Great Lakes Legacy Act Project Proposal to US EPA for Feasibility Study and Preliminary Design for Sediment Remediation in the Superior Slips

Superior, Wisconsin

St Louis River Area of Concern

Submitted by

State of Wisconsin Department of Natural Resources

Draft May 2021

Project Manager Information

Name:	Joe Graham
Position:	Contaminated Sediment Expert, Remediation & Redevelopment
Agency Affiliation:	Wisconsin Department of Natural Resources
Mailing Address:	810 W. Maple Street, Spooner, WI 54801
Phone Number:	(715) 292-4925 (cell)
Email:	Joseph.Graham@Wisconsin.gov

Executive Summary

The Wisconsin Department of Natural Resources (DNR) is requesting Great Lakes Legacy Act (GLLA) support to develop a project agreement for completing Feasibility Studies (FS) and Preliminary Designs (PD) for the Superior Slips in the St. Louis River Area of Concern (SLRAOC). The Superior Slips collectively include four slips in Superior, Wisconsin: Tower Avenue Slip, General Mills Slip, the Oil Barge Dock slip, and Hallet Dock 8/C. Reiss Coal slip.

Multiple lines of evidence obtained through site characterization efforts indicate that levels of sediment contaminants in these slips contribute to one or more beneficial use impairments (BUI). Accordingly, the Remedial Action Plan (RAP) for the SLRAOC includes specific management actions to remediate contaminated sediments in these four slips.

DNR proposes to lead this phase of the work and will procure professional services to complete the FS and PD. As the non-federal sponsor, DNR will utilize state funds to provide 35% of the project's costs. Modifications of the project agreement, or separate pacts with additional partners, are envisioned for completion of design and remedial construction with a transition to EPA lead for future phases of the work.

Management actions to remediate contaminated sediments in the Superior Slips are among the last significant areas of work to be done under the RAP. The work in this proposal is a priority for removing BUIs and the eventual delisting of the SLRAOC.

Table of Contents

I. Project Title

Feasibility Study and Preliminary Design for Sediment Remediation in the Superior Slips

II. Objectives

1. Develop feasibility studies[1] for the following Superior Slips:
    a. Tower Avenue Slip
    b. General Mills Slip
    c. Oil Barge Dock Slip
    d. Hallet Dock 8 / C. Reiss Coal Slip
2. Recruit additional project partners where feasible
3. Solicit public input on proposed remedial action(s) for each slip
4. Select remedial action(s) for each slip
5. Prepare remedial actions options reports[2]
6. Develop scoping and planning documents for pre-design investigations, as necessary
7. Prepare basis of design technical memoranda[3] for each slip
8. Prepare GLLA project proposal(s) with any recruited partners for design or design and construction of remedial actions

III. Justification

For more than 135 years, the Superior Slips have been a mainstay for shipments of fossil fuels (petroleum and coal), grain, and various industrial activities (Sigma 2019). This legacy of use has resulted in sediment impacts from petroleum, coal, heavy metals, and organotins.

---

[1] Feasibility studies will follow requirements of Wis. Stats. Ch. 292, Wis. Admin. Code Chs. NR 700 to 754, and the substantive elements of EPA guidance.

[2] A remedial action options report (RAOR) prepared under Wis. Admin Code Ch. NR 722 and approved by DNR is substantially equivelent to an EPA feasbility study and record of decision for remedy implementaion.

[3] Remedial design documents will be prepared to meet Wis. Admin. Code Ch. NR 724 and EPA requirements.

The Great Lakes National Program Office (GLNPO) of the U.S Environmental Protection Agency (EPA) characterized sediments in the Superior Slips in 2015 (EA 2016). DNR assessed the macroinvertebrate communities present in 2018 (DNR 2020). In 2020, DNR completed sediment characterization efforts in the Superior Slips along with benthic toxicity and bioaccumulation testing using GLRI funds under a cooperative agreement with the EPA. These efforts are compiled in the 2020 report (EA 2021) and are included with this proposal. The resulting chemical characterization, biological community, toxicity, and bioaccumulation results provide multiple lines of evidence of impacts from contaminated sediment in these slips.

Appendix 1 (Tables A_{1-3} to D_{1-3}) includes sediment chemistry summary statistics and comparisons to Wisconsin's Consensus-Based Sediment Quality Guidelines for benthic sediment quality, SLRAOC-specific sediment background threshold values, and Wis. Admin. Code ch. NR 720 residual contaminant levels (RCLs) for direct contact with soil (human health levels). Multiple contaminants exceed levels of concern for human health or the environment in the Superior Slips. Elevated levels of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), heavy metals[4], dioxin, and the organotin tributyltin (TBT) are present in one or more slips (EA 2021). Biological effects are evident in poor macroinvertebrate community ratings (DNR 2018) and statistically significant toxicity test results (EA 2021). Organotin bioaccumulation was found in the General Mills and Tower Avenue slips

[4] Metals present at elevated concentraions include: arsenic, copper, lead, mercury, nickel, silver, and zinc.

(EA 2021). Table 1 below summarizes the available lines of evidence for the four Superior Slips. Figures showing the distribution of contamination in the slips are in Appendix 2. Appendix 3 includes the locations of benthic toxicity tests and results.

Table 1 – Contamimated sediment lines of evidence for the Superior Slips

Slip	Sediment Chemistry[5]	Benthic Toxicity [6]	Bioaccumulation[7]	Benthic Community[8]	Dredging Disposal Restriction[9]
Tower Avenue	>>PEC: PAHs, PCBs, metals, mercury, TBT	Significant Effects	Organotin	Poor	Benzo(a)pyrene, PCBs, lead and mercury
General Mills	>>PEC: PAHs, lead, PCBs, dioxin, TBT >MEC: metals & mercury	Significant Effects	Organotin	Poor	Benzo(a)pyrene and Dioxin
Oil Barge Dock	>>PEC: VOCs, PAHs, arsenic & lead	Significant Effects	None indicated for analyses performed	Poor	Benzo(a)pyrene and lead
Hallet Dock 8/ C. Reiss Coal	>PEC: nickel >MEC: PAHs & lead	Significant Effects	None indicated for analyses performed	Poor	None

The sediment contamination in the slips poses a concern for ecological receptors, human health, and acts as a continued source of water quality impairments. The potential for resuspension of

[5] Consensus Based Sediment Quality Guidelines for benthic toxicity. PEC – probable effects concentration. MEC – midpoint effects concentration.

[6] See EA 2021 for details, specifically Table 6-1 and Figures 5-4 & 5-5 for effects on survival, growth, or reproduction.

[7] Statistically significant accumulation of mercury or organotin in *L. variegatus*. Dioxin & PCB bioaccumulation not evaluated due to available tissue volumes

[8] Trimetric Index (TMI) rating of "Poor", details in DNR 2018.

[9] Dredging disposal is considered a restriction if contaminant concentrations would preclude unrestricted placement on an industrial property (above Residual Contaminat Level for industrial direct contact)

sediment contaminants by ship propellers and bow thrusters and extreme weather events is omnipresent. Humans can be exposed to sediment contamination when working or recreating in the harbor, for example, pulling anchors, commercial diving, fishing, paddling, or when sediment is dredged and placed onshore. However, consumption of fish from the St Louis River is a more complete and significant exposure pathway. The St. Louis River and Superior harbor have site-specific fish consumption advisories for mercury and PCBs from the Superior Entry to the dam at Fond du Lac, MN[10]. A site-specific advisory is applied where exceptions to the statewide safe-eating guidelines are necessary due to locally elevated levels in fish. Ongoing research by the U.S. Geological Survey implicates legacy mercury from sediment as the source of the elevated mercury levels found in fish from the St. Louis River estuary (Jenssen et al., 2021).

Contaminated sediments in the Superior Slips contribute directly or indirectly to the following BUIs: restrictions on dredging, degradation of benthos, loss of fish and wildlife habitat, beach closings and body contact, and fish consumption advisories. The characterization and remediation of contaminated sediments in the four Superior Slips are priority actions in the SLRAOC RAP (RAP 2020). Remediation of contaminated sediments in the Tower Avenue Slip, General Mills Slip, Oil Barge Dock Slip, and Hallet Dock 8 / C. Reiss Coal Slip are listed as management actions 5.29, 5.23, 5.22, and 5.21 (RAP 2021). Completing the objectives identified

[10] Choose Wisely, A Guide for Eating Fish in Wisconsin, 2020-2021, Wisconsin DNR, PUB-FH-824 2020

in Section II above will facilitate necessary progress towards remediation of contaminated sediment and the eventual removal of associated BUIs, resulting in the delisting of the AOC.

IV. Approach and Methods

DNR seeks GLLA support to complete feasibility study (FS) and preliminary design (PD) work for the Superior Slips. DNR proposes to lead these efforts in close collaboration with EPA. The tasks for the approach and methods include:

1. Procure contractor support for professional services necessary to complete FS/PD tasks.
2. Develop conceptual site models, remedial action objectives, and preliminary remedial goals for each slip.
3. Evaluate structural or other impediments to remediation, such as the geotechnical stability of dock walls and structures and the presence of utility crossings or other potential objects.
4. Identify volumes and areas of contamination for action in each slip.
5. Complete evaluations of historical sources and recontamination potential from significant ongoing sources and identify any necessary source control measures.
6. Evaluate the technical, economic, and regulatory practicability of options to restore the environment and adequately address risks.
7. Identify remedial alternatives, or combinations of options, for evaluation, including no action, dredging, capping, monitored natural recovery, and in-situ/ex-situ treatment.
8. Develop draft feasibility studies for the four Superior Slips.
9. Recruit additional project partners, where feasible.
10. Solicit public input on proposed remedial action(s) for each slip.
11. Finalize cleanup goals and select remedial action(s) for each slip.
12. Prepare remedial action options reports and identify any data gaps.
13. Develop scoping and planning documents for pre-design investigations, as necessary.

14. Prepare basis of design technical memoranda for each slip.
15. Prepare GLLA project proposal(s) with any recruited partners to design or design and construct remedial actions as future phases toward remediation.
16. Continue collaboration with EPA and other project partners on design or design and construction of selected remedial acitons for each slip.

V. Impact Assessment

The identification, selection, and ultimate implementation of remedial actions for contaminated sediments in the Superior Slips will reduce the concentration, mass, mobility, toxicity, and volume of contamination that contributes to BUIs and presents risks to human and ecological receptors. The FS/PD phase of the project will move these sites toward remediation to address sediment-related BUIs, contributing to BUI removal and eventual delisting of the SLRAOC.

VI. Stakeholder Involvement

DNR has been working with USEPA GLNPO on the characterization of sediments in the Wisconsin portion of the SLRAOC and will continue working with EPA to remediate contaminated sediments in the Superior Slips. With GLNPO support, DNR expects to engage the City of Superior, Port of Superior, riparian landowners, and potentially responsible parties for recruitment as project partners to complete the design and implementation of remedial actions. The DNR will conduct public meetings and outreach to obtain input on remedial alternatives from local stakeholders, the broader group of AOC stakeholders, and tribal rights holders in cooperation with EPA.

VII. Timeline

A timeline for major and intermediate milestones is below. Target dates may change as the project proceeds.

Target Date	Milestone
30 Jun. 2021	Finalize project agreement between GLNPO and DNR
15 Jul. 2021	Solicit professional services contractor for FS and PD
01 Sept. 2021	Award contract and begin FS
31 Dec. 2021	Complete draft FS report(s)
28 Feb. 2022	Complete public participation and remedy selection
31 Mar. 2022	Issue final FS/remedial action option report(s)
30 May 2022	Draft preliminary design (PD)/basis of design memo(s)
30 Jun. 2022	Complete PD/basis of design memos
01 Jul. 2022	GLLA application for Phase II (design or design/remedial action)

VIII. Budget

The anticipated cost to complete feasibility and preliminary design tasks are $1,500,000. DNR will contribute 35% of the total project cost and has reserved $525,000 in state funding for this effort. DNR may supplement its contribution with labor or other in-kind contributions in support of the project. DNR proposes to take the lead in contracting professional services to complete the feasibility study and preliminary design during phase 1 of the project. DNR anticipates that one or more future GLLA project applications will be needed to complete remedial design(s) and construct the four Superior Slips' corrective action(s). The lead role for project administration will transition from DNR to GLNPO at an appropriate time under agreements for future project phases.

IX. Area of Concern (AOC) Documentation

The Superior Slips are located within the St. Louis River AOC (Figure 1), and the RAP identifies these sites as a priority for action. Remediation of contaminated sediments in the Tower Avenue Slip, General Mills Slip, Oil Barge Dock Slip, and Hallet Dock 8 / C. Reiss Coal Slip are listed as management actions 5.29, 5.23, 5.22, and in the SLRAOC RAP (Figure 2).

References

DNR 2003. Consensus-Based Sediment Quality Guidelines Recommendations for Use & Application. Interim Guidance RR-088. December 2003.

DNR 2020. 2018 St. Louis River Beneficial Use Impairment Monitoring, Assessment of Benthic Macroinvertebrates and Sediment Toxicity, Technical Report, November 2020.

