaqueous cap layers, although it may be considered for other work elements pending results of the current analysis. The Spirit Lake Contract Documents, including the design specifications, define chemical and physical requirements for materials used in caps and covers as part of the RA. Representative soil samples of Erie Pier Materials were collected and analyzed for chemical and physical properties to evaluate the material with respect to the project specifications as well as the data quality objectives identified in this Technical Memorandum.

Sampling was completed in general accordance with the 07 January 2022 draft "Phase 2 Quality Assurance Project Plan – Erie Pier Sampling Plan Addendum Remedial Action for Spirit Lake Sediment at the Former Duluth Works Site January 2022" and subsequent revisions. Following receipt of comments from MPCA on 13 January 2022, and comments provided by EPA along with a conditional approval on 15 January 2022, EA finalized the Sampling Plan (Attachment A). Sampling was completed in accordance with the plan as finalized in Attachment A.

The sampling effort was completed during the week of 17 January 2022. Samples were analyzed by Eurofins Test America. Actual sample locations are provided in Figure 1, Table 1 includes coordinates and sample depths and elevations for each location sampled. Results for grain size are provided in Table 2 and analytical chemistry and other physical results are provided in Table 3. Lithological logs were developed for each location sampled and are provided in Attachment B. Laboratory deliverables are provided in Attachment C.

The following tables, figures and attachments are provided to document the results of the Erie Pier Sampling effort.

Tables

- Table 1 – Actual Sample Location Coordinates
- Table 2 – Grain Size Sample Results
- Table 3 – Analytical Results
    - Table 3A Metals Results
    - Table 3B Semivolatile Organic Compounds (SVOCs) Results
    - Table 3C Polycyclic Aromatic Hydrocarbons (PAHs) Results
    - Table 3D Polychlorinated Biphenyls (PCBs) Results
    - Table 3E Pesticides Results
    - Table 3F Dioxins Results
    - Table 3G Physical Properties Results

Figures

- Figure 1 – Actual Locations Sampled

Attachments

- Attachment A –Sampling Plan Addendum
- Attachment B – Soil Boring Logs
- Attachment C – Laboratory Reports

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Tables

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Table 1. Actual Sample Location Coordinates
February 2022
Erie Pier - Spirit Lake Estuary Site

Sample Identification	Coordinates[1]		Ground Surface Elevation[2] (ft)	Boring Depth Elevation[2] (ft)	Sample Intervals (ft)	Penetration Depth (ft below surface)
	Easting	Northing				
SL22-EP-SB1	2863670.704	418098.732	617.93	609	0-4.5, 4.5-9	9
SL22-EP-SB2	2863720.574	418185.754	618.60	610	0-4.5, 4.5-9	9
SL22-EP-SB3	2863864.923	418322.375	624.46	609	0-4, 4-8, 8-12, 12-15	15
SL22-EP-SB4	2863935.808	418464.586	624.76	610	0-4, 4-8, 8-12, 12-15	15
SL22-EP-SB5	2863858.313	418580.287	621.81	610	0-4, 4-8, 8-12	12
SL22-EP-SB6	2863752.828	418481.924	622.59	608	0-4, 4-8, 8-12, 12-15	15
SL22-EP-SB7	2864061.727	418311.622	620.80	609	0-4, 4-8, 8-12	12
SL22-EP-SB8	2864083.863	418494.62	617.06	610	0-3.5, 3.5-7	7
SL22-EP-SB9	2864335.437	418523.967	624.77	610	0-4, 4-8, 8-12, 12-15	15
SL22-EP-SB10	2864054.58	418704.452	617.75	610	0-4, 4-8	8
SL22-EP-SB11	2864189.334	418693.532	617.40	609	0-4, 4-8	8
SL22-EP-SB12	2864330.639	418763.382	617.54	610	0-4, 4-8	8

NOTES:
1. Minnesota North Zone State Plane coordinate system
2. North American Vertical Datum of 1988
ft = foot (feet)

Table 2 Grain Size Sample Results
February 2022
Erie Pier - Spirit Lake Estuary Site

	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB3	EP-SB3	EP-SB3	EP-SB3	EP-SB4	EP-SB4	EP-SB4	EP-SB4
	Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB3-0040	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080	SL22-EP-SB4-8012	SL22-EP-SB4-1215
	Sample Date:	01/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
Analyte	**Depth Interval (ft):**	**0-4.5**	**4.5-9**	**0-4.5**	**4.5-9**	**0-4**	**4-8**	**8-12**	**12-15**	**0-4**	**4-8**	**8-12**	**12-15**
Grain Size													
Gravel	%	0.1	0	0	0	0	0	NA	0	0	0.2	0	0.5
Sand	%	79	35.3	43.9	29.4	34.9	19.5	NA	15.8	28.8	20.8	21	26.1
Coarse Sand	%	0.5	1	0.7	0.2	0.4	0.7	NA	0.6	0.3	0.1	0.3	0.6
Medium Sand	%	3.9	2.7	2.6	1.1	2.2	1.8	NA	0.5	1.2	1.2	0.8	2.7
Fine Sand	%	74.6	31.6	40.6	28.1	32.3	17	NA	14.7	27.3	19.5	19.9	22.8
Silt	%	12.8	31.2	37.8	44	39.3	47.6	NA	50.7	48.8	44.6	42.8	49.3
Clay	%	8.1	33.5	18.3	26.6	25.8	32.9	NA	33.5	22.4	34.4	36.2	24.1
Silt+Clay	%	20.9	64.7	56.1	70.6	65.1	80.5	NA	84.2	71.2	79	79	73.4
Sieve Size 3 inch - Percent Finer	% Passing	100	100	100	100	100	100	NA	100	100	100	100	100
Sieve Size 2 inch - Percent Finer	% Passing	100	100	100	100	100	100	NA	100	100	100	100	100
Sieve Size 1.5 inch - Percent Finer	% Passing	100	100	100	100	100	100	NA	100	100	100	100	100
Sieve Size 1 inch - Percent Finer	% Passing	100	100	100	100	100	100	NA	100	100	100	100	100
Sieve Size 0.75 inch - Percent Finer	% Passing	100	100	100	100	100	100	NA	100	100	100	100	100
Sieve Size 0.375 inch - Percent Finer	% Passing	100	100	100	100	100	100	NA	100	100	100	100	100
Sieve Size #4 - Percent Finer	% Passing	99.9	100	100	100	100	100	NA	100	100	99.8	100	99.5
Sieve Size #10 - Percent Finer	% Passing	99.4	99	99.3	99.8	99.6	99.3	NA	99.4	99.7	99.7	99.7	98.9
Sieve Size #20 - Percent Finer	% Passing	98.3	97.9	98.6	99.6	99	98.7	NA	99.2	99.2	99.1	99.3	98.1
Sieve Size #40 - Percent Finer	% Passing	95.5	96.3	96.7	98.7	97.4	97.5	NA	98.9	98.5	98.5	98.9	96.2
Sieve Size #60 - Percent Finer	% Passing	85.3	91	90.6	92.8	92.5	95.2	NA	97.7	96.9	97.3	97.6	90.9
Sieve Size #80 - Percent Finer	% Passing	72.9	83.2	84.2	84.8	87.1	91.9	NA	95	95	95.8	94.7	85.9
Sieve Size #100 - Percent Finer	% Passing	50.3	77.4	73.2	79.6	78	87	NA	92.3	90.8	91.2	91.9	83
Sieve Size #200 - Percent Finer	% Passing	20.9	64.7	56.1	70.6	65.1	80.5	NA	84.2	71.2	79	79	73.4
Hydrometer Reading 1 - Percent Finer	% Passing	11.4	51.1	32	48.5	40.6	60	NA	66.1	39.3	69.3	67.6	58.2
Hydrometer Reading 2 - Percent Finer	% Passing	10.9	48.6	29	42.6	39.2	53	NA	60.1	34.3	61.4	60.7	50
Hydrometer Reading 3 - Percent Finer	% Passing	9.8	44.8	23.1	35.6	33.2	44.9	NA	48.3	30.5	51.8	51.9	40.4
Hydrometer Reading 4 - Percent Finer	% Passing	9.2	39.8	20.2	30.6	29.5	39.9	NA	40.9	26.8	43.9	43.2	30.9
Hydrometer Reading 5 - Percent Finer	% Passing	8.1	33.5	18.3	26.6	25.8	32.9	NA	33.5	22.4	34.4	36.2	24.1
Hydrometer Reading 6 - Percent Finer	% Passing	5.9	23.5	14.3	20.6	19.8	24.8	NA	24.6	15.5	23.3	25.7	17.3
Hydrometer Reading 7 - Percent Finer	% Passing	5.4	19.7	10.8	16	14.9	18.1	NA	19.2	12.3	21.7	23.9	15.9

Notes:

% = percent

NA = Not analyzed

	Location:	EP-SB5	EP-SB5	EP-SB5	EP-SB6	EP-SB6	EP-SB6	EP-SB6	EP-SB7	EP-SB7	EP-SB7	EP-SB8	EP-SB8
	Sample ID:	SL22-EP-SB5-0040	SL22-EP-SB5-4080	SL22-EP-SB5-8012	SL22-EP-SB6-0040	SL22-EP-SB6-4080	SL22-EP-SB6-8012	SL22-EP-SB6-1215	SL22-EP-SB7-0040	SL22-EP-SB7-4080	SL22-EP-SB7-8012	SL22-EP-SB8-0035	SL22-EP-SB8-3570
	Sample Date:	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/21/2022	01/21/2022	01/21/2022	01/20/2022	01/20/2022
Analyte	**Depth Interval (ft):**	**0-4**	**4-8**	**8-12**	**0-4**	**4-8**	**8-12**	**12-15**	**0-4**	**4-8**	**8-12**	**0-3.5**	**3.5-7**
Grain Size													
Gravel	%	0	0	0.1	0	0	0	0	0.3	0.2	0.8	0.4	0.3
Sand	%	21.4	11.5	62.5	25.6	10.7	8	37.5	30.5	64	46.6	60	51.3
Coarse Sand	%	0.5	0.5	0.1	0.7	0	0.4	1.1	0.4	0.4	0.1	0.6	0.2
Medium Sand	%	1.9	1.6	0.7	1.6	1.4	0.4	1.1	2	4.4	2.9	1.5	1.2
Fine Sand	%	19	9.4	61.7	23.3	9.3	7.2	35.3	28.1	59.2	43.6	57.9	49.9
Silt	%	45.6	41.7	25.3	40.4	38.7	45.8	36.9	50.3	23.9	29.6	27.3	31.7
Clay	%	33	46.8	12.1	34	50.6	46.2	25.6	18.9	11.9	23	12.3	16.7
Silt+Clay	%	78.6	88.5	37.4	74.4	89.3	92	62.5	69.2	35.8	52.6	39.6	48.4
Sieve Size 3 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100	100	100
Sieve Size 2 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100	100	100
Sieve Size 1.5 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100	100	100
Sieve Size 1 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100	100	100
Sieve Size 0.75 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100	100	100
Sieve Size 0.375 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100	100	100
Sieve Size #4 - Percent Finer	% Passing	100	100	99.9	100	100	100	100	99.7	99.8	99.2	99.6	99.7
Sieve Size #10 - Percent Finer	% Passing	99.5	99.5	99.8	99.3	100	99.6	98.9	99.3	99.4	99.1	99	99.5
Sieve Size #20 - Percent Finer	% Passing	98.9	99	99.7	98.8	99.7	99.5	98.5	98.6	98.2	98.3	98.5	98.9
Sieve Size #40 - Percent Finer	% Passing	97.6	97.9	99.1	97.7	98.6	99.2	97.8	97.3	95	96.2	97.5	98.3
Sieve Size #60 - Percent Finer	% Passing	94.4	96.5	93.4	95.2	96.7	98.5	95.6	93.7	83.6	88.4	92.2	96.3
Sieve Size #80 - Percent Finer	% Passing	90.5	94.9	78.9	92.1	95	97.2	90.8	90.8	68.2	82.5	81.3	91.5
Sieve Size #100 - Percent Finer	% Passing	87.7	92.5	65.4	86.2	92.5	95.8	84.7	85.5	57.6	69.5	70.7	79.6
Sieve Size #200 - Percent Finer	% Passing	78.6	88.5	37.4	74.4	89.3	92	62.5	69.2	35.8	52.6	39.6	48.4
Hydrometer Reading 1 - Percent Finer	% Passing	58.2	79.4	21.7	63.2	82.9	81.2	48.4	39.5	24.1	40.2	27.1	34.4
Hydrometer Reading 2 - Percent Finer	% Passing	50.2	72.9	18.3	57.3	74.9	72.5	42.4	32.6	20.6	37.7	22	29.2
Hydrometer Reading 3 - Percent Finer	% Passing	43.1	61.5	16.2	45.7	66.8	63.7	37.6	25.7	16.6	32.8	18	24.1
Hydrometer Reading 4 - Percent Finer	% Passing	38	53.3	14.2	39.8	58.7	53.2	30.4	22.7	14.3	27.9	14.6	19.6
Hydrometer Reading 5 - Percent Finer	% Passing	33	46.8	12.1	34	50.6	46.2	25.6	18.9	11.9	23	12.3	16.7
Hydrometer Reading 6 - Percent Finer	% Passing	24.9	37.3	8.7	25.3	40.9	37.4	19.6	14.3	8.5	18	9.5	12.3
Hydrometer Reading 7 - Percent Finer	% Passing	18.2	26.1	6.9	18	28	26.9	13.6	12	8.5	18	8.9	11.5

Notes:

% = percent

NA = Not analyzed

	Location:	EP-SB9	EP-SB9	EP-SB9	EP-SB9	EP-SB10	EP-SB10	EP-SB11	EP-SB11	EP-SB12	EP-SB12
	Sample ID:	SL22-EP-SB9-0040	SL22-EP-SB9-4080	SL22-EP-SB9-8012	SL22-EP-SB9-1215	SL22-EP-SB10-0040	SL22-EP-SB10-4080	SL22-EP-SB11-0040	SL22-EP-SB11-4080	SL22-EP-SB12-0040	SL22-EP-SB12-4080
	Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/18/2022	01/18/2022
Analyte	**Depth Interval (ft):**	**0-4**	**4-8**	**8-12**	**12-15**	**0-4**	**4-8**	**0-4**	**4-8**	**0-4**	**4-8**
Grain Size											
Gravel	%	0	0	0	0	0.4	0	0	0.5	0.3	0.9
Sand	%	26.3	44.1	57.2	22.8	42.7	23.4	49.9	35	56.4	36.5
Coarse Sand	%	0.5	0.5	0.4	0.7	0.3	0.3	0.3	0.2	0.3	0.2
Medium Sand	%	1	2.4	1.1	0.8	1.6	0.6	1.1	0.6	1.6	1.2
Fine Sand	%	24.8	41.2	55.7	21.3	40.8	22.5	48.5	34.2	54.5	35.1
Silt	%	56.5	42	31	58.7	41.1	53.2	37.1	49.6	30.6	37.8
Clay	%	17.2	13.9	11.8	18.5	15.8	23.4	13	14.9	12.7	24.8
Silt+Clay	%	73.7	55.9	42.8	77.2	56.9	76.6	50.1	64.5	43.3	62.6
Sieve Size 3 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100
Sieve Size 2 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100
Sieve Size 1.5 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100
Sieve Size 1 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100
Sieve Size 0.75 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100
Sieve Size 0.375 inch - Percent Finer	% Passing	100	100	100	100	100	100	100	100	100	100
Sieve Size #4 - Percent Finer	% Passing	100	100	100	100	99.6	100	100	99.5	99.7	99.1
Sieve Size #10 - Percent Finer	% Passing	99.5	99.5	99.6	99.3	99.3	99.7	99.7	99.3	99.4	98.9
Sieve Size #20 - Percent Finer	% Passing	99.1	98.8	99.4	99.1	99	99.5	99.4	99.1	99	98.4
Sieve Size #40 - Percent Finer	% Passing	98.5	97.1	98.5	98.5	97.7	99.1	98.6	98.7	97.8	97.7
Sieve Size #60 - Percent Finer	% Passing	96.6	91.7	91.3	95.8	93.2	97.9	95.6	96.6	93.5	95.1
Sieve Size #80 - Percent Finer	% Passing	93.4	86.1	78.2	91.9	88.2	94.6	89.7	91	86.6	89
Sieve Size #100 - Percent Finer	% Passing	87.9	76.1	67.3	88	77.7	90.5	78.7	85.1	72.6	82.3
Sieve Size #200 - Percent Finer	% Passing	73.7	55.9	42.8	77.2	56.9	76.6	50.1	64.5	43.3	62.6
Hydrometer Reading 1 - Percent Finer	% Passing	41.9	30.1	25	49.3	30.5	46.3	25.8	31.9	27	52.4
Hydrometer Reading 2 - Percent Finer	% Passing	37.9	24.5	19.6	36.3	28.8	42.9	23.5	25.7	22.6	40.7
Hydrometer Reading 3 - Percent Finer	% Passing	27.6	20	16	26.8	22.3	33.7	17.5	21.1	18.3	34.3
Hydrometer Reading 4 - Percent Finer	% Passing	22	16.7	14.2	22.1	19	26.8	15.3	17.2	15.1	29
Hydrometer Reading 5 - Percent Finer	% Passing	17.2	13.9	11.8	18.5	15.8	23.4	13	14.9	12.7	24.8
Hydrometer Reading 6 - Percent Finer	% Passing	13.3	11	9.4	15	12.5	18.8	10	11.8	9.6	18.4
Hydrometer Reading 7 - Percent Finer	% Passing	9.5	8.4	7.2	11.8	8.4	13	7	8.8	7.1	12

Notes:
% = percent
NA = Not analyzed

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2	EP-SB3	EP-SB3	EP-SB3	EP-SB3	EP-SB4	EP-SB4	EP-SB4	EP-SB4	EP-SB5
						Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD	SL22-EP-SB3-0040	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080	SL22-EP-SB4-8012	SL22-EP-SB4-1215	SL22-EP-SB5-0040
						Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/19/2022
						Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9	0-4	4-8	8-12	12-15	0-4	4-8	8-12	12-15	0-4
Metals																				
Aluminum	NSL	NSL	30,000	40,000	100,000	mg/kg	3500	10000	4800	6800	5900	6700	11000	12000	9500	6800	11000	11000	9400	9600
Antimony	NSL	NSL	12	16	100	mg/kg	0.31	0.36	0.18	0.24	0.21	0.21	0.43	0.32	0.26	0.19	0.3	0.3	0.25 J	0.27
Arsenic	9.8	33	9	11	20	mg/kg	1.9	4.9	2.5	3	2.8	3.2	4.9	5.1	4	3.3	4.5	4.6	3.8	4.3
Barium	NSL	NSL	1100	1,100	18,000	mg/kg	24	89	41	62	53	75	100	110	90	64	99	99	81	80
Beryllium	NSL	NSL	55	75	230	mg/kg	0.23	0.54	0.29	0.41	0.36	0.46	0.67	0.75	0.56	0.36	0.53	0.55	0.48	0.64
Cadmium	0.99	5	25	35	200	mg/kg	0.11	0.46	0.2	0.24	0.21	0.26	0.47	0.44	0.37	0.24	0.44	0.41	0.29	0.3
Calcium	NSL	NSL	NSL	NSL	NSL	mg/kg	3200	8400	5600	8800	8600	7400	11000	15000	14000	10000	12000	12000	14000	11000
Chromium	43	110	44000	120	100000	mg/kg	11	29	13 B	18 B	17 B	17 B	29 B	30 B	25 B	18	27	28	23	24 B
Cobalt	NSL	NSL	600	800	2,600	mg/kg	4.2	10	5.3	6.8	6.1	6.3	11	11	9.1	7.4	11	11	9	9.2
Copper	32	150	100	100	9,000	mg/kg	7.9	28	12	16	16	16	30	30	24	16	26	26	20	24
Iron**	NSL	NSL	30,000	30,000	75,000	mg/kg	11000	25000	14000	17000	15000	19000	25000	26000	22000	17000	23000	24000	21000	23000
Lead	36	130	300	300	700	mg/kg	6.5	28	10	13	11	33	27	23	18	13	22	21	15	18
Magnesium	NSL	NSL	NSL	NSL	NSL	mg/kg	2600	7200	4200	6200	6000	5500	8500	11000	9700	7000	9000	9300	10000	8500
Manganese	NSL	NSL	3,600	5,000	8,100	mg/kg	210	670	340	370	350	420	590	640	570	520	690	680	580	480
Mercury***	0.18	1.1	0.5	1.2	1.5	mg/kg	0.041	0.14	0.081	0.076	0.07	0.11	0.16	**0.27**	**0.19**	0.1	0.15	**0.19**	0.14	0.15
Nickel	23	49	560	800	2,500	mg/kg	8	23	12	16	14	15	**25**	**26**	22	15	23	23	20	22
Potassium	NSL	NSL	NSL	NSL	NSL	mg/kg	410	1200	540	810	720	800	1300	1500	1200	830	1400	1400	1200	1200
Selenium	NSL	NSL	160	200	1,300	mg/kg	0.46 U	0.34 J	0.12 J	0.19 J	0.15 J	0.2 J	0.33 J	0.33 J	0.25 J	0.18 J	0.31 J	0.28 J	0.25 J	0.21 J
Silver	NSL	NSL	160	200	1,300	mg/kg	0.062 J	0.29	0.082	0.13	0.1	0.13	0.28	0.31	0.21	0.13	0.27	0.27	0.19	0.21
Sodium	NSL	NSL	NSL	NSL	NSL	mg/kg	110	220	130	170	150	160	250	260	230	190	230	230	240	220
Thallium	NSL	NSL	3	3	21	mg/kg	0.075 J	0.2	0.087	0.12	0.11	0.1	0.19	0.2	0.17	0.12	0.19	0.19	0.17	0.16
Vanadium**	NSL	NSL	120	120	250	mg/kg	24	38	24	28	25	25	37	40	34	30	38	38	39	33
Zinc	120	460	8,700	12,000	75,000	mg/kg	26	110	42	59	52	79	120	100	86	54	93	94	69	79

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

** Residential and Recreation screening criteria for iron and vanadium are background threshold values.

*** Mercury as inorganic elemental and mercuric chloride

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

mg/kg = milligrams per kilogram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]		Location:	EP-SB5	EP-SB5	EP-SB6	EP-SB6	EP-SB6	EP-SB6	EP-SB6	EP-SB7	EP-SB7	EP-SB7	EP-SB8	EP-SB8	EP-SB9	EP-SB9
							Sample ID:	SL22-EP-SB5-4080	SL22-EP-SB5-8012	SL22-EP-SB6-0040	SL22-EP-SB6-4080	SL22-EP-SB6-4080FD	SL22-EP-SB6-8012	SL22-EP-SB6-1215	SL22-EP-SB7-0040	SL22-EP-SB7-4080	SL22-EP-SB7-8012	SL22-EP-SB8-0035	SL22-EP-SB8-3570	SL22-EP-SB9-0040	SL22-EP-SB9-4080
							Sample Date:	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/21/2022	01/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
							Depth Interval (ft):	4-8	8-12	0-4	4-8	4-8	8-12	12-15	0-4	4-8	8-12	0-3.5	3.5-7	0-4	4-8
Metals																					
Aluminum	NSL	NSL	30,000	40,000	100,000	mg/kg		12000	3400	8400	12000	12000	11000	5700	7100	3600	9400	5100	5700	7100	5400
Antimony	NSL	NSL	12	16	100	mg/kg		0.34	0.2	0.22 J	0.3	0.33	0.28 J	0.2 J	0.25 J	0.18 J	0.26	0.23	0.21 J	0.23	0.17
Arsenic	9.8	33	9	11	20	mg/kg		5.1	1.7	3.9	4.8	4.8	4.7	3	3.4	1.9	3.9	2.5	2.9	3.2	2.2
Barium	NSL	NSL	1100	1,100	18,000	mg/kg		120	25	84	100	120	100	49	68	26	90	40	48	66	47
Beryllium	NSL	NSL	55	75	230	mg/kg		0.78	0.23	0.54	0.76	0.82	0.73	0.39	0.38	0.2	0.49	0.3	0.32	0.4	0.32
Cadmium	0.99	5	25	35	200	mg/kg		0.44	0.083	0.31	0.4	0.38	0.4	0.25	0.23	0.1 J	0.26	0.15	0.2	0.26	0.15
Calcium	NSL	NSL	NSL	NSL	NSL	mg/kg		13000	3800	9400	12000	11000	14000	5200	9900	3900	13000	6400	6200	9100	11000
Chromium	43	110	44000	120	100000	mg/kg		30 B	11 B	24	32	31	30	17	19	11	23	13	16	19 B	15 B
Cobalt	NSL	NSL	600	800	2,600	mg/kg		11	3.6	8.3	11	11	10	5.9	7.8	3.9	9.8	5.1	5.8	7.1	5.5
Copper	32	150	100	100	9,000	mg/kg		31	7	21	28	29	28	15	17	7.4	23	11	13	16	12
Iron**	NSL	NSL	30,000	30,000	75,000	mg/kg		25000	9500	20000	25000	25000	24000	14000	18000	10000	20000	13000	15000	17000	13000
Lead	36	130	300	300	700	mg/kg		23	5.3	19	20	17	20	12	12	5.9	12	9.6	12	12	7.5
Magnesium	NSL	NSL	NSL	NSL	NSL	mg/kg		10000	3000	7300	9600	10000	11000	4300	7200	3000	9400	4700	4600	6600	7200
Manganese	NSL	NSL	3,600	5,000	8,100	mg/kg		600	170	640	730	720	650	330	510	190	560	300	410	500	370
Mercury***	0.18	1.1	0.5	1.2	1.5	mg/kg		**0.21**	0.031 J	**0.2**	**0.19**	0.15	**0.24**	0.13	0.11	0.031	0.12	0.064	0.051	0.1	0.077
Nickel	23	49	560	800	2,500	mg/kg		**28**	7.8	19	**25**	**26**	**24**	13	17	8.1	21	11	13	16	13
Potassium	NSL	NSL	NSL	NSL	NSL	mg/kg		1600	380	980	1500	1600	1400	670	890	420	1300	650	670	810	600
Selenium	NSL	NSL	160	200	1,300	mg/kg		0.3 J	0.33 U	0.24 J	0.34 J	0.3 J	0.31 J	0.16 J	0.18 J	0.53 U	0.22 J	0.12 J	0.6 U	0.19 J	0.13 J
Silver	NSL	NSL	160	200	1,300	mg/kg		0.3	0.045 J	0.18	0.2	0.19	0.27	0.14	0.11 J	0.059 J	0.13	0.09	0.13	0.12	0.069
Sodium	NSL	NSL	NSL	NSL	NSL	mg/kg		270	110	180	220	220	220	140	170	110	190	140	160	180	170
Thallium	NSL	NSL	3	3	21	mg/kg		0.2	0.046 J	0.13	0.18	0.21	0.18	0.089 J	0.13 J	0.11 U	0.17	0.086 J	0.095 J	0.12	0.1
Vanadium**	NSL	NSL	120	120	250	mg/kg		39	18	30	37	36	36	24	30	20	34	25	27	28	24
Zinc	120	460	8,700	12,000	75,000	mg/kg		110	24	78	100	91	95	52	59	27	63	36	49	60	39

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

** Residential and Recreation screening criteria for iron and vanadium are background threshold values.

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B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

mg/kg = milligrams per kilogram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]		Location:	EP-SB9	EP-SB9	EP-SB9	EP-SB10	EP-SB10	EP-SB11	EP-SB11	EP-SB12	EP-SB12	EP-SB12
							Sample ID:	SL22-EP-SB9-8012	SL22-EP-SB9-1215	SL22-EP-SB9-1215FD	SL22-EP-SB10-0040	SL22-EP-SB10-4080	SL22-EP-SB11-0040	SL22-EP-SB11-4080	SL22-EP-SB12-0040	SL22-EP-SB12-0040FD	SL22-EP-SB12-4080
							Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/18/2022	01/18/2022	01/18/2022
							Depth Interval (ft):	8-12	12-15	12-15	0-4	4-8	0-4	4-8	0-4	0-4	4-8
Metals																	
Aluminum	NSL	NSL	30,000	40,000	100,000	mg/kg		4700	6400	6400	5300	7300	5300	6000	8700	4300	5800
Antimony	NSL	NSL	12	16	100	mg/kg		0.18	0.2	0.23	0.28	0.22	0.2	0.19	0.25	0.16 J	0.2 J
Arsenic	9.8	33	9	11	20	mg/kg		2.4	2.8	3	2.7	3.2	2.7	2.8	3.9	2.1	2.7
Barium	NSL	NSL	1100	1,100	18,000	mg/kg		37	57	61	43	62	42	53	74	33	48
Beryllium	NSL	NSL	55	75	230	mg/kg		0.29	0.4	0.41	0.36	0.44	0.37	0.4	0.55	0.3	0.38
Cadmium	0.99	5	25	35	200	mg/kg		0.17	0.17	0.18	0.22	0.32	0.21	0.18	0.42	0.16	0.4
Calcium	NSL	NSL	NSL	NSL	NSL	mg/kg		4900	14000	12000	5700	8000	6300	8000	6700	4900	5900
Chromium	43	110	44000	120	100000	mg/kg		14 B	15 B	15 B	19	22	15	17	26	12	18
Cobalt	NSL	NSL	600	800	2,600	mg/kg		5.1	6.6	6.4	5.5	6.9	5.5	6	8.1	4.3	5.4
Copper	32	150	100	100	9,000	mg/kg		11	15	16	13	18	13	15	24	9.5	16
Iron**	NSL	NSL	30,000	30,000	75,000	mg/kg		13000	15000	15000	14000	17000	13000	14000	19000	11000	14000
Lead	36	130	300	300	700	mg/kg		8.4	7.9	6.5	16	17	11	10	24	10	15
Magnesium	NSL	NSL	NSL	NSL	NSL	mg/kg		3900	9000	7900	4200	5900	4700	5900	5600	3600	4400
Manganese	NSL	NSL	3,600	5,000	8,100	mg/kg		270	380	380	280	330	320	350	460	250	270
Mercury***	0.18	1.1	0.5	1.2	1.5	mg/kg		0.09	0.074	0.091	0.12	0.15	0.077	0.089	0.1	0.093	0.13
Nickel	23	49	560	800	2,500	mg/kg		11	15	15	12	16	12	14	19	9.6	13
Potassium	NSL	NSL	NSL	NSL	NSL	mg/kg		520	800	830	610	820	650	740	1000	500	670
Selenium	NSL	NSL	160	200	1,300	mg/kg		0.1 J	0.13 J	0.17 J	0.15 J	0.22 J	0.15 J	0.14 J	0.3 J	0.56 U	0.22 J
Silver	NSL	NSL	160	200	1,300	mg/kg		0.097	0.065 J	0.059 J	0.1 J	0.21	0.11	0.089 J	0.29	0.071 J	0.16
Sodium	NSL	NSL	NSL	NSL	NSL	mg/kg		140	190	170	140	170	130	150	160	120	150
Thallium	NSL	NSL	3	3	21	mg/kg		0.08 J	0.11	0.13	0.087 J	0.11	0.088 J	0.094	0.13	0.11 U	0.093 J
Vanadium**	NSL	NSL	120	120	250	mg/kg		24	27	29	24	27	23	25	29	20	24
Zinc	120	460	8,700	12,000	75,000	mg/kg		40	42	37	51	75	47	47	91	37	63