DNR In progress. DNR Technical Memorandum, Background Threshold Values for Sediment Contaminants in the St. Louis River Area of Concern, in progress.

EA 2016. EA Engineering, Science, and Technology, Inc., PBC (EA). 2016. Site Characterization Report Assessment of Contaminated Sediment Superior Waterfront Characterization, St. Louis River and Bay Area of Concern, Superior, Wisconsin. February.

EA 2021. Site Investigation Report Characterization of Sediments in the North End District and Clough Island St. Louis River and Bay Area of Concern, Superior, Wisconsin. Draft submitted March. DNR Contract: 37000-0000012861. GLRI Grant ID: GL-00E02392.

RAP 2020. MPCA & WDNR. St Louis River Area of Concern 2020 Remedial Action Plan https://widnr.widen.net/content/tsmr1ygmbp/pdf/GW_SLR_RAP2020.pdf

MAL 2021. St Louis River Area of Concern (SLRAOC) Remedial Action Plan (RAP) Management Action List, Revised 4/5/2021

Sigma 2019. Historic Records Screening Reports for Identification of Sources and PRPs for Superior Sediment Sites, WDNR PO 37000-0000010657, The Sigma Group, November 2019

Great Lakes Legacy Act Requests for Projects Application Instructions, accessed April 2021 at https://www.epa.gov/great-lakes-aocs/applying-great-lakes-legacy-act-funding

Choose Wisely, A Guide for Eating Fish in Wisconsin, 2020-2021, Wisconsin DNR, PUB-FH-824 2020

Janssen et al. 2021. Sarah E. Janssen, Joel C. Hoffman, Ryan F. Lepak, David P. Krabbenhoft, David Walters, Collin A. Eagles-Smith, Greg Peterson, Jacob M. Ogorek, John F. DeWild, Anne Cotter, Mark Pearson, Michael T. Tate, Roger B. Yeardley, Marc A. Mills, *Examining historical mercury sources in the Saint Louis River estuary: How legacy contamination influences biological mercury levels in Great Lakes coastal regions*, Science of The Total Environment, Volume 779, July 2021, 146284, https://doi.org/10.1016/j.scitotenv.2021.146284

Wisconsin Public Radio coverage of fish consumption advisories/legacy mercury, https://www.wpr.org/historic-pollution-driving-higher-mercury-concentrations-fish-within-st-louis-river

Figures

Figure 1 – St Louis River Area of Concern

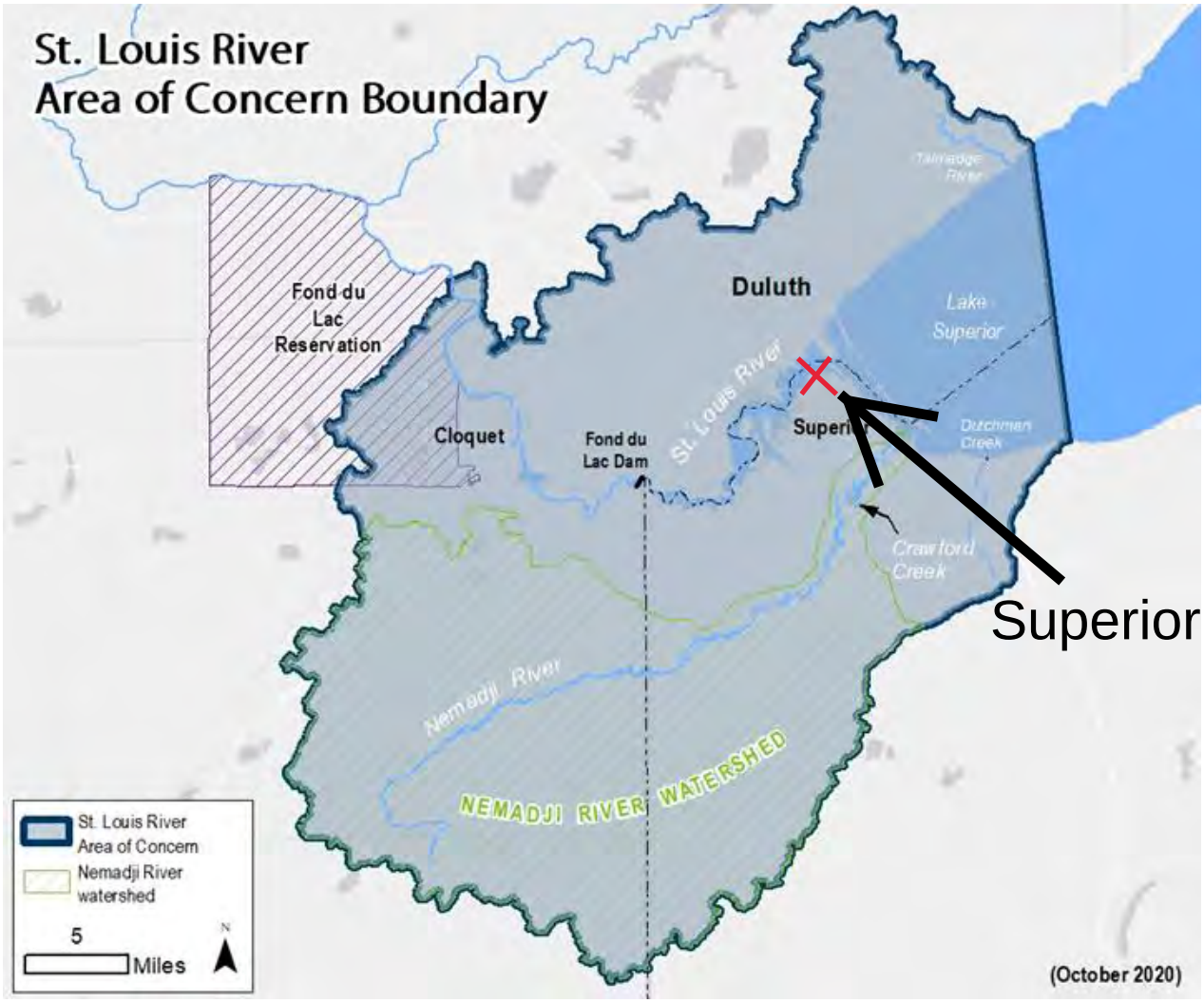
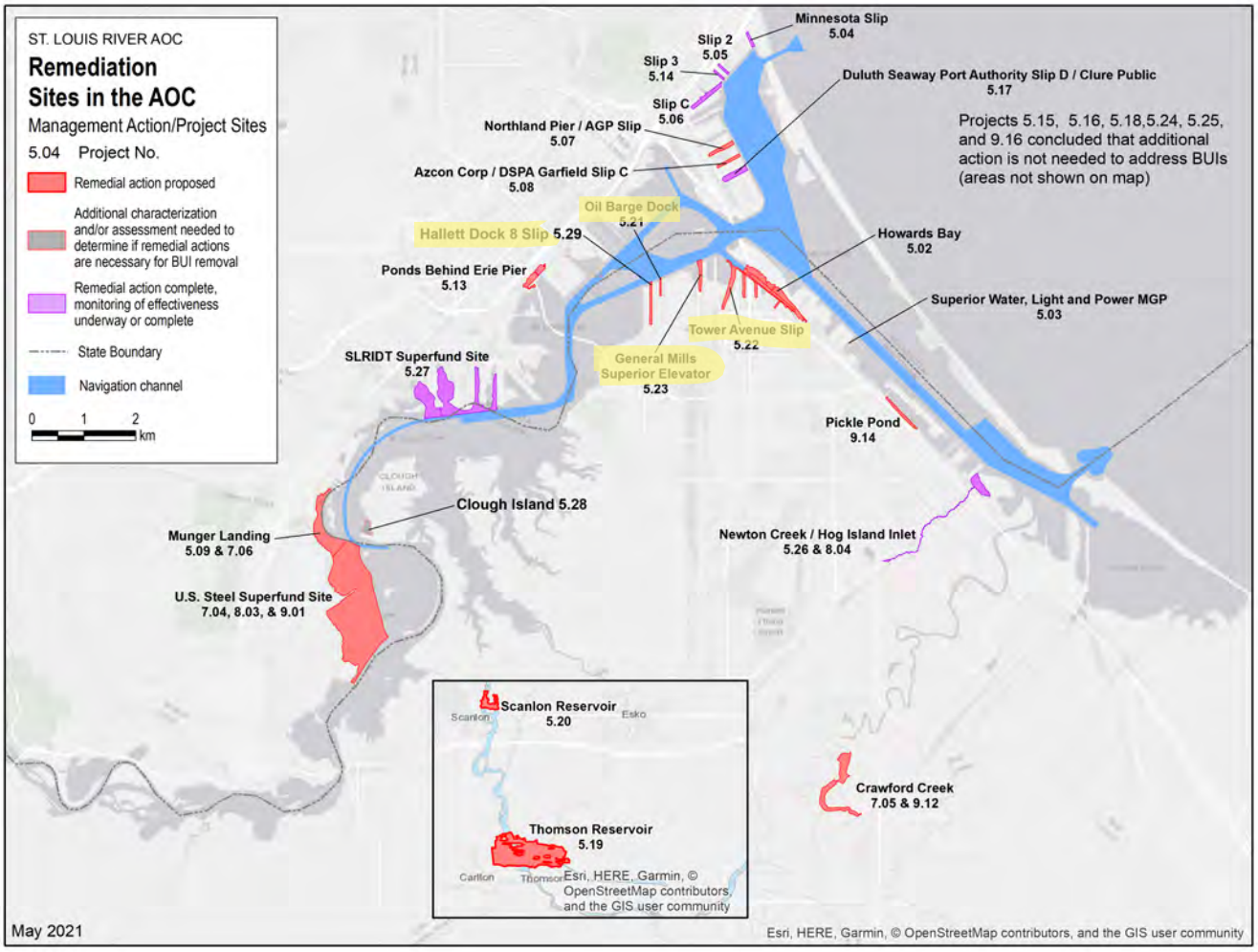


Figure 2 – Remediation Sites in the St Louis River AOC (Superior Slips highlighted)



Appendices

Appendix 1 Summary of Sediment Chemistry Data

Appendix 1

A - Tower Avenue Slip Summary Tables

1. Sediment Chemistry Summary Statistics
2. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines
3. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Table A1 - Tower Avenue Slip.. Sediment Chemistry Summary Statistics

Surface (0-15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	27	27	0	1,121	19,532	7,689	7,745	9,274	15,069
BaP[3]	µg/kg	27	27	0	85	1,500	533.5	510	647	1,052
Total PCBs[4]	µg/kg	22	22	0	10	197	89.86	92	146	159.5
Copper	mg/kg	36	36	0	15.4	97.3	53.43	55.95	60	90.75
Lead	mg/kg	36	36	0	15	123	57.4	54.55	66	102
Mercury	mg/kg	36	22	14	0.055	0.17	0.106	0.0955	0.0978	0.163
Nickel	mg/kg	36	36	0	13.7	42.4	30.29	32.75	32.4	38.98
Silver	mg/kg	36	4	32	0.18	0.23	0.2	0.19	0.17	0.22
Zinc	mg/kg	36	36	0	65.2	279	162.3	162	180	251.8
DF TEQ Fish[5]	ng TEQ/kg	8	8	0	4.33	20.28	14.72	17.44	18.49	19.66
Tributyltin	µg/kg	19	5	14	1	33	7.88	1.4	11.72	7.17

Subsurface (>15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	94	94	0	12.8	239,790	28,658	9,734	39,338	117,980
BaP[3]	µg/kg	94	79	15	5.8	13,000	1,966	980	2,233	6,235
Total PCBs[4]	µg/kg	52	38	14	4.4	4,140	211.5	93	499	258.3
Copper	mg/kg	108	108	0	7.2	151	51.82	40.85	58	127.9
Lead	mg/kg	108	108	0	2.9	2,070	117.7	61.55	144	331.3
Mercury	mg/kg	108	74	34	0.035	11.3	1.356	0.465	1.778	5.17
Nickel	mg/kg	108	108	0	9.4	43.7	23.86	23.95	25.1	36.53
Silver	mg/kg	108	54	0	0.12	5.5	1.34	0.96	1.18	3.03
Zinc	mg/kg	108	108	0	17.5	732	185.9	136	212	541.3
DF TEQ Fish[5]	ng TEQ/kg	5	5	0	0.25	19.08	10.54	13.86	17.69	18.04
Tributyltin	µg/kg	36	12	24	2.6	64	10.77	5.85	14.16	18.5