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

** Residential and Recreation screening criteria for iron and vanadium are background threshold values.

*** Mercury as inorganic elemental and mercuric chloride

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics = **Exceeded Residential SRV**

Underline Shaded Bolded Italics = **Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics = **Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

mg/kg = milligrams per kilogram

Table 3B SVOCs Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2
						Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD
						Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	430 U	520 U	400 U	420 U	400 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	5.1 J	**25**	**27**	**28**	17
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	8.7 U	**15**	**8.1**	**11**	5.3 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	8.7 U	3.3 J	**11**	**16**	**8.1 J**
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	87 U	100 U	81 U	86 U	82 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	6.1 J	16	29	44	21
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	87 U	100 U	81 U	86 U	82 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	87 U	100 U	81 U	86 U	82 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	22	40	82	**120**	59
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	23	39	79	110	56
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	31	49	94	130	70
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	19	30	61	79	42
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	13	20	39	58	23
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	430 U	520 U	90 J	49 J	400 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	8.7 U	4.7 J	7.4 J	9.4	4.8 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2
						Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD
						Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	24	46	94	130	68
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	8.9	9.1 J	19	23	11
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	43 U	52 U	15 J	17 J	40 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	43 U	52 U	28 J	33 J	23 J
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	34	75	130	200	92
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	2.9 J	14	14	20	9.9
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	18	26	53	67	34
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	6.9 J	30	48	67	38
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	87 U	100 U	81 U	85 U	82 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	8.7 U	10 U	8.1 U	8.6 U	8.2 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	220 U	270 U	210 U	220 U	210 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	20	57	83	120	52
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	43 U	52 U	40 U	42 U	40 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	32	72	120	180	89

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB3	EP-SB3	EP-SB3	EP-SB3	EP-SB4
						Sample ID:	SL22-EP-SB3-0040	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4	4-8	8-12	12-15	0-4
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	410 U	480 U	510 U	470 U	420 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	**35**	**50**	12	13	14
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	**13**	**22**	**6.9 J**	5.3 J	6.5 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	**27**	**28**	**6.4 J**	**7.4 J**	**6.5 J**
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	84 U	97 U	100 U	95 U	85 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	**64**	**96**	18	18	25
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	84 U	97 U	100 U	95 U	85 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	10 J	97 U	100 U	6.3 J	85 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	**180**	**260**	47	48	67
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	**190**	**260**	45	51	67
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	250	340	56	54	96
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	150	200	35	35	63
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	98	140	21	27	36
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	170 J	110 J	510 U	470 U	420 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	41 U	41 J	51 U	47 U	42 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	20	13	4.1 J	2.4 J	5.2 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB3	EP-SB3	EP-SB3	EP-SB3	EP-SB4
						Sample ID:	SL22-EP-SB3-0040	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4	4-8	8-12	12-15	0-4
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	**220**	**270**	55	56	80
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	**43**	**56**	11	9 J	20
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	21 J	35 J	51 U	47 U	42 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	29 J	48 U	51 U	47 U	42 U
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	310	330	87	79	120
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	19	45	9.6 J	8.8 J	13
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	130	190	31	29	58
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	65	160	22	36	23
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	83 U	97 U	100 U	94 U	84 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	8.4 U	9.7 U	10 U	9.5 U	8.5 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	41 U	48 U	51 U	47 U	42 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	210 U	250 U	260 U	240 U	210 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	170	**220**	49	42	69
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	41 U	48 U	51 U	15 J	42 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	**250**	**400**	83	75	110

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB4	EP-SB4	EP-SB4	EP-SB5	EP-SB5
						Sample ID:	SL22-EP-SB4-4080	SL22-EP-SB4-8012	SL22-EP-SB4-1215	SL22-EP-SB5-0040	SL22-EP-SB5-4080
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/19/2022	01/19/2022
						Depth Interval (ft):	4-8	8-12	12-15	0-4	4-8
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	11 U	11 U	10 U	9 U	9.9 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	11 U	11 U	10 U	9 U	9.9 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	530 U	530 U	500 U	440 U	490 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	11 U	11 U	10 U	9 U	9.9 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	4.7 J	3.4 J	10	**45**	**34**
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	11 U	11 U	**7.8 J**	**14**	**14**
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	11 U	11 U	5.8 J	**14**	**14**
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	110 U	110 U	100 U	90 U	99 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	5.7 J	3.6 J	20	52	50
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	110 U	110 U	100 U	90 U	99 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	110 U	110 U	100 U	90 U	99 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	12	9.5 J	53	**120**	**130**
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	13	9.5 J	53	140	140
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	16	12	72	200	190
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	10 J	7.6 J	42	120	120
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	3.9 J	3.9 J	25	61	65
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	11 U	11 U	10 U	9 U	9.9 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	530 U	530 U	500 U	91 J	80 J
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	53 U	53 U	50 U	41 J	38 J
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	11 U	11 U	5.2 J	11	7.8 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB4	EP-SB4	EP-SB4	EP-SB5	EP-SB5
						Sample ID:	SL22-EP-SB4-4080	SL22-EP-SB4-8012	SL22-EP-SB4-1215	SL22-EP-SB5-0040	SL22-EP-SB5-4080
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/19/2022	01/19/2022
						Depth Interval (ft):	4-8	8-12	12-15	0-4	4-8
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	14	11	61	150	140
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	11 U	11 U	9.7 J	30	**35**
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	53 U	53 U	50 U	25 J	23 J
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	53 U	53 U	50 U	34 J	30 J
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	24	18	110	180	180
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	3.7 J	2.5 J	13	25	27
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	11 U	11 U	10 U	9 U	9.9 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	11 U	11 U	10 U	9 U	9.9 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	9.5 J	7.6 J	38	110	100
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	9.7 J	6.9 J	18	81	88
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	110 U	110 U	100 U	90 U	99 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	11 U	11 U	10 U	9 U	9.9 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	270 U	270 U	260 U	230 U	250 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	17	11	59	140	120
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	53 U	53 U	50 U	44 U	49 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	24	16	97	**210**	**220**

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

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Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB5	EP-SB6	EP-SB6	EP-SB6	EP-SB6
						Sample ID:	SL22-EP-SB5-8012	SL22-EP-SB6-0040	SL22-EP-SB6-4080	SL22-EP-SB6-4080FD	SL22-EP-SB6-8012
						Sample Date:	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022
						Depth Interval (ft):	8-12	0-4	4-8	4-8	8-12
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	390 U	440 U	500 U	470 U	540 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	9.9	12	4.5 J	6 J	5.7 J
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	**7.9 J**	2.7 J	10 U	9.5 U	11 U
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	**6.8 J**	3.9 J	3.4 J	3.6 J	3.2 J
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	80 U	89 U	100 U	95 U	110 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	18	7.4 J	7.6 J	9.2 J	7.9 J
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	80 U	89 U	100 U	95 U	110 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	80 U	89 U	100 U	95 U	110 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	47	24	21	26	21
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	42	24	21	23	20
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	48	28	22	26	24
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	31	20	14	18	17
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	18	10	9.8 J	11	9.1 J
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	390 U	440 U	500 U	470 U	540 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	4.6 J	2.5 J	10 U	9.5 U	11 U

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB5	EP-SB6	EP-SB6	EP-SB6	EP-SB6
						Sample ID:	SL22-EP-SB5-8012	SL22-EP-SB6-0040	SL22-EP-SB6-4080	SL22-EP-SB6-4080FD	SL22-EP-SB6-8012
						Sample Date:	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022
						Depth Interval (ft):	8-12	0-4	4-8	4-8	8-12
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	53	29	22	26	23
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	8.3	5.9 J	10 U	9.5 U	11 U
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	34 J	44 U	50 U	47 U	54 U
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	83	35	32	36	29
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	11	3.6 J	4 J	4.6 J	3.2 J
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	26	16	14	15	12
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	21	15	12	15	13
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	80 U	88 U	100 U	94 U	110 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	8 U	8.9 U	10 U	9.5 U	11 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	200 U	220 U	260 U	240 U	280 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	58	24	18	22	17
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	39 U	44 U	50 U	47 U	54 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	75	37	34	39	31

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

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Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB6	EP-SB7	EP-SB7	EP-SB7	EP-SB8
						Sample ID:	SL22-EP-SB6-1215	SL22-EP-SB7-0040	SL22-EP-SB7-4080	SL22-EP-SB7-8012	SL22-EP-SB8-0035
						Sample Date:	01/19/2022	01/21/2022	01/21/2022	01/21/2022	01/20/2022
						Depth Interval (ft):	12-15	0-4	4-8	8-12	0-3.5
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	430 U	480 U	430 U	470 U	420 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	5.8 J	9.8	10	4 J	12
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	4 J	4.8 J	5.8 J	9.6 U	**11**
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	4.4 J	3.7 J	3.6 J	9.6 U	3.7 J
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	88 U	98 U	88 U	96 U	84 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	16	22	16	5.1 J	20
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	88 U	98 U	88 U	96 U	84 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	88 U	98 U	88 U	96 U	7.6 J
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	36	46	35	12	38
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	31	46	34	12	36
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	35	57	46	15	48
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	23	35	28	11	31
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	13	20	15	6.1 J	17
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	430 U	480 U	430 U	470 U	420 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	5 J	3.9 J	4.1 J	9.6 U	5.7 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB6	EP-SB7	EP-SB7	EP-SB7	EP-SB8
						Sample ID:	SL22-EP-SB6-1215	SL22-EP-SB7-0040	SL22-EP-SB7-4080	SL22-EP-SB7-8012	SL22-EP-SB8-0035
						Sample Date:	01/19/2022	01/21/2022	01/21/2022	01/21/2022	01/20/2022
						Depth Interval (ft):	12-15	0-4	4-8	8-12	0-3.5
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	40	49	40	14	46
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	9.3	11	6.7 J	9.6 U	9.4
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	66	80	70	20	88
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	8.3 J	8.9 J	9.5	2.4 J	14
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	19	30	24	9.7	27
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	10	23	18	8.7 J	19
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	87 U	97 U	88 U	95 U	84 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	8.8 U	9.8 U	8.8 U	9.6 U	8.4 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	220 U	250 U	220 U	240 U	210 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	56	53	44	14	71
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	43 U	48 U	43 U	47 U	42 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	65	71	61	18	79

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

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Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB8	EP-SB9	EP-SB9	EP-SB9	EP-SB9
						Sample ID:	SL22-EP-SB8-3570	SL22-EP-SB9-0040	SL22-EP-SB9-4080	SL22-EP-SB9-8012	SL22-EP-SB9-1215
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	3.5-7	0-4	4-8	8-12	12-15
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	480 U	420 U	400 U	400 U	440 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	13	**57**	**33**	**37**	8.6 J
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	6.2 J	**17**	**8.2**	**18**	4.5 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	5.2 J	**17**	**15**	**11**	3.8 J
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	98 U	86 U	81 U	81 U	90 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	18	**66**	32	48	12
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	98 U	86 U	81 U	81 U	90 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	98 U	86 U	81 U	81 U	90 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	47	**150**	81	100	26
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	48	150	79	96	25
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	60	190	98	130	29
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	40	110	68	81	18
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	21	71	30	50	11
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	480 U	75 J	400 U	95 J	440 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	48 U	34 J	40 U	50	44 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	6.1 J	9.3	5.5 J	9.5	2.4 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB8	EP-SB9	EP-SB9	EP-SB9	EP-SB9
						Sample ID:	SL22-EP-SB8-3570	SL22-EP-SB9-0040	SL22-EP-SB9-4080	SL22-EP-SB9-8012	SL22-EP-SB9-1215
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	3.5-7	0-4	4-8	8-12	12-15
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	52	160	92	110	31
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	12	**38**	19	23	9 U
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	48 U	28 J	16 J	22 J	44 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	48 U	32 J	40 U	40 U	37 J
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	84	200	140	160	47
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	10	33	16	30	7.2 J
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	36	110	58	72	13
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	48 U	14 J	40 U	40 U	44 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	17	130	64	74	20
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	98 U	86 U	80 U	81 U	90 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	9.8 U	8.6 U	8.1 U	8.1 U	9 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	250 U	220 U	200 U	210 U	230 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	53	150	77	130	27
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	48 U	42 U	40 U	40 U	44 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	84	**260**	120	**210**	49

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

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Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB9	EP-SB10	EP-SB10	EP-SB11	EP-SB11
						Sample ID:	SL22-EP-SB9-1215FD	SL22-EP-SB10-0040	SL22-EP-SB10-4080	SL22-EP-SB11-0040	SL22-EP-SB11-4080
						Sample Date:	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022
						Depth Interval (ft):	12-15	0-4	4-8	0-4	4-8
SVOCs											
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	440 U	450 U	450 U	420 U	450 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	18	11	8.2 J	6.5 J	5.6 J
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	**6.8 J**	3.5 J	2.6 J	3.2 J	2.8 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	**7.9 J**	**6 J**	5.3 J	2.4 J	2.7 J
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	89 U	91 U	92 U	85 U	92 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	25	14	10	7.4 J	7.2 J
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	89 U	91 U	92 U	85 U	92 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	89 U	91 U	92 U	85 U	92 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	50	46	29	20	21
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	50	52	34	19	18
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	57	48	39	23	20
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	38	34	22	15	14
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	22	18	9.2	8.1 J	7.9 J
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	440 U	450 U	450 U	420 U	450 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	3.8 J	2.7 J	9.2 U	2.3 J	2.6 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB9	EP-SB10	EP-SB10	EP-SB11	EP-SB11
						Sample ID:	SL22-EP-SB9-1215FD	SL22-EP-SB10-0040	SL22-EP-SB10-4080	SL22-EP-SB11-0040	SL22-EP-SB11-4080
						Sample Date:	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022
						Depth Interval (ft):	12-15	0-4	4-8	0-4	4-8
SVOCs											
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	57	49	33	23	20
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	11	8.1 J	7 J	8.5 U	9.2 U
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	120	74	41	35	35
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	13	5.1 J	4.6 J	4.9 J	4 J
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	32	26	20	14	11
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	35	17	19	8.8	9 J
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	88 U	91 U	91 U	84 U	91 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	8.9 U	9.1 U	9.2 U	8.5 U	9.2 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	220 U	230 U	230 U	220 U	230 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	53	41	25	23	23
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	44 U	45 U	45 U	42 U	45 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	84	74	42	37	36

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB12	EP-SB12	EP-SB12
						Sample ID:	SL22-EP-SB12-0040	SL22-EP-SB12-0040FD	SL22-EP-SB12-4080
						Sample Date:	01/18/2022	01/18/2022	01/18/2022
						Depth Interval (ft):	0-4	0-4	4-8
SVOCs									
1,1'-Biphenyl	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
2,2'-oxybis[1-chloropropane]	NSL	NSL	NSL	NSL	NSL	ug/kg	8.5 U	8.2 U	8.5 U
2,4,5-Trichlorophenol	NSL	NSL	1920000	NSL	NSL	ug/kg	42 U	40 U	42 U
2,4,6-Trichlorophenol	NSL	NSL	595000	NSL	NSL	ug/kg	42 U	40 U	42 U
2,4-Dichlorophenol	NSL	NSL	48000	NSL	NSL	ug/kg	8.5 U	8.2 U	8.5 U
2,4-Dimethylphenol	NSL	NSL	390000	NSL	NSL	ug/kg	42 U	40 U	42 U
2,4-Dinitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	420 U	400 U	420 U
2,4-Dinitrotoluene	NSL	NSL	50000	NSL	NSL	ug/kg	42 U	40 U	42 U
2,6-Dinitrotoluene	NSL	NSL	25000	NSL	NSL	ug/kg	42 U	40 U	42 U
2-Chloronaphthalene	NSL	NSL	NSL	NSL	NSL	ug/kg	8.5 U	8.2 U	8.5 U
2-Chlorophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
2-Methylnaphthalene	20	200	100000	120,000	369,000	ug/kg	7.3 J	13	10
2-Methylphenol	NSL	NSL	75000	NSL	NSL	ug/kg	42 U	40 U	42 U
2-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	210 U	220 U
2-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
3,3'-Dichlorobenzidine	NSL	NSL	25000	NSL	NSL	ug/kg	42 U	40 U	42 U
3-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	210 U	220 U
4,6-Dinitro-2-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	210 U	220 U
4-Bromophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
4-Chloro-3-methylphenol	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
4-Chloroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
4-Chlorophenyl phenyl ether	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
4-Nitroaniline	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	210 U	220 U
4-Nitrophenol	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	210 U	220 U
Acenaphthene	6.7	89	1200000	1,860,000	5,260,000	ug/kg	2.5 J	5.2 J	3.3 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	ug/kg	5.4 J	**8.6**	5.1 J
Acetophenone	NSL	NSL	NSL	NSL	NSL	ug/kg	85 U	82 U	85 U
Anthracene	57	850	7880000	10,000,000	45,400,000	ug/kg	11	22	11
Atrazine	NSL	NSL	NSL	NSL	NSL	ug/kg	85 U	82 U	85 U
Benzaldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	85 U	82 U	85 U
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	ug/kg	34	63	34
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	ug/kg	33	56	34
Benzo[b]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	38	66	43
Benzo[g,h,i]perylene	NSL	NSL	NSL	NSL	NSL	ug/kg	25	40	26
Benzo[k]fluoranthene	NSL	NSL	NSL	NSL	NSL	ug/kg	15	20	11
Bis(2-chloroethoxy)methane	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
Bis(2-chloroethyl)ether	NSL	NSL	2500	6,000	NSL	ug/kg	8.5 U	8.2 U	8.5 U
Bis(2-ethylhexyl) phthalate	NSL	NSL	570000	NSL	NSL	ug/kg	420 U	400 U	420 U
Butyl benzyl phthalate	NSL	NSL	580000	NSL	NSL	ug/kg	42 U	40 U	42 U
Caprolactam	NSL	NSL	NSL	NSL	NSL	ug/kg	220 U	210 U	220 U
Carbazole	NSL	NSL	700000	NSL	NSL	ug/kg	2.7 J	4.5 J	3 J

Analyte	Level I SQTs[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB12	EP-SB12	EP-SB12
						Sample ID:	SL22-EP-SB12-0040	SL22-EP-SB12-0040FD	SL22-EP-SB12-4080
						Sample Date:	01/18/2022	01/18/2022	01/18/2022
						Depth Interval (ft):	0-4	0-4	4-8
SVOCs									
Chrysene	170	1,300	NSL	NSL	NSL	ug/kg	39	64	38
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	ug/kg	7 J	12	6.7 J
Dibenzofuran	NSL	NSL	104000	NSL	NSL	ug/kg	42 U	40 U	42 U
Diethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
Dimethyl phthalate	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
Di-n-butyl phthalate	NSL	NSL	2440000	NSL	NSL	ug/kg	42 U	40 U	42 U
Di-n-octyl phthalate	NSL	NSL	520000	NSL	NSL	ug/kg	42 U	40 U	42 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	ug/kg	53	92	51
Fluorene	77	540	850000	1,200,000	4,120,000	ug/kg	4.9 J	9	5.8 J
Hexachlorobenzene	NSL	NSL	5000	NSL	NSL	ug/kg	8.5 U	8.2 U	8.5 U
Hexachlorobutadiene	NSL	NSL	6000	6,000	37,000	ug/kg	8.5 U	8.2 U	8.5 U
Hexachlorocyclopentadiene	NSL	NSL	2000	NSL	NSL	ug/kg	42 U	40 U	42 U
Hexachloroethane	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
Indeno[1,2,3-cd]pyrene	NSL	NSL	NSL	NSL	NSL	ug/kg	21	33	22
Isophorone	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
Methylphenol, 3 & 4	NSL	NSL	NSL	NSL	NSL	ug/kg	42 U	40 U	42 U
Naphthalene	180	560	10000	24,000	28,000	ug/kg	14	23	24
Nitrobenzene	NSL	NSL	NSL	NSL	NSL	ug/kg	85 U	82 U	85 U
N-Nitrosodi-n-propylamine	NSL	NSL	700	NSL	NSL	ug/kg	8.5 U	8.2 U	8.5 U
N-Nitrosodiphenylamine	NSL	NSL	1950000	NSL	NSL	ug/kg	42 U	40 U	42 U
Pentachlorophenol	NSL	NSL	80000	NSL	NSL	ug/kg	220 U	210 U	220 U
Phenanthrene	200	1,200	NSL	NSL	NSL	ug/kg	30	55	32
Phenol	NSL	NSL	1,500,000	NSL	NSL	ug/kg	42 U	40 U	42 U
Pyrene	200	1,500	890,000	1,060,000	5,800,000	ug/kg	54	96	51

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

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Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

SVOCs = Semivolatile organic compounds

ug/kg = micrograms per kilogram

Table 3C PAHs Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2	EP-SB3
							Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD	SL22-EP-SB3-0040
							Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
							Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9	0-4
PAHs													
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	5.1 J	**25**	**27**	**28**	17	**35**
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	8.7 U	**15**	**8**	**11**	5.3 J	**13**
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	8.7 U	3.3 J	**11**	**16**	**8.1 J**	**27**
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	6.1 J	16	29	44	21	**64**
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	22	40	82	**120**	59	**180**
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	23	39	79	110	56	**190**
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	24	46	94	130	68	**220**
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	8.9	9.1 J	19	23	11	**43**
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	34	75	130	200	92	310
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	2.9 J	14	14	20	9.9	19
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	6.9 J	30	48	67	38	65
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	20	57	83	120	52	170
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	32	72	120	180	89	**250**
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	194	441	744	1069	526	1586

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

CUG[1] = Cleanup goals set at the mid-point between Level I and Level II Minnesota Pollution Control Agency Sediment Quality Targets (MPCA 2007).

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FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]	Location:	EP-SB3	EP-SB3	EP-SB3	EP-SB4	EP-SB4	EP-SB4
							Sample ID:	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080	SL22-EP-SB4-8012
							Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
							Depth Interval (ft):	4-8	8-12	12-15	0-4	4-8	8-12
PAHs													
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	**50**	12	13	14	4.7 J	3.4 J
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	**22**	**6.9 J**	5.3 J	6.5 J	11 U	11 U
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	**28**	**6.4 J**	**7.4 J**	**6.5 J**	11 U	11 U
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	**96**	18	18	25	5.7 J	3.6 J
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	**260**	47	48	67	12	9.5 J
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	**260**	45	51	67	13	9.5 J
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	**270**	55	56	80	14	11
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	**56**	11	9 J	20	11 U	11 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	330	87	79	120	24	18
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	45	9.6 J	8.8 J	13	3.7 J	2.5 J
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	160	22	36	23	9.7 J	6.9 J
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	**220**	49	42	69	17	11
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	**400**	83	75	110	24	16
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	**2197**	452	449	621	144	108

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

CUG[1] = Cleanup goals set at the mid-point between Level I and Level II Minnesota Pollution Control Agency Sediment Quality Targets (MPCA 2007).

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B = Present in Method Blank

J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Table 3C PAHs Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]						
Location:								**EP-SB4**	**EP-SB5**	**EP-SB5**	**EP-SB5**	**EP-SB6**	**EP-SB6**
Sample ID:								**SL22-EP-SB4-1215**	**SL22-EP-SB5-0040**	**SL22-EP-SB5-4080**	**SL22-EP-SB5-8012**	**SL22-EP-SB6-0040**	**SL22-EP-SB6-4080**
Sample Date:								**01/20/2022**	**01/19/2022**	**01/19/2022**	**01/19/2022**	**01/19/2022**	**01/19/2022**
Depth Interval (ft):								**12-15**	**0-4**	**4-8**	**8-12**	**0-4**	**4-8**
PAHs													
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	10	**45**	**34**	9.9	12	4.5 J
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	**7.8 J**	**14**	**14**	**7.9 J**	2.7 J	10 U
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	5.8 J	**14**	**14**	**6.8 J**	3.9 J	3.4 J
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	20	52	50	18	7.4 J	7.6 J
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	53	**120**	**130**	47	24	21
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	53	140	140	42	24	21
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	61	150	140	53	29	22
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	9.7 J	30	**35**	8.3	5.9 J	10 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	110	180	180	83	35	32
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	13	25	27	11	3.6 J	4 J
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	18	81	88	21	15	12
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	59	140	120	58	24	18
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	97	**210**	**220**	75	37	34
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	517	1201	1192	441	224	190

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

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Shaded Bold Italics **= Exceeds Residential SRV**

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J = Estimated value

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]	Location:	EP-SB6	EP-SB6	EP-SB6	EP-SB7	EP-SB7	EP-SB7
							Sample ID:	SL22-EP-SB6-4080FD	SL22-EP-SB6-8012	SL22-EP-SB6-1215	SL22-EP-SB7-0040	SL22-EP-SB7-4080	SL22-EP-SB7-8012
							Sample Date:	01/19/2022	01/19/2022	01/19/2022	01/21/2022	01/21/2022	01/21/2022
							Depth Interval (ft):	4-8	8-12	12-15	0-4	4-8	8-12
PAHs													
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	6 J	5.7 J	5.8 J	9.8	10	4 J
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	9.5 U	11 U	4 J	4.8 J	5.8 J	9.6 U
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	3.6 J	3.2 J	4.4 J	3.7 J	3.6 J	9.6 U
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	9.2 J	7.9 J	16	22	16	5.1 J
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	26	21	36	46	35	12
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	23	20	31	46	34	12
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	26	23	40	49	40	14
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	9.5 U	11 U	9.3	11	6.7 J	9.6 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	36	29	66	80	70	20
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	4.6 J	3.2 J	8.3 J	8.9 J	9.5	2.4 J
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	15	13	10	23	18	8.7 J
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	22	17	56	53	44	14
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	39	31	65	71	61	18
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	220	185	352	428	354	125

Notes:

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RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Table 3C PAHs Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]	Location:	EP-SB8	EP-SB8	EP-SB9	EP-SB9	EP-SB9	EP-SB9
							Sample ID:	SL22-EP-SB8-0035	SL22-EP-SB8-3570	SL22-EP-SB9-0040	SL22-EP-SB9-4080	SL22-EP-SB9-8012	SL22-EP-SB9-1215
							Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
							Depth Interval (ft):	0-3.5	3.5-7	0-4	4-8	8-12	12-15
PAHs													
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	12	13	**57**	**33**	**37**	8.6 J
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	**11**	6.2 J	**17**	**8**	**18**	4.5 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	3.7 J	5.2 J	**17**	**15**	**11**	3.8 J
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	20	18	**66**	32	48	12
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	38	47	**150**	81	100	26
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	36	48	150	79	96	25
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	46	52	160	92	110	31
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	9.4	12	**38**	19	23	9 U
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	88	84	200	140	160	47
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	14	10	33	16	30	7.2 J
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	19	17	130	64	74	20
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	71	53	150	77	130	27
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	79	84	**260**	120	**210**	49
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	447	449	1428	776	1047	266

Notes:

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RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Table 3C PAHs Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]	Location:	EP-SB9	EP-SB10	EP-SB10	EP-SB11	EP-SB11	EP-SB12
							Sample ID:	SL22-EP-SB9-1215FD	SL22-EP-SB10-0040	SL22-EP-SB10-4080	SL22-EP-SB11-0040	SL22-EP-SB11-4080	SL22-EP-SB12-0040
							Sample Date:	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/18/2022
							Depth Interval (ft):	12-15	0-4	4-8	0-4	4-8	0-4
PAHs													
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	18	11	8.2 J	6.5 J	5.6 J	7.3 J
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	**6.8 J**	3.5 J	2.6 J	3.2 J	2.8 J	2.5 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	**7.9 J**	**6 J**	5.3 J	2.4 J	2.7 J	5.4 J
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	25	14	10	7.4 J	7.2 J	11
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	50	46	29	20	21	34
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	50	52	34	19	18	33
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	57	49	33	23	20	39
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	11	8.1 J	7 J	8.5 U	9.2 U	7 J
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	120	74	41	35	35	53
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	13	5.1 J	4.6 J	4.9 J	4 J	4.9 J
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	35	17	19	8.8	9 J	14
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	53	41	25	23	23	30
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	84	74	42	37	36	54
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	531	401	261	194	189	295

Notes:

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RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Table 3C PAHs Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Anlayte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	CUG[1]	Location:	EP-SB12	EP-SB12
							Sample ID:	SL22-EP-SB12-0040FD	SL22-EP-SB12-4080
							Sample Date:	01/18/2022	01/18/2022
							Depth Interval (ft):	0-4	4-8
PAHs									
2-Methylnaphthalene	20	200	100,000	120,000	369,000	NSL	µg/kg	13	10
Acenaphthene	6.7	89	1,200,000	1,860,000	5,260,000	NSL	µg/kg	5.2 J	3.3 J
Acenaphthylene	5.9	130	NSL	NSL	NSL	NSL	µg/kg	**9**	5.1 J
Anthracene	57	850	7,880,000	10,000,000	45,400,000	NSL	µg/kg	22	11
Benzo[a]anthracene	110	1,100	NSL	NSL	NSL	NSL	µg/kg	63	34
Benzo[a]pyrene	150	1,500	2,000	NSL	NSL	NSL	µg/kg	56	34
Chrysene	170	1,300	NSL	NSL	NSL	NSL	µg/kg	64	38
Dibenz[a,h]anthracene	33	140	NSL	NSL	NSL	NSL	µg/kg	12	6.7 J
Fluoranthene	420	2,200	1,080,000	1,290,000	6,800,000	NSL	µg/kg	92	51
Fluorene	77	540	850,000	1,200,000	4,120,000	NSL	µg/kg	9	5.8 J
Naphthalene	180	560	10,000	24,000	28,000	NSL	µg/kg	23	24
Phenanthrene	200	1,200	NSL	NSL	NSL	NSL	µg/kg	55	32
Pyrene	200	1,500	890,000	1,060,000	5,800,000	NSL	µg/kg	96	51
Total 13PAHs (ND=1/2RL)	1,600	23,000	NSL	NSL	NSL	12,300	µg/kg	519	306

Notes:

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FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

PAHs = Polycyclic aromatic hydrocarbons

µg/kg = micrograms per kilogram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2	EP-SB3	EP-SB3
						Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD	SL22-EP-SB3-0040	SL22-EP-SB3-4080
						Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9	0-4	4-8
PCBs													
Aroclor 1016	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor 1221	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor 1232	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor 1242	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor 1248	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor 1254	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	2.8	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor 1260	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3	1.3 U	2	8.8	3.7	1.8	1.2
Aroclor-1262	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Aroclor-1268	NSL	NSL	NSL	NSL	NSL	ug/kg	1.1 U	1.3 U	1 U	1.1 U	1 U	1 U	1.2 U
Total PCBs	60	680	1,200	1,400	8,000	ug/kg	1.3	2.8	2	8.8	3.7	1.8	1.2

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U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

PCBs = Polychlorinated biphenyls

RL = Reporting Limit

SQT = Sediment quality target

ug/kg = micrograms per kilogram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB3	EP-SB3	EP-SB4	EP-SB4
						Sample ID:	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	8-12	12-15	0-4	4-8
PCBs										
Aroclor 1016	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Aroclor 1221	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Aroclor 1232	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Aroclor 1242	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Aroclor 1248	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Aroclor 1254	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.5
Aroclor 1260	NSL	NSL	NSL	NSL	NSL	ug/kg	6.5	1.8	9.9	1.4 U
Aroclor-1262	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Aroclor-1268	NSL	NSL	NSL	NSL	NSL	ug/kg	1.3 U	1.2 U	1.1 U	1.4 U
Total PCBs	60	680	1,200	1,400	8,000	ug/kg	6.5	1.8	9.9	1.5

Notes:

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RL = Reporting Limit

SQT = Sediment quality target

ug/kg = micrograms per kilogram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2	EP-SB3
						Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD	SL22-EP-SB3-0040
						Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9	0-4
Pesticides												
4,4'-DDD	4.9	28	56000	74,000	125,000	ug/kg	0.14 p	0.26 p	1.2 p	0.67 Jp	0.75 Jp	4 p
4,4'-DDE	3.2	31	40000	52,000	80,000	ug/kg	0.061 J	0.091 J	1 U	0.64 J	1 U	1.3
4,4'-DDT	4.2	63	15000	18,000	88,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	2.3 p
Aldrin	NSL	NSL	1000	1,000	2,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
alpha-BHC	NSL	NSL	2000	3,000	3,500	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
beta-BHC	NSL	NSL	7000	11,000	15,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
cis-Chlordane	NSL	NSL	NSL	NSL	NSL	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	0.63 J
delta-BHC	NSL	NSL	NSL	NSL	NSL	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Dieldrin	1.9	62	800	1,200	2,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Endosulfan I	NSL	NSL	NSL	140,000	700,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Endosulfan II	NSL	NSL	NSL	140,000	700,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Endosulfan sulfate	NSL	NSL	NSL	NSL	NSL	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Endrin	2.2	210	8000	10,000	56,000	ug/kg	0.068 Jp	0.064 Jp	0.57 Jp	0.98 J	0.55 Jp	1.2 p
Endrin aldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Endrin ketone	NSL	NSL	NSL	NSL	NSL	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
gamma-BHC (Lindane)	2.4	5	9000	12,000	15,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Heptachlor	NSL	NSL	2000	3,000	3,500	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Heptachlor epoxide	2.5	16	400	500	3,000	ug/kg	0.11 U	0.13 U	1 U	1.1 U	1 U	1 U
Methoxychlor	NSL	NSL	11000	13,000	50,000	ug/kg	0.22 U	0.26 U	2 U	2.2 U	2.1 U	2.1 U
Toxaphene	0.1	32	13000	17,000	28,000	ug/kg	4.3 U	5.2 U	40 U	44 U	42 U	41 U
trans-Chlordane	NSL	NSL	NSL	NSL	NSL	ug/kg	0.11 U	0.032 Jp	1 U	1.1 U	1 U	0.47 Jp

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

J = Estimated value

p = The %RPD between the primary and confirmation column/detector is >40%. The lower value is reported.

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

ug/kg = micrograms per kilogram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB3	EP-SB3	EP-SB3	EP-SB4	EP-SB4
						Sample ID:	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	4-8	8-12	12-15	0-4	4-8
Pesticides											
4,4'-DDD	4.9	28	56000	74,000	125,000	ug/kg	1.9 p	1.6 p	0.95 Jp	0.58 p	0.13 U
4,4'-DDE	3.2	31	40000	52,000	80,000	ug/kg	1.1 J	1.3 U	1.2 U	0.2 p	0.13 U
4,4'-DDT	4.2	63	15000	18,000	88,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Aldrin	NSL	NSL	1000	1,000	2,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
alpha-BHC	NSL	NSL	2000	3,000	3,500	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
beta-BHC	NSL	NSL	7000	11,000	15,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
cis-Chlordane	NSL	NSL	NSL	NSL	NSL	ug/kg	1.2 U	1.3 U	1.2 U	0.097 Jp	0.13 U
delta-BHC	NSL	NSL	NSL	NSL	NSL	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Dieldrin	1.9	62	800	1,200	2,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Endosulfan I	NSL	NSL	NSL	140,000	700,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Endosulfan II	NSL	NSL	NSL	140,000	700,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Endosulfan sulfate	NSL	NSL	NSL	NSL	NSL	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Endrin	2.2	210	8000	10,000	56,000	ug/kg	1.3 p	0.94 Jp	0.63 Jp	0.74 p	0.13 U
Endrin aldehyde	NSL	NSL	NSL	NSL	NSL	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Endrin ketone	NSL	NSL	NSL	NSL	NSL	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
gamma-BHC (Lindane)	2.4	5	9000	12,000	15,000	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Heptachlor	NSL	NSL	2000	3,000	3,500	ug/kg	1.2 U	1.3 U	1.2 U	0.11 U	0.13 U
Heptachlor epoxide	2.5	16	400	500	3,000	ug/kg	1.2 U	1.3 U	1.2 U	0.15 p	0.13 U
Methoxychlor	NSL	NSL	11000	13,000	50,000	ug/kg	2.4 U	2.6 U	2.3 U	0.21 U	0.27 U
Toxaphene	0.1	32	13000	17,000	28,000	ug/kg	48 U	51 U	47 U	4.2 U	5.4 U
trans-Chlordane	NSL	NSL	NSL	NSL	NSL	ug/kg	1.2 U	1.3 U	1.2 U	0.19 p	0.13 U

Notes:

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Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

Underline Shaded Bolded Italics **= Exceeds Recreational SRV**

Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

J = Estimated value

p = The %RPD between the primary and confirmation column/detector is >40%. The lower value is reported.

U = Not Detected

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

ug/kg = micrograms per kilogram

Table 3F Dioxins Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2	EP-SB3
						Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD	SL22-EP-SB3-0040
						Sample Date:	1/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9	0-4
Dioxins												
2,3,7,8-TCDD	NSL	NSL	20	25	35	pg/g	1.3 U	1.8	0.87 Jq	1.1 Jq	1.2	1.1 Jq
1,2,3,7,8-PeCDD	0.85	21.5	NSL	NSL	NSL	pg/g	0.35 Jq	**2.2 J**	**0.93 Jq**	6.3 U	**0.9 Jq**	6.3 U
1,2,3,4,7,8-HxCDD	NSL	NSL	NSL	NSL	NSL	pg/g	1.2 JB	2.7 JB	1.7 JB	2.1 JqB	1.7 JB	1.8 JB
1,2,3,6,7,8-HxCDD	NSL	NSL	NSL	2,500	5,000	pg/g	2.5 JB	13 B	6.5 B	11 B	6.7 B	9 B
1,2,3,7,8,9-HxCDD	NSL	NSL	2,000	NSL	NSL	pg/g	2.2 JB	8.5 B	4.8 J	8.1	4.8 J	6.5
1,2,3,4,6,7,8-HpCDD	NSL	NSL	NSL	NSL	NSL	pg/g	53 B	210 B	150 B	340 B	190 B	170 B
OCDD	NSL	NSL	NSL	NSL	NSL	pg/g	610 B	1800 B	1400 B	3600 B	1900 B	1800 B
2,3,7,8-TCDF	NSL	NSL	NSL	NSL	NSL	pg/g	1.2 J	6.1	2.6	3	2.1	3.4
1,2,3,7,8-PeCDF	0.85	21.5	NSL	NSL	NSL	pg/g	0.59 JB	**1.6 JB**	**3 J**	6.3 U	**1.3 J**	6.3 U
2,3,4,7,8-PeCDF	0.85	21.5	NSL	NSL	NSL	pg/g	0.52 JB	**2.3 JB**	6.1 U	6.3 U	6.2 U	**1.5 J**
1,2,3,4,7,8-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	1.3 J	4.3 J	10	6.3 U	3.3 Jq	5.6 J
1,2,3,6,7,8-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	1.6 J	6.1 J	7.1	6.3 U	4.4 J	5.8 J
2,3,4,6,7,8-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	0.96 J	2.2 Jq	2.5 J	6.3 U	6.2 U	6.3 U
1,2,3,7,8,9-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	0.4 J	7.7 U	1.9 J	6.3 U	6.2 U	6.3 U
1,2,3,4,6,7,8-HpCDF	NSL	NSL	NSL	NSL	NSL	pg/g	49 B	270 B	160 B	190 B	130 B	230 B
1,2,3,4,7,8,9-HpCDF	NSL	NSL	NSL	NSL	NSL	pg/g	1.5 JB	4.2 JB	27 B	9.4 B	5 JB	6.4 B
OCDF	NSL	NSL	NSL	NSL	NSL	pg/g	30 B	140 B	310 B	170 B	90 B	160 B
WHO TEQ_2005 (ND=1/2RL)	NSL	NSL	NSL	NSL	NSL	pg/g	1.20	6.04	4.57	7.25	4.57	6.82

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

Bolded = Exceeds Level I screening level

Bolded Italics = Exceeds Level II screening level

Shaded Bold Italics **= Exceeded Residential SRV**

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Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

q = The reported result is the estimated maximum possible concentration of this analyte, quantitated using the theoretical ion ratio. The measured ion ratio does not meet qualitative identification criteria and indicates a possible interference.

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

pg/g = picograms per gram

Analyte	Level I SQTS[a]	Level II SQTs[a]	Residential SRVs[b]	Recreational SRVs[b]	Industrial SRVs[b]	Location:	EP-SB3	EP-SB3	EP-SB3	EP-SB4	EP-SB4
						Sample ID:	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080
						Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
						Depth Interval (ft):	4-8	8-12	12-15	0-4	4-8
Dioxins											
2,3,7,8-TCDD	NSL	NSL	20	25	35	pg/g	1.7 q	2.5	1.8	0.92 Jq	2
1,2,3,7,8-PeCDD	0.85	21.5	NSL	NSL	NSL	pg/g	7.1 U	**1.7 J**	**1.7 J**	**1.1 J**	**2 J**
1,2,3,4,7,8-HxCDD	NSL	NSL	NSL	NSL	NSL	pg/g	2.9 JB	2.9 JB	2.6 JB	1.2 JBq	2.6 JB
1,2,3,6,7,8-HxCDD	NSL	NSL	NSL	2,500	5,000	pg/g	15 B	12 B	11 B	6.1 JB	12 B
1,2,3,7,8,9-HxCDD	NSL	NSL	2,000	NSL	NSL	pg/g	10	8.3	8.9	3.4 JB	8.2 B
1,2,3,4,6,7,8-HpCDD	NSL	NSL	NSL	NSL	NSL	pg/g	320 B	350 B	220 B	110 B	200 B
OCDD	NSL	NSL	NSL	NSL	NSL	pg/g	4400 B	3100 B	2300 B	1300 B	1800 B
2,3,7,8-TCDF	NSL	NSL	NSL	NSL	NSL	pg/g	5.9	6.2	4.8	2.7	5.1
1,2,3,7,8-PeCDF	0.85	21.5	NSL	NSL	NSL	pg/g	**2 J**	**1.7 J**	**2.1 J**	0.73 JB	**1.4 JB**
2,3,4,7,8-PeCDF	0.85	21.5	NSL	NSL	NSL	pg/g	7.1 U	7.6 U	7.2 U	**0.92 JB**	**1.6 JB**
1,2,3,4,7,8-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	7.7	5.6 J	7.4	2.5 J	4.1 J
1,2,3,6,7,8-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	8.6	6.2 J	7.8	2.7 J	6.4 J
2,3,4,6,7,8-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	2.6 J	7.6 U	1.9 J	1 J	1.9 J
1,2,3,7,8,9-HxCDF	NSL	NSL	NSL	NSL	NSL	pg/g	7.1 U	7.6 U	7.2 U	6.3 U	7.5 U
1,2,3,4,6,7,8-HpCDF	NSL	NSL	NSL	NSL	NSL	pg/g	390 B	180 B	280 B	140 B	250 B
1,2,3,4,7,8,9-HpCDF	NSL	NSL	NSL	NSL	NSL	pg/g	8.7 B	5.6 JB	9 B	2.3 JB	3.8 JB
OCDF	NSL	NSL	NSL	NSL	NSL	pg/g	260 B	130 B	200 B	77 B	140 B
WHO TEQ_2005 (ND=1/2RL)	NSL	NSL	NSL	NSL	NSL	pg/g	9.26	9.58	8.85	2.31	6.13

Notes:

[a] = Source: Guidance for the Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota, Publication No. TDR-GL-04 , MPCA February 2007.

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Double Underline Shaded Bolded Italics **= Exceeds Industrial SRV**

B = Present in Method Blank

J = Estimated value

U = Not Detected

q = The reported result is the estimated maximum possible concentration of this analyte, quantitated using the theoretical ion ratio. The measured ion ratio does not meet qualitative identification criteria and indicates a possible interference.

FD = Field Duplicate

NSL = No Screening Level

RL = Reporting Limit

SQT = Sediment quality target

pg/g = picograms per gram

Analyte	Location:	EP-SB1	EP-SB1	EP-SB2	EP-SB2	EP-SB2	EP-SB3	EP-SB3	EP-SB3	EP-SB3	EP-SB4	EP-SB4	EP-SB4
	Sample ID:	SL22-EP-SB1-0045	SL22-EP-SB1-4590	SL22-EP-SB2-0045	SL22-EP-SB2-4590	SL22-EP-SB2-4590FD	SL22-EP-SB3-0040	SL22-EP-SB3-4080	SL22-EP-SB3-8012	SL22-EP-SB3-1215	SL22-EP-SB4-0040	SL22-EP-SB4-4080	SL22-EP-SB4-8012
	Sample Date:	01/21/2022	01/21/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022
	Depth Interval (ft):	0-4.5	4.5-9	0-4.5	4.5-9	4.5-9	0-4	4-8	8-12	12-15	0-4	4-8	8-12
Other													
Percent Moisture	%	**24.4**	**36.9**	**19.3**	**23.8**	**20.1**	**20.4**	**31.4**	**36**	**30.2**	**21.2**	**39**	**38.8**
Moisture Content	%	**13.4**	**55.9**	**20.6**	**27**	NA	**25.5**	**39.3**	NA	**43.9**	**26.6**	**51.5**	**49.8**
Liquid Limit	none	0	**66**	0	**27**	NA	**45**	**52**	NA	**57**	**43**	**59**	**61**
Plastic Limit	none	0	**38**	0	**23**	NA	**27**	**32**	NA	**32**	**27**	**33**	**33**
Plasticity Index	none	NP	**28**	NP	**4**	NA	**18**	**20**	NA	**25**	**16**	**26**	**28**
Total Organic Carbon	mg/kg	**7700**	**46000**	**14000**	**14000**	**18000**	**22000**	**34000**	**32000**	**29000**	**14000**	**27000**	**29000**
Total Organic Carbon	%	**0.77**	**4.6**	**1.4**	**1.4**	**1.8**	**2.2**	**3.4**	**3.2**	**2.9**	**1.4**	**2.7**	**2.9**

Notes:

% = percent

FD = Field Duplicate

NA = Not analyzed

NP = No plasticity

mg/kg = milligrams per kilogram

Analyte	Location:	EP-SB4	EP-SB5	EP-SB5	EP-SB5	EP-SB6	EP-SB6	EP-SB6	EP-SB6	EP-SB6	EP-SB7	EP-SB7	EP-SB7
	Sample ID:	SL22-EP-SB4-1215	SL22-EP-SB5-0040	SL22-EP-SB5-4080	SL22-EP-SB5-8012	SL22-EP-SB6-0040	SL22-EP-SB6-4080	SL22-EP-SB6-4080FD	SL22-EP-SB6-8012	SL22-EP-SB6-1215	SL22-EP-SB7-0040	SL22-EP-SB7-4080	SL22-EP-SB7-8012
	Sample Date:	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/21/2022	01/21/2022	01/21/2022
	Depth Interval (ft):	12-15	0-4	4-8	8-12	0-4	4-8	4-8	8-12	12-15	0-4	4-8	8-12
Other													
Percent Moisture	%	**34.5**	**26.1**	**33.8**	**17.8**	**25.9**	**35.4**	**30.8**	**40.5**	**25.7**	**32.8**	**25.8**	**30.4**
Moisture Content	%	**55.7**	**34.8**	**54.8**	**24.4**	**46.4**	**46.2**	NA	**54.6**	**37.3**	**26.2**	**26.5**	**29.9**
Liquid Limit	none	**47**	**43**	**75**	0	**47**	**83**	NA	**83**	**65**	**41**	0	**59**
Plastic Limit	none	**28**	**28**	**39**	0	**29**	**40**	NA	**45**	**37**	**26**	0	**31**
Plasticity Index	none	**19**	**15**	**36**	NP	**18**	**43**	NA	**38**	**28**	**15**	NP	**28**
Total Organic Carbon	mg/kg	**37000**	**25000**	**28000**	**5300**	**25000**	**35000**	**28000**	**39000**	**25000**	**21000**	**6500**	**20000**
Total Organic Carbon	%	**3.7**	**2.5**	**2.8**	**0.53**	**2.5**	**3.5**	**2.8**	**3.9**	**2.5**	**2.1**	**0.65**	**2**

Notes:

% = percent

FD = Field Duplicate

NA = Not analyzed

NP = No plasticity

mg/kg = milligrams per kilogram

Table 3G Physical Properties Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Analyte	Location:	EP-SB8	EP-SB8	EP-SB9	EP-SB9	EP-SB9	EP-SB9	EP-SB9	EP-SB10	EP-SB10	EP-SB11	EP-SB11	EP-SB12
	Sample ID:	SL22-EP-SB8-0035	SL22-EP-SB8-3570	SL22-EP-SB9-0040	SL22-EP-SB9-4080	SL22-EP-SB9-8012	SL22-EP-SB9-1215	SL22-EP-SB9-1215FD	SL22-EP-SB10-0040	SL22-EP-SB10-4080	SL22-EP-SB11-0040	SL22-EP-SB11-4080	SL22-EP-SB12-0040
	Sample Date:	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/20/2022	01/19/2022	01/19/2022	01/19/2022	01/19/2022	01/18/2022
	Depth Interval (ft):	0-3.5	3.5-7	0-4	4-8	8-12	12-15	12-15	0-4	4-8	0-4	4-8	0-4
Other													
Percent Moisture	%	**20.6**	**31.6**	**24.3**	**19.1**	**19.1**	**26.7**	**26.3**	**27.7**	**27.6**	**22.5**	**27.8**	**23.2**
Moisture Content	%	**45.4**	**44.4**	**28.9**	**24.7**	**24.4**	**32.8**	NA	**25.1**	**36.8**	**35.2**	**32.1**	**25.8**
Liquid Limit	none	0	**37**	**41**	**27**	**25**	**39**	NA	0	**45**	0	0	0
Plastic Limit	none	0	**31**	**28**	**24**	**24**	**25**	NA	0	**28**	0	0	0
Plasticity Index	none	NP	**6**	**13**	**3**	**1**	**14**	NA	NP	**17**	NP	NP	NP
Total Organic Carbon	mg/kg	**12000**	**21000**	**26000**	**14000**	**13000**	**15000**	**20000**	**23000**	**28000**	**14000**	**17000**	**28000**
Total Organic Carbon	%	**1.2**	**2.1**	**2.6**	**1.4**	**1.3**	**1.5**	**2**	**2.3**	**2.8**	**1.4**	**1.7**	**2.8**

Notes:

% = percent

FD = Field Duplicate

NA = Not analyzed

NP = No plasticity

mg/kg = milligrams per kilogram

Table 3G Physical Properties Results
February 2022
Erie Pier - Spirit Lake Estuary Site

Analyte	Location:	EP-SB12	EP-SB12
	Sample ID:	SL22-EP-SB12-0040FD	SL22-EP-SB12-4080
	Sample Date:	01/18/2022	01/18/2022
	Depth Interval (ft):	0-4	4-8
Other			
Percent Moisture	%	**20.1**	**23.2**
Moisture Content	%	NA	**51**
Liquid Limit	none	NA	0
Plastic Limit	none	NA	0
Plasticity Index	none	NA	NP
Total Organic Carbon	mg/kg	**17000**	**22000**
Total Organic Carbon	%	**1.7**	**2.2**

Notes:

% = percent

FD = Field Duplicate

NA = Not analyzed

NP = No plasticity

mg/kg = milligrams per kilogram

Figures

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Legend

- Actual Soil Boring Location
- Area of Interest

Contour (feet)

- 610 - 614
- 614 - 616
- 616 - 619
- 619 - 623
- 623 - 629
- Water Table Contour (613 ft)

Map Date: 1/21/2022
Source: J.F Brennan, 2021
Projection: NAD 1983 State Plane Minnesota North - Feet

N

0 100 200
Feet

Figure 1
Actual Soil Boring Locations
Erie Pier CDF
Duluth, Minnesota

\\lovetongis\GISdata\Federal\Midwest\Minnesota\SpiritLake\MXD\Phase3\ErniePierCDF\Erie Pier CDF\Erie Pier CDF.aprx

Attachment A

Sampling Plan

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EA Engineering, Science, and Technology, Inc., PBC

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Fax: 410-771-1625
www.eaest.com

TITLE OF PLAN AND APPROVAL

Phase 2 Quality Assurance Project Plan – Erie Pier Sampling Plan Addendum
Remedial Action for Spirit Lake Sediment at the Former Duluth Works Site
January 2022

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
444 Lake Cook Road
Suite 18
Deerfield, Illinois 60015

Prepared by:

Michael C. Ciarlo — 01/24/2022

Michael Ciarlo, EA Project Manager — Date

Reviewed by:

Samantha Saalfield — 01/24/2022

Samantha Saalfield, EA Project Quality Assurance Manager — Date

Approved by:

Mark J. Loomis — Digitally signed by MARK LOOMIS
Date: 2022.03.24 12:16:35 -05'00'

Mark Loomis, EPA GLNPO Contracting Officer's Representative (COR) — Date

Approved by:

Louis Blume — Digitally signed by Louis Blume
Date: 2022.03.16 10:32:13 -05'00'

Louis Blume, EPA GLLA Quality Assurance Lead and Data Manager — Date

Reviewed by:

Carrie Gamber — 2-18-2022

Carrie Gamber, Eurofins TestAmerica Analytical Laboratory Project Manager — Date

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24 January 2022

TECHNICAL MEMORANDUM

TO: Mark Loomis, U.S. Environmental Protection Agency
Mark Rupnow, U.S. Steel

FROM: Michael Ciarlo, EA Project Manager

SUBJECT: Technical Memorandum for Erie Pier Sampling Plan Addendum to Spirit Lake Planning Documents
St. Louis River Area of Concern, Duluth, Minnesota
EA Project No. 1583408

1. INTRODUCTION AND BACKGROUND

The remediation of Spirit Lake sediments is being conducted under a Project Partnership between U.S. Environmental Protection Agency (EPA) and the Non-Federal Sponsor, U.S. Steel Corporation (USS). EA Engineering, Science, and Technology, Inc., PBC (EA) has been selected by both EPA and USS to contract and manage remediation with EA's Construction Contractor, Brennan. The remedial action (RA) has been designed to remediate sediments in Spirit Lake that contain elevated levels of chemical constituents and to perform restoration of the areas of remediation. The remediation and restoration strategy includes a combination of sediment removal, subaqueous capping, enhanced natural recovery, upland disposal, and habitat enhancements (EA 2020a).

In early December 2021, discussions between the Duluth Seaway Port Authority (Port), U.S. Army Corps of Engineers (USACE), EPA, USS, and EA identified a stockpile of material immediately available for potential use in caps and covers at the Spirit Lake site. Specifically, the material is being considered for use in the subaqueous cap layers, although it may be considered for other work elements pending results of the current analysis. The Spirit Lake Contract Documents, including the design specifications, define chemical and physical requirements for materials used in caps and covers as part of the RA. Representative soil samples of Erie Pier Materials will be collected and analyzed for chemical and physical properties to evaluate the material with respect to the project specifications as well as the data quality objectives identified in this Technical Memorandum.

EPA requires that all environmental monitoring and measurement efforts mandated or supported by EPA participate in a centrally managed quality assurance (QA) and quality control (QC) program. Any party generating data under this program has the responsibility to implement minimum procedures to ensure that the precision, accuracy, completeness, and representativeness of its data are known and documented. During Phase 1 and Phase 2 of the Spirit Lake RA, EA prepared the following project planning documents on behalf of EPA Great

Lakes National Program Office and USS. These documents outline the roles and responsibilities for QA, lines-of-communication, and the details of QA activities for compliance with permits and performance of work per the requirements of the Spirit Lake Engineering Drawings and Technical Specifications during Phases 1 and 2 of the RA:

- *Construction Quality Assurance Plan – Phase 1 Addendum Spirit Lake Estuary Site, St. Louis River Area of Concern, Duluth, Minnesota.* EA Engineering, Science, and Technology, Inc., PBC. December 2020. (EA 2020b)

- *Phase 1 Quality Assurance Project Plan Remedial Action for Spirit Lake Sediment at the Former Duluth Works Site, Duluth, Minnesota.* EA Engineering, Science, and Technology, Inc., PBC. December 2020. (EA 2020c)

- *Construction Quality Assurance Plan – Phase 2 Addendum Spirit Lake Estuary Site, St. Louis River Area of Concern, Duluth, Minnesota.* EA Engineering, Science, and Technology, Inc., PBC. September 2021. (EA 2021a)

- *Phase 2 Quality Assurance Project Plan Remedial Action for Spirit Lake Sediment at the Former Duluth Works Site, Duluth, Minnesota.* EA Engineering, Science, and Technology, Inc., PBC. September 2021. (EA 2021b)

- *Phase 1 Health and Safety Plan Addendum Spirit Lake Sediment Site, Duluth, Minnesota.* EA Engineering, Science, and Technology, Inc., PBC. October 2020. (EA 2020d)

- *Phase 2 Health and Safety Plan Addendum Spirit Lake Sediment Site, Duluth, Minnesota.* July EA Engineering, Science, and Technology, Inc., PBC. September 2021. (EA 2021c)

EA has prepared this Technical Memorandum and its attachments as an addendum to the above referenced documents for the sampling to be conducted at the Erie Pier long-term Processing and Reuse Facility (PRF). This document will be distributed to relevant key project personnel provided in Table A-1 of the Phase 2 QAPP (EA 2021b), including EPA's Contracting Officer's Representative, EPA's Quality Assurance Team, EA's Project Management and Quality Assurance Team, Eurofins TestAmerica Analytical Laboratory Project Manager, EA's Field Team and the Project Partner. Additionally, the plan will be shared with MPCA and USACE. Sampling will be conducted in January 2022, and will include subcontractor mobilization with EA oversight, and drilling using direct-push methods.

While the Phase 1 and Phase 2 documents largely cover general sampling detail, EA had identified relevant information from the Quality Assurance Project Plan (QAPP) that will require updates specific to the Erie Pier sampling. The 2021 Phase 2 Health and Safety Plan, as referenced previously, will be used to guide the sampling effort, and provide personnel with protection standards and mandatory safety practices, procedures, and contingencies to be followed while performing field activities during sampling. A revised route to hospital is included as Figure 1.

EA has identified the following tables, figures and attachments requiring specific input and clarification for Erie Pier sampling:

Tables

- Table 1 – Data Quality Objectives
- Table 2 – Proposed Analytical Program – Erie Pier Sampling
- Table 3 – Sample Location Coordinates

Figures

- Figure 1 – Route to Hospital
- Figure 2 – Proposed Soil Boring Locations

Attachments

- Attachment A – Soil Boring Log
- Attachment B – Standard Operating Procedures
- Attachment C – Task Hazard Analysis Direct Push Drilling
- Attachment D – Driller's Standard Operating Procedure

The Erie Pier sampling will be completed in accordance with the Phase 1 and Phase 2 planning documents, with specific elements as described in this Technical Memorandum. The EA project team, documentation, standard operating procedures, and other information compiled in the Phase 1 and Phase 2 planning documents will be incorporated by reference for the Erie Pier sampling effort. Project laboratories, data management, sample techniques, handling and custody, sample nomenclature, analytical methods, QC, reporting requirements, reporting and verification, and associated procedures and equipment will remain consistent with the Phase 2 QAPP (EA 2021b).

2. FIELD INVESTIGATION

Material available at the Erie Pier PRF is under consideration for use in the ongoing RA currently underway at the Spirit Lake Estuary Site. Based on conversations with the Port and USACE, approximately 200,000 cubic yards of material is available at the PRF located at 2305 W. Superior Street, Duluth, Minnesota 55802. The facility is operated by USACE; administrative and strategic support is provided by the Port Authority as the local sponsor.

2.1 SAMPLE DESIGN

The sampling design is based on characterizing 120,000 cubic yards of material immediately available for use at the Spirit Lake site, to support construction of subaqueous caps. Data quality objectives are summarized in Table 1. Prior to the use offsite materials, chemistry and physical

characteristics of the material must be analyzed to verify compliance with criteria specified in the Contract Documents for the intended use. EA anticipates collecting soil samples at 12 locations (Figure 2) spread throughout the available material. Design documents specify per source of material, samples will be collected at a minimum rate of 1 sample per 1,000 CY of material for the first 10,000 CY of material. EA anticipates approximately 120,000 CY of material may be used from the Erie Pier site. EA will collect 34 samples from 12 locations spread across the site. The sampling frequency provides 1 sample for every 3,500 CY of material and one sample approximately every 4 ft vertically and allows for samples spatially representative of available material at the Erie Pier Facility. This sample frequency will also meet the specification requirements.

Samples will be collected from in situ soil borings using direct-push technology to depths representative of the available stockpile above the water line. Materials above the water line were identified by Brennan for ease of access, transport, and overall efficiencies in material management during construction.