All Intervals										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	121	121	0	12.8	239,790	23,979	8,489	31,017	101,720
BaP[3]	µg/kg	121	106	15	5.8	13,000	1,601	725	1,790	6,200
Total PCBs[4]	µg/kg	74	60	14	4.4	4,140	166.90	93	377	218
Copper	mg/kg	144	144	0	7.2	151	52.22	43.5	57	118
Lead	mg/kg	144	144	0	2.9	2,070	102.6	60.95	140	312.9
Mercury	mg/kg	144	96	48	0.035	11.3	1.07	0.28	1.368	3.255
Nickel	mg/kg	144	144	0	9.4	43.7	25.47	25.4	26.6	37.84
Silver	mg/kg	144	58	86	0.12	5.5	1.26	0.88	0.94	2.74
Zinc	mg/kg	144	144	0	17.5	732	180	142.5	200	498.5
DF TEQ Fish[5]	ng TEQ/kg	13	13	0	0.25	20.28	13.11	13.87	16.3	19.56
Tributyltin	µg/kg	55	17	38	1	64	9.92	5.2	11.42	19.2

Notes:

1. 95%UCL - 95% upper confidence limit of the mean
2. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
3. BaP - benzo(a)pyrene
4. PCBs - polychlorinated biphenyls
5. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Table A2 - Tower Avenue Slip. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines

Surface (0-15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	19,532	9,274	15,069
BaP[7]	µg/kg	150	800	1,450	710	1,500	647	1,052
Total PCBs[8]	µg/kg	60	368	676	108	197	146	159.5
Copper	mg/kg	32	91	150	50	97.3	60	90.75
Lead	mg/kg	36	83	130	75	123	66	102
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.17	0.0978	0.163
Nickel	mg/kg	23	36	49	38	42.4	32.4	38.98
Silver	mg/kg	1.6	1.9	2.2	NA	0.23	0.17	0.22
Zinc	mg/kg	120	290	460	210	279	180	251.8
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	20.28	18.49	19.66
Tributyltin	µg/kg	0.52	1.73	2.94	NA	33	11.72	7.17

Subsurface (>15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	239,790	39,338	117,980
BaP[7]	µg/kg	150	800	1,450	710	13,000	2,233	6,235
Total PCBs[8]	µg/kg	60	368	676	108	4,140	499	258.3
Copper	mg/kg	32	91	150	50	151	58	127.9
Lead	mg/kg	36	83	130	75	2,070	144	331.3
Mercury	mg/kg	0.18	0.64	1.1	0.59	11.3	1.778	5.17
Nickel	mg/kg	23	36	49	38	43.7	25.1	36.53
Silver	mg/kg	1.6	1.9	2.2	NA	5.5	1.18	3.03
Zinc	mg/kg	120	290	460	210	732	212	541.3
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	19.08	17.69	18.04
Tributyltin	µg/kg	0.52	1.73	2.94	NA	64	14.16	18.5

All Intervals								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	239,790	31,017	101,720
BaP[7]	µg/kg	150	800	1,450	710	13,000	1,790	6,200
Total PCBs[8]	µg/kg	60	368	676	108	4,140	377	218
Copper	mg/kg	32	91	150	50	151	57	118
Lead	mg/kg	36	83	130	75	2,070	140	312.9
Mercury	mg/kg	0.18	0.64	1.1	0.59	11.3	1.368	3.255
Nickel	mg/kg	23	36	49	38	43.7	26.6	37.84
Silver	mg/kg	1.6	1.9	2.2	NA	5.5	0.94	2.74
Zinc	mg/kg	120	290	460	210	732	200	498.5
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	20.28	16.3	19.56
Tributyltin	µg/kg	0.52	1.73	2.94	NA	64	11.42	19.2

Notes:

applicable cleanup level

exceeds MEC or background

exceeds PEC

exceeds 2x PEC

exceeds 5x PEC

1. TEC - threshold effect concentration
2. MEC - midpoint effect concentration
3. PEC - probable effect concentration
4. BTV (95/95UTL) - background threshold value for St. Louis River AOC sediments using 95/95 upper tolerance limit
5. 95%UCL - 95% upper confidence limit of the mean
6. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
7. BaP - benzo(a)pyrene
8. PCBs - polychlorinated biphenyls
9. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Table A3 - Tower Avenue Slip. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Surface (0-15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	1,500	647	1,052
Total PCBs[5]	µg/kg	9.4	234	967	NA	197	146	159.5
Copper	mg/kg	92	3,130	46,700	35	97.3	60	90.75
Lead	mg/kg	27	400	800	52	123	66	102
Mercury	mg/kg	0.21	3.13	3.13	NA	0.17	0.0978	0.163
Nickel	mg/kg	13.1	1,550	22,500	31	42.4	32.4	38.98
Silver	mg/kg	0.85	391	5,840	NA	0.23	0.17	0.22
Zinc	mg/kg	NA	23,500	100,000	150	279	180	251.8
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	20.28	18.49	19.66
Tributyltin	µg/kg	NA	19	246	NA	33	11.72	7.17

Subsurface (>15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	13,000	2,233	6,235
Total PCBs[5]	µg/kg	9.4	234	967	NA	4,140	499	258.3
Copper	mg/kg	92	3,130	46,700	35	151	58	127.9
Lead	mg/kg	27	400	800	52	2,070	144	331.3
Mercury	mg/kg	0.21	3.13	3.13	NA	11.3	1.778	5.17
Nickel	mg/kg	13.1	1,550	22,500	31	43.7	25.1	36.53
Silver	mg/kg	0.85	391	5,840	NA	5.5	1.18	3.03
Zinc	mg/kg	NA	23,500	100,000	150	732	212	541.3
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	19.08	17.69	18.04
Tributyltin	µg/kg	NA	19	246	NA	64	14.16	18.5

All Intervals								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	13,000	1,790	6,200
Total PCBs[5]	µg/kg	9.4	234	967	NA	4,140	377	218
Copper	mg/kg	92	3,130	46,700	35	151	57	118
Lead	mg/kg	27	400	800	52	2,070	140	312.9
Mercury	mg/kg	0.21	3.13	3.13	NA	11.3	1.368	3.255
Nickel	mg/kg	13.1	1,550	22,500	31	43.7	26.6	37.84
Silver	mg/kg	0.85	391	5,840	NA	5.5	0.94	2.74
Zinc	mg/kg	NA	23,500	100,000	150	732	200	498.5
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	20.28	16.3	19.56
Tributyltin	µg/kg	NA	19	246	NA	64	11.42	19.2

Notes:

5.8 Exceedances of Ind DC RCL

1. Wis. Admin. Code NR 720 residual contaminant levels for the protection of groundwater.
2. Wis Admin. Code NR 720 residual contaminant levels for direct contact with soil for industrial and non-industrial land uses.
3. 95%UCL - 95% upper confidence limit of the mean
4. BaP - benzo(a)pyrene
5. PCBs - polychlorinated biphenyls
6. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors; soil RCLs are for 2,3,7,8-TCDD

Appendix 1

B - General Mills Slip Summary Tables

1. Sediment Chemistry Summary Statistics
2. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines
3. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Tabel B1 - General Mills Slip. Sediment Chemistry Summary Statistics

Surface (0-15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	16	16	0	579.40	10,750	4,789	3,910	6,208	10,685
BaP[3]	µg/kg	16	16	0	37	500	270.4	210	345	492.5
Total PCBs[4]	µg/kg	10	10	0	6	41	21.8	19	28.87	37.4
Copper	mg/kg	19	19	0	9.40	70	33.84	33.60	40.11	55.42
Lead	mg/kg	19	19	0	6.5	32.8	20.63	20	23.92	32.62
Mercury	mg/kg	19	6	13	0.052	0.16	0.0917	0.0760	0.0802	0.133
Nickel	mg/kg	19	19	0	12	32.4	23.99	23.1	26.59	32.22
Zinc	mg/kg	19	19	0	35.2	148	99.58	97	113.1	140.8
DF TEQ Fish[5]	ng TEQ/kg	4	4	0	7.81	53.89	27.79	24.73	50.44	49.89
Tributyltin	µg/kg	13	3	10	4.5	19	12.5	14	11.77	16

Subsurface (>15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	55	55	0	12.86	146,140	20,415	14,095	40,671	56,297
BaP[3]	µg/kg	55	46	9	1	8,000	1,297	760	2,212	3,230
Total PCBs[4]	µg/kg	13	11	2	3.7	650	100.9	36	299.4	378.8
Copper	mg/kg	61	61	0	6.3	129	40.55	39.7	46.21	85.8
Lead	mg/kg	61	61	0	2.3	345	54.17	47.5	68.15	155
Mercury	mg/kg	61	35	26	0.049	0.67	0.22	0.2	0.224	0.45
Nickel	mg/kg	61	61	0	8.5	28.5	17.82	17.8	18.9	26.4
Zinc	mg/kg	61	61	0	15.3	408	135.9	131	155.1	271
DF TEQ Fish[5]	ng TEQ/kg	0	NA	NA	NA	NA	NA	NA	NA	NA
Tributyltin	µg/kg	29	6	23	0.58	81	23.46	14.15	19.34	26

All Intervals										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	71	71	0	12.86	146,140	16,894	10,663	28,366	50,695
BaP[3]	µg/kg	71	62	9	1	8,000	1,032	575	1,218	2,900
Total PCBs[4]	µg/kg	23	21	2	3.70	650	63.22	30	180.3	183.2
Copper	mg/kg	80	80	0	6.3	129	38.96	36.85	43.5	78.87
Lead	mg/kg	80	80	0	2.3	345	46.2	29.25	55.59	132.2
Mercury	mg/kg	80	41	39	0.049	0.67	0.201	0.160	0.189	0.412
Nickel	mg/kg	80	80	0	8.5	32.4	19.29	19.6	20.41	29.5
Zinc	mg/kg	80	80	0	15.3	408	127.3	120	142.4	265.3
DF TEQ Fish[5]	ng TEQ/kg	4	4	0	7.81	53.89	27.79	24.73	50.44	49.89
Tributyltin	µg/kg	42	9	33	0.58	81	19.81	14	15.3	22.8

Notes:

1. 95%UCL - 95% upper confidence limit of the mean
2. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
3. BaP - benzo(a)pyrene
4. PCBs - polychlorinated biphenyls
5. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Tabel B2 - General Mills Slip. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines

Surface (0-15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	10,750	6,208	10,685
BaP[7]	µg/kg	150	800	1,450	710	500	345	492.5
Total PCBs[8]	µg/kg	60	368	676	108	41	28.87	37.4
Copper	mg/kg	32	91	150	50	70	40.11	55.42
Lead	mg/kg	36	83	130	75	32.8	23.92	32.62
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.16	0.0802	0.133
Nickel	mg/kg	23	36	49	38	32.4	26.59	32.22
Zinc	mg/kg	120	290	460	210	148	113.1	140.8
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	53.89	50.44	49.89
Tributyltin	µg/kg	0.52	1.73	2.94	NA	19	11.77	16

Subsurface (>15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	146,140	40,671	56,297
BaP[7]	µg/kg	150	800	1,450	710	8,000	2,212	3,230
Total PCBs[8]	µg/kg	60	368	676	108	650	299.4	378.8
Copper	mg/kg	32	91	150	50	129	46.21	85.8
Lead	mg/kg	36	83	130	75	345	68.15	155
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.67	0.224	0.45
Nickel	mg/kg	23	36	49	38	28.5	18.9	26.4
Zinc	mg/kg	120	290	460	210	408	155.1	271
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	NA	NA	NA
Tributyltin	µg/kg	0.52	1.73	2.94	NA	81	19.34	26

All Intervals								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	146,140	28,366	50,695
BaP[7]	µg/kg	150	800	1,450	710	8,000	1,218	2,900
Total PCBs[8]	µg/kg	60	368	676	108	650	180.3	183.2
Copper	mg/kg	32	91	150	50	129	43.5	78.87
Lead	mg/kg	36	83	130	75	345	55.59	132.2
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.67	0.189	0.412
Nickel	mg/kg	23	36	49	38	32.4	20.41	29.5
Zinc	mg/kg	120	290	460	210	408	142.4	265.3
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	53.89	50.44	49.89
Tributyltin	µg/kg	0.52	1.73	2.94	NA	81	15.3	22.8

Notes:

applicable cleanup level

exceeds MEC or background

exceeds PEC

exceeds 2x PEC

exceeds 5x PEC

1. TEC - threshold effect concentration
2. MEC - midpoint effect concentration
3. PEC - probable effect concentration
4. BTV (95/95UTL) - background threshold value for St. Louis River AOC sediments using 95/95 upper tolerance limit
5. 95%UCL - 95% upper confidence limit of the mean
6. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
7. BaP - benzo(a)pyrene
8. PCBs - polychlorinated biphenyls
9. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Tabel B3 - General Mills Slip. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Surface (0-15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	500	345	492.5
Total PCBs[5]	µg/kg	9.4	234	967	NA	41	28.87	37.4
Copper	mg/kg	92	3,130	46,700	35	70	40.11	55.42
Lead	mg/kg	27	400	800	52	32.8	23.92	32.62
Mercury	mg/kg	0.21	3.13	3.13	NA	0.16	0.0802	0.133
Nickel	mg/kg	13.1	1,550	22,500	31	32.4	26.59	32.22
Zinc	mg/kg	NA	23,500	100,000	150	148	113.1	140.8
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	53.89	50.44	49.89
Tributyltin	µg/kg	NA	19	246	NA	19	11.77	16