Based on survey data provided by Brennan in December 2021 (Brennan 2021), depths of the stockpile within a few feet above the current water level (613 feet [ft]) are estimated to be approximately 7-15 ft. At each station, the total length of the core will be dived into sampling intervals as defined on Table 2, intervals will be 4 ft in length where practical based on the core depths, a minimum interval of 3 ft is required for adequate sample volume. Where the desired core depth is 9 ft, 0-4.5 ft and 4.5-9 ft will be analyzed. At locations where the desired core depth is not evenly divided into 4 ft intervals, a 3 ft interval will be analyzed as identified in Table 2. Based on the observed lithology, additional sampling will be conducted if visual alterations are observed in the composition/nature of the source material. Each interval will be composited and analyzed in accordance with the methods identified on Table 2 and in accordance with the procedures specified in the Phase 2 QAPP (EA 2021b). Proposed sampling locations are shown in Figure 2 and summarized in Tables 2 and 3.

2.2 SAMPLING ACTIVITIES AND PROCEDURES

Soil borings will be collected from 12 locations (SL22-EP-SB1 through SL22-EP-SB12), with the collection of thin-walled tubes by EA's subcontracted driller, Twin Ports Testing[1]. Thin-walled tubes will be collected by direct push in Shelby tubes. Boring locations were spatially distributed throughout the available material volume. Target penetration depth for each location ranges from 7 to 15 ft (Tables 2 and 3).

Borings of upland sediment will be collected using an all-terrain direct-push drill rig with an assembled sampler capable of pushing a 1.5-inch diameter plastic liner into the subsurface. The sampler will then be reassembled using a new liner and advanced back down the hole to collect

1 The Twin Ports Testing's field team will be led by Mr. James M. Johnson, as the project engineer. Twin Ports Testing under the direction of Mr. Johnson will be responsible for clearing access to each location, mobilizing the appropriate drilling equipment to the sampling location and completing the drilling scope described in this plan. Following core collection at each location, Twin Ports Testing will seal and label the cores and provide the sealed cores to EA for boring log development and sample processing.

the next sample. For the core samples, the amount of sample recovery will be measured from the bottom of the core to the top of the sediment using a tape measure. If a core recovery (where core recovery is equal to the core length divided by the depth of penetration) of less than 75 percent is calculated in the field, the field team will offset, up to three attempts will be made to collect a more complete core at the location.

Core tubes will be clearly labeled by writing directly on the core tube using a permanent marker. Labeling will include the core location number (e.g., SB-1) and an indication of the top of the core. EA will record the actual core sample location (horizontal position) on the soil boring log (Attachment A) along with ground surface elevation (vertical position), sample recovery, and other observations on collection.

Once the cores have been capped and labeled, the sediment recovery has been measured, and location observations have been recorded in the field logbook and on the soil boring log, EA will transport the cores to the sample processing area located at the Spirit Lake site.

EA will log the cores from the top of the core (surface) to the bottom (recovery depth), representing a vertical profile and documented on the soil boring log (Attachment A). Sampling activities will be performed in accordance with SOP 025 and 047 (Attachment B) and the SOPs included with the Phase 2 QAPP (EA 2021b) and Attachment D. A task hazard analysis specific to direct push drilling is included as Attachment C.

The collected cores will be split in half lengthwise for examination and sampling. With the open exposed sediment core, the targeted subsample intervals will then be measured and marked and recorded on the soil boring log (Attachment A).

After the soil boring log is completed, the soil from each interval described in Table 2 will be removed from the core liner with a clean stainless-steel spatula or spoon and placed in a clean disposable aluminum pan.

Subsamples will be homogenized in disposable aluminum pans using stainless steel tools and then placed into the appropriate sample containers. Sample containers for the Erie Pier Sampling effort are as follows (sample containers were based on available supplies and are generally consistent with Table B-2 of the Phase 2 QAPP [EA 2021b] and have been approved by ETA, holding times are consistent with Table B-2 of the Phase 2 QAPP):

- Grain Size, Atterberg Limits, Moisture Content – 1 x 16 oz. soil jar
- Dioxins – 1 x 8 oz. amber jar (a minimum volume of 4 oz. is required for analysis)
- SVOCs, metals, mercury, PCBs, pesticides, TOC – 1 x 8 oz. clear jar

Vegetation and debris will be noted and removed from the samples before the samples are placed in appropriate containers. Equipment that is re-used (e.g., cutting tools, broad knife, spatula, bowls, etc.) will be decontaminated in accordance with the decontamination procedures

described in the Phase 2 QAPP (EA 2021b). Sample logging and processing activities will be performed at the Spirit Lake site.

2.3 ANALYTICAL REQUIREMENTS AND QUALITY ASSURANCE/QUALITY CONTROL

In accordance with the Phase 2 QAPP (EA 2021b), Eurofins TestAmerica will be responsible for performing analyses on the soil samples by the following methods:

- Semivolatile organic compounds including polycyclic aromatic hydrocarbons (SW846 8270E Low Level)
- Metals (aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, silver, thallium, vanadium, zinc) (SW846 6020B)
- Mercury (SW846 7471B)
- Polychlorinated biphenyls (SW846 8082A)
- Dioxins and furans (SW846 8290A)
- Pesticides (SW 846 8081B Low Level)
- Total organic carbon (Lloyd Kahn)
- Moisture content (ASTM International [ASTM] D2216/2540G)
- Grain size (ASTM D422)
- Atterberg limits (ASTM D4318)

Samples for grain size and Atterberg Limits will be shipped to Eurofins TestAmerica's (ETA) Burlington Laboratory, dioxin samples will be shipped to ETA's Sacramento Laboratory[2] and all other samples will be shipped to ETA's Pittsburgh Laboratory as described in Section 6.2 (Sample Shipment of the Appendix A FSP in the EA Phase 2 QAPP (EA 2021b).

For chemistry data, EA will include QC samples (e.g., field duplicates and matrix spike/ matrix spike duplicate) sufficient to meet the requirements of the data quality objectives as defined in the Phase 2 QAPP (EA 2021b). QC and data reporting requirements will follow the Phase 2 QAPP (EA 2021b).

2 The Phase 2 QAPP will be updated to include the Sacramento Facility, the address is 880 Riverside Parkway, West Sacramento, California 95605. Phone 916-373-5600.

2.4 REPORTING

Analytical results will be scheduled for 5-day turnaround time to facilitate the project schedule. Sampling is anticipated to occur the week of January 17, 2022. EA anticipates that samples will be received by ETA on or around 25 Janury 2022 pending shipping schedules and logistics. Initial results are anticipated on Tuesday, 01 February 2022 but may extend beyond that date if re-extractions or other laboratory processes require additional time. Upon receipt, results will be screened against the Level I and II sediment quality target (SQT) levels; results will also be screened agaisnt the mid-point of the Level I and Level II SQTs (Minnesota Pollution Control Agency [MPCA] 2007). Results between the Level 1 SQT and Level I/II mid-point will be considered for use below the ordinary high water level (OHWL) elevation if most results are below Level I SQTs and there are no significant exceedances of the Level I/II midpoint concentration.

If concentrations are greater than the Level 1 SQT and Level I/II mid-point, material may be considered usable in areas above the OHWL elevation, adjacent to or within a public access area if concentrations are less than or equal to the MPCA recreational soil reference value (SRV). If concentrations are greater than the MPCA recreational SRV, material may be considered usable in areas above the OHWL elevation and outside a public access area if concentrations are less than or equal to the MPCA industrial SRV.

An engineering review of physical parameters will be performed by EA's Principal Engineer, Mr. Jamie Beaver, to ensure consistency or suitability for a given use per EA Technical Specification Section 31 05 13, and chemical concentrations results will be compared to specific criteria for uses identified in EA Technical Specification Sections 01 35 45 and 31 05 13. The results of this review and usability of this material will be documented in EA's Phase 3 Design Report. The Phase 3 Design Report will be submitted to EPA for review in February 2022.

3. REFERENCES

Brennan. 2021. *E-Mail Correspondence from David Horne (Brennan) to Michal Ciarlo (EA) regarding survey data posted to project Sharepoint site: Submittals QC Data > Survey Data> 211219 Ponds Behind Erie Pier folder.* 28 December 2021.

EA Engineering, Science, and Technology, Inc., PBC (EA). 2020a. *Remedial Design Issued for Construction, Spirit Lake Estuary Site, St. Louis River Area of Concern, Duluth, Minnesota, Revision 2.* Prepared by EA for USS and U.S. EPA. June.

———. 2020b. *Construction Quality Assurance Plan – Phase 1 Addendum Spirit Lake Estuary Site, St. Louis River Area of Concern, Duluth, Minnesota*. December.

———. 2020c. *Phase 1 Quality Assurance Project Plan Remedial Action for Spirit Lake Sediment at the Former Duluth Works Site, Duluth, Minnesota*. December.

———. 2020d. *Phase 1 Health and Safety Plan Addendum Spirit Lake Sediment Site, Duluth, Minnesota.* October.

———. 2021a. *Construction Quality Assurance Plan– Phase 2 Addendum Spirit Lake Estuary Site (Draft), St. Louis River Area of Concern, Duluth, Minnesota*. September.

———. 2021b. *Phase 2 Quality Assurance Project Plan Remedial Action for Spirit Lake Sediment at the Former Duluth Works Site (Draft), Duluth, Minnesota*. September.

———. 2021c. *Phase 2 Health and Safety Plan Addendum Spirit Lake Sediment Site, Duluth, Minnesota.* September.

Minnesota Pollution Control Agency (MPCA). 2007. *Guidance for Use and Application of Sediment Quality Targets for the Protection of Sediment-Dwelling Organisms in Minnesota.* MPCA Document Number tdr-gl-04. February.

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Tables

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Figures

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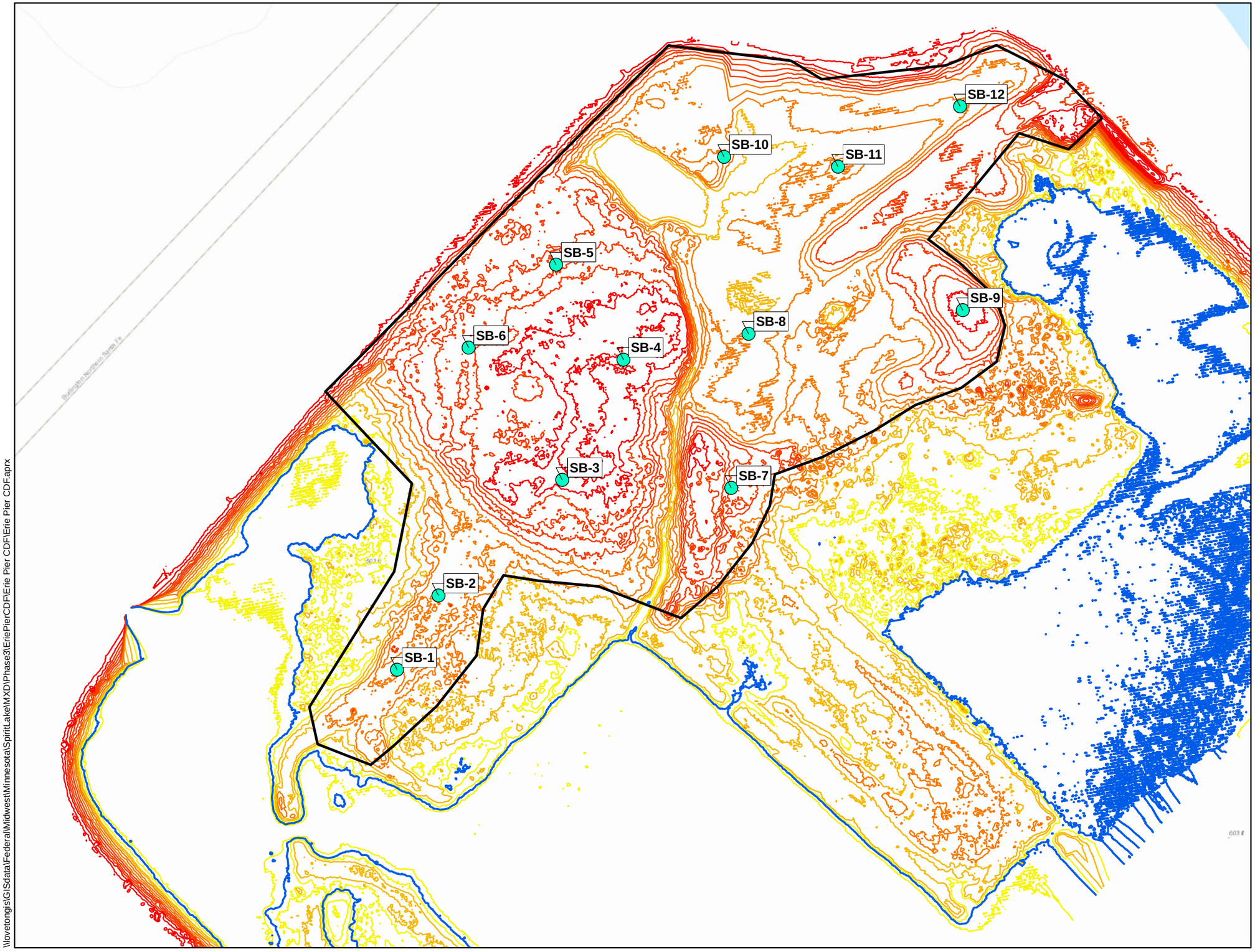


Legend

- Sample Location
- Area of Interest

Contour (feet)

- 610 - 614
- 614 - 616
- 616 - 619
- 619 - 623
- 623 - 629
- Water Table Contour (613 ft)

Note: Soil Boring coordinates are in NAD 1983 State Plane Minnesota North - Feet.

Map Date: 1/7/2022
Source: J.F Brennan, 2021
Projection: NAD 1983 State Plane Minnesota North - Feet

MN

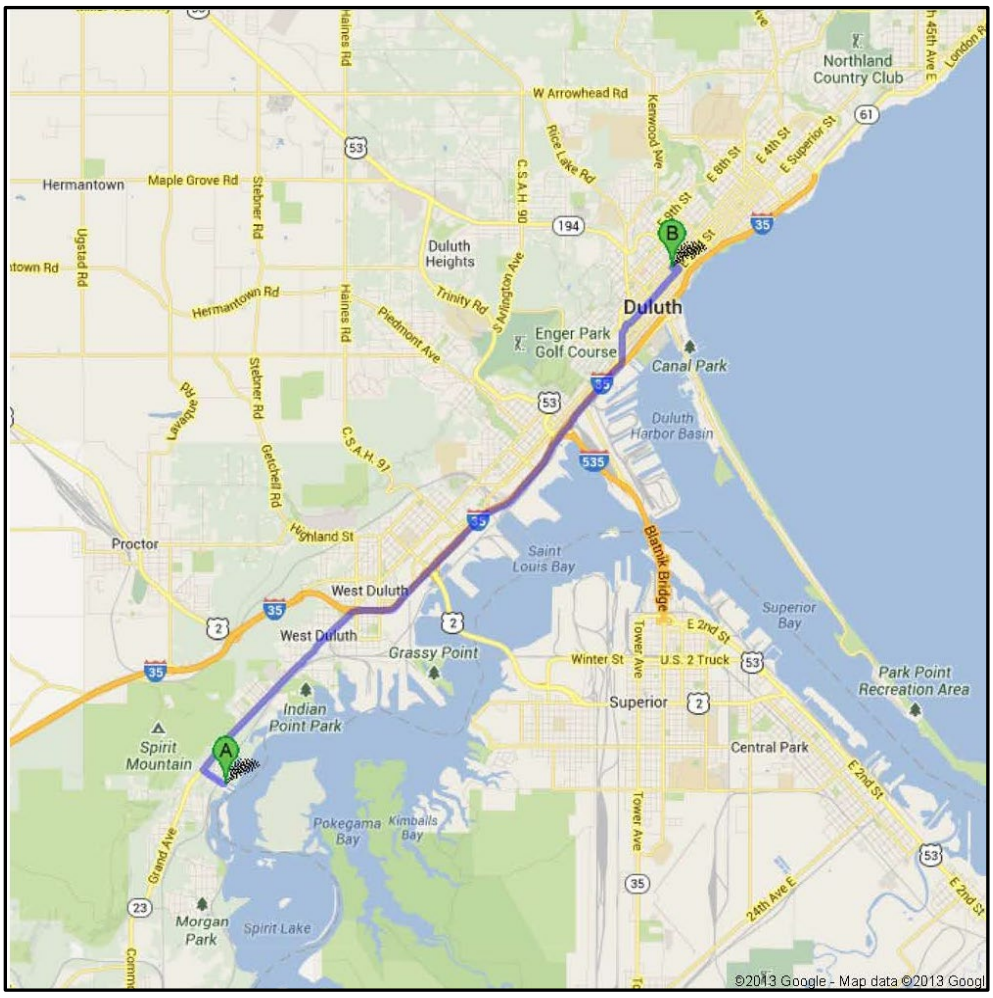
0 100 200
Feet

Figure 2
Proposed Soil Boring Locations
Erie Pier CDF
Duluth, Minnesota

\\lovetongis\GISdata\FederalMidwest\Minnesota\SpiritLake\MXD\Phase3\EriePierCDF\Erie Pier CDF\Erie Pier CDF.aprx

Figure 1. Route to Hospital

St. Mary's Medical Center, Duluth, Minnesota



1. Start out going northeast on W Superior St toward S 23rd Avenue W
2. Turn left onto W Michigan Street
3. W Michigan St becomes Mesaba Avenue
4. Turn slight right onto W 2nd Street
5. Turn left onto N 5th Ave E.
6. Take the 1st left onto E 3rd Street
7. Destination will be on the right

St. Mary's Medical Center is located at 407 East Third Street, Duluth, MN 55805

Attachment A

Soil Boring Log

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EA Engineering, Science, and Technology, Inc.

BORING ID

NORTHING _____ EASTING _____ COORDINATE SYSTEM _____

PROJECT NAME AND NUMBER _____ PERMIT NUMBER _____

GEOLOGIST _____ DRILLING START _____ BORE DIAMETER (in) _____

DRILLER _____ DRILLING END _____ FIRST WATER (ft bgs) _____

DRILLING METHOD _____ TOTAL DEPTH (ft bgs) _____ SAMPLING METHOD _____

RIG MAKE/MODEL _____ WELL COMPLETION DATE _____ SOIL SAMPLES COLLECTED (Y/N) _____

LOCATION DESCRIPTION / SURFACE CONDITIONS _____ GW SAMPLES COLLECTED (Y/N) _____

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Drilling/Sample Notes

NOTES:

- W>LL: Water content greater than the Liquid Limit inhibited field determination of plasticity.

Attachment B

Standard Operating Procedures

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Standard Operating Procedure No. 025
for
Soil Sampling

Prepared by

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, Maryland 21031

Revision 0
December 2014

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CONTENTS

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1. SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure is to delineate protocols for sampling surface and subsurface soils. Soil samples give an indication of the area and depth of site contamination, so a representative sample is very important.

2. MATERIALS

The following materials may be required:

Bucket auger or push tube sampler	Split-spoon, Shelby tube, or core barrel sampler
Drill rig and associated equipment	Stainless steel bowl
Personal protective equipment as required by the Health and Safety Plan	Stainless steel spoon, trowel, knife, spatula (as needed)

3. PROCEDURE

3.1 SUBSURFACE SAMPLES

Don personal protective equipment. Collect split-spoon, core barrel, or Shelby Tube samples during drilling. Upon opening sampler, or extruding sample, immediately screen soil for volatile organic compounds using either a photoionization detector or flame ionization detector. If sampling for volatile organic compounds, determining the area of highest concentration, use a stainless steel knife, trowel, or laboratory spatula to peel and sample this area. Log the sample in the Field Logbook while it is still in the sampler. Peel and transfer the remaining sample in a decontaminated stainless steel bowl. Mix thoroughly with a decontaminated stainless steel spoon or trowel. Place the sample into the required number of sample jars. Preserve samples as required. Discard any remaining sample into the drums being used for collection of cuttings. Decon sampling implements. All borings will be abandoned.

NOTE: If sample recoveries are poor, it may be necessary to composite samples before placing them in jars. In this case, the procedure will be the same, except that two split-spoon samples will be mixed together. The Field Logbook should clearly state that the samples have been composited, which samples were composited, and why the compositing was done.

Samples taken for geotechnical analysis will be undisturbed samples, collected using a thin-walled (Shelby tube) sampler.

3.2 SURFICIAL SOIL SAMPLES

Don personal protective equipment. Remove vegetative mat. Collect a sample from under the vegetative mat with a stainless steel trowel, push tube sampler, or bucket auger. If a representative sample is desired over the depth of a shallow hole or if several shallow samples are to be taken to represent an area, composite as follows:

- As each sample is collected, place a standard volume in a stainless steel bowl.
- After all samples from each hole or area are in the bucket, homogenize the sample thoroughly with a decontaminated stainless steel spoon or spatula.

If no compositing is to occur, place sample directly into the sample jars. Place the leftover soil in the auger borings and holes left by sampling. If necessary, add clean sand to bring the subsampling areas back to original grade. Replace the vegetative mat over the disturbed areas. Samples for volatile organic compounds will not be composited. A separate sample will be taken from a central location of the area being composited and transferred directly from the sampler to the sample container. Preserve samples as required. Decon sampling implements.

4. MAINTENANCE

Not applicable.

5. PRECAUTIONS

Refer to the Health and Safety Plan.

Soil samples will not include vegetative matter, rocks, or pebbles, unless the latter are part of the overall soil matrix.

6. REFERENCES

ASTM International. Method D1586-84, Penetration Test and Split-Barrel Sampling of Soils.

———. Method D1587-83, Thin Walled Sampling of Soils.

Department of the Army, Office of the Chief of Engineers. 1972. Engineer Manual 1110-2-1907 Soil Sampling. 31 March.

Standard Operating Procedure No. 047
Direct-Push Technology Sampling

Prepared by

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Hunt Valley, Maryland 21031

Revision: 0
December 2014

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CONTENTS

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1. SCOPE AND APPLICATION

This Standard Operating Procedure (SOP) establishes the protocol for using direct-push technology (DPT) in media sampling and performing subsurface characterization. This SOP includes the following DPT methods: Geoprobe®, Hydropunch®, Cone Penetrometer Testing (CPT), and Site Characterization and Analysis Penetrometer System (SCAPS).

2. MATERIALS

The following materials may be required:

Appropriately sized, all-terrain vehicle-skid-or track-mounted; DPT equipment; and supplies (i.e., hydraulic derrick and hammer assembly)	Personal protective equipment
Bentonite grout and clean sand for DPT hole abandonment	Phosphate-free, laboratory-grade detergent (e.g., Liquinox, Alconox, etc.)
DPT stainless steel rods	Source of approved water
Heavy plastic sheeting	Steam cleaner/sprayer and water obtained from approved source for decontaminating DPT equipment
Logbook	Steel drums for intrusion derived wastes (e.g., contaminated personal protective equipment, decon solutions, etc.)
Long-handled bristle brushes	Wash and rinse tubs
Mini-bailer or tubing and peristaltic pump (groundwater sampling only)	

3. GEOPROBE® AND HYDROPUNCH®

3.1 MATERIALS

Water sources for Geoprobe® and Hydropunch® activities, grouting, sealing, filter placement, well installation, and equipment decontamination must be approved by the Project Manager prior to arrival of the Geoprobe® and Hydropunch® equipment. Information required for the water source includes: water source, manufacturer/owner, address and telephone number, type of treatment and filtration prior to tap, time of access, cost per gallon (if applicable), dates and results associated with all available chemical analysis over the past 2 years, and the name and address of the analytical laboratory (if applicable).

Pure sodium bentonite with no additives will be the only additive allowed, and its use must be approved by the Project Manager prior to the arrival of the Geoprobe® and Hydropunch® equipment. The information required for evaluation includes: brand name, manufacturer, manufacturer's address and telephone number, product number, product description, and intended use for the product.

Portland Type II cement will be used for grout (refer to SOP No. 019).

3.2 GROUNDWATER – HYDRAULIC PUSHING AND SAMPLING

The objective of the selected DPT sampling technique is to allow grab samples to be taken at a selected site to facilitate aquifer characterization and analysis of potential contaminants. The analytical results from sampling can also be used to determine the placement of monitoring wells.

A site geologist will be present during all sampling and installation procedures, and will fully document all procedures and soil characteristics in the Field Logbook (refer to SOP No. 016).

The site geologist will have on hand, at a minimum, a copy of the approved Health and Safety Plan, this SOP, the Field Investigation Work Plan, a hand lens (10X), a standard color chart, and a grain size chart.

Only solid vegetable shortening (e.g., Crisco®) without flavoring or additives may be used on downhole Geoprobe® and Hydropunch® equipment.

Surface runoff or other fluids will not be allowed to enter any DPT location or well during or after DPT activities.

The subcontractor will use the equipment specific guidelines for installation of the Geoprobe® DPT equipment. Probe rods will be forced into the ground by hydraulic means.

- Drive the sampler to the desired groundwater sampling interval. At the desired depth, insert extension rods down the inside diameter of the probe rods until the extension reaches the bottom of the screen. Remove the probe rods and sampler sheath while holding the screen in place.

- Collect the groundwater sample in the screen interval with a mini-bailer, peristaltic or vacuum pump, or other acceptable small diameter sampling device.

- The head of the rod may be equipped with a sensing device for characterization of soil properties or the contaminant content.

The subcontractor will use the equipment-specific guidelines for installation of the Hydropunch® equipment. Rods will be forced into the ground by hydraulic means.

- The Hydropunch® tool is a double cylinder, designed to be sealed until the desired sampling depth is reached. Upon reaching the desired sampling depth, the outer cylinder is pulled back, exposing a perforated, stainless steel sampling barrel covered with filter material.

- The water sample enters the barrel and the sample is retrieved by pulling the probe rods from the hole with the hydraulic derrick and hammer assembly. Groundwater is the only media that is sampled by Hydropunch® equipment.

- The head of the rod may be equipped with a sensing device for characterization of the soil properties or the contaminant content.

- The sample volume collected with this technique is approximately 500-1,000 ml. Larger sample volumes can be collected by inserting tubing attached to a peristaltic pump into the rods to obtain water samples.

If desired, a small diameter monitoring well may be installed at this point. Refer to SOP No. 019 (Monitoring Well Installation).

If a well will not be installed, the rods will be removed as the borehole is simultaneously filled with a bentonite/grout mixture. A polyvinyl chloride (PVC) tube fed into the rod casing will allow the addition of grout.

3.3 SUBSURFACE SOIL – HYDRAULIC PUSHING AND SAMPLING

The objective of the selected DPT sampling technique is to allow grab samples to be taken at a selected site for characterization of the stratigraphy and for analysis of potential contaminants. The analytical results from sampling can also be used to determine the placement of monitoring wells.

A site geologist will be present during all DPT sampling and soil characterization. All procedures and soil characteristics will be fully documented in the Field Logbook (refer to SOP No. 016).

The site geologist will have on hand, at a minimum, a copy of the approved Health and Safety Plan, this SOP, the Field Investigation Plan, a hand lens (10X), a standard color chart, and a grain-size chart.

Only solid vegetable shortening (e.g., Crisco®) without flavoring or additives may be used on downhole Geoprobe® equipment.

Surface runoff or other fluids will not be allowed to enter any DPT location or well during or after DPT activities.

The subcontractor will use the equipment specific guidelines for installation of the Geoprobe® DPT equipment. Probe rods will be forced into the ground by hydraulic means. Additional rods will be added in 3- to 4-ft increments until the leading edge of the sampler reaches the top of the desired sampling interval.

Once the desired sampling depth has been reached, insert extension rods down the inside diameter of the probe rods until it reaches the top of the sampler assembly. Attach the extension rod handle to the top extension rod. Turn the handle clockwise until the stop-pin detaches from the drive head. Remove the extension rods and the stop-pin. Attach a drive cap to the probe and drive the sampler approximately 2 ft using hydraulic derrick.

The DPT sampler can be retrieved by pulling the probe rods from the hole with the hydraulic derrick and hammer assembly.

The liner will be capped with Teflon® tape and vinyl end caps. The liners can be split open to remove samples for composition analysis or for transfer to other containers for shipment to the laboratory for analysis.

The head of the rod may be equipped with a sensing device for characterization of the soil properties or the contaminant content.

3.4 DECONTAMINATION

All Geoprobe® and Hydropunch® DPT equipment must be thoroughly cleaned before and after each use to allow retrieval of representative groundwater samples. Geoprobe® soil sample liners are disposed of after each use. Scrub all metal parts with a stiff, long bristle brush and a non-phosphate soap solution. Steam cleaning may be substituted where available. Rinse with distilled water and allow to air-dry before assembly.

After decontamination, a new clean liner will be installed and all parts will be inspected for wear or damage.

Refer to SOP No. 005 (Field Decontamination).

3.5 ABANDONMENT

Pure bentonite or a bentonite/grout mixture (20:1) will be used to fill the resulting borehole if the water table is penetrated. Boreholes that do not penetrate the water table will be backfilled with cuttings from the hole and topped with a bentonite seal. Clean sand will be used to fill any remaining volume in the borehole.

Abandonment of Geoprobe® and Hydropunch® generated DPT boreholes will meet the standards established under SOP No. 028 (Well and Boring Abandonment).

4. CONE PENETROMETER TESTING

4.1 MATERIALS

A CPT rig typically consists of an enclosed 20- to 40-ton truck equipped with vertical hydraulic rams that are used to force a sensor probe into the ground. The weight of the CPT rig is dependent upon the thrust required at the site. The majority of CPT rigs are mounted in heavy-duty trucks that are ballasted to a total dead weight of approximately 15 tons. Screw anchors are utilized to develop the extra reaction to reach the maximum thrust of 20 tons. The rig is separated into two separate workspaces: data acquisition and hydraulic push areas.

Water sources for CPT activities and decontamination must be approved by the Project Manager prior to arrival of the CPT equipment. Information required for the water source includes: water source, manufacturer/owner, address and telephone number, type of treatment and filtration prior to tap, time of access, cost per gallon (if applicable), dates and results associated with all available chemical analysis over the past 2 years, and the name and address of the analytical laboratory (if applicable).

Pure sodium bentonite with no additives will be the only additive allowed, and its use must be approved by the Project Manager prior to the arrival of the DPT equipment. The information required for evaluation includes: brand name, manufacturer, manufacturer's address and telephone number, product number, product description, and intended use for the product.

Portland Type II cement will be used for grout (refer to SOP No. 019).