Subsurface (>15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	8,000	2,212	3,230
Total PCBs[5]	µg/kg	9.4	234	967	NA	650	299.4	378.8
Copper	mg/kg	92	3,130	46,700	35	129	46.21	85.8
Lead	mg/kg	27	400	800	52	345	68.15	155
Mercury	mg/kg	0.21	3.13	3.13	NA	0.67	0.224	0.45
Nickel	mg/kg	13.1	1,550	22,500	31	28.5	18.9	26.4
Zinc	mg/kg	NA	23,500	100,000	150	408	155.1	271
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	NA	NA	NA
Tributyltin	µg/kg	NA	19	246	NA	81	19.34	26

All Intervals								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	8,000	1,218	2,900
Total PCBs[5]	µg/kg	9.4	234	967	NA	650	180.3	183.2
Copper	mg/kg	92	3,130	46,700	35	129	43.5	78.87
Lead	mg/kg	27	400	800	52	345	55.59	132.2
Mercury	mg/kg	0.21	3.13	3.13	NA	0.67	0.189	0.412
Nickel	mg/kg	13.1	1,550	22,500	31	32.4	20.41	29.5
Zinc	mg/kg	NA	23,500	100,000	150	408	142.4	265.3
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	53.89	50.44	49.89
Tributyltin	µg/kg	NA	19	246	NA	81	15.3	22.8

Notes:

5.8 Exceedances of Ind DC RCL

1. Wis. Admin. Code NR 720 residual contaminant levels for the protection of groundwater.
2. Wis Admin. Code NR 720 residual contaminant levels for direct contact with soil for industrial and non-industrial land uses.
3. 95%UCL - 95% upper confidence limit of the mean
4. BaP - benzo(a)pyrene
5. PCBs - polychlorinated biphenyls
6. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors; soil RCLs are for 2,3,7,8-TCDD

Appendix 1

C - Oil Barge Dock Slip Summary Tables

1. Sediment Chemistry Summary Statistics
2. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines
3. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Table C1 - Oil Barge Dock Slip. Sediment Chemistry Summary Statistics

Surface (0-15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
1,2-Dichlorobenzene	µg/kg	21	3	18	0.48	110	73.49	110	99.62	110
1,4-Dichlorobenzene	µg/kg	21	3	18	0.44	120	73.48	100	100.8	120
Benzene	µg/kg	21	2	19	19	130	74.5	74.5	92.98	130
Xylenes, total	µg/kg	21	4	17	0.6	950	445.9	416.5	337.3	770
Total PAH[2]	µg/kg	21	21	0	1,439	60,340	11,477	4,742	26,186	37,764
BaP[3]	µg/kg	21	21	0	92	2,900	512.3	260	831.4	1,400
Total PCBs[4]	µg/kg	8	7	1	3	78	26.86	21	60.44	59.45
Arsenic	mg/kg	21	21	0	4.7	16.8	9.03	8.2	10.25	14.7
Copper	mg/kg	21	21	0	15.4	65.1	31.23	30.5	35.86	55
Lead	mg/kg	21	21	0	14.6	219	46.16	34.1	62.6	86.3
Nickel	mg/kg	21	21	0	7.6	43.60	26.28	31.9	36.99	40.3
Zinc	mg/kg	21	21	0	28.8	264	131.5	142	153.1	200
DF TEQ Fish[5]	ng TEQ/kg	5	5	0	0.77	11.37	7.19	10.1	12.01	11.3

Subsurface (>15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
1,2-Dichlorobenzene	µg/kg	117	5	112	92	130	112	110	47.35	152
1,4-Dichlorobenzene	µg/kg	117	5	112	87	120	109	120	31.93	120
Benzene	µg/kg	117	10	107	17	850	320.3	164.5	90.34	184
Xylenes, total	µg/kg	117	12	105	2.9	2,100	668.4	375.0	279.5	724
Total PAH[2]	µg/kg	117	117	0	12.27	93,410	8,734	1,073	15,412	41,702
BaP[3]	µg/kg	117	86	31	1.5	2,200	310.2	155	381.3	1,020
Total PCBs[4]	µg/kg	5	4	1	12	112	40	18	120.4	93.8
Arsenic	mg/kg	117	117	0	1.6	132	8.6	3.6	15.03	36.3
Copper	mg/kg	117	117	0	2.3	70	19.02	14.9	21.22	52
Lead	mg/kg	117	117	0	1.9	1,610	43.88	8.4	105.2	140
Nickel	mg/kg	117	117	0	5.8	37.3	16.3	15.6	17.22	26.04
Zinc	mg/kg	117	117	0	10.7	289	77.84	58.4	87.06	197
DF TEQ Fish[5]	ng TEQ/kg	0	NA	NA	NA	NA	NA	NA	NA	NA

All Intervals										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
1,2-Dichlorobenzene	µg/kg	138	8	130	0.48	130	97.56	110	47.22	151.50
1,4-Dichlorobenzene	µg/kg	138	8	130	0.44	120	95.68	110	35.3	120
Benzene	µg/kg	138	12	126	17	850	279.3	104.5	81.62	183
Xylenes, total	µg/kg	138	16	122	0.6	2,100	612.8	375	256	771.5
Total PAH[2]	µg/kg	138	138	0	12.27	93,410	9,152	2,030	15,230	41,521
BaP[3]	µg/kg	138	107	31	1.5	2,900	349.9	190	436.2	1,115
Total PCBs[4]	µg/kg	13	11	2	3	112	31.64	21	65.75	91.6
Arsenic	mg/kg	138	138	0	1.6	132	8.66	4	14.14	29.04
Copper	mg/kg	138	138	0	2.3	70	20.88	16.6	23.31	52.6
Lead	mg/kg	138	138	0	1.9	1,610	44.23	15.35	96.56	139.8
Nickel	mg/kg	138	138	0	5.8	43.6	17.82	16	18.91	34.41
Zinc	mg/kg	138	138	0	10.7	289	86.01	62.3	107.4	200.2
DF TEQ Fish[5]	ng TEQ/kg	5	5	0	0.77	11.37	7.19	10.1	12.01	11.3

Notes:

1. 95%UCL - 95% upper confidence limit of the mean

2. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs

3. BaP - benzo(a)pyrene

4. PCBs - polychlorinated biphenyls

5. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Table C2 - Oil Barge Dock Slip. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines

Surface (0-15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
1,2-Dichlorobenzene	µg/kg	23		23	NA	110	99.62	110
1,4-Dichlorobenzene	µg/kg	31	61	90	NA	120	100.8	120
Benzene	µg/kg	57	84	110	NA	130	92.98	130
Xylenes, total	µg/kg	25	38	50	NA	950	337.3	770
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	60,340	26,186	37,764
BaP[7]	µg/kg	150	800	1,450	710	2,900	831.4	1,400
Total PCBs[8]	µg/kg	60	368	676	108	78	60.44	59.45
Arsenic	µg/kg	10	21	33	NA	16.8	10.25	14.7
Copper	mg/kg	32	91	150	50	65.1	35.86	55
Lead	mg/kg	36	83	130	75	219	62.6	86.3
Nickel	mg/kg	23	36	49	38	43.60	36.99	40.3
Zinc	mg/kg	120	290	460	210	264	153.1	200
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	11.37	12.01	11.3

Subsurface (>15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
1,2-Dichlorobenzene	µg/kg	23		23	NA	130	47.35	152
1,4-Dichlorobenzene	µg/kg	31	61	90	NA	120	31.93	120
Benzene	µg/kg	57	84	110	NA	850	90.34	184
Xylenes, total	µg/kg	25	38	50	NA	2,100	279.5	724
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	93,410	15,412	41,702
BaP[7]	µg/kg	150	800	1,450	710	2,200	381.3	1,020
Total PCBs[8]	µg/kg	60	368	676	108	112	120.4	93.8
Arsenic	µg/kg	10	21	33	NA	132	15.03	36.3
Copper	mg/kg	32	91	150	50	70	21.22	52
Lead	mg/kg	36	83	130	75	1,610	105.2	140
Nickel	mg/kg	23	36	49	38	37.3	17.22	26.04
Zinc	mg/kg	120	290	460	210	289	87.06	197
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	NA	NA	NA

All Intervals								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
1,2-Dichlorobenzene	µg/kg	23		23	NA	130	47.22	151.50
1,4-Dichlorobenzene	µg/kg	31	61	90	NA	120	35.3	120
Benzene	µg/kg	57	84	110	NA	850	81.62	183
Xylenes, total	µg/kg	25	38	50	NA	2,100	256	771.5
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	93,410	15,230	41,521
BaP[7]	µg/kg	150	800	1,450	710	2,900	436.2	1,115
Total PCBs[8]	µg/kg	60	368	676	108	112	65.75	91.6
Arsenic	µg/kg	10	21	33	NA	132	14.14	29.04
Copper	mg/kg	32	91	150	50	70	23.31	52.6
Lead	mg/kg	36	83	130	75	1,610	96.56	139.8
Nickel	mg/kg	23	36	49	38	43.6	18.91	34.41
Zinc	mg/kg	120	290	460	210	289	107.4	200.2
DF TEQ Fish[9]	ng TEQ/kg	0.85	11	22	24	11.37	12.01	11.3

Notes:

applicable cleanup level

exceeds MEC or background

exceeds PEC

exceeds 2x PEC

exceeds 5x PEC

1. TEC - threshold effect concentration
2. MEC - midpoint effect concentration
3. PEC - probable effect concentration
4. BTV (95/95UTL) - background threshold value for St. Louis River AOC sediments using 95/95 upper tolerance limit
5. 95%UCL - 95% upper confidence limit of the mean
6. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
7. BaP - benzo(a)pyrene
8. PCBs - polychlorinated biphenyls
9. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Table C3 - Oil Barge Dock Slip. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Surface (0-15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
1,2-Dichlorobenzene	µg/kg	1,168	376,000	376,000	NA	110	99.62	110
1,4-Dichlorobenzene	µg/kg	144	3,740	3,740	NA	120	100.8	120
Benzene	µg/kg	5.1	1,600	7,070	NA	130	92.98	130
Xylenes, total	µg/kg	3,960	260,000	260,000	NA	950	337.3	770
BaP[4]	µg/kg	470	115	2,110	NA	2,900	831.4	1,400
Total PCBs[5]	µg/kg	9.4	234	967	NA	78	60.44	59.45
Arsenic	µg/kg	584	677	3,000	8,000	16.8	10.25	14.7
Copper	mg/kg	92	3,130	46,700	35	65.1	35.86	55
Lead	mg/kg	27	400	800	52	219	62.6	86.3
Nickel	mg/kg	13.1	1,550	22,500	31	43.60	36.99	40.3
Zinc	mg/kg	NA	23,500	100,000	150	264	153.1	200
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	11.37	12.01	11.3

Subsurface (>15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
1,2-Dichlorobenzene	µg/kg	1,168	376,000	376,000	NA	130	47.35	152
1,4-Dichlorobenzene	µg/kg	144	3,740	3,740	NA	120	31.93	120
Benzene	µg/kg	5.1	1,600	7,070	NA	850	90.34	184
Xylenes, total	µg/kg	3,960	260,000	260,000	NA	2,100	279.5	724
BaP[4]	µg/kg	470	115	2,110	NA	2,200	381.3	1,020
Total PCBs[5]	µg/kg	9.4	234	967	NA	112	120.4	93.8
Arsenic	µg/kg	584	677	3,000	8,000	132	15.03	36.3
Copper	mg/kg	92	3,130	46,700	35	70	21.22	52
Lead	mg/kg	27	400	800	52	1,610	105.2	140
Nickel	mg/kg	13.1	1,550	22,500	31	37.3	17.22	26.04
Zinc	mg/kg	NA	23,500	100,000	150	289	87.06	197
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	NA	NA	NA

All Intervals								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
1,2-Dichlorobenzene	µg/kg	1,168	376,000	376,000	NA	130	47.22	151.50
1,4-Dichlorobenzene	µg/kg	144	3,740	3,740	NA	120	35.3	120
Benzene	µg/kg	5.1	1,600	7,070	NA	850	81.62	183
Xylenes, total	µg/kg	3,960	260,000	260,000	NA	2,100	256	771.5
BaP[4]	µg/kg	470	115	2,110	NA	2,900	436.2	1,115
Total PCBs[5]	µg/kg	9.4	234	967	NA	112	65.75	91.6
Arsenic	µg/kg	584	677	3,000	8,000	132	14.14	29.04
Copper	mg/kg	92	3,130	46,700	35	70	23.31	52.6
Lead	mg/kg	27	400	800	52	1,610	96.56	139.8
Nickel	mg/kg	13.1	1,550	22,500	31	43.6	18.91	34.41
Zinc	mg/kg	NA	23,500	100,000	150	289	107.4	200.2
DF TEQ Fish[6]	ng TEQ/kg	NA	4.8	21.8	NA	11.37	12.01	11.3

Notes:

5.8 Exceedances of Ind DC RCL

1. Wis. Admin. Code NR 720 residual contaminant levels for the protection of groundwater.
2. Wis Admin. Code NR 720 residual contaminant levels for direct contact with soil for industrial and non-industrial land uses.
3. 95%UCL - 95% upper confidence limit of the mean
4. BaP - benzo(a)pyrene
5. PCBs - polychlorinated biphenyls
6. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors; soil RCLs are for 2,3,7,8-TCDD

Appendix 1

D - Hallet Dock 8 / C. Reiss Coal Slip Summary Tables

1. Sediment Chemistry Summary Statistics
2. Comparison of Sediment Chemistry Data to Sediment Quality Guidelines
3. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Table D1 - Hallet Dock 8/ C. Reiss Coal Slip. Sediment Chemistry Summary Statistics

Surface (0-15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	8	8	0	1,162	20,464	8,133	6,693	13,280	19,989
BaP[3]	µg/kg	8	8	0	57	1,300	537.80	465	877.90	1,300
Lead	mg/kg	8	8	0	4.5	23.4	12.95	14.2	17.18	21.27
Mercury	mg/kg	8	4	4	0.05	0.083	0.063	0.0595	0.064	0.0764
Nickel	mg/kg	8	8	0	9.2	22.4	13.19	12.35	15.85	19.25
Zinc	mg/kg	8	8	0	26.6	90.3	50.79	49.45	63.5	78.89
DF TEQ Fish[4]	ng TEQ/kg	4	4	0	3.34	4.39	3.74	3.62	4.3	4.30

Subsurface (>15cm)										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	30	30	0	12	22,090	3,733	282	10,996	17,527
BaP[3]	µg/kg	30	23	7	1.4	1,400	257.4	44	614	1,001
Lead	mg/kg	30	30	0	2.3	106	14.99	6	30.82	32.05
Mercury	mg/kg	30	14	16	0.031	0.23	0.0816	0.071	0.0897	0.133
Nickel	mg/kg	30	30	0	6.3	49.9	14.19	12.1	16.9	29.08
Zinc	mg/kg	30	30	0	12.5	141	46.14	29.3	61.7	109.4
DF TEQ Fish[4]	ng TEQ/kg	0	NA	NA	NA	NA	NA	NA	NA	NA

All Intervals										
Chemical	Units	# of Samples	# of Detects	# of NDs	Min	Max	Mean	Median	95%UCL[1]	95%ile
Total PAH[2]	µg/kg	38	38	0	12	22,090	4,660	1,307	7,872	20,316
BaP[3]	µg/kg	38	31	7	1	1,400	329.7	93	691	1,300
Lead	mg/kg	38	38	0	2.3	106	14.56	9.6	20.8	31.65
Mercury	mg/kg	38	18	20	0.031	0.23	0.0774	0.0655	0.0822	0.109
Nickel	mg/kg	38	38	0	6.3	49.9	13.98	12.35	16.15	24.59
Zinc	mg/kg	38	38	0	12.5	141	47.12	37.05	57.17	95.59
DF TEQ Fish[4]	ng TEQ/kg	4	4	0	3.34	4.39	3.74	3.62	4.3	4.3

Notes:

1. 95%UCL - 95% upper confidence limit of the mean
2. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
3. BaP - benzo(a)pyrene
4. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Table D2 - Hallet Dock 8/ C. Reiss Coal Slip Comparison of Sediment Chemistry Data to Sediment Quality Guidelines

Surface (0-15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	20,464	13,280	19,989
BaP[7]	µg/kg	150	800	1,450	710	1,300	877.90	1,300
Lead	mg/kg	36	83	130	75	23.4	17.18	21.27
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.083	0.064	0.0764
Nickel	mg/kg	23	36	49	38	22.4	15.85	19.25
Zinc	mg/kg	120	290	460	210	90.3	63.5	78.89
DF TEQ Fish[8]	ng TEQ/kg	0.85	11	22	24	4.39	4.3	4.30

Subsurface (>15cm)								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	22,090	10,996	17,527
BaP[7]	µg/kg	150	800	1,450	710	1,400	614	1,001
Lead	mg/kg	36	83	130	75	106	30.82	32.05
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.23	0.0897	0.133
Nickel	mg/kg	23	36	49	38	49.9	16.9	29.08
Zinc	mg/kg	120	290	460	210	141	61.7	109.4
DF TEQ Fish[8]	ng TEQ/kg	0.85	11	22	24	NA	NA	NA

All Intervals								
Chemical	Units	TEC[1]	MEC[2]	PEC[3]	BTV (95/95UTL)[4]	Max	95%UCL[5]	95%ile
Total PAH[6]	µg/kg	1,610	12,205	22,800	7,820	22,090	7,872	20,316
BaP[7]	µg/kg	150	800	1,450	710	1,400	691	1,300
Lead	mg/kg	36	83	130	75	106	20.8	31.65
Mercury	mg/kg	0.18	0.64	1.1	0.59	0.23	0.0822	0.109
Nickel	mg/kg	23	36	49	38	49.9	16.15	24.59
Zinc	mg/kg	120	290	460	210	141	57.17	95.59
DF TEQ Fish[8]	ng TEQ/kg	0.85	11	22	24	4.39	4.3	4.3

Notes:

applicable cleanup level

exceeds MEC or background

exceeds PEC

exceeds 2x PEC

exceeds 5x PEC

1. TEC - threshold effect concentration
2. MEC - midpoint effect concentration
3. PEC - probable effect concentration
4. BTV (95/95UTL) - background threshold value for St. Louis River AOC sediments using 95/95 upper tolerance limit
5. 95%UCL - 95% upper confidence limit of the mean
6. Total PAHs - total polycyclic aromatic hydrocarbons based on sum of 18 PAHs
7. BaP - benzo(a)pyrene
8. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors.

Table D3 - Hallet Dock 8/ C. Reiss Coal Slip. Comparison of Sediment Chemistry Data to NR 720 Soil RCLs

Surface (0-15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	1,300	877.90	1,300
Lead	mg/kg	27	400	800	52	23.4	17.18	21.27
Mercury	mg/kg	0.21	3.13	3.13	NA	0.083	0.064	0.0764
Nickel	mg/kg	13.1	1,550	22,500	31	22.4	15.85	19.25
Zinc	mg/kg	NA	23,500	100,000	150	90.3	63.5	78.89
DF TEQ Fish[5]	ng TEQ/kg	NA	4.8	21.8	NA	4.39	4.3	4.30

Subsurface (>15cm)								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	1,400	614	1,001
Lead	mg/kg	27	400	800	52	106	30.82	32.05
Mercury	mg/kg	0.21	3.13	3.13	NA	0.23	0.0897	0.133
Nickel	mg/kg	13.1	1,550	22,500	31	49.9	16.9	29.08
Zinc	mg/kg	NA	23,500	100,000	150	141	61.7	109.4
DF TEQ Fish[5]	ng TEQ/kg	NA	4.8	21.8	NA	NA	NA	NA

All Intervals								
Chemical	Units	GW Pathway RCL[1]	Non-Ind DC RCL[2]	Ind DC RCL[2]	Soil BTV	Max	95%UCL[3]	95%ile
BaP[4]	µg/kg	470	115	2,110	NA	1,400	691	1,300
Lead	mg/kg	27	400	800	52	106	20.8	31.65
Mercury	mg/kg	0.21	3.13	3.13	NA	0.23	0.0822	0.109
Nickel	mg/kg	13.1	1,550	22,500	31	49.9	16.15	24.59
Zinc	mg/kg	NA	23,500	100,000	150	141	57.17	95.59
DF TEQ Fish[5]	ng TEQ/kg	NA	4.8	21.8	NA	4.39	4.3	4.3

Notes:

5.8 Exceedances of Ind DC RCL

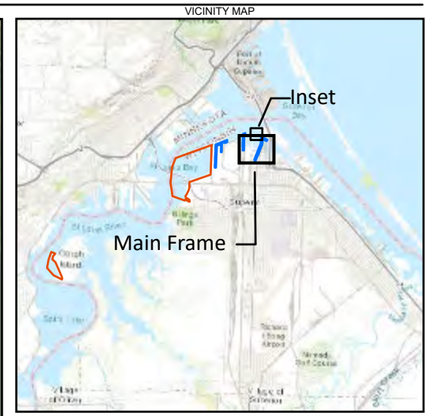
1. Wis. Admin. Code NR 720 residual contaminant levels for the protection of groundwater.
2. Wis Admin. Code NR 720 residual contaminant levels for direct contact with soil for industrial and non-industrial land uses.
3. 95%UCL - 95% upper confidence limit of the mean
4. BaP - benzo(a)pyrene
5. DF TEQ Fish - dioxin/furan toxicity equivalency quotient based on 1998 WHO toxicity equivalency factors; soil RCLs are for 2,3,7,8-TCDD

Appendix 2 – Contaminant Distribution Figures

Appendix 2 – Contaminant Distribution Figures

Tower Avenue Slip

VICINITY MAP



Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

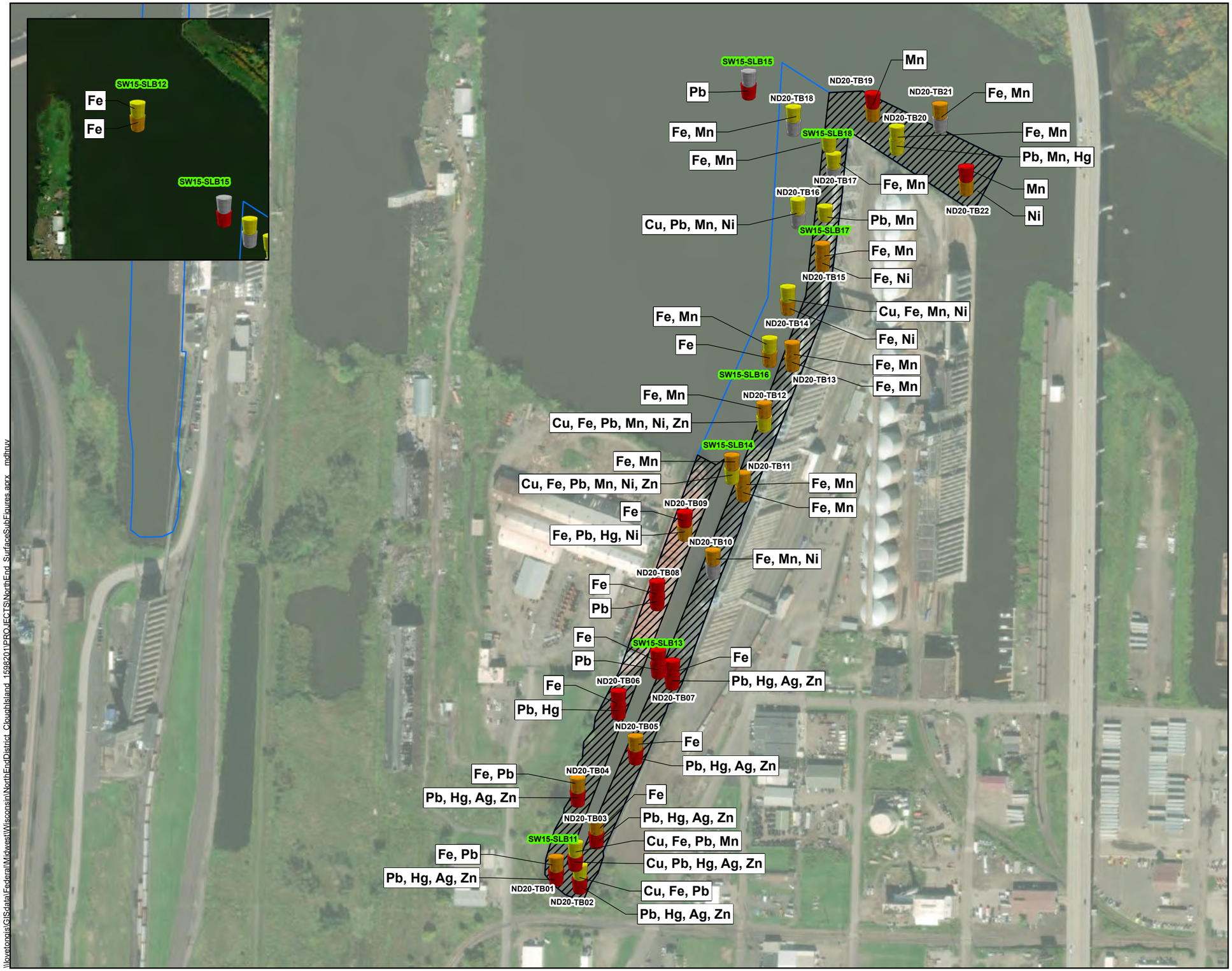
Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