4.2 SUBSURFACE CHARACTERIZATION

The objective of this technology is to collect stratigraphic information using CPT equipment to determine subsurface stratigraphy and geotechnical properties at a particular site. CPT activities will be in accordance with American Society for Testing and Materials D 3441-86 and American Society for Testing and Materials D 5778-95. The stratigraphic information gathered can be used to facilitate the selection of DPT sampling screen intervals. At the same time, it is possible to install a 0.25-in. diameter pre-packed PVC monitoring well.

CPT rods are used to hydraulically push the CPT probe into the subsurface. Probes cannot be pushed into hard rock, and significant gravel or cobble content in the formation may impede or preclude penetration of the probe. The depth of penetration achievable depends on the type of formation, type of sampling probe, and size of the hydraulic equipment used.

The CPT probe includes the following components:

- A conical tip to measure vertical resistance beneath the tip.
- A friction sleeve to measure frictional resistance on the side of the probe, as a function of depth.

- Two internal strain gauge-type load cells, which independently measure the vertical resistance and side friction.

- A cone pressure gauge to measure the water pressure as the probe is pushed into the ground.

- Inclinometer to determine potential drifting of the probe (optional).

- Seismic transducers to perform downhole seismic surveys (optional). Therefore, stratigraphic data collected with the CPT include: tip resistance, local friction, friction ratio, pore pressure, and resistivity.

Data will be transferred from the probe to the data acquisition system or logger through an electrical cable. The hole will be advanced continuously at a rate of 0.6-1.0 in. per second. The data will be logged at every 0.4-0.8 in. of penetration. Monitor the probe's stratigraphic position will be monitored as it advances downward. Perform pore water pressure dissipation tests in representative hydrostratigraphic intervals. Record dissipated pore water pressures to represent hydraulic head values.

Once the confining unit underlying the surficial aquifer or the required depth has been reached, the CPT is pulled from the ground. Target interval samples can be collected during CPT hole advancement using direct push sampling techniques, i.e., Geoprobe® or Hydropunch® (Section 3).

4.3 DECONTAMINATION

All CPT equipment must be thoroughly cleaned before arrival at the work site, between test holes, and prior to being moved out of a work area. Scrub all metal parts with a stiff, long bristle brush and a non-phosphate soap solution. Steam cleaning may be substituted where available. Rinse with distilled water and allow to air-dry before assembly.

Refer to SOP No. 005 (Decontamination).

4 .4 ABANDONMENT

If the push hole was developed for the stratigraphic test only, once the testing is completed, grout the hole from bottom to top. If the hole has not collapsed after removing the CPT, PVC piping will be used to grout the hole. If the hole has collapsed after removing the CPT, then hollow CPT rods and a sacrificial tip will be used to grout the hole. The PVC pipe or CPT rods will be pushed to the bottom of the hole. Grout will then be pumped to the bottom of the hole as the PVC pipe or CPT rods are withdrawn.

Refer to SOP No. 028 (Well and Boring Abandonment).

5. SITE CHARACTERIZATION AND ANALYSIS PENETROMETER SYSTEM

5.1 MATERIALS

SCAPS cone penetrometer and laser induced fluorescence (LIF) technology requires the use of a specialized 20-ton truck. The truck has two separate enclosed compartments. Each compartment is temperature controlled and monitored for air quality. The two rooms are the data acquisition and processing room, and the hydraulic ram/rod handling room. Approximately 20 ft of overhead clearance is required to fully extend the hydraulic ram and allow for leveling jack movement.

All materials required to complete SCAPS analysis are provided by the subcontractor to include cone penetrometer equipment. All hydraulic equipment, SCAPS rods, nitrogen lasers, etc. are included within the vehicle. A decontamination water source and a source of water for mixing the grout are required.

Water sources for equipment decontamination must be approved by the Project Manager prior to arrival of the SCAPS equipment. Information required for the water source includes: water source, manufacturer/owner, address and telephone number, type of treatment and filtration prior to tap, time of access, cost per gallon (if applicable), dates and results associated with all available chemical analysis over the past 2 years, and the name and address of the analytical laboratory (if applicable).

Pure sodium bentonite with no additives will be the only additive allowed, and its use must be approved by the Project Manager prior to the arrival of the SCAPS equipment. The information required for evaluation includes: brand name, manufacturer, manufacturer's address and telephone number, product number, product description, and intended use for the product.

Portland Type II cement will be used for grout (refer to SOP No. 019).

5.2 HYDRAULIC PUSHING AND SAMPLING

The objective of the SCAPS technique is to allow grab samples and stratigraphic information to be collected at a selected site to facilitate subsurface characterization and for analysis of potential contaminants. The analytical results obtained can also be used to determine the placement of monitoring wells. At the same time, it is possible to install a small diameter well for sampling purposes. Refer to SOP No. 019 (Monitoring Well Installation). If a well will not be installed, the borehole can be grouted as the equipment is removed.

A site geologist will be present during all installation and sampling procedures and will fully document all procedures and soil characteristics in the Field Logbook (refer to SOP No. 016).

The site geologist will have on hand, at a minimum, a copy of the approved Health and Safety Plan, this SOP, the Field Investigation Work Plan, a hand lens (10X), a standard color chart, and a grain-size chart.

Only solid vegetable shortening (e.g., Crisco®) without flavoring or additives may be used on downhole SCAPS equipment.

Surface runoff or other fluids will not be allowed to enter any DPT location or well during or after direct-push activities.

The subcontractor will use the equipment specific guidelines for installation of the SCAPS DPT equipment. Prior to SCAPS field activities, calibration soil samples will be collected and analyzed in order to determine the LIF sensor fluorescence threshold and detection limits for the site.

SCAPS LIF technology uses a pulsed nitrogen laser coupled with an optical detector to make fluorescence measurements via optical fibers. The LIF sensor is mounted on a cone penetrometer probe so that soil classification data and fluorescence data are collected simultaneously. The laser consumes nitrogen gas, which is supplied from cylinders stored on the accompanying trailer.

The SCAPS CPT sensors are used to gather stratigraphic information. See Section 4 for CPT operating procedures.

Target interval samples can be collected during SCAPS hole advancement using direct push sampling techniques such as Geoprobe® or Hydropunch® (Section 3).

5.3 DECONTAMINATION

Decontamination of SCAPS equipment is automated after initialization by a field team member. A pressurized hot water system is used to decontaminate the push rods as they are retracted from the ground. The SCAPS vehicle is equipped with a decontamination collar mounted to the bottom that cleans the rods. The decontamination water is removed by vacuum and transferred to a storage drum prior to disposal or treatment. A trailer attached to the back of the vehicle contains the water pump, heater for decontamination, and decontamination water containment drum.

Worker exposure is reduced by minimizing contact with contaminated media.

Refer to SOP No. 005 (Decontamination).

5.4 ABANDONMENT

SCAPS automatically grouts the penetrometer cavity as the rods are removed. The grout is pumped at high pressure through a 0.25-in. diameter tube in the center of the penetrometer rods. The tip is sacrificed at the bottom of the cavity to allow release of the grout.

A trailer attached to the back of the vehicle contains the 300-gal grout mixing bin and pump.

If the automatic grout feed does not work, the cavity will be manually filled with grout.

Abandonment of SCAPS generated borehole will meet the standards established under SOP No. 028 (Well and Boring Abandonment).

6. MAINTENANCE

Not applicable.

7. PRECAUTIONS

Refer to the site-specific Health and Safety Plan for discussion of hazards and preventive measures during intrusive activities.

8. REFERENCES

American Society for Testing and Materials (ASTM). 1986. ASTM Designation D3441-86. American Society for Testing and Materials, Standard Test Method for Deep, Quasi-Static, Cone and Friction-Cone Penetration Test of Soil. December.

Battelle. 1994. Northern Boundary Area Ground Water Assessment Work Plan, Appendix B.

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(U.S.) Environmental Protection Agency (EPA). 1993. Subsurface Characterization and Monitoring Techniques, Volume 1, Appendices A and B. May.

———. 1997. The Site Characterization and Analysis Penetrometer System Laser-Induced Fluorescence Sensor and Support System. Innovative Technology Verification Report. February.

Kejr Engineering, Inc. 1995. Geoprobe® Screen Point 15 Groundwater Sampler Standard Operating Procedure, Technical Bulletin No. 95-1500.

———. 1996a. Geoprobe® Large Bore Soil Sampler Standard Operating Procedure, Technical Bulletin No. 93-660.

———. 1996b. Geoprobe® Macro-Core® Soil Sampler Standard Operating Procedures, Technical Bulletin No. 95-8500.

Attachment C

Task Hazard Analysis Direct Push Drilling

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EA Engineering, Science, and Technology, Inc., PBC

Attachment B Task Hazard Analysis - Direct Push Drilling

Location	Project Number	Project Title:
Duluth, MN	1583408.00	Erie Pier Sampling Plan Addendum

Task	
Direct Push Drilling	
Potential Safety Hazard	**Procedure to Control Hazard**
General Safety Hazards	Clear walkways and work areas of equipment and debris. Wear personal protective equipment (PPE), including hard hats, safety shoes, and safety glasses. Mark, identify, or barricade obstructions. Watch for accumulation of water on walkways and work surfaces. Stay aware of footing and do not run.
Working Over or Near Water	Wear U.S. Coast Guard approved personal flotation device (PFD). Identify unsafe conditions, such as water or sediment on the deck, obstructions, or overhead objects that could cause a slip, trip, or fall. Keep ring buoys in an accessible location for overboard emergencies. Monitor severe weather conditions. Carry flares, a cellular phone, fire extinguishers, and extra food and water in case of unanticipated emergencies.
Material Handling, Lifting, Moving	Observe proper lifting techniques and obey sensible lifting limits (50 pound maximum per person). Use mechanical lifting equipment to move large awkward loads. Use two or more persons for heavy bulk lifting.
Heavy Equipment Hazards (drill rig and support vehicles)	Be aware of the location of equipment, where high visibility safety colors, establish eye contact with operator. Be aware of pinch points, swinging chains, augers, etc. Where appropriate PPE (hard hat) when working in proximity to rig. Isolate equipment swing areas. Make eye contact with operators before approaching equipment. Understand and review hand signals. Wear hard hats and steel-toe safety shoes to prevent injuries.
Faulty or Inappropriate Equipment	Qualified driller must inspect drill rig prior to use, if faulty or inappropriate, do not proceed until repaired or replaced.
Direct Push Drilling	Heed all CAUTION, WARNING, and DANGER decals posted on the machine. Clear area of obstructions and communicate with all workers involved that drilling is beginning. Secure loose clothing. Do not walk under suspended loads. When possible, remove overhead hazards promptly. Wear appropriate PPE including hard hat and American National Standards Institute (ANSI) Z41 approved steel toed or composite toed footwear. Operators must wear hearing protection. OSHA-approved hearing protection for sound levels exceeding 85 dba is recommended. The Emergency Kill switch button on the control panel will immediately shut off the engine when pushed. Familiarize yourself with the location of this button before operating the machine. Ensure that everyone is clear of all moving parts before starting the engine. The machine should not be driven with the probe cylinder or winch mast extended. This practice could result in equipment damage and/or personal injury from contact with overhead objects such as power lines. The unit should only be driven using the remote control box. The steering levers located on the machine are for positioning only. Do not attempt to drive using the levers on the machine as this requires the operator to walk too close to the tracks while the vehicle is in motion. Do not attempt to drive the unit on slopes of more than 20°. Always drive straight up or down steep grades. Avoid sideslopes whenever possible. A track-mounted machine is generally transported on a trailer. Use special caution when loading the unit with wet ramps as it is significantly easier for the tracks to slip under such conditions. When operating the unit on sloped surfaces, always position the unit parallel with the slope. This provides the greatest degree of stability and will limit shifting during probing or augering operations. Position the track-mounted machine with the control panel upslope whenever possible so the machine will roll away from the operator if it becomes unstable and moves unexpectedly. Do not extend the outriggers such that the tracks are raised off of the ground more than one or two inches. Raising the tracks several inches off of the ground surface decreases the stability of the machine and provides no operational advantage. Designate one person to operate the machine while probing or augering. This will avoid injuries from having someone unexpectedly engage the machine controls while another person is working near moving parts. Operators must stand to the control side of the machine, clear of the probe foot and derrick, while operating the controls. Never reach across the probe assembly to manipulate the machine controls. Never place your hands on top of the tool string while raising or lowering the GH60 hammer. Never move the probe assembly (swing, extend, fold, etc.) or operate the tracks while anyone is in physical contact with the tool string. Use caution when probing on loose or soft surfaces. Reduced weight on the tracks may allow the unit to shift or slide under such conditions. Limit the rate at which the GH60 hammer is lowered while advancing the tool string to avoid raising the probe foot more than approximately 6 inches off of the ground surface. Never raise the machine foot more than a few inches from the ground surface with the probe cylinder and/or winch mast fully extended. If the foot must be raised significantly, first lower the hammer and winch. Always place the machine foot firmly on the ground when pulling tools from the subsurface. In the event of a problem, the operator should release all control levers. The spring-loaded levers will automatically return to the neutral position and machine operation will cease. Rotating parts can cause serious injuries. Shut off the engine before attempting to clean or service the unit. Avoid hydraulic fluid leaks. Pressurized fluid may be injected into the skin resulting in serious bodily injury. In the event of an accident, seek medical attention immediately.https://geoprobe.com/service/service-knowledgebase/safety-first
Noise	Use hearing protection during drilling activities.
Fire/Explosion	Eliminate sources of ignition from the work area. Prohibit smoking in the work areas. Provide ABC (or equivalent) fire extinguishers in work areas. Store flammable liquids in well ventilated areas, in approved, properly labeled containers.
Weather	Monitor weather for up-to-date severe weather forecasts. Discontinue work during thunderstorms and severe weather events. Take breaks as needed. Be aware of weather conditions and dress appropriately. Consume adequate food/beverages. If possible, adjust work schedule to avoid heat/cold stresses.
Electrical	Identify electrical utility hazards prior to sampling. Inspect work areas for spark sources, maintain safe distances, properly illuminate work areas, and provide barriers to prevent inadvertent contact. Maintain minimum clearance distances for overhead energized electrical lines.
Utilities	Contact local utility companies to identify utility right-of-ways prior to sampling. Be aware of unanticipated hazards.
Insect Bites	Wear protective outer clothing and insect repellant. Workers with allergies will carry antidote kits, if necessary.
Training Requirements	
Employees will be required to read the site safety plan and will receive instruction as to the general safety requirements for the project. Employees are required to have OSHA 40-hour HAZWOPER training and first aid/CPR training.	

Attachment D

Driller's Standard Operating Procedure

(to be provided as separate file upon request)

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Attachment B

Soil Boring Logs

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EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-1

NORTHING 418098.732 **EASTING** 2863670.704 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/19/2022 2:10:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/21/2022 9:00:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 9 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 1 ft snow, timber.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	617	5/ 3.3		SW	(0 to 2.7 ft) Reddish Brown (5YR 4/4) SAND, vf to c., subangular, Qtz., tr. SILT, tr. roots, moist at top of interval, medium dense, non-cohesive with siltier, cohesive areas, sharp contact.	5	95	0	SL22-EP-SB-1-0045
2	616								
3	615			CL	(2.7 to 3.3 ft) Dark Brown (7.5YR 3/2) CLAY, some SILT, tr. GRAVEL, lg. (<2 cm), subrounded, Qtz., tr. mica, tr. root and other plant material, stiff, low plasticity.	99	0	1	
4	614		NR		(3.3 to 6.1 ft) No Recovery				
5	613								
6	612			SP	(6.1 to 6.8 ft) Reddish Brown (5YR 4/4) SAND, vf to m., few SILT, tr. root and wood fragments, medium dense to loose, cohesive, sharp contact.	10	90	0	SL22-EP-SB-1-4590
7	611	4/ 2.9		CH	(6.8 to 9 ft) Dark Brown (7.5YR 3/2) CLAY, few SILT, tr. mica, tr. wood fragments, stiff to soft, medium to high plasticity.	100	0	0	
8	610								
9	609								
	608								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-2

NORTHING 418185.754 **EASTING** 2863720.574 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/19/2022 1:20:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 12:20:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 9 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 1 ft snow, timber.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
0	618	5/ 4.1		OL	(0 to 0.3 ft) Very Dark Brown (7.5YR 2.5/2) ORGANIC SILT, tr. SAND, vf to f., roots and plant material, musty odor, gradational contact.	95	5	0	SL22-EP-SB-2-0045
1	617			SP	(0.3 to 1.75 ft) Reddish Brown (5YR 4/3) SAND, vf to f. with tr. m., tr. SILT, dense, cohesive, odorless, sharp contact.	5	95	0	
2	616			CL	(1.75 to 3.7 ft) Reddish Brown (5YR 4/3) to Brown (7.5YR 4/2) CLAY, some SILT, tr. SAND in lenses @ -3.1, -3.4 ft., tr. mica, stiff, medium plasticity, sharp contact.	95	5	0	
3	615			SP	(3.7 to 4.1 ft) Brown (7.5YR 4/2) SAND, vf to f., few SILT, tr. mica, dense, cohesive.	10	90	0	
4	614		NR		(4.1 to 5 ft) No Recovery				
5	613	4/ 3		ML CL	(5 to 5.3 ft) Dark Brown (7.5YR 3/2) SILT, some CLAY, tr. mica, soft, low to medium plasticity, gradational contact.	100	0	0	SL22-EP-SB-2-4590 SL22-EP-SB-2-4590FD
6	612			SM	(5.3 to 5.8 ft) Dark Brown (7.5YR 3/2) SAND, vf to f., little SILT, tr. CLAY, loose, cohesive, sharp contact.	15	85	0	
7	611			CL	(5.8 to 7.1 ft) Dark Brown (7.5YR 3/2) CLAY, some SILT, tr. SAND, vf to f., tr. wood fragments, stiff, medium plasticity, sharp contact.	95	5	0	
8	610			SP	(7.1 to 7.3 ft) Dark Brown (7.5YR 3/2) SAND, vf to f., little SILT, tr. CLAY, loose, cohesive, gradational contact.	10	90	0	
9	609			CH	(7.3 to 8 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, tr. mica, stiff, high plasticity.	100	0	0	

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-3

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418322.375 **EASTING** 2863864.923 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/19/2022 12:15:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 8:45:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow, timber.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
0	624	5/ 3.3		CL	(0 to 2.1 ft) Dark Brown (7.5YR 3/3) CLAY, some SILT, few SAND, vf to f., tr. root and plant material, stiff, low to medium plasticity, sharp contact.	90	10	0	SL22-EP-SB-3-0040
2	622			SP	(2.1 to 3.3 ft) Brown (7.5YR 5/4) SAND, vf to f., tr. SILT, very loose, noncohesive.	5	95	0	
4	620		NR		(3.3 to 5 ft) No Recovery				
5	619	5/ 3.6		SP	(5 to 5.4 ft) Brown (7.5YR 5/4) SAND, vf to f., tr. SILT, very loose, noncohesive, sharp contact.	5	95	0	SL22-EP-SB-3-4080
				CL	(5.4 to 5.6 ft) Dark Brown (7.5YR 3/3) CLAY, some SILT, few SAND, vf to f., stiff, low to medium plasticity, sharp contact.	90	10	0	
				SM	(5.6 to 6 ft) Brown (7.5YR 4/3) SAND, vf to f., some SILT, very loose, noncohesive, sharp contact.	40	60	0	
6	618			CH	(6 to 6.5 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft, medium to high plasticity, gradational contact.	100	0	0	
				ML	(6.5 to 6.6 ft) Light Brown (7.5YR 6/4) SILT, little SAND, vf., soft, low plasticity, gradational contact.	80	20	0	
7	617			CH	(6.6 to 8.6 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft, medium to high plasticity.	100	0	0	
9	615		NR		(8.6 to 12.5 ft) No Recovery				SL22-EP-SB-3-8012

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-3

NORTHING 418322.375 **EASTING** 2863864.923 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/19/2022 12:15:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 8:45:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow, timber.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
11	614		NR		(8.6 to 12.5 ft) No Recovery *(continued)*				SL22-EP-SB-3-8012
12	613								
13	612	5/ 2.5		CH	(12.5 to 12.6 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft, medium to high plasticity, sharp contact.	100	0	0	SL22-EP-SB-3-1215
14	611			SM		45	55	0	
15	610			CH	(12.6 to 12.8 ft) Brown (7.5YR 4/2) SAND, vf to f., some SILT, tr. mica, loose, cohesive, sharp contact.	100	0	0	
16	609			SM	(12.8 to 13.5 ft) Dark Brown (7.5YR 3/2) CLAY, few SILT, fining upwards, tr. wood fragments, soft, medium to high plasticity, sharp contact.	45	55	0	
17	608			CH	(13.5 to 13.6 ft) Reddish Brown (5YR 4/3) SAND, vf to f., some SILT, tr. mica, loose, cohesive, sharp contact.				
18	607				(13.6 to 15 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, tr. mica, soft, medium to high plasticity, gradational contact.	100	0	0	
19	606								
	605								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-4

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418464.586 **EASTING** 2863935.808 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/19/2022 9:30:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 3:35:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 1 ft snow, timber.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	624	5/ 3.8		ML	(0 to 0.3 ft) Dark Brown (7.5YR 3/3) SILT, few CLAY, tr. SAND, vf to f., tr. root and other plant material, moist, medium stiff to stiff, low plasticity, gradational contact.	95	5	0	SL22-EP-SB-4-0040
				ML	(0.3 to 0.5 ft) Brown (7.5YR 4/3) SILT, few SAND, vf to f., few CLAY, tr. root and other plant material, moist, medium stiff to stiff, low plasticity, gradational contact.	85	15	0	
				SM	(0.5 to 1.25 ft) Dark Brown (7.5YR 3/3) SILT, few CLAY, tr. SAND, vf to f., tr. mica, tr. root and other plant material, moist, medium stiff to stiff, low plasticity, sharp contact.	95	5	0	
2	623			ML	(1.25 to 1.6 ft) Brown (7.5YR 5/4) SAND, vf., some SILT, tr. wood fragments, medium dense, cohesive, sharp contact.	30	70	0	
				SM	(1.6 to 2.1 ft) Dark Brown (7.5YR 3/3) SILT, few CLAY, tr. SAND, vf to f., tr. root and other plant material, moist, medium stiff to stiff, low plasticity, sharp contact.	95	5	0	
3	622			ML	(2.1 to 2.25 ft) Brown (7.5YR 5/4) SAND, vf., some SILT, tr. wood fragments, medium dense, cohesive, sharp contact.	30	70	0	
				SM	(2.25 to 2.65 ft) Dark Brown (7.5YR 3/3) SILT, few CLAY, tr. SAND, vf to f., tr. root and other plant material, medium stiff to stiff, low plasticity, sharp contact.	95	5	0	
4	621			CL	(2.65 to 2.8 ft) Brown (7.5YR 5/4) SAND, vf., some SILT, tr. root and wood fragments, medium dense, cohesive, sharp contact.	30	70	0	
			NR		(2.8 to 3.8 ft) Brown (7.5YR 4/3) CLAY, some SILT, tr. SAND, vf., tr. root, stiff to soft, medium plasticity.	99	1	0	
5	620				(3.8 to 5 ft) No Recovery				
		5/ 2.8		ML	(5 to 5.4 ft) Brown (7.5YR 4/4) SILT, some SAND, tr. mica, soft, low plasticity, sharp contact.	51	49	0	SL22-EP-SB-4-4080
				CH	(5.4 to 5.8 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, stiff, high plasticity, sharp contact.	100	0	0	
6	619			SP	(5.8 to 6 ft) Brown (7.5YR 5/4) SAND, vf., tr. SILT, medium dense, noncohesive, sharp contact.	5	95	0	
				CH	(6 to 7 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, stiff, high plasticity, sharp contact.	100	0	0	
7	618			SP	(7 to 7.2 ft) Reddish Brown (5YR 5/3) SAND, vf to f., tr. SILT, medium dense to dense, slightly cohesive, sharp contact.	5	95	0	
				CH	(7.2 to 7.8 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, stiff, high plasticity, sharp contact.	100	0	0	
8	617								
9	616		NR		(7.8 to 10 ft) No Recovery				SL22-EP-SB-4-8012
	615								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-4

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418464.586 **EASTING** 2863935.808 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/19/2022 9:30:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 3:35:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 1 ft snow, timber.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
11	614	5/ 3.2		CH	(10 to 11.85 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft to medium stiff, high plasticity, intervals of siltier material @ -10.5, -11 ft., vf. SAND interval @ -11.6 ft., sharp contact.	95	5	0	SL22-EP-SB-4-8012
12	613			OL	(11.85 to 11.95 ft) Black (7.5YR 2.5/1) ORGANIC CLAY, some SILT, tr. SAND, vf., low to medium plasticity, abundant plant and wood fragments, sharp contact.	95	5	0	SL22-EP-SB-4-1215
				ML		99	1	0	
				ML		100	0	0	
13	612			CH	(11.95 to 12.2 ft) Brown (7.5YR 4/2) SILT, few CLAY, tr. SAND, vf to f., coarsening upwards, soft, cohesive, low plasticity, sharp contact.	100	0	0	
				SW		5	95	0	
				CH	(12.2 to 12.5 ft) Brown (7.5YR 4/2) SILT, few CLAY, coarsening upwards, soft, cohesive, medium plasticity, gradational contact.	100	0	0	
14	611				(12.5 to 12.65 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft to medium stiff, high plasticity, sharp contact.				
					(12.65 to 12.8 ft) Brown (7.5YR 4/2) SAND, vf to m., subangular, Qtz., tr. SILT, medium dense, noncohesive, sharp contact.				
15	610				(12.8 to 13.2 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft to medium stiff, high plasticity.				
16	609								
17	608								
18	607								
19	606								
	605								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-5

NORTHING 418580.287 **EASTING** 2863858.313 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 2:45:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/18/2022 4:45:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 12 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow, ground frozen, moderate tree cover.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	621	5/ 3.2		ML	(0 to 0.4 ft) Dark Brown (7.5YR 3/3) SILT, little CLAY, tr. SAND, vf to f., tr. mica, tr. root and other plant material, stiff, low to medium plasticity, sharp contact.	99	1	0	SL22-EP-SB-5-0040
				ML	(0.4 to 0.8 ft) Brown (7.5YR 5/4) SILT, some SAND, vf to f., tr. mica, tr. root, medium stiff, cohesive, nonplastic, sharp contact.	60	40	0	
2	620			CH	(0.8 to 2.2 ft) Dark Brown (7.5YR 3/4) CLAY, few SILT, fining upwards, tr. mica, tr. root and wood fragments, stiff, high plasticity, sharp contact.	100	0	0	
3	619			ML	(2.2 to 2.8 ft) Brown (7.5YR 5/4) SILT, some SAND, vf to f., tr. mica, tr. root, medium stiff, cohesive, nonplastic, sharp contact.	65	45	0	
				ML	(2.8 to 3.2 ft) Dark Brown (7.5YR 3/4) SILT, little CLAY, tr. GRAVEL, sm. (<1 cm), subangular, tr. SAND, vf to f., stiff, low plasticity.	97	2	1	
4	618		NR		(3.2 to 5 ft) No Recovery				
5	617	5/ 3.6		CL	(5 to 6.4 ft) Dark Brown (7.5YR 3/2) CLAY, little SILT, with interval of Yellowish Brown (10YR 6/4), siltier material @ -6.2 ft., tr. mica, tr. plant material, stiff, medium plasticity, gradational contact.	100	0	0	SL22-EP-SB-5-4080
6	616								
7	615			CH	(6.4 to 7.9 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, tr. mica, soft, high plasticity, sharp contact.	100	0	0	
8	614			SP	(7.9 to 8.6 ft) Dark Reddish Brown (5YR 3/2) SAND, vf to f., tr. SILT, tr. mica, medium dense, cohesive.	3	97	0	SL22-EP-SB-5-8012
9	613		NR		(8.6 to 9.7 ft) No Recovery				
	612			CL	(9.7 to 10 ft) Brown (7.5YR 4/2) CLAY, some SILT, tr. GRAVEL, sm.,	97	2	1	

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-5

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418580.287 **EASTING** 2863858.313 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 2:45:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/18/2022 4:45:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 12 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow, ground frozen, moderate tree cover.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
11	611	2/ 2.3		SM	subangular, claystone, tr. SAND, vf., moist, very soft, medium plasticity, sharp contact. (10 to 11.4 ft) Brown (7.5YR 4/2) SAND, vf to f., some SILT, tr. CLAY, coarsening upwards, tr. mica, dense, cohesive, nonplastic, sharp contact.	35	65	0	SL22-EP-SB-5-8012
12	610			SW	(11.4 to 11.5 ft) Light Brown (7.5YR 6/4) SAND, vf to m., rounded, tr. SILT, dense, cohesive.	1	99	0	
				ML	(11.5 to 12 ft) Brown (7.5YR 4/2) SILT, some SAND, vf to f., tr. CLAY, coarsening upwards, tr. mica, dense, cohesive, nonplastic, sandier intervals @ -11.6, -11.8 ft.	60	40	0	
13	609								
14	608								
15	607								
16	606								
17	605								
18	604								
19	603								
	602								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-6

NORTHING 418481.924 **EASTING** 2863752.828 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 1:30:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/19/2022 9:05:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS Offset 2 ft N from original location.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	622	5/ 3.5		ML	(0 to 2.1 ft) Dark Brown (7.5YR 3/3) SILT, some CLAY, tr. root and wood fragments, medium stiff, low plasticity, sharp contact.	100	0	0	SL22-EP-SB-6-0040
2	621			SM	(2.1 to 2.4 ft) Dark Yellowish Brown (10YR 5/6) SAND, vf., some SILT, tr. mica, tr. root, medium dense, cohesive, nonplastic, gradational contact.	40	60	0	
3	620			CH	(2.4 to 3.1 ft) Dark Brown (7.5YR 3/3) CLAY, few SILT, tr. SAND, vf to f., stiff, high plasticity, sand lens @ -2.8 ft., gradational contact.	95	5	0	
4	619			ML	(3.1 to 3.5 ft) Dark Brown (7.5YR 3/3) SILT, little CLAY, few SAND, vf to m., subrounded, Qtz., tr. mica, medium stiff to stiff, low plasticity.	85	15	0	
5	618		NR		(3.5 to 5 ft) No Recovery				
6	617	5/ 3.7		CL	(5 to 5.15 ft) Dark Grayish Brown (10YR 3/2) CLAY, little SILT, tr. mica, soft, medium plasticity, gradational contact.	100	0	0	SL22-EP-SB-6-4080 SL22-EP-SB-6-4080FD SL22-EP-SB-6-4080MS SL22-EP-SB-6-4080MSD
7	616			CL	(5.15 to 5.4 ft) Brown (10YR 4/3) CLAY, little SILT, tr. mica, tr. root, medium stiff, medium plasticity, gradational contact.	100	0	0	
				CH	(5.4 to 7.7 ft) Mixture of Dark Grayish Brown (10YR 3/2) and Dark Reddish Gray (5YR 4/2) CLAY, tr. SILT, tr. mica, stiff, high plasticity, lenses of SAND @ -6.2, -6.7 ft., vf to m., subrounded, Qtz., gradational contact.	98	2	0	
8	615			CH	(7.7 to 8.1 ft) Dark Grayish Brown (10YR 3/2) CLAY, tr. SILT, tr. mica, tr. wood fragments, stiff, high plasticity, lenses of Pale Brown (10YR 6/3) SAND, vf to f., Qtz., sharp contact.	95	5	0	
9	614			CH	(8.1 to 8.7 ft) Mixture of Dark Grayish Brown (10YR 3/2) and Dark Reddish Gray (5YR 4/2) CLAY, tr. SILT, tr. mica, stiff, high plasticity.	100	0	0	SL22-EP-SB-6-8012
	613		NR		(8.7 to 12.5 ft) No Recovery				