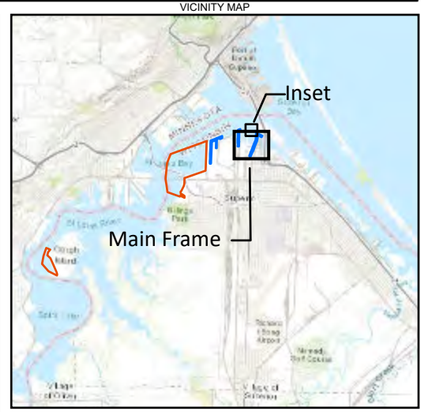
0 250 500
Feet

Figure 6-7
Summary of SQG Exceedance for Surface and Subsurface Organics
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\ovetonqis\GISdata\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv



VICINITY MAP



Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

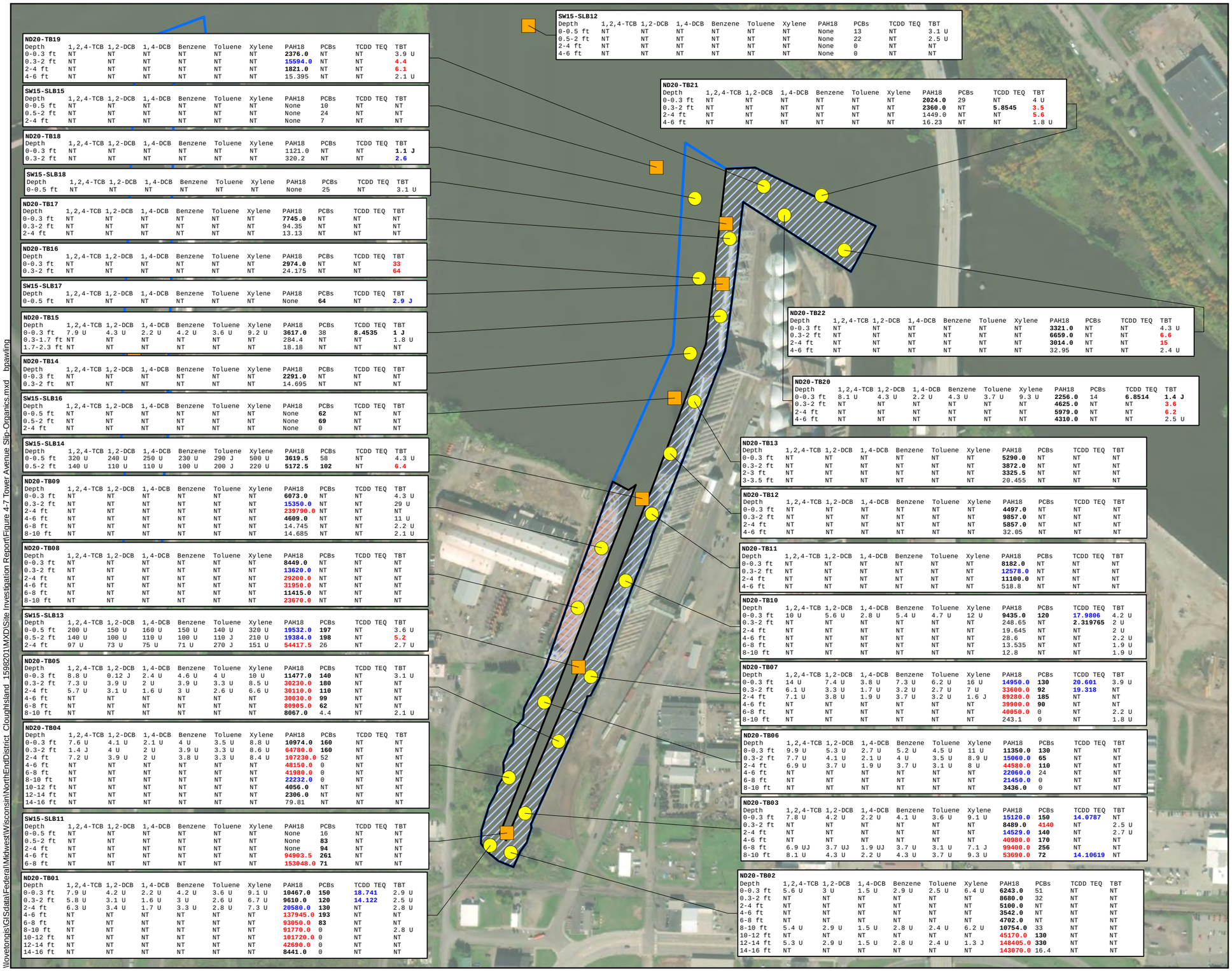
Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

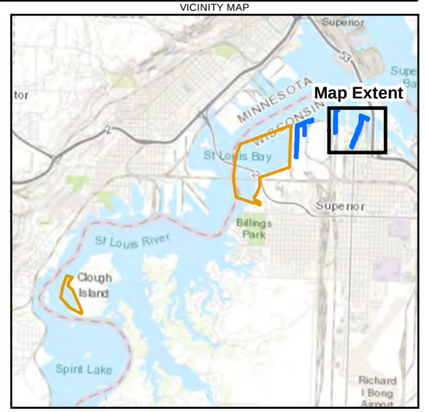
0 250 500
Feet

Figure 6-8
Summary of SQG Exceedance for Surface and Subsurface Metals
Tower Avenue Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv



VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in ug/kg.
Fish TEQ results are in pg/g.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in **blue** exceed the MEC.
Concentrations shown in **red** exceed the PEC.
TCDD TEQ in text boxes calculated as Fish TEQ (ND=1/2RL)

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
NT = Not tested.
ug/kg - Micrograms per kilogram
pg/g - Picograms per gram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

Analyte	Abbreviation	TEC	MEC	PEC
		(ug/kg)		
1,2,4-Trichlorobenzene	1,2,4-TCB	8	13	18
1,2-Dichlorobenzene	1,2-DCB	23		23
1,4-Dichlorobenzene	1,4-DCB	31	60.5	90
Benzene	Benzene	57	83.5	110
Toluene	Toluene	890	1345	1800
Xylene	Xylene	25	37.5	50
Total PAH18 ND=1/2RL	PAH18	1610	12205	22800
Total PCBs ND=0	PCBs	60	368	676
FISH TEQ (ND=1/2RL)	TCDD TEQ	0.85	11.2	21.5
Tributyltin	TBT	0.52	1.73	2.94

0 200 400
Feet

N

Figure 4-7
Tower Avenue Slip - Organics
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

ND20-TB20

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.68 U	4.2	0.42 J	26.8	23.4	**22900.0**	25.1 J	**522**	0.045 U	21.3	0.13 U	93.5
0.3-2 ft	0.49 U	3.9	0.62	23.2	21.9	18800.0	**53.2 J**	**536**	0.036 U	16.5	0.092 U	107
2-4 ft	0.44 U	3.4	0.52	22.5	23	17900.0	**47 J**	403	**0.29**	20.6	0.083 U	117
4-6 ft	0.65 U	3.8	0.45 J	23.5	27.4	19300.0	**44.3 J**	265	**0.54**	20.5	0.12 U	107

SW15-SLB15

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.3 UJ	3.1	0.25 J	25.3	15.4	16800.0	15.5 J	439	0.04 UJ	13.7	0.082 UJ	65.2
0.5-2 ft	0.48 J	4.5	0.5 J	22.7	27.7	19000.0	**328 J**	323	**0.28**	17	0.07 UJ	111
2-4 ft	0.33 UJ	4.9	0.58 J	25.8	29	**21900.0**	**48.3 J**	383	**0.28**	19.3	0.09 UJ	**126**
4-6 ft	0.42 UJ	4.6	0.49 J	39.9	31.3	**29400.0**	32.2 J	**593**	**0.24**	**28.8**	0.12 UJ	113

ND20-TB18

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.65 U	4.2	0.33 J	29.4	20.8	**21100.0**	15 J	**680**	0.04 U	21	0.12 U	76.9
0.3-2 ft	0.41 U	3.5	0.24 J	20.2	18.1	18200.0	8.6 J	426	0.033 U	19.3	0.077 U	46

SW15-SLB18

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.31 UJ	4.0	0.48 J	26.7	25.8	**24100.0**	18.3 J	**625**	0.059 J-	21.8	0.087 UJ	87.2

ND20-TB17

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.63 U	4.8	0.37 J	26.7	25	**24100.0**	21.1	**647 J**	0.055 J	21	0.12 U	89.8
0.3-2 ft	0.44 U	3.5	0.21 J	18.6	16.9	15800.0	6.1 J	328	0.027 U	17.9	0.082 U	33.1
2-4 ft	0.41 U	2.3	0.17 J	9.9	7.3	9980.0	2.9 J	211	0.031 U	10.3	0.078 U	18.4

ND20-TB16

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.82 U	4.4	0.42 J	30.4	**68.4**	**29100.0**	19.9	**732 J**	0.072 J	**31.9**	0.15 U	105
0.3-2 ft	0.42 U	2.3	0.17 J	11.6	8	11000.0	9.8 J	247	0.028 U	10.7	0.08 U	20.8

ND20-TB14

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.87 U	4.8	0.46 J	38.7	**32.5**	**28400.0**	28.2	**777 J**	0.052 U	**27.2**	0.16 U	106
0.3-2 ft	0.57 U	4.5	0.29 J	41.1	**36.8**	**33200.0**	10.3 J	**576**	0.035 U	**40.6**	0.11 U	62.3

SW15-SLB16

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.35 UJ	4.5	0.38 J	27.7	29.9	**24200.0**	25.2 J	**644**	0.063 J-	20.2	0.096 UJ	111
0.5-2 ft	0.39 J	4.5	0.48 J	32.2	**37**	**26900.0**	32.7 J	**580**	0.079 J-	22.6	0.075 UJ	114
2-4 ft	0.22 UJ	4.9	0.2 J	**43.2**	**38.6**	**34800.0**	11.1 J	**670**	0.036 UJ	**32.1**	0.062 UJ	60.7

ND20-TB12

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.1 U	6.4	0.67 J	41.6	**44.4**	**36100.0**	**49.2**	**965 J**	0.16 J	**32.5**	0.22 U	**158**
0.3-2 ft	0.73 U	6.1	0.58 J	30.8	**40.6**	**25300.0**	**47.9**	**556**	0.063 J	**25.2**	0.22 J	**137**
2-4 ft	0.57 U	4.6	0.57 J	30.2	**34.3**	**24800.0**	**39.5**	**475**	0.11 J	**26.2**	0.31 J	**135**
4-6 ft	0.64 U	3.1	0.3 J	29.9	22	**21100.0**	6.9	213	0.035 U	**25.4**	0.12 U	60.7

SW15-SLB14

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.8 J	6.9	0.61 J	39	**50.1**	**35900.0**	**53**	**829**	0.13 J	**29**	0.17 U	**166**
0.5-2 ft	0.65 J	6.4	0.62 J	33.2	**43.6**	**28900.0**	**57.4**	**545**	0.15 J	**24**	0.09 U	**164**

ND20-TB09

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.1 J	8.5	0.82 J	**49.5**	**64.8**	43200.0	**74.2**	**909 J**	0.078 J	**38.9**	0.2 U	**216**
0.3-2 ft	0.74 U	6.1	**1.2**	39.1	**62.7**	**28100.0**	**119**	443	**0.92**	**27.3**	0.93 J	**256**
2-4 ft	0.65 U	5.4	0.9	31.9	**45.5**	**27100.0**	**64.1**	408	**0.47**	**28.6**	0.48 J	**211**
4-6 ft	0.68 U	4.1	0.4 J	35.1	**34.5**	**27100.0**	29.4	**479**	**0.21**	**30**	0.13 U	88
6-8 ft	0.54 U	4.3	0.23 J	39.5	**39**	**30800.0**	8.6	**509**	0.035 U	**36.4**	0.1 U	56.6
8-10 ft	0.44 U	4.7	0.19 J	33.5	**32.8**	**25100.0**	7.4	450	0.032 U	**29.6**	0.084 U	46.2

ND20-TB08

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.6 J	9.0	0.84 J	**47.4**	**74**	**40700.0**	**89.1**	**876 J**	0.085 J	**37.5**	0.16 U	**228**
0.3-2 ft	0.64 U	6.0	0.96	40.7	**51.8**	**29400.0**	**90.9**	**491**	**0.37**	**30.7**	0.33 J	**204**
2-4 ft	0.68 U	6.3	**1.2**	42.7	**66.2**	**29100.0**	**148**	454	**0.77**	**28.3**	0.83 J	**259**
4-6 ft	0.63 U	5.3	**1.2**	37.4	**49.6**	**28200.0**	**79.8**	429	**0.46**	**29.1**	0.56 J	**237**
6-8 ft	0.68 U	4.6	0.69 J	25.4	**38.1**	**20300.0**	**60.7**	314	**0.31**	20.3	0.58 J	**154**
8-10 ft	0.68 U	5.2	**1**	30.3	**71.3**	**24300.0**	**90.9**	345	**0.59**	**23.9**	1.5	**232**

SW15-SLB13

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	1.5 J	**10.8**	0.99	**48.6**	**91.2**	**42700.0**	**123**	**849**	0.086 J	**35**	0.11 U	**266**
0.5-2 ft	0.92 J	9.1	**1**	**46.8**	**75.1**	**37200.0**	**118**	**719**	**0.23**	**32.9**	0.18 J	**244**
2-4 ft	1.5 J	6.1	**1.1**	29.9	**65.6**	**25000.0**	**152**	349	**1.1**	21.7	**1.8**	**290**
4-6 ft	0.29 UJ	2.6	0.38 J	14.7	14.6	12700.0	10.2	202	0.17	12.4	0.081 U	37

ND20-TB06

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.6 J	9.5	0.88 J	**44.4**	**88.2**	**42100.0**	**96.5**	**749**	0.16 J	**38.9**	0.23 J	**247**
0.3-2 ft	0.83 J	6.4	0.93	**44.6**	**55.6**	**31700.0**	**98.1**	**550**	**0.33**	**32.8**	0.28 J	**202**
2-4 ft	0.9 J	6.7	**1.6**	36.8	**71.7**	**25700.0**	**149**	354	**1.1**	**26.9**	1.6	**331**
4-6 ft	1.2 J	6.4	0.84	19.3	**49.7**	**20200.0**	**106**	242	**1.7**	16.1	0.74 J	**217**
6-8 ft	0.76 J	3.7	0.41 J	16.4	**34.3**	13700.0	**61.2**	168	**0.94**	13.8	0.36 J	**122**
8-10 ft	0.45 U	2.5	0.19 J	11.8	**40.7**	10300.0	24.3	132	**0.23**	10.7	0.18 J	51.2

ND20-TB04

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.2 J	7.6	0.8	**45.4**	**77.1**	**36200.0**	**86.4**	**686 J**	0.054 U	**36.3**	0.13 U	**221**
0.3-2 ft	1.6 J	9.1	**1.5**	**43.6**	**103**	**34100.0**	**171**	**656**	**0.47**	**33.3**	**2.4**	**556**
2-4 ft	2 J	9.5	**2.3**	35.4	**133**	**27900.0**	**312**	333	**4**	**29.8**	1.6	**664**
4-6 ft	1.1 J	6.7	**1**	24.8	**108**	**20400.0**	**192**	296	**2.9**	21.8	1.4 J	**428**
6-8 ft	**2.8 J**	5.7	0.85	27.2	**89.2**	**21700.0**	**177**	279	**3**	23	**1.8**	**314**
8-10 ft	0.54 J	4.7	0.56	17.3	**65.2**	19900.0	**434**	241	**1.9**	20	0.94 J	**187**
10-12 ft	0.55 U	3.2	0.46 J	16.9	**43.4**	15100.0	**61.9**	186	**0.62**	15.7	0.78 J	**139**
12-14 ft	0.49 U	3.2	0.24 J	16.1	20.9	13900.0	16.6	203	**0.45**	15	0.23 J	46.5
14-16 ft	0.5 U	2.0	0.15 U	10.9	8.5	10900.0	3.3	175	0.027 U	10.9	0.095 U	19

SW15-SLB11

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.75 J	5.2	0.36 J	25.8	**46.5**	**22900.0**	**56.1**	**542**	0.043 UJ	22.1	0.078 U	101
0.5-2 ft	**2.1 J**	7.6	0.43 J	34.8	**58.1**	**29500.0**	**70.6**	**594**	0.11 J	**27.8**	0.068 U	**133**
2-4 ft	0.27 UJ	5.6	0.63 J	38	**60.4**	**24600.0**	**90.3**	**558**	0.16 J	**30.5**	0.075 U	**155**
4-6 ft	1.2 J	8.1	**2**	**46.3**	**122**	**29600.0**	**300**	**502**	**1.5**	**28.3**	**1.9**	**510**
6-8 ft	0.71 J	8.9	**2.8**	34.2	**151**	19700.0	**456**	350	**5.8**	**25.4**	**4.3**	**732**

ND20-TB01

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	**1.3 J**	8.3	0.76 J	42.6	**82.7**	**35000.0**	**87.2**	**598**	0.14 J	**34.9**	0.15 U	**218**
0.3-2 ft	1.3 J	7.5	0.72 J	**51.1**	**62.6**	**29100.0**	**73.8**	**525**	0.038 U	**38.1**	0.14 U	**147 J**
2-4 ft	1.3 J	6.8	**1**	**48.6**	**72.5**	**29500.0**	**136**	**515**	**0.26**	**33.5**	0.26 J	**211 J**
4-6 ft	1.8 J	6.8	**1.8**	30.9	**137**	20000.0	**253**	293	**1.9**	**23.6**	**5.5**	**393 J**
6-8 ft	**2.9 J**	9.4	**2.7**	31.8	**135**	**20600.0**	**386**	225	**6.2**	**24.2**	**2**	**681 J**
8-10 ft	1.3 J	5.9	**1.1**	22.3	**80.7**	16800.0	**299**	345	**11.3**	17.2	1.2 J	**433 J**
10-12 ft	0.96 J	6.0	0.97	34.9	**119**	17900.0	**280**	210	**9.5**	19	**3.4**	**385 J**
12-14 ft	0.79 J	5.1	0.74 J	23.8	**102**	**20400.0**	**210**	271	**3.3**	21.9	1.4 J	**290**
14-16 ft	0.65 U	3.6	0.49 J	20	**62.5**	14700.0	**111**	175	**1.6**	16.3	1.2 J	**165**

SW15-SLB12

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.44 UJ	3.7	0.34 J	21.5	18.7	**20400.0**	16.9	**600**	0.087 J	17	0.12 U	75.3
0.5-2 ft	0.72 J	5.7	**1.2**	33.6	**38**	**31400.0**	**70**	**491**	**0.45**	**23.6**	0.62 J	**231**
2-4 ft	0.29 J	4.1	0.7	25.3	**41.7**	**23200.0**	**45.8**	420	**0.29**	19.6	0.072 U	**138**
4-6 ft	0.32 UJ	4.1	0.47 J	23.9	25	**20500.0**	29.4	407	0.094 J	18.6	0.089 U	100

ND20-TB19

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.83 U	6.4	0.54 J	35	**36**	**37100.0**	**38.3**	**1190**	0.066 U	**33**	0.18 J	**138**
0.3-2 ft	0.6 U	4.8	0.46 J	30.9	**34.3**	**25900.0**	30.9 J	**815**	0.043 U	**24.3**	0.11 U	99.7
2-4 ft	0.56 U	3.9	0.44 J	28.4	30	**24200.0**	25.4 J	**577**	0.14	**24.2**	0.11 U	89.1
4-6 ft	0.52 U	4.6	0.27 J	39.1	**33.9**	**29900.0**	9.4 J	**588**	0.033 U	**36.1**	0.098 U	55.6

ND20-TB22

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.2 U	7.2	0.65 J	39.1	**55.4**	**39500.0**	**39.9**	**1180**	0.072 U	**34.9**	0.22 U	**152**
0.3-2 ft	0.62 U	4.4	0.46 J	27.4	27.5	**23800.0**	30.6	**562**	0.088 J	22.6	0.12 U	106
2-4 ft	0.54 U	3.5	0.37 J	27	29	**21400.0**	25.7	430	0.063 J	**23.7**	0.1 U	86.9
4-6 ft	0.66 U	3.9	0.3 J	41.2	**34.3**	**29000.0**	10.6	336	0.042 U	**37.1**	0.13 U	66.2

ND20-TB21

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1 U	5.5	0.58 J	37.8	30.3	**32600.0**	30.4 J	**1090**	0.065 U	**29.5**	0.19 U	**139**
0.3-2 ft	0.57 U	3.8	0.34 J	20.2	21.9	17100.0	23.3	451	0.13 J	16.5	0.72 J	73.8
2-4 ft	0.55 U	3.8	0.35 J	20.8	19.9	17500.0	26.5	409	0.13 J	17.5	0.1 U	71.5
4-6 ft	0.5 U	2.5	0.15 U	9.4	7.2	8920.0	3.2	221	0.026 U	9.4	0.094 U	17.5

SW15-SLB17

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.31 UJ	3.5	0.43 J	26.6	22.9	20000.0	**52.5 J**	**605**	0.053 UJ	15.8	0.086 UJ	80

ND20-TB15

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.1 J	6.7	0.61 J	41.4	**41.5**	**36200.0**	33.8	**926**	0.1 J	**33.5**	0.19 U	**146**
0.3-1.7 ft	0.44 U	3.3	0.24 J	29.1	**32.7**	**22400.0**	9.7 J	393	0.026 U	**26**	0.084 U	52.3
1.7-2.3 ft	0.73 J	5.5	0.31 J	42.6	**41**	**34900.0**	11.4 J	**567**	0.031 U	**43.7**	0.1 U	66.9

ND20-TB13

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.88 U	6.6	0.6 J	39.8	**40.4**	**36000.0**	**40.5**	**1000 J**	0.069 J	**31.8**	0.17 U	**149**
0.3-2 ft	0.83 J	6.1	0.51 J	35.7	**40.5**	**30800.0**	**36.4**	**830**	0.069 J	**29.3**	0.17 J	**132**
2-3 ft	0.9 J	6.2	0.58 J	35.9	**45.3**	**33500.0**	**42.8 J**	**743**	0.05 U	**30.6**	0.13 U	**138**

ND20-TB11

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.1 J	8.3	0.72 J	**43.8**	**56.5**	**38300.0**	**65.4**	**912 J**	0.13 J	**34.5**	0.19 J	**193**
0.3-2 ft	0.95 U	8.7	0.85 J	**43.8**	**65.4**	**36500.0**	**79.6**	**798**	0.17 J	**34.5**	0.3 J	**207**
2-4 ft	0.92 U	7.0	0.81 J	40.1	**47.5**	**31100.0**	**67.2**	**699**	0.14 J	**30.5**	0.41 J	**178**
4-6 ft	0.47 U	2.4	0.23 J	14.1	12.7	13100.0	6.9	307	0.032 U	14.7	0.089 U	33.1

ND20-TB10

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.3 J	9.1	0.79 J	**45.7**	**67**	**38500.0**	**78.1**	**941**	0.071 U	**36.9**	0.17 U	**213**
0.3-2 ft	0.52 U	2.4	0.2 J	18.9	13.6	14500.0	5.9	206	0.032 U	15.1	0.098 U	36.7
2-4 ft	0.46 U	2.1	0.14 U	14.5	8.8	11000.0	3.7	112	0.035 U	11.4	0.088 U	26.3
4-6 ft	0.48 U	2.3	0.2 J	16.9	10.9	11800.0	4	119	0.035 U	12.9	0.091 U	37.4
6-8 ft	0.42 U	2.2	0.13 J	13.9	9.3	11000.0	3.2	97	0.03 U	12.2	0.08 U	24.7
8-10 ft	0.41 U	2.6	0.17 J	11.3	10.7	9730.0	3.2	194	0.029 U	12.5	0.078 U	20.1

ND20-TB07

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.5 J	**10.3**	**1 J**	**47.7**	**97.3**	**46200.0**	**99.3**	**826**	0.12 J	**42.4**	0.23 U	**279**
0.3-2 ft	0.54 U	4.7	0.72	26.1	**43**	18200.0	**70.1**	315	**0.34**	18.1	0.43 J	**166**
2-4 ft	0.71 U	6.3	**1.4**	32.6	**73.6**	**24400.0**	**161**	339	**0.79**	**25**	**3.1**	**300**
4-6 ft	0.74 U	6.1	**1.4**	26.6	**75.3**	**21300.0**	**210**	264	**2.3**	20.2	1.1 J	**360**
6-8 ft	0.62 U	3.2	0.36 J	14.2	26.5	12500.0	**53**	172	**0.68**	12	0.19 J	103
8-10 ft	0.4 U	2.3	0.15 J	10.3	8.4	9220.0	3.4	204	0.032 U	9.4	0.076 U	19.1

ND20-TB05

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.2 J	7.7	0.75 J	38.8	**69.3**	**32700.0**	**82.5**	**614 J**	0.051 U	**31.4**	0.14 U	**194**
0.3-2 ft	1.1 J	7.4	**1.1**	41	**67.5**	**27900.0**	**131**	**488**	**0.47**	**28.9**	0.32 J	**226**
2-4 ft	0.61 U	6.3	**1.3**	36.7	**70.7**	**25300.0**	**161**	375	**0.75**	**25.9**	1.1 J	**293**
4-6 ft	0.65 J	6.0	**1.2**	30	**66**	**23100.0**	**124**	316	**0.68**	**24**	**2.8**	**281**
6-8 ft	1.5 J	8.0	**2.2**	34.8	**109**	**21700.0**	**280**	279	**2.8**	**23.2**	1.6	**514**
8-10 ft	0.5 J	2.8	0.41 J	11.9	28.8	10100.0	**64.9**	121	**0.45**	10.4	0.24 J	**130**