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-6

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418481.924 **EASTING** 2863752.828 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 1:30:00 PM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/19/2022 9:05:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS Offset 2 ft N from original location.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
11	612		NR		(8.7 to 12.5 ft) No Recovery *(continued)*				SL22-EP-SB-6-8012
12	611								
13	610	5/ 2.5		CH	(12.5 to 13.95 ft) Mixture of Dark Grayish Brown (10YR 3/2) and Dark Reddish Gray (5YR 4/2) CLAY, tr. SILT, tr. mica, tr. root, soft, high plasticity, sharp contact.	100	0	0	SL22-EP-SB-6-1215
14	609			SP	(13.95 to 14.1 ft) Brown (7.5YR 4/2) SAND, vf to f., tr. SILT, tr. mica, dense, cohesive, nonplastic, gradational contact.	5	95	0	
				CH		100	0	0	
	608			SP	(14.1 to 14.2 ft) Mixture of Dark Grayish Brown (10YR 3/2) and Dark Reddish Gray (5YR 4/2) CLAY, tr. SILT, tr. mica, tr. root, soft, high plasticity, sharp contact.	2	98	0	
15				CH	(14.2 to 14.7 ft) Brown (7.5YR 4/3) SAND, vf to f., tr. SILT, tr. mica, tr. wood fragments, dense, cohesive, nonplastic, CLAY lens @ -14.5 ft., sharp contact.	100	0	0	
16	607				(14.7 to 15 ft) Mixture of Dark Grayish Brown (10YR 3/2) and Dark Reddish Gray (5YR 4/2) CLAY, tr. SILT, tr. mica, tr. root, soft, high plasticity.				
17	606								
18	605								
19	604								
	603								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-7

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418311.622 **EASTING** 2864061.727 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 10:30:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/21/2022 7:15:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 12 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS ~2 ft snow drift, light brush needed clearing.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	620	5/4		OH	(0 to 1.65 ft) Brown (7.5YR 4/2) ORGANIC CLAY, some SILT, few root and wood fragments, moist, stiff in drier intervals, high plasticity, blocky structure.	100	0	0	SL22-EP-SB-7-0040
2	619			ML	(1.65 to 2 ft) Yellowish Red (5YR 5/6) SILT, few SAND, vf., stiff, nonplastic, sharp contact.	99	1	0	
				OH	(2 to 2.35 ft) Brown (7.5YR 4/2) ORGANIC CLAY, some SILT, few wood fragments, stiff, high plasticity, blocky structure, sharp contact.	100	0	0	
				SW	(2.35 to 2.5 ft) Light Yellowish Brown 10YR 6/4) SAND, vf to c., subangular, Qtz., loose, noncohesive, sharp contact.	0	100	0	
3	618			OH	(2.5 to 2.8 ft) Brown (7.5YR 4/2) ORGANIC CLAY, little SILT, few wood fragments, stiff, high plasticity, blocky structure, gradational contact.	100	0	0	
				ML	(2.8 to 3.2 ft) Yellowish Red (5YR 5/6) SILT, few SAND, vf., tr. mica, stiff, nonplastic, gradational contact.	99	1	0	
4	617			OH	(3.2 to 4 ft) Brown (7.5YR 4/2) ORGANIC CLAY, little SILT, few wood fragments, stiff, high plasticity, blocky structure.	100	0	0	
5	616		NR		(4 to 5 ft) No Recovery				SL22-EP-SB-7-4080
6	615	5/3.3		OL	(5 to 6 ft) Brown (7.5YR 4/2) ORGANIC CLAY, some SILT, few wood fragments, stiff, low plasticity, blocky structure, sharp contact.	100	0	0	
				SW	(6 to 6.65 ft) Reddish Brown (5YR 5/4) SAND, vf to m., tr. GRAVEL, sm. (< 5 mm), subangular, Qtz., tr. SILT, tr. mica, loose, noncohesive, gradational contact.	1	98	1	
7	614			SW	(6.65 to 7.8 ft) Dark Brown (7.5YR 3/2) SAND, vf to m., few SILT, tr. mica, moist, loose, noncohesive, sharp contact.	6	94	0	
8	613			CH	(7.8 to 8.3 ft) Dark Brown (7.5YR 3/2) CLAY, medium stiff, high plasticity.	100	0	0	
9	612		NR		(8.3 to 10.3 ft) No Recovery				SL22-EP-SB-7-8012
	611								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-7

NORTHING 418311.622 **EASTING** 2864061.727 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 10:30:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/21/2022 7:15:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 12 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS ~2 ft snow drift, light brush needed clearing.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
11	610	2/ 1.7	NR		(8.3 to 10.3 ft) No Recovery *(continued)*				SL22-EP-SB-7-8012
				SM	(10.3 to 10.8 ft) Brown (7.5YR 4/3) SAND, vf to m., few SILT, few CLAY, tr. plant material, loose, cohesive, gradational contact.	40	60	0	
12	609			CH	(10.8 to 12 ft) Dark Brown (7.5YR 3/2) CLAY, medium stiff, high plasticity.	100	0	0	
13	608								
14	607								
15	606								
16	605								
17	604								
18	603								
19	602								
	601								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-8

NORTHING 418494.62 **EASTING** 2864083.863 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 9:50:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 5:40:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 7 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	616	5/ 3.3		ML	(0 to 1.2 ft) Reddish Brown (5YR 4/3) SILT, little SAND, vf to f., few CLAY, some root, soft, nonplastic, musty odor, gradational contact.	80	20	0	SL22-EP-SB-8-0035
2	615			SC	(1.2 to 2.5 ft) Mixture of Reddish Brown (5YR 4/4) SAND, vf to f., tr. SILT, dense, cohesive AND Brown (7.5YR 4/2) CLAY, medium stiff, high plasticity, gradational contact.	35	65	0	
3	614			OL	(2.5 to 3 ft) Black (7.5YR 2.5/1) ORGANIC SILT, some SAND, vf to f., tr. mica, tr. root and wood fragments, gradational contact.	70	30	0	
				SP SM	(3 to 3.3 ft) Reddish Brown (5YR 4/3) SAND, vf to f., few SILT, dense, cohesive, nonplastic.	15	85	0	
4	613		NR		(3.3 to 4.3 ft) No Recovery				SL22-EP-SB-8-3570
5	612			ML	(4.3 to 4.8 ft) Dark Brown (7.5YR 3/2) SILT, some SAND, vf to f., little CLAY, wet, soft, low plasticity, gradational contact.	75	25	0	
				SM	(4.8 to 5.5 ft) Brown (7.5YR 4/4) SAND, vf to f., little SILT, tr. mica, moist, rapid dilatency, dense, cohesive, sharp contact.	20	80	0	
				CH	(5.5 to 5.7 ft) Very Dark Gray (7.5YR 3/1) CLAY, tr. mica, soft, high plasticity, sharp contact.	100	0	0	
6	611	2/ 4.3		SP		10	90	0	
				CH	(5.7 to 5.9 ft) Brown (7.5YR 4/4) SAND, vf to f., few SILT, tr. mica, moist, rapid dilatency, dense, cohesive, sharp contact.	100	0	0	
				CL	(5.9 to 6.2 ft) Very Dark Gray (7.5YR 3/1) CLAY, tr. mica, soft, high plasticity, sharp contact.	90	10	0	
7	610			ML	(6.2 to 6.6 ft) Dark Brown (7.5YR 3/2) CLAY, little SILT, few SAND, vf to f., tr. wood fragments, soft, medium plasticity, gradational contact.	75	25	0	
					(6.6 to 7 ft) Dark Brown (7.5YR 3/2) SILT, some SAND, vf to f., little CLAY, wet, soft, low plasticity.				
8	609								
9	608								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-9

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418523.967 **EASTING** 2864335.437 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 11:05:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 10:35:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow, ground frozen.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	624	5/ 3.8		CL	(0 to 2.9 ft) Dark Brown (7.5YR 3/2) CLAY, little SILT, tr. SAND, vf., tr. mica, tr. root, stiff, medium plasticity, sharp contact.	95	5	0	SL22-EP-SB-9-0040
2	623								
3	622			SP	(2.9 to 3.1 ft) Brown (7.5YR 5/3) SAND, vf to f., tr. mica, medium dense, noncohesive, sharp contact.	0	100	0	
				CL	(3.1 to 3.8 ft) Dark Brown (7.5YR 3/2) CLAY, some SILT, coarsening upwards, tr. mica, tr. root, stiff, medium plasticity.	100	0	0	
4	621		NR		(3.8 to 5 ft) No Recovery				
5	620	5/ 3.6		CL	(5 to 6.4 ft) Dark Brown (7.5YR 3/2) CLAY, some SILT, coarsening upwards, tr. mica, tr. root, stiff, interval of wood fragments @ -6.1 to -6.2 ft., medium plasticity, gradational contact..	100	0	0	SL22-EP-SB-9-4080
6	619			SM	(6.4 to 6.8 ft) Brown (7.5YR 5/3) SAND, vf to f., little SILT, tr. mica, dense, cohesive, gradational contact.	30	70	0	
7	618			ML	(6.8 to 7.5 ft) Dark Brown (7.5YR 3/2) SILT, some CLAY, stiff to very stiff, low plasticity, lens of SAND, vf to f., @ -7.1 ft., gradational contact.	95	5	0	
8	617			SM	(7.5 to 7.6 ft) Brown (7.5YR 5/3) SAND, vf to f., little SILT, tr. mica, dense, cohesive, sharp contact.	20	80	0	
				ML		100	0	0	
				SP	(7.6 to 7.9 ft) Dark Brown (7.5YR 3/2) SILT, some CLAY, stiff to very stiff, low plasticity, sharp contact.	7	93	0	
				ML		100	0	0	
				SP	(7.9 to 8.1 ft) Brown (7.5YR 5/3) SAND, vf to f., few SILT, tr. mica, dense, cohesive, sharp contact.	5	95	0	
				ML		100	0	0	
9	616		NR		(8.1 to 8.3 ft) Dark Brown (7.5YR 3/2) SILT, some CLAY, stiff to very stiff, low plasticity, sharp contact.				SL22-EP-SB-9-8012
					(8.3 to 8.45 ft) Brown (7.5YR 5/3) SAND, tr. SILT, vf to f., few SILT, tr. mica, dense, cohesive, gradational contact.				
	615				(8.45 to 8.6 ft) Dark Brown (7.5YR 3/2) SILT, some CLAY, stiff to very stiff, low plasticity.				

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-9

NORTHING 418523.967 **EASTING** 2864335.437 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 11:05:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/20/2022 10:35:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 15 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 6 in snow, ground frozen.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
11	614	5/ 4.1	NR		(8.6 to 10.9 ft) No Recovery *(continued)*				
12	613			CL	(10.9 to 12.45 ft) Interbedded (5 mm to 3 cm) Brown (7.5YR 5/3) SAND, vf to f., few SILT, tr. mica, dense, cohesive AND Dark Brown (7.5YR 3/2) CLAY, tr. SILT, soft, high plasticity, sharp contact.	55	45	0	SL22-EP-SB-9-8012
13	612			ML CL	(12.45 to 13.5 ft) Brown (7.5YR 5/3) SILT, some CLAY, coarsening upwards, tr. root, moist, stiff, medium plasticity, sharp contact.	100	0	0	
14	611			CH	(13.5 to 13.75 ft) Dark Brown (7.5YR 3/2) CLAY, tr. SILT, tr. mica, medium stiff, high plasticity, gradational contact.	100	0	0	SL22-EP-SB-9-1215 SL22-EP-SB-9-1215FD SL22-EP-SB-9-1215MS SL22-EP-SB-9-1215MSD
				CL	(13.75 to 14.7 ft) Dark Brown (7.5YR 3/2) CLAY, some SILT, medium stiff, medium plasticity, SAND lens @ -14.4 ft., gradational contact.	98	2	0	
15	610			ML	(14.7 to 15 ft) Brown (7.5YR 5/3) SILT, little CLAY, tr. SAND, vf to f., coarsening upwards, tr. root, stiff, medium plasticity, sharp contact.	97	3	0	
16	609								
17	608								
18	607								
19	606								
	605								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

GEOPROBE-SPIRIT LAKE-REPORT LOG ERIE PIER.GPJ NWS EARLE.GPJ 7/2/22 REV.

EA Engineering, Science, and Technology, Inc., PBC

BORING ID SL22-EP-SB-10

NORTHING 418704.452 **EASTING** 2864054.58 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 9:30:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/19/2022 11:30:00 AM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 8 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS 5 in snow, ground frozen.

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
1	617	5/ 3.8		OL	(0 to 1.5 ft) Brown (7.5YR 4/2) ORGANIC SILT, some SAND, vf to f, tr. m., little CLAY, few root and plant material, medium stiff, cohesive, low plasticity, granular structure, sharp contact.	60	40	0	SL22-EP-SB-10-0040
2	616			SW	(1.5 to 1.6 ft) Pink (7.5YR 7/4) SAND, vf to m., subangular to subrounded, Qtz., mafics, tr. wood fragments, loose, noncohesive, sharp contact.	0	100	0	
				CH	(1.6 to 2.2 ft) Dark Brown (7.5YR 3/2) CLAY, few SILT, tr. plant material, medium stiff to soft, medium to high plasticity, gradational contact.	100	0	0	
3	615			ML	(2.2 to 3.8 ft) Dark Brown (7.5YR 3/2) SILT, little SAND, vf to f, tr. m., little CLAY, tr. root and plant material, medium stiff, cohesive, low plasticity, sharp contact.	85	15	0	
4	614		NR		(3.8 to 5 ft) No Recovery				
5	613	3/ 2.2		ML	(5 to 5.6 ft) Brown (7.5YR 4/2) SILT, some CLAY, tr. SAND, vf to f., tr. plant material, stiff, low plasticity, gradational contact.	95	5	0	SL22-EP-SB-10-4080
6	612			SP	(5.6 to 5.75 ft) Brown (7.5YR 4/4) SAND, vf to f., few SILT, tr. mica, medium dense, cohesive, nonplastic, sharp contact.	10	90	0	
7	611			CH	(5.75 to 7.2 ft) Dark Brown (7.5YR 3/2) CLAY, few SILT, tr. mica, tr. plant material, medium stiff to soft, medium to high plasticity.	100	0	0	
8	610								
9	609								
	608								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

BORING ID SL22-EP-SB-11

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418693.532 **EASTING** 2864189.334 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 9:00:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/19/2022 12:45:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 8 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS ---

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
0	617	5/ 3.5		ML	(0 to 1.1 ft) Dark Brown (7.5YR 3/2) SILT, little CLAY, tr. SAND, vf., tr. root and wood fragments, moist, stiff, low plasticity, gradational contact.	97	3	0	SL22-EP-SB-11-0040
1				SM	(1.1 to 1.3 ft) Reddish Brown (5YR 5/4) SAND, vf to f., little SILT, tr. mica, dense, cohesive, nonplastic, gradational contact.	20	80	0	
	616			ML	(1.3 to 1.9 ft) Dark Brown (7.5YR 3/2) SILT, little CLAY, tr. SAND, vf., tr. root and wood fragments, stiff, low plasticity, gradational contact..	95	5	0	
2				SM	(1.9 to 2.4 ft) Reddish Brown (5YR 5/4) SAND, vf to f., little SILT, tr. mica, dense, cohesive, nonplastic, gradational contact.	20	80	0	
	615			SM	(2.4 to 2.6 ft) Dark Brown (7.5YR 3/2) SAND, vf to f., some SILT, tr. mica, few wood fragments @ -2.6 ft., dense, cohesive, nonplastic, sharp contact.	40	60	0	
3				SM		20	80	0	
				ML	(2.6 to 2.8 ft) Reddish Brown (5YR 5/4) SAND, vf to f., little SILT, tr. mica, dense, cohesive, nonplastic, gradational contact.	70	30	0	
	614				(2.8 to 3.5 ft) Mixture of Dark Brown (7.5YR 3/2) SILT, some CLAY, tr. SAND, vf., stiff, low plasticity AND Reddish Brown (5YR 5/4) SAND, vf to f., little SILT, tr. mica, dense, cohesive, nonplastic.				
4			NR		(3.5 to 5 ft) No Recovery				
	613								
5				CL	(5 to 5.15 ft) Dark Brown (7.5YR 3/2) CLAY, little SILT, tr. SAND, vf., tr. mica, soft, medium plasticity, gradational contact.	98	2	0	SL22-EP-SB-11-4080
	612	3/ 3							
6				ML	(5.15 to 8 ft) Dark Brown (7.5YR 3/2) SILT, few SAND, vf to f., little CLAY, tr. mica, tr. root and wood fragments, stiff, cohesive, low plasticity.	90	10	0	
	611								
7									
	610								
8									
	609								
9									
	608								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

GEOPROBE-SPIRIT LAKE-REPORT LOG ERIE PIER.GPJ NWS EARLE.GPJ 7/2/22 REV.

BORING ID SL22-EP-SB-12

EA Engineering, Science, and Technology, Inc., PBC

NORTHING 418763.382 **EASTING** 2864330.639 **SPC MN N USFT (NAD83)**

PROJECT NAME AND NUMBER Spirit Lake - Erie Pier Sampling (1609801)

GEOLOGIST K. Merandi **DRILL DATE/TIME** 1/18/2022 8:40:00 AM **BORE DIAMETER (in)** 1.5

DRILLER Twin Ports Testing, Inc. **SAMPLE DATE/TIME** 1/18/2022 5:25:00 PM **SAMPLING METHOD** Composite

DRILLING METHOD Direct Push **TOTAL DEPTH (ft bgs)** 8 **SOIL SAMPLES COLLECTED (Y/N)** Y

RIG MAKE/MODEL Geoprobe Systems 662CPT **GW SAMPLES COLLECTED (Y/N)** N

LOCATION DESCRIPTION / SURFACE CONDITIONS ---

DEPTH BELOW GROUND SURFACE (ft)	ELEVATION (ft)	SAMPLER ADVANCE/RECOV. (ft)	GRAPHIC LOG	USCS CLASS	MATERIAL DESCRIPTION Depth Interval, Color (Munsell), Moisture, Principal Components, Minor Components, Density/Consistency, Grading, Stratification/Contacts, Odor	PERCENT FINES	PERCENT SAND	PERCENT GRAVEL	Composite Sample ID
0	617	5/ 3.5		SP	(0 to 0.75 ft) Brown (7.5YR 4/4) SAND, vf to m., Qtz., tr. SILT, fining upwards, tr. mica, moist, medium dense, cohesive, slight sweet odor, sharp contact.	1	99	0	SL22-EP-SB-12-0040 SL22-EP-SB-12-0040FD
1	616			CH	(0.75 to 2.3 ft) Very Dark Grayish Brown (10YR 3/2) CLAY, little SILT, tr. mica, stiff, medium to high plasticity, gradational contact.	100	0	0	
2	615			ML	(2.3 to 2.95 ft) Dark Brown (7.5YR 3/2) SILT, little SAND, vf to m., Qtz., few CLAY, tr. mica, moist, low plasticity, gradational contact.	75	25	0	
3				SP	(2.95 to 3.4 ft) Dark Brown (7.5YR 3/3) SAND, vf to m., tr. c., few SILT, dense, cohesive, sharp contact.	10	90	0	
4	614			CH	(3.4 to 3.5 ft) Very Dark Grayish Brown (10YR 3/2) CLAY, tr. SILT, tr. mica, stiff, high plasticity, gradational contact.	100	0	0	
	613		NR		(3.5 to 5 ft) No Recovery				
5		3/ 2.8		CH	(5 to 5.2 ft) Very Dark Grayish Brown (10YR 3/2) CLAY, little SILT, tr. mica, stiff, medium to high plasticity, sharp contact.	100	0	0	SL22-EP-SB-12-4080
6	612			SP	(5.2 to 5.55 ft) Dark Brown (7.5YR 3/2) very moist SAND, vf to m., few SILT, tr. mica, no dilatency, medium dense, cohesive, nonplastic, sharp contact.	10	90	0	
				CL	(5.55 to 6.3 ft) Very Dark Gray (10YR 3/1) moist CLAY, some SILT, tr. SAND, vf to f., tr. mica, dense, low plasticity, sharp contact.	95	5	0	
7	611			SP SM	(6.3 to 6.4 ft) Brown (7.5YR 4/3) SAND, vf to f., few SILT, tr. mica, dense, cohesive, nonplastic, gradational contact.	15	85	0	
				ML	(6.4 to 7.8 ft) Very Dark Gray (10YR 3/1) CLAY, some SILT, tr. SAND, vf to f., tr. mica, dense, low plasticity AND thin beds of Brown (7.5YR 4/3) SAND, vf to f., few SILT, tr. mica, dense, cohesive, nonplastic.	85	15	0	
8	610								
9	609								
	608								

NOTES:

- Composite samples were collected from available recovered material within the predetermined sample interval.

DRAFT

Attachment C

Laboratory Reports

(Provided under separate cover)

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MINNESOTA POLLUTION CONTROL AGENCY

520 Lafayette Road North | St. Paul, Minnesota 55155-4194 | 651-296-6300

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

February 1, 2018

Mr. James Sharrow
Duluth Seaway Port Authority
Erie Pier Processing & Reuse Facility
1200 Port Terminal Rd
Duluth, Minnesota 55802

RE: Final Reissued NPDES/SDS Permit Erie Pier Processing & Reuse Facility
Permit No. MN0052612
T049N, R14W, Section 08, Duluth, St. Louis County, Minnesota

Dear Mr. Sharrow:

Enclosed is the final permit for the facility identified above. The Minnesota Pollution Control Agency (MPCA) has prepared this permit in accordance with Minn. Stat. chs. 115, 115A, and 116, and Minn. R. chs. 7000, 7001, and 7035.

If you have any questions regarding any of the terms and conditions of the draft permit, please contact Emily Schnick at 651-757-2699 or by email at emily.schnick@state.mn.us.

Sincerely,

Jeff Udd

This document has been electronically signed.

Jeff Udd, P.E.
Supervisor, Water Quality Permits Unit
Water Section
Industrial Division

JU/ES:lmg

Enclosure: Final Permit

MINNESOTA POLLUTION CONTROL AGENCY

National Pollutant Discharge Elimination System/State Disposal System

MN0052612

Permittee:	Duluth Seaway Port Authority
Facility name:	Erie Pier Processing & Reuse Facility
City or Township:	Duluth **County:** St. Louis
Issuance date:	February 1, 2018
Expiration date:	January 31, 2023

The state of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Permittee to operate a disposal system at the facility named above in accordance with the requirements of this permit.

The goal of this permit is to reduce pollutant levels in point source discharges and protect water quality in accordance with the U.S. Clean Water Act, Minnesota statutes and rules, and federal laws and regulations.

This permit is effective on the issuance date identified above. This permit expires at midnight on the expiration date identified above.

Signature: Jeff Udd

This document has been electronically signed.

for the Minnesota Pollution Control Agency

Jeff Udd, P.E.
Supervisor, Water Quality Permits Unit
Water Section
Industrial Division

Submit eDMRs
Submit via the MPCA e-Services at
https://rsp.pca.state.mn.us/TEMPO_RSP/Orchestrate.do?initiate=true

Submit other WQ reports to:
Attention: WQ Submittals Center
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Questions on this permit?
For eDMR and other permit reporting issues, contact:
Jennifer Satnik, 651-757-2692

For specific permit requirements, please refer to:
Craig Weingart, 218-302-6650

Wastewater Permit Program general questions, contact:
MPCA, 651-282-6143 or 1-800-657-3938.

Table of Contents

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1. Permitted facility description

The Erie Pier Processing & Reuse Facility facility (facility) is located at 1200 Port Terminal Dr, Duluth, Minnesota 55802-2609, St. Louis County.

Erie Pier has been used as a Confined Disposal Facility (CDF) since 1979. The Facility owner is the Duluth Seaway Port Authority (Permittee) and the City of Duluth is a co-sponsor with certain responsibilities after closure of the Facility (1978 Agreement on file). It was constructed and operated by the United States Army Corps of Engineer (USACE) as a place to dispose of dredge material from the federal navigable channel within the Duluth/Superior Harbor and also from private slips if approved by USACE. In recent years, the facility focus has not only been on disposal but also on beneficial reuse of dredge material. This permit defines the procedures and evaluations necessary for the beneficial reuse of dredge material and it also authorizes the disposal of dredge material at the site under the conditions described.

This is a non-discharging wastewater disposal system regulated by the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) through the water quality program of the Minnesota Pollution Control Agency. This permit does not authorize or otherwise regulate dredging activity. However, dredging activity is subject to the water quality standards specified in Minn. R. chs. 7050 and 7060. Surface water discharge, except storm water and incidental discharges as specified by this permit, is not authorized under the terms of this permit.

2. Location map of permitted facility

Topographic Map of Permitted Facility

MN0052612: Erie Pier Processing & Reuse Facility
T49N, R14W, Section 8
Duluth, St. Louis County, Minnesota

Map produced by: MPCA Staff, 12/7/2017
Scale: 1:15,783,890

0 0.15 0.3 0.6 Miles

3. Flow diagram

There is no flow diagram to display.

4. Summary of stations and station locations

Station	Type of station	Local name	PLS location
WS 001	Solids to Land Disposal/Non-application	Dredge Material	T49N, R14W, S08, NE Quarter of the NE Quarter

5. Permit requirements

MN0052612	Erie Pier Processing & Reuse Facility	
		Waste Stream Station General Requirements
	5.1.1	Representative Samples. [Minn. R. 7001]
	5.1.2	Grab and composite samples shall be collected at a point representative of total influent flow to the system. [Minn. R. 7001]
		Dredged Material Management
	5.2.3	Authorization. [Minn. R. 7001]
	5.2.4	This permit authorizes the Permittee to store, dispose, and/or reuse dredged material in accordance with the provisions of this permit. [Minn. R. 7001]
	5.2.5	This permit authorizes the discharge of stormwater originating from the project site as delineated and described by the requirements of the Storage and/or Reuse of Dredged Material section of this chapter, as well as incidental discharges associated with re-handling, off-loading and/or transportation activities when managed in accordance with the Rehandling, Off-loading and Transportation of Dredged Material section of this chapter. Other discharges of wastewater are not authorized by this permit. [Minn. R. 7001]
	5.2.6	This permit does not authorize or otherwise regulate dredging activity. However, dredging activity is subject to the water quality standards specified in Minnesota Rules chs. 7050 and 7060. Receipt of dredge material shall not commence until all federal, state and/or local approvals that may be required for a particular project, including but not limited to state permits regulating activities in the bed of public waters as defined in Minn. Stat. sec. 105 from the Minnesota Department of Natural Resources (DNR), federal permits for dredged or fill material from the US Army Corps of Engineers (USACE), and local permits from the appropriate Soil and Water Conservation District, county or local unit of government (LUG). [Minn. R. 7050, Minn. R. 7060]
	5.2.7	The following activities are not authorized by this permit: a. The discharge of wastewater or stormwater into waters of the state, except as provided by the Authorization section of this permit. b. The discharge of dredged material to surface water from the storage, disposal and/or reuse facility (Erie Pier). c. Permit coverage at sites for which Environmental Assessment Worksheets or Environmental Impact Statements are required, in accordance with Minn. R. ch. 4410, until that environmental review is completed. d. The discharge of sewage, wash water, scrubber water, spills, oil, hazardous substances, or equipment/vehicle cleaning and maintenance wastewaters to ditches, wetlands nor other surface waters of the state. e. The routing of pollutants from the dredging activity or the dredged material storage, disposal, and/or reuse facility to a municipal wastewater treatment system in any manner unless authorized by the municipal authority (WLSSD). In the case of Erie Pier, the Western Lake Superior Sanitary District approved the discharge of up to 72,000 gallons per day provided there is no visual sign oil, grease, or other petroleum

		related products (see March 28, 2005 letter for details). f. The transport of pollutants to a municipal wastewater treatment system that will interfere with the operation of the treatment system or cause pass-through violations of effluent limits or water quality standards. [Minn. R. 7001]
	5.2.8	Compliance with the terms and conditions of this permit releases the Permittee from the requirement to obtain a separate permit for industrial activities at the storage, disposal and/or reuse site that would otherwise require the Permittee to obtain an industrial stormwater permit in accordance with the Clean Water Act and Agency rules, except where the use or reuse of dredged material is occurring at a location separate from other activity covered by this permit. The requirement to obtain a construction stormwater permit for land disturbing activities, where otherwise required, is not waived by this permit. Note that the requirement for a construction stormwater permit only applies to areas outside of the diked disposal area (where sediment is contained). [Minn. R. 7001]
	5.2.9	Re-handling, Off-Loading and Transportation of Dredged Material. [Minn. R. 7001]
	5.2.10	Dredged materials shall be managed in a manner so as to minimize the amount of material returned by spillage, erosion or other discharge to waters of the state during re-handling, off-loading and/or transportation activities. [Minn. R. 7001]
	5.2.11	Areas for the re-handling and/or off-loading of dredged material shall be sloped away from surface water, or otherwise designed to prevent runoff from the area. In cases where the topography of the project does not physically allow for a slope away from surface water, the Permittee shall otherwise manage the area to minimize the amount of material returned by spillage, erosion or other discharge to waters of the state. [Minn. R. 7001]
	5.2.12	Dredged material hauled on federal, state, or local highways, roads, or streets shall be hauled in such a way as to prevent dredged material from leaking, spilling, or otherwise being deposited in the right-of-way. Dredged material deposited on a public roadway shall be immediately removed and properly disposed. [Minn. R. 7001]
	5.2.13	The Permittee shall minimize vehicle tracking of soil or dredged material off-site at locations where vehicles exit the dredging, storage, disposal and/or reuse facility onto impervious surfaces by BMPs such as stone pads, concrete or steel wash racks, or equivalent systems. [Minn. R. 7001]
	5.2.14	Tracked soil and/or dredged material shall be removed from impervious surfaces that do not drain back to the dredged material storage, disposal and/or reuse facility within 24 hours of discovery, and placed in the storage, disposal and/or reuse facility site. [Minn. R. 7001]
	5.2.15	Storage, Disposal and/or Reuse of Dredged Material. [Minn. R. 7001]
	5.2.16	Authorization. Prior to the use of a site for the storage, disposal, and/or reuse of dredged material, the Permittee shall obtain written MPCA approval for such use. The Erie Pier site has been an MPCA-approved dredge disposal and storage site since its construction in 1979. [Minn. R. 7001]
	5.2.17	General. Any site used for the storage, disposal and/or reuse of a dredged material shall be operated and maintained by the Permittee to control and prevent runoff, including stormwater and snowmelt, from the facility to prevent the exceedance of water quality standards specified in Minnesota Rules, chs. 7053 and 7060. [Minn. R. 7001]
	5.2.18	The Permittee shall limit and control the use of materials at the facility that may cause exceedances of ground water standards specified in Minnesota Rules, ch. 7060. These materials include, but are not limited to, detergents and cleaning

		agents, solvents, chemical dust suppressants, lubricants, fuels, drilling fluids, oils, fertilizers, explosives and blasting agents. [Minn. R. 7001]
	5.2.19	The Permittee may dispose of dredged material at a permitted solid waste landfill, through on-site disposal, or through reuse for a beneficial purpose, as follows: a. Temporary storage and/or treatment of dredged material at the dredge project site. Temporary storage of dredged material is subject to the requirements of the Temporary Storage and/or Treatment of Dredged Material section of this chapter. b. Disposal of dredged material at the dredge project site. Disposal of dredged material is subject to the Disposal of Dredged Material section of this chapter. c. Reuse of dredged material for beneficial purposes. Reuse of dredged material is subject to the Beneficial Use of Re-Use of Dredged Material section of this chapter. [Minn. R. 7001]
	5.2.20	A. Temporary Storage and/or Treatment of Dredged Material. [Minn. R. 7001]
	5.2.21	All of the following requirements apply to the temporary storage and/or treatment of dredged material (at harbor location other than Erie Pier): a. Temporary storage shall not exceed 1 year. Storage or accumulation of dredged material for more than 1 year constitutes disposal, and is subject to the disposal facility requirements of the Disposal of Dredged Material section of this chapter. b. The quantity of dredged material to be stored at the site shall not exceed the quantity of material authorized for disposal at the site, as specified by the Disposal of Dredged Material section of this chapter. c. Dredged materials shall be managed in a manner so as to minimize the amount of material returned by spillage, erosion or other discharge to waters of the state. Best management practices for the management of dredged materials are outlined in the MPCA fact sheet, "Best Management Practices for the Management of Dredged Material", (wq-qen2-02, 3/14). d. If dikes, berms or silt fences have been constructed to contain temporary stockpiles of dredged material, they shall not be removed until all material has been removed from the stockpile. [Minn. R. 7001]
	5.2.22	B. Disposal of Dredged Material. [Minn. R. 7001]
	5.2.23	Notification. Notification of a new or existing dredge disposal facility shall be to the MPCA for review and approval with permit application for modification. [Minn. R. 7001]
	5.2.24	Disposal facilities shall be constructed/operated in accordance with local requirements, including the requirement to obtain a permit, license, or other governmental approval to initiate construction. [Minn. R. 7001]
	5.2.25	Initial Site Plan (already completed for Erie Pier). An initial site plan shall be prepared and submitted for MPCA review and approval with permit application. The initial site plan shall consist of volume calculations for the final permitted capacity and a map of the facility. The map of the facility shall include the permitted boundaries, dimensions, site contours (at contour intervals of two feet or less), soil boring locations with surface elevations and present and planned pertinent features, including but not limited to roads, screening, buffer zone, fencing, gate, shelter and equipment buildings, and surface water diversion and drainage. The initial site plan shall be signed by a land surveyor registered in Minnesota or a professional engineer registered in Minnesota. [Minn. R. 7001]
	5.2.26	Delineation and Identification of Permitted Waste Boundary. The perimeter or outer limit of a dredged material disposal facility shall be indicated by permanent signage. In addition, a permanent sign, identifying the operation and showing the permit

		number of the site, shall be posted at the dredged material disposal facility. [Minn. R. 7001]
	5.2.27	Design Requirements. [Minn. R. 7001]
	5.2.28	Design Capacity. The maximum quantity of dredged material authorized for disposal at the dredged material disposal facility (final permitted capacity) is limited to the volume of material contained by the permitted footprint of the facility and the maximum slope requirement of twenty percent unless otherwise approved. [Minn. R. 7001]
	5.2.29	The following design standards apply to a facility used for the disposal of dredged materials: a. An earthen containment dike, or other MPCA approved embankment and/or other sediment control measure(s), shall be established around the perimeter of the dredged material disposal facility (permitted waste boundary). b. Site preparation shall allow for orderly development of the site. Initial site preparations shall include clearing and grubbing, topsoil stripping and stockpiling, fill excavation, if appropriate, drainage control structures, and other design features necessary to construct and operate the facility. c. The site shall be developed in phases in accordance with a 'Operational Plan', as specified in this chapter, to achieve final fill elevations as rapidly as possible. The design of each phase shall take into account weather conditions, site drainage, and the waste flow pattern into the site. d. Surface water runoff shall be diverted around dredged materials disposal facilities to prevent erosion, and protect the structural integrity of exterior embankments from failure. e. Slopes and drainageways shall be designed to prevent erosion. Slopes longer than 200 feet shall be interrupted with drainageways. f. Final slopes for the fill area shall be a minimum two percent and a maximum 20 percent, and shall be consistent with the planned ultimate use for the site. g. Final cover shall consist of at least 18 inches of soil with the top 12 inches capable of sustaining vegetative growth. h. For a system that will impound water (e.g. hydraulic dredging) with a constructed dike over 6 feet in height, or that impound more than 15 acre-feet of water, the system is subject to Minn. R. parts 6115.0300 through 6115.0520 [state Dam Safety Program]. Contact state Dam Safety Program staff at (651) 296-0521 for more information. [Minn. R. 7001]
	5.2.30	Site Stabilization. The Permittee shall stabilize the dredged material disposal facility before any disposal in the facility is allowed, as follows: a. The exterior slope of all permanent dikes or berms shall be no steeper than 3 to 1 (horizontal to vertical). The exterior slopes of all permanent dikes or berms shall be seeded and a soil fixative (e.g. mulch, blanket) applied within 72 hours of the completion of any grading work on the slopes. b. If grading work is completed too late in the growing season to seed or plant the desired species, then the Permittee shall propagate an annual cover crop that can be dormant seeded or planted and shall apply a soil fixative to the site. At the very minimum, the Permittee shall apply a soil fixative to the exterior slopes of all permanent dikes or berms prior to the first snowfall. c. Silt fences, if used, shall be properly installed. The silt fences shall be tall enough and installed at a sufficient distance from the base of the permanent dikes/berms or temporary stockpiles to create a reasonable secondary containment area. [Minn. R.

		7001]
	5.2.31	Operational Plan. An Operational Plan of the site and immediately adjacent area shall be developed and implemented, and shall show progressive development of trench and/or area fills and any phase construction. The scale of the development plan shall not be greater than 200 feet per inch. The existing Erie Pier Management Plan covers this requirement. [Minn. R. 7001]
	5.2.32	Facilities for the disposal of dredged material shall be designed by a professional engineer registered in the state of Minnesota, and in accordance with the criteria in this chapter. The Permittee shall construct the facility in accordance with these design plans and specifications under the direct supervision of a professional engineer registered in the state of Minnesota. [Minn. R. 7001]
	5.2.33	Certification Required. Prior to use of a facility for the disposal of dredged material under this part, the Permittee shall obtain and submit written certification from an engineer licensed in Minnesota stating that the disposal facility meets the requirements in this chapter, and has been constructed in accordance with the design plans and specifications. [Minn. R. 7001]
	5.2.34	Site Management, Limitations, and Restrictions for Disposal Facilities. [Minn. R. 7001]
	5.2.35	New or Expanded Facilities. All of the following requirements apply to the construction of new or expanded facilities used for the disposal of dredged material: a. The Permittee shall plan for and implement construction practices that minimize erosion and maintain dike integrity. b. Erosion control measures shall be established on all downgradient perimeters prior to the initiation of any upgradient land-disturbing construction activities. c. Surface runoff shall be directed around and away from the storage and/or disposal facility site, until the site is stabilized, usually by assuring that vegetative cover is well-established. d. Sediment control practices shall be designed and implemented to minimize sediment from entering surface waters. The timing of the installation of sediment control practices may be adjusted to accommodate short-term activities such as equipment access. Any short-term activity shall be completed as quickly as possible and the sediment control practices shall be installed immediately after the activity is completed. However, sediment control practices shall be installed before the next precipitation event even if the activity is not complete. e. All erosion and sediment control measures shall remain in place until final stabilization has been established. Permanent cover or final stabilization methods are used to prevent erosion, such as the placement of rip rap, sodding, or permanent seeding or planting. Permanent seeding and planting shall have a uniform perennial vegetation cover of at least 70 percent density to constitute final stabilization. f. The facility shall be stabilized, as specified in this chapter, before any disposal in the facility is allowed. [Minn. R. 7001]
	5.2.36	Management of Disposal Facilities. The following standards apply to a facility used for the disposal of dredged material: a. A permanent benchmark shall be installed on-site and show its location on the facility as-built plan. b. Run-on and run-off of stormwater shall be controlled. The owner or operator shall implement management practices designed to control run-on and run-off of stormwater from the disposal facility. c. Vegetative cover shall be established within 120 days of reaching the final

		permitted capacity of the dredged material disposal facility, or within 120 days of the inactivation or completion of a phase of the facility thereof. d. If the disposal facility contains any particulate matter that may be subject to wind dispersion, the owner or operator shall manage the dredged material to control wind dispersion. e. Nuisance conditions resulting from the disposal of dredged material shall be controlled and managed by the facility owner or operator. f. Final closure of a dredged material disposal facility shall be completed in accordance with this chapter, and requires MPCA approval. [Minn. R. 7001]
	5.2.37	Inspection and Maintenance. [Minn. R. 7001]
	5.2.38	The Permittee shall operate and maintain the integrity of the dike system, embankment and/or other erosion control equipment in compliance with the design requirements of this chapter at all times. [Minn. R. 7001]
	5.2.39	Periodic Site Inspections. The Permittee shall inspect the disposal facility to ensure integrity of the erosion control measures, system stability and dredged material containment. At a minimum, the facility shall be inspected: a. prior to the initial placement of any dredged material in the facility; and, b. at least once per month if a is not occurring. [Minn. R. 7001]
	5.2.40	Recordkeeping. The Permittee shall record the date of each inspection, any problem identified with the facility, and the action(s) taken to correct any identified problem. The Permittee shall keep these inspection records on site and available to MPCA staff upon request. [Minn. R. 7001]
	5.2.41	Nonfunctioning erosion and sediment control measures shall be repaired, replaced or supplemented with functioning erosion and/or sediment control measures. This repair shall be initiated within three days of discovery. [Minn. R. 7001]
	5.2.42	Where dredging and disposal have been suspended due to frozen ground conditions, the inspections and maintenance shall begin as soon as weather conditions warrant, or prior to resuming dredged material placement in the disposal facility, whichever occurs first. [Minn. R. 7001]
	5.2.43	The Permittee shall continue inspections required by this part until final closure of the site has been completed as specified in this chapter. [Minn. R. 7001]
	5.2.44	Sediment Removal and Disposal. [Minn. R. 7001]
	5.2.45	Dredged material shall be removed from disposal facilities in a manner so as to not damage the integrity and effectiveness of the containment structure or area. [Minn. R. 7001]
	5.2.46	Dredged material removed from a storage, disposal, and/or reuse facility shall be managed in accordance with of this chapter. [Minn. R. 7001]
	5.2.47	Recordkeeping. The Permittee shall record the dates, the volume of dredged material removed from the disposal facility, and the method and location of the disposition (disposal or reuse) of such materials. This information shall be submitted with the annual 'Dredged Material Report', as specified in the 'Annual Report' part of this chapter. [Minn. R. 7001]
	5.2.48	Closure and Post-Closure Requirements. [Minn. R. 7001]
	5.2.49	The Permittee shall cease to dispose of dredged materials and immediately close the dredged material disposal facility when: a. the Permittee declares the dredged material disposal facility closed; b. all fill areas reach final permitted capacity, as specified by this permit; c. an agency permit held by the facility expires, and renewal of the permit is not applied for, or is applied for and denied;

		d. an agency permit for the facility is revoked; and/or, e. an agency order to cease operations is issued. [Minn. R. 7001]
	5.2.50	Closure Plan. The Permittee shall prepare and submit a 'Closure Plan' for the final closure of a dredged material disposal facility for MPCA review and approval with permit application. [Minn. R. 7001]
	5.2.51	If repairs are necessary as a result of the professional engineer's inspection, a detailed proposal for restoration shall be submitted to the Agency for review within 180 days of discovery, and at least 60 days prior to initiation of restoration work. [Minn. R. 7001]
	5.2.52	A copy of the approved 'Closure Plan' and all revisions to the plan shall be kept at the facility until closure is completed and certified in accordance with this chapter. At the time of closure, the Agency will issue a closure document in accordance with Minn. R. part 7001.3055. [Minn. R. 7001]
	5.2.53	Amendment of Plan. The Permittee may amend the 'Closure Plan' (plan) any time during the life of the facility. The Permittee shall amend the plan whenever changes in the operating plan or facility design affect the closure procedures needed, and whenever the expected year of closure changes. Required amendments shall be completed within 60 days of any change or event that affects the closure plan. [Minn. R. 7001]
	5.2.54	Notification of Final Facility Closure. The Permittee shall notify the MPCA at least 90 days before final facility closure activities are to begin, except if the permit for the facility has been revoked. [Minn. R. 7001]
	5.2.55	Closure Performance Standard. The Permittee shall close the dredged material disposal facility in a manner that eliminates, minimizes, or controls the escape of pollutants to ground water or surface waters, to soils, or to the atmosphere during the post closure period. [Minn. R. 7001]
	5.2.56	Completion of Closure Activities. Within 30 days after receiving the last shipment of dredged material for disposal, the Permittee shall begin the final closure activities outlined in the approved 'Closure Plan' for the dredged material disposal facility. Closure activities shall be completed according to the approved 'Closure Plan'. The MPCA may approve a longer period if the owner or operator demonstrates that the closure activities will take longer due to adverse weather or other factors not in the control of the Permittee. [Minn. R. 7001]
	5.2.57	Closure Procedures. If one or more of the conditions of the Closure and Post-Closure Requirements section of this chapter exists, the Permittee shall: a. Complete the appropriate activities outlined in the approved 'Closure Plan'. b. Complete final closure activities consisting of submitting to the county recorder and the MPCA a detailed description of the waste types accepted at the facility and what the facility was used for, together with a survey plat of the site. The plat shall be prepared and certified by a land surveyor registered in Minnesota. The landowner shall record a notation on the deed to the property or on some other instrument normally examined during a title search, that will in perpetuity notify any potential purchaser of the property of any special conditions or limitations for use of the site, as set out in the 'Closure Plan' and closure document. [Minn. R. 7001]
	5.2.58	Certification of Closure. When final facility closure is completed, the Permittee shall submit to the commissioner certification by the Permittee and an engineer registered in Minnesota that the facility has been closed in accordance with this chapter. The certification shall contain the following elements:

		a. a completed and signed 'Site Closure Record'; b. documentation of closure, such as pictures, showing the construction techniques used during closure; and, c. a copy of the notation carrying the recorder's seal which has been filed with the county recorder. [Minn. R. 7001]
	5.2.59	Post-Closure Care. After final closure, the Permittee shall comply with the following requirements: a. restrict access to the facility by use of gates, fencing, or other means to prevent further disposal at the site, unless the site's final use allows access; b. maintain the integrity and effectiveness of the final cover, including making repairs to the final cover system as necessary to correct the effects of settling, subsidence, gas and leachate migration, erosion, root penetration, burrowing animals, or other events; c. prevent run-on and run-off from eroding or otherwise damaging the final cover; d. protect and maintain surveyed benchmarks used in complying with the Site Management, Limitation, and Restrictions: Management of Disposal Facilities section of this chapter; and, e. complete corrective action necessary to meet the requirements of the Site Management, Limitations, and Restrictions: Management of Disposal Facilities section of this chapter within 30 days of discovery. [Minn. R. 7001]
	5.2.60	C. Beneficial Use or Re-Use of Dredged Material. [Minn. R. 7001]
	5.2.61	Prior to the use or reuse of a dredged material, the Permittee shall determine the appropriate "suitable reuse category" of the dredged material to be used or reused, as described below. [Minn. R. 7001]
	5.2.62	Suitable Reuse Categories. The suitable reuse category of a dredged material is based on the analyzed characteristics of the dredged material and appropriately applied Soil Reference Values (SRVs), which are listed in Table 1 in the Appendices section of this permit. For the purposes of this permit, dredged material intended for the beneficial use or reuse is categorized into three tiers: Level 1, Level 2, and Level 3. a. Level 1 material is authorized to be used or reused at/on sites with a residential or recreational property use category. Level 1 material is characterized by: i. a contaminant level that is at or below all respective analyte concentrations listed in the Residential SRV column for any contaminant that can be reasonably expected to be present in the dredged material; or, ii. having more than 93% sand, as demonstrated by the grain size analysis described by the Sampling and Analysis section of this chapter and available laboratory analysis does not show contamination above Level 1 concentrations. b. Level 2 material is authorized to be used or reused on/at sites with an industrial use category. Level 2 material is characterized by a contaminant level that is at or below all respective analyte concentrations listed in the Industrial SRV column for any contaminant that can be reasonably expected to be present in the dredged material. c. Level 3 material is NOT authorized to be used, reused or placed in permanent disposal at the facility under this permit. Level 3 material is characterized by a contaminant level that is greater than any respective analyte concentrations listed in the Industrial SRV column for any contaminant that can be reasonably expected to

		be present in the dredged material. [Minn. R. 7001]
	5.2.63	The use or reuse of dredged material as beach nourishment is not authorized by this permit. [Minn. R. 7001]
	5.2.64	Storage Prior to Reuse. Storage of dredged material prior to reuse or use is subject to the temporary storage or disposal requirements of this chapter, as applicable. [Minn. R. 7001]
	5.2.65	Sampling and Analyses. [Minn. R. 7001]
	5.2.66	Timing of sediment evaluation. Dredged material shall be evaluated for pollutant contamination prior to removal of sediment, and in accordance with the terms and conditions of this permit. Evaluation need not be repeated prior to final disposition, except in the case where co-mingling with other material has occurred at the treatment, storage, disposal and/or reuse site, and/or if additional analysis is specified by the MPCA. [Minn. R. 7001]
	5.2.67	Sampling location. Sample locations shall properly characterize the dredged sediment. [Minn. R. 7001]
	5.2.68	Number of samples. Except for sieve grain size analysis, refer to Table 3 of Appendix 1 to this permit to determine the minimum number of samples required for sediment evaluation. Analysis shall be conducted on samples that are representative of, and in consideration of the dredged material and surrounding current and historical activities at the project site. In some cases, the minimum number of samples indicated on Table 3 will not be adequate to obtain representative samples, and additional analysis may be required. For samples demonstrating sediment composition equal to or greater than 93% sand, as evidenced by the analyte results for "Particle Size .05-2.0 mm Sand, Dry Weight", analysis of remaining analytes in Table 1 of the Appendix is not required. [Minn. R. 7001]
	5.2.69	Based on the evaluation of historical land uses and the reasonable likelihood for pollutants in the sediment to be dredged, analysis of analytes beyond the baseline analytes (Table 1 of the Appendix) may be required. These additional analytes are listed in Table 2 of the Appendix. [Minn. R. 7001]
	5.2.70	All of the following apply to sediment sampling at dredge project sites: a. Samples shall be managed in accordance with ASTM E1391-03 Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing and for Selection of Samplers Used to Collect Benthic Invertebrates. b. All samples shall be taken with a core sampler, or another MPCA approved method such as composite grab samples. c. All sampling equipment shall be properly cleaned prior to and following each sample collection. d. Samples collected for PCB, pesticide and other organic analyses shall be collected and processed using metallic (stainless steel preferred) liners, tubs, spoons and spatulas. Samples collected for other chemical analysis, including heavy metals, shall be collected and processed using non-metallic liners, tubs, spoons and spatulas. e. Samples from the dredging site shall be taken to the proposed dredging depth plus 2 feet, and shall be analyzed from each distinct layer observed in the material to be dredged. If no strata formation exists, core samples shall be divided into 2-foot segments, and each segment shall be analyzed for the required chemicals and characteristics. For cores extending into parent material, analysis of only the top 2-foot segment of parent material is required. f. Samples shall be visually inspected for the existence of strata formation, and a written description including position, length, odor, texture and color of the strata

		shall be provided to the Agency. [Minn. R. 7001]
	5.2.71	Grain Size Analysis. To demonstrate that dredged material from a given project or site is predominantly sand, and is therefore unlikely to be contaminated, 93% of the dredged material shall be coarser than silt. To make this determination, the following procedure shall be used: a. Conduct a sieve grain analysis using ASTM Method C-136 for the gradation analysis and ASTM Method D-2487 for classification. b. Determine the minimum number of samples required using Table 3 in the Appendices section of this permit, based on the total amount of material to be dredged. c. Conduct the analysis using the following US Standard sieves: 1"", 1/2"", 3/8"", #4, #10, #100 and #200. d. Report the results for each of the discrete sample locations as a mass percentage of retained sediments. [Minn. R. 7001]
	5.2.72	Annual Report. [Minn. R. 7001]
	5.2.73	The Permittee shall submit an annual dredged material report : Due by February 1 of each year following permit issuance, for the preceding calendar year on the form provided by the MPCA, or another MPCA approved form. [Minn. R. 7001]
	5.2.74	The Permittee shall provide this report even if no dredging occurred during the preceding calendar year. [Minn. R. 7001]
	5.2.75	The annual 'Dredged Material Report' shall be on a form provided by the MPCA, or another MPCA approved form, and shall include the following elements: a. Dates of dredging; b. Volume of material placed into storage or disposal facility; c. Any incidents, such as spills, unauthorized discharge and/or other permit violations which may have occurred; d. Such information as the MPCA may reasonably require of the Permittee pursuant to Minn. R. 7001 and Minn. Stat. chap. 115 and 116 as amended; e. For disposal facilities, the dates of 'Periodic Site Inspections' required by this chapter, and the status of erosion control measures at the disposal facility; f. For disposal facilities, the dates, the volume of dredged material removed from the disposal facility, and the method and location of the disposition (disposal or reuse) of such materials. g. For facilities that used or reused dredged material during the previous calendar year, the following information shall also be provided: i. A written description of the use or reuse of the dredged material; ii. A written determination of the use category and appropriate Soil Reference Values (SRVs), as described by this chapter; and, iii. The results of an evaluation of the level of contaminants in the dredged material proposed for reuse for the respective SRVs, as described in this chapter. [Minn. R. 7001]
	5.2.76	Where a spill, unauthorized discharge and/or other violation occurred during the previous calendar year, a copy of the report generated or information submitted in accordance with the 'Total Facility Requirements' chapter shall be included in the annual 'Dredged Material Report'. [Minn. R. 7001]
	5.2.77	Definitions. [Minn. R. 7001]
	5.2.78	"Agency" means the Minnesota Pollution Control Agency (MPCA). [State Definitions]
	5.2.79	"Beach Nourishment" means the disposal of dredged material on the beaches or in the water starting at or above the Ordinary High Water Level (OHWL) for the

		purpose of adding to, replenishing, or preventing the erosion of, beach material. [State Definitions]
	5.2.80	"Beneficial Re-use" means the re-use of dredged material, after the material has been dewatered, in projects such as, but not limited to: road base, building base or pad, etc. [State Definitions]
	5.2.81	"Best Management Practices" (BMPs) means practices to prevent or reduce pollution of the waters of the state, including schedules of activities, prohibitions of practices, and other management practices and also includes treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge, or waste disposal or drainage from material storage, as defined in Minnesota Rules pt. 7001.1020, subp.5. [State Definitions]
	5.2.82	"Carriage, or Conveyance, Water" means the water portion of a slurry of water and dredged material. [State Definitions]
	5.2.83	"Carriage Water Return Flow" means the carriage water which is returned to a receiving water after separation of the dredged material from the carriage water in a disposal, re-handling or treatment facility. [State Definitions]
	5.2.84	"Construction Activity" means a disturbance to the land that results in a change in the topography, existing soil cover (both vegetative and non-vegetative), or the existing soil topography that may result in accelerated stormwater runoff, leading to soil erosion and movement of sediment into waters of the state. Examples can include clearing, grading, filling and excavating. [State Definitions]
	5.2.85	"Design capacity" means the total volume of compacted dredged materials, along with any topsoil, intermittent, intermediate, and/or final cover, as calculated from final contour and cross-sectional plan sheets that define the areal and vertical extent of the fill area. [State Definitions]
	5.2.86	"Discharges of Dredged Material" means any addition of dredged material into waters of the state and includes discharges of water from dredged material disposal operations including beach nourishment, upland, or confined disposal which return to waters of state. Material re-suspended during normal dredging operations is considered "de minimis" and is not a dredged material discharge. [State Definitions]
	5.2.87	"Disposal Facility" means a structure, site or area for the disposal of dredged material. [State Definitions]
	5.2.88	"Dredged Material" means any material removed from the bed of any waterway by dredging. [State Definitions]
	5.2.89	"Dredging" means any part of the process of the removal of material from the beds of waterways; transport of the material to a disposal, re-handling or treatment facility; treatment of the material; discharge of carriage or interstitial water; and disposal of the material. [State Definitions]
	5.2.90	"Erosion Control" means methods employed to prevent erosion. Examples include: soil stabilization practices, horizontal slope grading, temporary or permanent cover, and construction phasing. (look for SW definition). [State Definitions]
	5.2.91	"Final Stabilization" means that all soil disturbing activities at the site have been completed, and that a uniform perennial vegetative cover (a density of 70 percent cover for unpaved areas and areas not covered by permanent structures) has been established or equivalent permanent stabilization measures have been employed. Examples of vegetative cover practices can be found in Supplemental Specifications to the 1988 Standard Specifications for Construction (Minnesota Department of Transportation, 1991). [State Definitions]
	5.2.92	"Flood Event" means that the surface elevation of a waterbody has risen to a level that causes the inundation or submersion of areas normally above the Ordinary High Water Level. [State Definitions]

	5.2.93	"Grain Size Analysis" means a method to determine dredged material and disposal site sediment particle size distribution. [State Definitions]
	5.2.94	"Hazardous Waste" has the meaning given in Minn. Stat. section 116.06, subd. 11. [State Definitions]
	5.2.95	"Impervious Surface" means a constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include: rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads. [State Definitions]
	5.2.96	"Impoundment" means a natural or artificial body of water or sludge confined by a dam, dike, floodgate, or other barrier. [State Definitions]
	5.2.97	"Interstitial, or Pore, Water" means water contained in the interstices or voids of soil or rock in the dredged material. [State Definitions]
	5.2.98	"MPCA" means the Minnesota Pollution Control Agency, or Minnesota Pollution Control Agency staff as delegated by the Minnesota Pollution Control Agency. [State Definitions]
	5.2.99	"Ordinary High-Water Level (OHWL)" means the boundary of water basins, watercourses, public waters, and public waters wetlands, and shall be an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly that point where the natural vegetation Cs from predominantly aquatic to predominantly terrestrial. For watercourses, the ordinary high water level is the elevation of the top of the bank of the channel. For reservoirs and flowages, the ordinary high water level is the operating elevation of the normal summer pool. (Minn. Stat. chap. 103G.005 Subd. 14 and MN Rule 6120.2500 Subp. 11.). [State Definitions]
	5.2.100	"Permittee" means the entity identified as Permittee on the cover letter authorizing coverage under this permit. [State Definitions]
	5.2.101	"Pollutant" means any sewage, industrial waste, or other wastes, as defined in Minnesota Statutes permit 115.01, discharged into a disposal system or to waters of the state. [State Definitions]
	5.2.102	"Re-handling Facility" means a temporary storage site or facility used during the transportation of dredged material to a treatment or disposal facility. [State Definitions]
	5.2.103	"Run-off" means any liquid that drains over land from any part of a facility. [State Definitions]
	5.2.104	"Run-on" means any liquid that drains over land onto any part of a facility. [State Definitions]
	5.2.105	"Sediment" means the unconsolidated inorganic and organic material that is suspended in and being transported by surface water, or has settled out and has deposited into beds. [State Definitions]
	5.2.106	"Significant Storm Event" means a storm event that is greater than 1.0 inches in magnitude and that occurs at least 72 hours from the previously measurable (greater than 1.0 inch rainfall) storm event. The 72-hour storm event interval may be waived where: a. the preceding measurable storm event did not result in a measurable discharge from the facility; or, b. the Permittee documents that less than a 72-hour interval is representative for local storm events during the season when sampling is being conducted. [State Definitions]
	5.2.107	"Stabilized" means staked sod, riprap, wood fiber blanket, or other material that

		prevents erosion from occurring has covered the exposed ground surface. Grass seed is not stabilization. [State Definitions]
	5.2.108	"Storage Facility" means a structure, site or area for the holding of dredged material for more than 48 hours in quantities equal to or greater than ten cubic yards. Storage for more than 1 year constitutes disposal. [State Definitions]
	5.2.109	"Treatment Facility" in this permit means a natural or artificial confinement structure, site or area used for the separation of dredged material solids from the interstitial or carriage water. [State Definitions]
	5.2.110	"Unconfined Disposal" means the deposition of dredged material, in water, on the bed of a waterway. [State Definitions]
	5.2.111	"Upland Disposal" means the disposal of dredged materials landward from the ordinary high-water level of a waterway or waterbody. [State Definitions]
	5.2.112	"Waters of the State" means all streams, lakes, ponds, marshes, wetlands, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof. [State Definitions]
	5.2.113	"Water table" means the surface of the ground water at which the pressure is atmospheric. Generally this is the top of the saturated zone. [State Definitions]
	5.2.114	"Wetlands" means those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Constructed wetlands designed for wastewater treatment are not waters of the state. Wetlands shall have the following attributes: a. a predominance of hydric soils; b. inundated or saturated by surface water or groundwater at a frequency and duration to support a prevalence of hydrophytic vegetation typically adapted for life in a saturated soil condition; and, c. under normal circumstances support a prevalence of such vegetation. [State Definitions]
		Total Facility Requirements (NPDES/SDS)
	5.3.115	Definitions. Refer to the 'Permit Users Manual' found on the MPCA website (www.pca.state.mn.us) for standard definitions. [Minn. R. 7001.]
	5.3.116	Incorporation by Reference. The following applicable federal and state laws are incorporated by reference in this permit, are applicable to the Permittee, and are enforceable parts of this permit: 40 CFR pts. 122.41, 122.42, 136, 403 and 503; Minn. R. pts. 7001, 7041, 7045, 7050, 7052, 7053, 7060, and 7080; and Minn. Stat. ch. 115 and 116. [Minn. R. 7001]
	5.3.117	Permittee Responsibility. The Permittee shall perform the actions or conduct the activity authorized by the permit in compliance with the conditions of the permit and, if required, in accordance with the plans and specifications approved by the Agency. [Minn. R. 7001.0150, subp. 3(E)]
	5.3.118	Toxic Discharges Prohibited. Whether or not this permit includes effluent limitations for toxic pollutants, the Permittee shall not discharge a toxic pollutant except according to Code of Federal Regulations, Title 40, sections 400 to 460 and Minnesota Rules 7050, 7052, 7053 and any other applicable MPCA rules. [Minn. R. 7001.1090, subp. 1(A)]
	5.3.119	Nuisance Conditions Prohibited. The Permittee's discharge shall not cause any

		nuisance conditions including, but not limited to: floating solids, scum and visible oil film, acutely toxic conditions to aquatic life, or other adverse impact on the receiving water. [Minn. R. 7050.0210, subp. 2]
	5.3.120	Property Rights. This permit does not convey a property right or an exclusive privilege. [Minn. R. 7001.0150, subp. 3(C)]
	5.3.121	Liability Exemption. In issuing this permit, the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Permittee in the conduct of its actions, including those activities authorized, directed, or undertaken under this permit. To the extent the state and the MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act. [Minn. R. 7001.0150, subp. 3(O)]
	5.3.122	The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules, or plans beyond what is authorized by Minnesota Statutes. [Minn. R. 7001.0150, subp. 3(D)]
	5.3.123	Liabilities. The MPCA's issuance of this permit does not release the Permittee from any liability, penalty or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit. [Minn. R. 7001.0150, subp. 3(A)]
	5.3.124	The issuance of this permit does not prevent the future adoption by the MPCA of pollution control rules, standards, or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards, or orders against the Permittee. [Minn. R. 7001.0150, subp. 3(B)]
	5.3.125	Severability. The provisions of this permit are severable and, if any provisions of this permit or the application of any provision of this permit to any circumstance are held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby. [Minn. R. 7001]
	5.3.126	Compliance with Other Rules and Statutes. The Permittee shall comply with all applicable air quality, solid waste, and hazardous waste statutes and rules in the operation and maintenance of the facility. [Minn. R. 7001]
	5.3.127	Inspection and Entry. When authorized by Minn. Stat. ch. 115.04; 115B.17, subd. 4; and 116.091, and upon presentation of proper credentials, the agency, or an authorized employee or agent of the agency, shall be allowed by the Permittee to enter at reasonable times upon the property of the Permittee to examine and copy books, papers, records, or memoranda pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit; and to conduct surveys and investigations, including sampling or monitoring, pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit. [Minn. R. 7001.0150, subp. 3(I)]
	5.3.128	Control Users. The Permittee shall regulate the users of its wastewater treatment facility so as to prevent the introduction of pollutants or materials that may result in the inhibition or disruption of the conveyance system, treatment facility or processes, or disposal system that would contribute to the violation of the conditions of this permit or any federal, state or local law or regulation. [Minn. R. 7001.0150, subp. 3(F)]
	5.3.129	Sampling. [Minn. R. 7001]
	5.3.130	Representative Sampling. Samples and measurements required by this permit shall be conducted as specified in this permit and shall be representative of the discharge or monitored activity. [40 CFR 122.41(j)(1)]
	5.3.131	Additional Sampling. If the Permittee monitors more frequently than required, the results and the frequency of monitoring shall be reported on the Discharge

		Monitoring Report (DMR) or another MPCA-approved form for that reporting period. [Minn. R. 7001.1090, subp. 1(E)]
	5.3.132	Certified Laboratory. A laboratory certified by the Minnesota Department of Health and/or registered by the MPCA shall conduct analyses required by this permit. Analyses of dissolved oxygen, pH, temperature, specific conductance, and total residual oxidants (chlorine, bromine) do not need to be completed by a certified laboratory but shall comply with manufacturers specifications for equipment calibration and use. [Minn. R. 4740.2010, Minn. R. 4740.2050 through 2120]
	5.3.133	Sample Preservation and Procedure. Sample preservation and test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and Minn. R. 7041.3200. [40 CFR 136, Minn. R. 7041.3200]
	5.3.134	Equipment Calibration: Flow meters, pumps, flumes, lift stations or other flow monitoring equipment used for purposes of determining compliance with permit shall be checked and/or calibrated for accuracy at least twice annually. [Minn. R. 7001.0150, 2(B and C)]
	5.3.135	Maintain Records. The Permittee shall keep the records required by this permit for at least three years, including any calculations, original recordings from automatic monitoring instruments, and laboratory sheets. The Permittee shall extend these record retention periods upon request of the MPCA. The Permittee shall maintain records for each sample and measurement. The records shall include the following information: a. the exact place, date, and time of the sample or measurement; b. the date of analysis; c. the name of the person who performed the sample collection, measurement, analysis, or calculation; d. the analytical techniques, procedures and methods used; and e. the results of the analysis. [Minn. R. 7001.0150, 2(C)]
	5.3.136	Completing Reports. The Permittee shall submit the results of the required sampling and monitoring activities on the forms provided, specified, or approved by the MPCA. The information shall be recorded in the specified areas on those forms and in the units specified. Required forms may include DMR Supplemental/Sample Value Form Individual values for each sample and measurement shall be recorded on the DMR Supplemental/Sample Value Form which, if required, will be provided by the MPCA. DMR Supplemental/Sample Value Forms shall be submitted with the appropriate DMRs. You may design and use your own supplemental form; however it shall be approved by the MPCA. Note: Required summary information shall also be recorded on the DMR. Summary information that is submitted ONLY on the DMR Supplemental/Sample Value Form does not comply with the reporting requirements. [Minn. R. 7001.1090, 1(D), Minn. R. 7001.150, 2(B)]
	5.3.137	Submitting Reports. DMRs, DMR supplemental forms and related attachments must be electronically submitted via the MPCA Online Services Portal after authorization is approved. DMRs and DMR Supplemental Forms shall be electronically submitted by the 21st day of the month following the sampling period or as otherwise specified in this permit. Electronic DMR submittal shall be complete on or before 11:59 PM of the 21st day of the month following the sampling period or as otherwise specified in this permit. A DMR shall be submitted for each required station even if no discharge

		occurred during the reporting period. Other reports required by this permit shall be postmarked by the date specified in the permit to: MPCA, Attn: WQ Submittals Center, 520 Lafayette Road North, St Paul Minnesota 551554194. [Minn. R. 7001..0150, Subp. 2(B), Minn. R. 7001..0150, Subp. 3(H)]
	5.3.138	Incomplete or Incorrect Reports. The Permittee shall immediately submit an electronically amended report or DMR to the MPCA upon discovery by the Permittee or notification by the MPCA that it has submitted an incomplete or incorrect report or DMR. The amended report or DMR shall contain the missing or corrected data along with a cover letter explaining the circumstances of the incomplete or incorrect report. If it is impossible to electronically amend the report or DMR, the Permittee shall immediately notify the MPCA and the MPCA will provide direction for the amendment submittals. [Minn. R. 7001.0150, 3(G)]
	5.3.139	Required Signatures. All DMRs, forms, reports, and other documents submitted to the MPCA shall be signed by the Permittee or the duly authorized representative of the Permittee. Minn. R. 7001.0150, subp. 2, item D. The person or persons that sign the DMRs, forms, reports or other documents shall certify that he or she understands and complies with the certification requirements of Minn. R. 7001.0070 and 7001.0540, including the penalties for submitting false information. Technical documents, such as design drawings and specifications and engineering studies required to be submitted as part of a permit application or by permit conditions, shall be certified by a registered professional engineer. [Minn. R. 7001.0540]
	5.3.140	Detection Level. The Permittee shall report monitoring results below the reporting limit (RL) of a particular instrument as "<" the value of the RL. For example, if an instrument has a RL of 0.1 mg/L and a parameter is not detected at a value of 0.1 mg/L or greater, the concentration shall be reported as "<0.1 mg/L." "Non-detected," "undetected," "below detection limit," and "zero" are unacceptable reporting results, and are permit reporting violations. Where sample values are less than the level of detection and the permit requires reporting of an average, the Permittee shall calculate the average as follows: a. If one or more values are greater than the level of detection, substitute zero for all nondetectable values to use in the average calculation. b. If all values are below the level of detection, report the averages as "<" the corresponding level of detection. c. Where one or more sample values are less than the level of detection, and the permit requires reporting of a mass, usually expressed as kg/day, the Permittee shall substitute zero for all nondetectable values. [Minn. R. 7001.0150, 2(B)]
	5.3.141	Records. The Permittee shall, when requested by the Agency, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit. [Minn. R. 7001.0150, 3(H)]
	5.3.142	Confidential Information. Except for data determined to be confidential according to Minn. Stat. ch. 116.075, subd. 2, all reports required by this permit shall be available for public inspection. Effluent data shall not be considered confidential. To request the Agency maintain data as confidential, the Permittee shall follow Minn. R. 7000.1300. [Minn. R. 7000.1300]
	5.3.143	Noncompliance and Enforcement. [Minn. R. 7001]

	5.3.144	Subject to Enforcement Action and Penalties. Noncompliance with a term or condition of this permit subjects the Permittee to penalties provided by federal and state law set forth in section 309 of the Clean Water Act; United States Code, title 33, section 1319, as amended; and in Minn. Stat. ch. 115.071 and 116.072, including monetary penalties, imprisonment, or both. [Minn. R. 7001.1090, 1(B)]
	5.3.145	Criminal Activity. The Permittee may not knowingly make a false statement, representation, or certification in a record or other document submitted to the Agency. A person who falsifies a report or document submitted to the Agency, or tampers with, or knowingly renders inaccurate a monitoring device or method required to be maintained under this permit is subject to criminal and civil penalties provided by federal and state law. [Minn. R. 7001.0150, 3(G), Minn. R. 7001.1090, 1(G and H), Minn. Stat. ch. 609.671, 1]
	5.3.146	Noncompliance Defense. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. [40 CFR 122.41(c)]
	5.3.147	Effluent Violations. If sampling by the Permittee indicates a violation of any discharge limitation specified in this permit, the Permittee shall immediately make every effort to verify the violation by collecting additional samples, if appropriate, investigate the cause of the violation, and take action to prevent future violations. If the permittee discovers that noncompliance with a condition of the permit has occurred which could endanger human health, public drinking water supplies, or the environment, the Permittee shall within 24 hours of the discovery of the noncompliance, orally notify the commissioner and submit a written description of the noncompliance within 5 days of the discovery. The written description shall include items a. through e., as listed below. If the Permittee discovers other non-compliance that does not explicitly endanger human health, public drinking water supplies, or the environment, the non-compliance shall be reported during the next reporting period to the MPCA with its Discharge Monitoring Report (DMR). If no DMR is required within 30 days, the Permittee shall submit a written report within 30 days of the discovery of the noncompliance. This description shall include the following information: a. a description of the event including volume, duration, monitoring results and receiving waters; b. the cause of the event; c. the steps taken to reduce, eliminate and prevent reoccurrence of the event; d. the exact dates and times of the event; and e. steps taken to reduce any adverse impact resulting from the event. [Minn. R. 7001.150, 3(K)]
	5.3.148	Upset Defense. In the event of temporary noncompliance by the Permittee with an applicable effluent limitation resulting from an upset at the Permittee's facility due to factors beyond the control of the Permittee, the Permittee has an affirmative defense to an enforcement action brought by the Agency as a result of the noncompliance if the Permittee demonstrates by a preponderance of competent evidence: a. the specific cause of the upset; b. that the upset was unintentional; c. that the upset resulted from factors beyond the reasonable control of the Permittee and did not result from operational error, improperly designed treatment

		facilities, inadequate treatment facilities, lack of preventative maintenance, or increases in production which are beyond the design capability of the treatment facilities; d. that at the time of the upset the facility was being properly operated; e. that the Permittee properly notified the Commissioner of the upset in accordance with Minn. R. 7001.1090, subp. 1, item I; and f. that the Permittee implemented the remedial measures required by Minn. R. 7001.0150, subp. 3, item J. [Minn. R. 7001.1090]
	5.3.149	Release. [Minn. R. 7001]
	5.3.150	Unauthorized Releases of Wastewater Prohibited. Except for discharges from outfalls specifically authorized by this permit, overflows, discharges, spills, or other releases of wastewater or materials to the environment, whether intentional or not, are prohibited. However, the MPCA will consider the Permittee's compliance with permit requirements, frequency of release, quantity, type, location, and other relevant factors when determining appropriate action. [40 CFR 122.41, Minn. Stat. ch. 115.061]
	5.3.151	Discovery of a release. Upon discovery of a release, the Permittee shall: a. Take all reasonable steps to immediately end the release. b. Notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 or (651)649-5451 (metro area) immediately upon discovery of the release. You may contact the MPCA during business hours at 1(800)657-3864 or (651)296-6300 (metro area). c. Recover as rapidly and as thoroughly as possible all substances and materials released or immediately take other action as may be reasonably possible to minimize or abate pollution to waters of the state or potential impacts to human health caused thereby. If the released materials or substances cannot be immediately or completely recovered, the Permittee shall contact the MPCA. If directed by the MPCA, the Permittee shall consult with other local, state or federal agencies (such as the Minnesota Department of Natural Resources and/or the Wetland Conservation Act authority) for implementation of additional clean-up or remediation activities in wetland or other sensitive areas. [Minn. R. 7001.1090]
	5.3.152	Sampling of a release. Upon discovery of a release, the Permittee shall: a. Collect representative samples of the release. The Permittee shall sample the release for parameters of concern immediately following discovery of the release. The Permittee may contact the MPCA during business hours to discuss the sampling parameters and protocol. In addition, Fecal Coliform Bacteria samples shall be collected where it is determined by the Permittee that the release contains or may contain sewage. If the release cannot be immediately stopped, the Permittee shall consult with MPCA regarding additional sampling requirements. Samples shall be collected at least, but not limited to, two times per week for as long as the release continues. b. Submit the sampling results on the Release Sampling Form (http://www.pca.state.mn.us/index.php/view-document.html?gid=18867). The Release Sampling Form shall be submitted to the MPCA with the next DMR or within 30 days whichever is sooner. [Minn. R. 7001.1090]
	5.3.153	Bypass. [Minn. R. 7001]
	5.3.154	Anticipated bypass. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if the bypass is for essential maintenance to assure efficient operation of the facility. The permittee shall submit

		prior notice, if possible at least ten days before the date of the bypass to the MPCA. The notice of the need for an anticipated bypass shall include the following information: a. the proposed date and estimated duration of the bypass; b. the alternatives to bypassing; and c. a proposal for effluent sampling during the bypass. Any bypass wastewater shall enter waters of the state from outfalls specifically authorized by this permit. Therefore, samples shall be collected at the frequency and location identified in this permit or two times per week for as long as the bypass continues, whichever is more frequent. [40 CFR 122.41(m)(2 and 3), Minn. R. 7001.1090, 1(J)]
	5.3.155	All other bypasses are prohibited. The MPCA may take enforcement action against the Permittee for a bypass, unless the specific conditions described in Minn. R. Ch. 7001.1090 subp. 1, K and 122.41(m)(4)(i) are met. In the event of an unanticipated bypass, the permittee shall: a. Take all reasonable steps to immediately end the bypass. b. Notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 or (651)649-5451 (metro area) immediately upon commencement of the bypass. You may contact the MPCA during business hours at 1(800)657-3864 or (651)296-6300 (metro area). c. Immediately take action as may be reasonably possible to minimize or abate pollution to waters of the state or potential impacts to human health caused thereby. If directed by the MPCA, the Permittee shall consult with other local, state or federal agencies for implementation of abatement, clean-up, or remediation activities. d. Only allow bypass wastewater as specified in this section to enter waters of the state from outfalls specifically authorized by this permit. Samples shall be collected at the frequency and location identified in this permit or two times per week for as long as the bypass continues, whichever is more frequent. The permittee shall also follow the reporting requirements for effluent violations as specified in this permit. [40 CFR 122.41(m)(4)(i), Minn. Stat. ch. 115.061]
	5.3.156	Operation and Maintenance. [Minn. R. 7001]
	5.3.157	The Permittee shall at all times properly operate and maintain the facilities and systems of treatment and control, and the appurtenances related to them which are installed or used by the Permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. The Permittee shall install and maintain appropriate backup or auxiliary facilities if they are necessary to achieve compliance with the conditions of the permit and, for all permits other than hazardous waste facility permits, if these backup or auxiliary facilities are technically and economically feasible Minn. R. 7001.0150. subp. 3, item F. [Minn. R. 7001.0150, 3(F)]
	5.3.158	In the event of a reduction or loss of effective treatment of wastewater at the facility, the Permittee shall control production or curtail its discharges to the extent necessary to maintain compliance with the terms and conditions of this permit. The Permittee shall continue this control or curtailment until the wastewater treatment facility has been restored or until an alternative method of treatment is provided.

		[Minn. R. 7001.1090, 1(C)]
	5.3.159	Solids Management. The Permittee shall properly store, transport, and dispose of biosolids, septage, sediments, residual solids, filter backwash, screenings, oil, grease, and other substances so that pollutants do not enter surface waters or ground waters of the state. Solids should be disposed of in accordance with local, state and federal requirements. [40 CFR 503, Minn. R. 7041]
	5.3.160	Scheduled Maintenance. The Permittee shall schedule maintenance of the treatment works during non-critical water quality periods to prevent degradation of water quality, except where emergency maintenance is required to prevent a condition that would be detrimental to water quality or human health. [Minn. R. 7001.0150, 3(F), Minn. R. 7001.150, 2(B)]
	5.3.161	Control Tests. In-plant control tests shall be conducted at a frequency adequate to ensure compliance with the conditions of this permit. [Minn. R. 7001.0150, 3(F), Minn. R. 7001.150, 2(B)]
	5.3.162	Changes to the Facility or Permit. [Minn. R. 7001]
	5.3.163	Permit Modifications. Except as provided under Minnesota Statutes, section 115.07, subdivisions 1 and 3, no person required by statute or rule to obtain a permit may construct, install, modify, or operate the facility to be permitted, nor shall a person commence an activity for which a permit is required by statute or rule until the agency has issued a written permit for the facility or activity. Permittees that propose to make a change to the facility or discharge that requires a permit modification shall follow Minn. R. 7001.0190. If the Permittee cannot determine whether a permit modification is needed, the Permittee shall contact the MPCA prior to any action. It is recommended that the application for permit modification be submitted to the MPCA at least 180 days prior to the planned change. [Minn. R. 7001.0030]
	5.3.164	Plans, specifications and MPCA approval are not necessary when maintenance dictates the need for installation of new equipment, provided the equipment is the same design size and has the same design intent. For instance, a broken pipe, lift station pump, aerator, or blower can be replaced with the same design-sized equipment without MPCA approval. If the proposed construction is not expressly authorized by this permit, it may require a permit modification. If the construction project requires an Environmental Assessment Worksheet under Minn. R. 4410, no construction shall begin until a negative declaration is issued and all approvals are received or implemented. [Minn. R. 7001.0030]
	5.3.165	Report Changes. The Permittee shall give advance notice as soon as possible to the MPCA of any substantial changes in operational procedures, activities that may alter the nature or frequency of the discharge, and/or material factors that may affect compliance with the conditions of this permit. [Minn. R. 7001.0150, 3(M)]
	5.3.166	Chemical Additives. The Permittee shall receive prior written approval from the MPCA before increasing the use of a chemical additive authorized by this permit, or using a chemical additive not authorized by this permit, in quantities or concentrations that have the potential to change the characteristics, nature and/or quality of the discharge. The Permittee shall request approval for an increased or new use of a chemical additive at least 60 days, or as soon as possible, before the proposed increased or new use. This written request shall include at least the following information for the

		proposed additive: a. The process for which the additive will be used; b. Safety Data Sheet (SDS) which shall include aquatic toxicity, human health, and environmental fate information for the proposed additive. The aquatic toxicity information shall include at minimum the results of: a) a 48-hour LC50 or EC50 acute study for a North American freshwater planktonic crustacean (either Ceriodaphnia or Daphnia sp.) and b) a 96-hour LC50 acute study for rainbow trout, bluegill or fathead minnow or another North American freshwater aquatic species other than a planktonic crustacean; c. a complete product use and instruction label; d. the commercial and chemical names and Chemical Abstract Survey (CAS) number for all ingredients in the additive (If the MSDS does not include information on chemical composition, including percentages for each ingredient totaling to 100%, the Permittee shall contact the supplier to have this information provided); and e. The proposed method of application, application frequency, concentration, and daily average and maximum rates of use. Upon review of the information submitted regarding the proposed chemical additive, the MPCA may require additional information be submitted for consideration. This permit may be modified to restrict the use or discharge of a chemical additive and include additional influent and effluent monitoring requirements. Approval for the use of an additive shall not justify the exceedance of any effluent limitation nor shall it be used as a defense against pollutant levels in the discharge causing or contributing to the violation of a water quality standard. [Minn. R. 7001.0170]
	5.3.167	MPCA Initiated Permit Modification, Suspension, or Revocation. The MPCA may modify or revoke and reissue this permit pursuant to Minn. R. 7001.0170. The MPCA may revoke without reissuance this permit pursuant to Minn. R. 7001.0180. [Minn. R. 7001.0170, Minn. R. 7001.0180]
	5.3.168	TMDL Impacts. Facilities that discharge to an impaired surface water, watershed or drainage basin may be required to comply with additional permits or permit requirements, including additional restriction or relaxation of limits and monitoring as authorized by the CWA 303(d)(4)(A) and 40 CFR 122.44.l.2.i., necessary to ensure consistency with the assumptions and requirements of any applicable US EPA approved wasteload allocations resulting from Total Maximum Daily Load (TMDL) studies. [40 CFR 122.44(l)(2)(i)]
	5.3.169	Permit Transfer. The permit is not transferable to any person without the express written approval of the Agency after compliance with the requirements of Minn. R. 7001.0190. A person to whom the permit has been transferred shall comply with the conditions of the permit. [Minn. R. 7001.0150, 3(N)]
	5.3.170	Facility Closure. The Permittee is responsible for closure and post-closure care of the facility. The Permittee shall notify the MPCA of a significant reduction or cessation of the activities described in this permit at least 180 days before the reduction or cessation. The MPCA may require the Permittee to provide to the MPCA a facility Closure Plan for approval. Facility closure that could result in a potential long-term water quality concern, such as the ongoing discharge of wastewater to surface or ground water, may require a permit modification or reissuance. The MPCA may require the Permittee to establish and maintain financial assurance

		to ensure performance of certain obligations under this permit, including closure, post-closure care and remedial action at the facility. If financial assurance is required, the amount and type of financial assurance, and proposed modifications to previously MPCA-approved financial assurance, shall be approved by the MPCA. [Minn. Stat. ch. 116.07, 4]
	5.3.171	Permit Reissuance. If the Permittee desires to continue permit coverage beyond the date of permit expiration, the Permittee shall submit an application for permit reissuance : Due by 180 days prior to permit expiration. If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA in writing at least 180 days before permit expiration. If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines any of the following (Minn. R. 7001.0040 and 7001.0160): a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit; b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit; c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies. [Minn. R. 7001.0160]

6. Submittal action summary

MN0052612	Erie Pier Processing & Reuse Facility	
		Dredged Material Management
	6.1.1	The Permittee shall submit an annual dredged material report : Due by February 1 of each year following permit issuance, for the preceding calendar year on the form provided by the MPCA, or another MPCA approved form. [Minn. R. 7001]
		Total Facility Requirements (NPDES/SDS)
	6.2.2	Permit Reissuance. If the Permittee desires to continue permit coverage beyond the date of permit expiration, the Permittee shall submit an application for permit reissuance : Due by 180 days prior to permit expiration. If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA in writing at least 180 days before permit expiration. If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines any of the following (Minn. R. 7001.0040 and 7001.0160): a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit; b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit; c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies. [Minn. R. 7001.0160]

7. Appendices

Tables for Dredged Material Management

Table 1. Baseline Sediment Parameter List

Parameter	**Analytical Method**	**Method Detection Limit** *(mg/kg, dry weight unless noted)*	**Residential Soil Reference Value (SRV)** *(mg/kg, dry weight unless noted)*	**Industrial Soil Reference Value (SRV)** *(mg/kg, dry weight unless noted)*
Inorganics – Metals				
Arsenic	SW-846 3050B/6010B EPA 6010 or 7060	0.42	9	20
Cadmium	SW-846 3050B/6010B EPA 7131	0.02	25	200
Chromium III	SW-846 3050B/6010B EPA 6010 or 7191	0.058	44,000	100,000
Chromium VI	SW-846 3050B/6010B EPA 6010 or 7191	0.058	87	650
Copper	SW-846 3050B/6010B EPA 6010 or 7211	0.1	100	9,000
Lead	SW-846 3050B/6010B EPA 6010 or 7421	0.22	300	700
Mercury	SW-846 7471A EPA 7471	0.02	0.5	1.5
Nickel	SW-846 3050B/6010B EPA 6010	0.36	560	2,500
Selenium	SW-846 3050B/6010B	0.43	160	1,300
Zinc	SW-846 3050B/6010B EPA 6010 or 7951	0.35	8,700	75,000
Inorganics – Nutrients				
Total Phosphorus	EPA 365.2/365.3	50		
Nitrate + Nitrite				
Ammonia-Nitrogen				
Total Kjeldahl Nitrogen				
Organics				
PCBs (Total)	SW-846 8082 EPA 8082, 3540B, 3541, 3545	0.02	1.2	8
Total Organic Carbon	SW846-EPA 9060	0.2%		
Physical Tests				
Sieve Analysis	ASTM Method C-136 for the gradation analysis and ASTM Method D-2487 for classification			
Moisture Content	ASTM D-2216			

Table 2. Additional Sediment Parameter List

Parameter	**Analytical Method**	**Residential** **Soil Reference Value (SRV)** *(mg/kg)*	**Industrial** **Soil Reference Value (SRV)** *(mg/kg)*
Barium	SW-846 3050B/6010B	1,100	18,000
Cyanide	SW-846 9012A	60	5,000
Manganese	SW-846 3050B/6010B	3,600	8,100
Oil & Grease	SW-846 9070		
Aldrin	SW-846 8081 EPA 8081, 354440B, 3541	1	2
Chlordane	SW-846 8081 EPA 8081, 354440B, 3541	13	74
Endrin	SW-846 8081 EPA 8081, 354440B, 3541	8	56
Dieldrin	SW-846 8081 EPA 8081, 354440B, 3541	0.8	2
Heptachlor	SW-846 8081 EPA 8081, 354440B, 3541	2	3.5
Lindane (Gamma BHC)	SW-846 8081 EPA 8081, 354440B, 3541	9	15
DDT	SW-846 8081 EPA 8081, 354440B, 3541	15	88
DDD	SW-846 8081 EPA 8081, 354440B, 3541	56	125
DDE	SW-846 8081 EPA 8081, 354440B, 3541	40	80
Toxaphene	SW-846 8081	13	28
2,3,7,8-dioxin, 2,3,7,8-furan and 15 2,3,7,8-substituted dioxin and furan congeners	EPA 8290	0.00002	0.00003
Polycyclic Aromatic Hydrocarbons (PAHs)			
Naphthalene	SW-846 EPA 8270	10	28
Pyrene	SW-846 EPA 8270	890	5,800
Fluorene	SW-846 EPA 8270	850	4,120
Acenapthene	SW-846 EPA 8270	1,200	5,260
Anthracene	SW-846 EPA 8270	7,880	45,400
Fluoranthene	SW-846 EPA	1,080	6,800

	8270		
Quinoline	SW-846 EPA 8270	4	7
Benz(a) anthracene	SW-846 EPA 8270	The results for these carcinogenic PAHs should be added together using the benzo(a)pyrene (BAP) equivalent calculation. Residential SRV = 2mg/kg, Industrial SRV = 3mg/kg	
Benzo (a) pyrene	SW-846 EPA 8270		
Benzo (b) fluoranthene	SW-846 EPA 8270		
Benzo (k) fluoranthene	SW-846 EPA 8270		
Chrysene	SW-846 EPA 8270		
Dibenz(a,h)anthracene	SW-846 EPA 8270		
Indeno[1,2,3,-c,d]pyrene	SW-846 EPA 8270		
Benzo(j)flouranthene	SW-846 EPA 8270		
Dibenz[a,h]acridine	SW-846 EPA 8270		
Dibenz[a,j]acridine	SW-846 EPA 8270		
7H-Dibenzo[c,g]carbazole	SW-846 EPA 8270		
Dibenzo[a,e]pyrene	SW-846 EPA 8270		
Dibenzo[a,h]pyrene	SW-846 EPA 8270		
Dibenzo[a,i]pyrene	SW-846 EPA 8270		
Dibenzo[a,l]pyrene	SW-846 EPA 8270		
7,12 Dimethylbenzanthracene	SW-846 EPA 8270		
1,6-Dinitropyrene	SW-846 EPA 8270		
1,8-Dinitropyrene	SW-846 EPA 8270		
3-Methylcholanthrene	SW-846 EPA 8270		

5-Methylchrysene	SW-846 EPA 8270	
5-Nitroacenaphthene	SW-846 EPA 8270	
6-Nitrochrysene	SW-846 EPA 8270	
2-Nitrofluorene	SW-846 EPA 8270	
1-Nitropyrene	SW-846 EPA 8270	
4-Nitropyrene	SW-846 EPA 8270	

Table 3. Minimum number of samples for sediment characterization and evaluation.

VOLUME PLANNED FOR REMOVAL in CUBIC YARDS	NUMBER OF CORE SAMPLE SITES	NUMBER OF SIEVE ANALYSIS SITES
</=1,000	1	3
1,000-30,000	3	6
30,000-100,000	5	10
100,000-500,000	6	12
500,000-1,000,000	8	16
>1,000,000	>8	>16