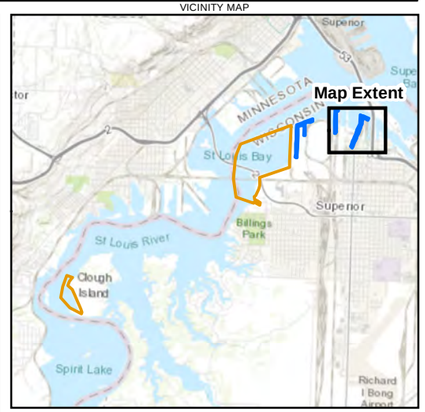
ND20-TB03

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	**2.8 J**	7.5	0.72 J	40.4	**77.2**	**33400.0**	**75**	**594**	0.1 J	**34**	0.15 U	**204**
0.3-2 ft	1.1 J	6.6	0.69	**45**	**59.1**	**26000.0**	**70.3**	**622**	0.042 U	**26.4**	0.12 U	**154 J**
2-4 ft	0.87 J	6.0	0.77	**48.2**	**60.1**	**32500.0**	**95.5**	**660**	0.045 U	**36.7**	0.12 U	**195 J**
4-6 ft	1.5 J	5.9	**1.4**	**48.9**	**73.8**	**30200.0**	**172**	**551**	**0.65**	**32.4**	0.98 J	**276 J**
6-8 ft	1.5 J	7.8	**2**	34.7	**112**	**23500.0**	**225**	339	**1.6**	**27**	**5.5**	**425 J**
8-10 ft	1.4 J	7.9	**2.5**	27.7	**131**	19800.0	**313**	218	**7.7**	22.6	**1.9**	**622**

ND20-TB02

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.58 J	4.9	0.3 J	21.8	**32.6**	**20500.0**	**36.7**	408 J	0.037 U	20.6	0.098 U	72.9
0.3-2 ft	1.1 J	5.5	0.41 J	30.6	**40**	**24800.0**	**40.6**	**580**	0.03 U	**29.4**	0.11 U	83.8 J
2-4 ft	0.6 J	5.1	0.41 J	26	**34**	**23000.0**	34.4	**897**	0.032 U	**33.5**	0.089 U	78 J
4-6 ft	0.82 J	5.1	0.4 J	29.5	**38.3**	**24900.0**	34.7	**658**	0.032 U	**31.9**	0.1 U	79.6 J
6-8 ft	0.9 J	4.6	0.47 J	**47.7**	**36.5**	**24600.0**	**41.2**	**539**	0.033 U	**36.6**	0.1 U	86.5 J
8-10 ft	0.76 J	4.7	0.51 J	33.9	**40.6**	**25200.0**	**50.2**	**512**	0.032 U	**30**	0.13 U	99.3 J
10-12 ft	0.97 J	4.5	0.67	30.4	**47.2**	19800.0	**105**	407	**0.25**	22	0.12 J	**148 J**
12-14 ft	1.3 J	4.9	**1.4**	29.7	**85**	19900.0	**457**	329	**0.47**	**23.8**	**3.8**	**271 J**
14-16 ft	2 J	6.1	**3.3**	27.5	**146**	14200.0	**2070**	133	**9.2**	18.2	**1.8**	**571 J**

VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in mg/kg.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in blue exceed the MEC.
Concentrations shown in red exceed the PEC.

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
mg/kg - Milligrams per Kilogram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

Metal	TEC	MEC	PEC
	(mg/kg)		
Antimony	2	13.5	25
Arsenic	9.8	21.4	33
Cadmium	0.99	3	5
Chromium	43	76.5	110
Copper	32	91	150
Iron	20000	30000	40000
Lead	36	83	130
Manganese	460	780	1100
Mercury	0.18	0.64	1.1
Nickel	23	36	49
Silver	1.6	1.9	2.2
Zinc	120	290	460

0 200 400
Feet

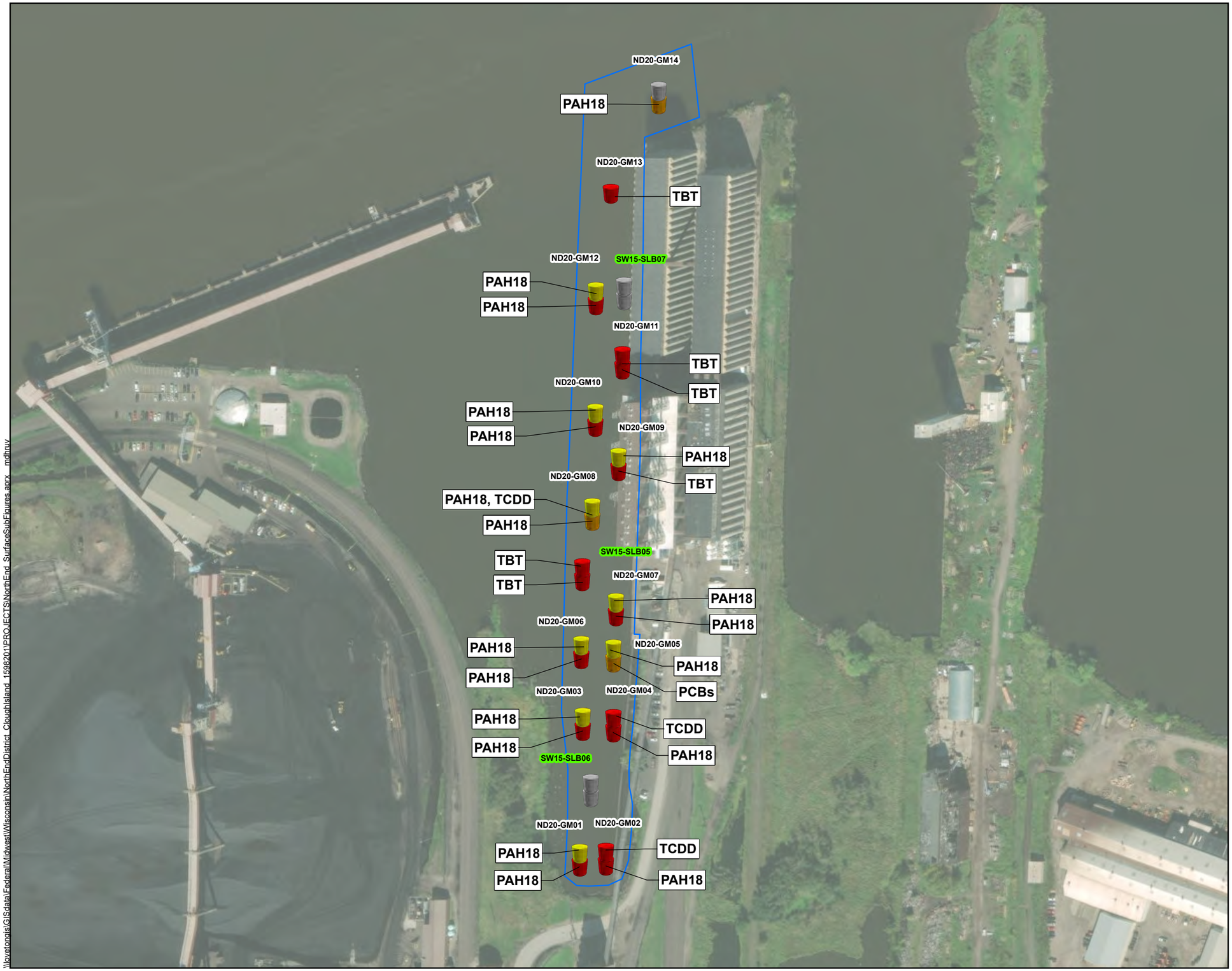
N

Figure 4-8
Tower Avenue Slip - Metals
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_15982001MXD\Site Investigation Report\Figure 4-8 Tower Avenue Slip-Metals.mxd bpawling

Appendix 2 – Contaminant Distribution Figures

General Mills Slip



VICINITY MAP

Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

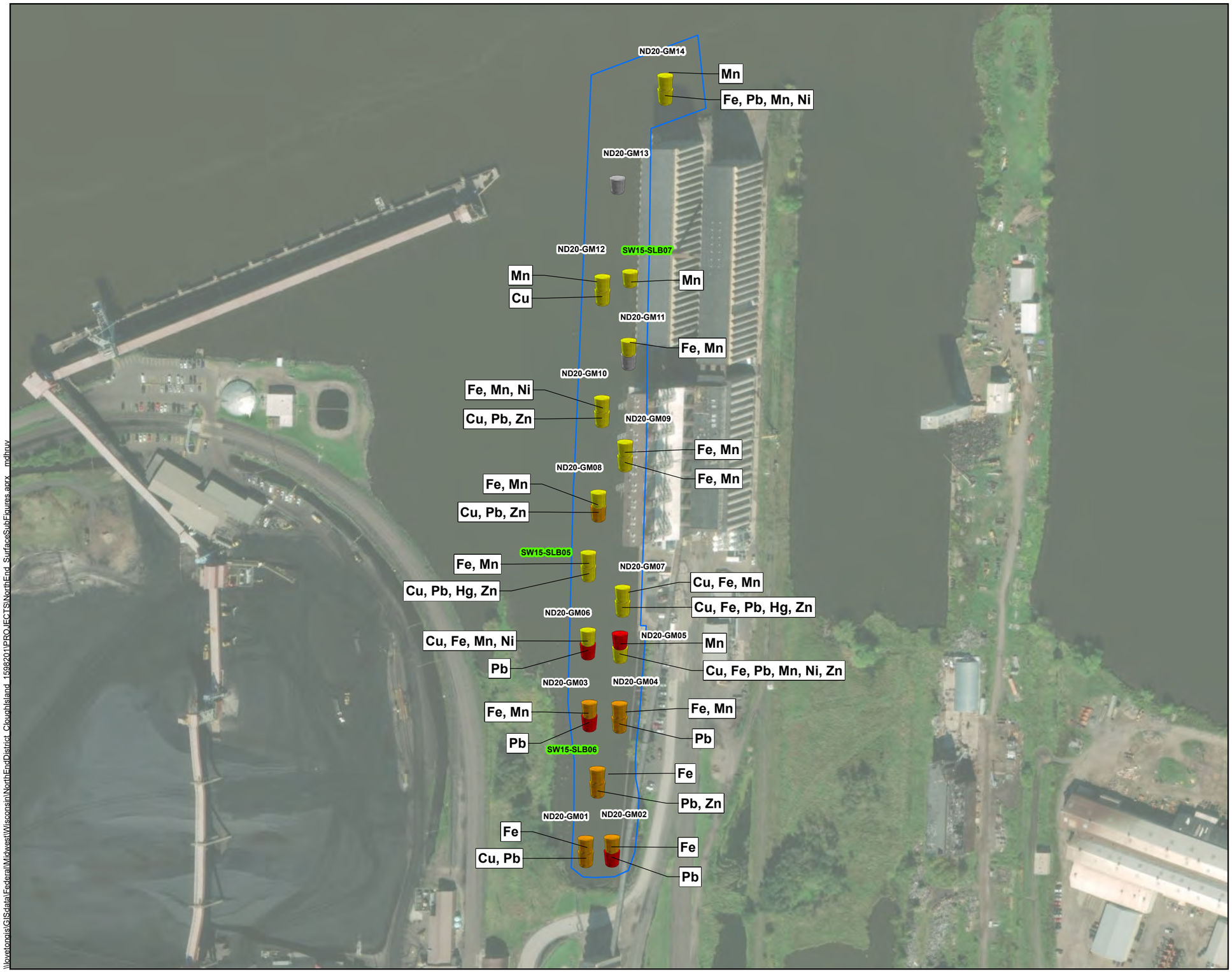
Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

0 150 300
Feet

Figure 6-5
Summary of SQG Exceedance for Surface and Subsurface Organics
General Mills Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetonnis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECT\StNorthEnd_SurfaceSubFigures.aprx mdhruv



VICINITY MAP

Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

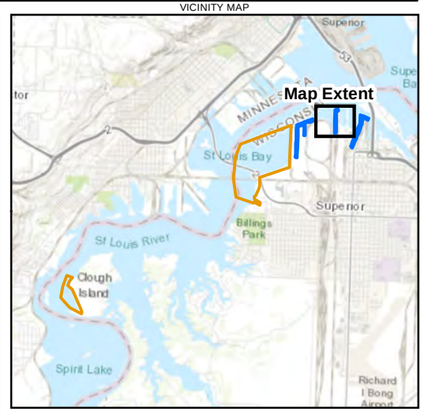
N

0 150 300
Feet

Figure 6-6
Summary of SQG Exceedance for Surface and Subsurface Metals
General Mills Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GISdata\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv

VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in ug/kg.
Fish TEQ results are in pg/g.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in **blue** exceed the MEC.
Concentrations shown in **red** exceed the PEC.
TCDD TEQ in text boxes calculated as Fish TEQ (ND=1/2RL)

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
NT = Not tested.
ug/kg - Micrograms per kilogram
pg/g - Picograms per gram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

Analyte	Abbreviation	TEC	MEC	PEC
		(ug/kg)		
1,2,4-Trichlorobenzene	1,2,4-TCB	8	13	18
1,2-Dichlorobenzene	1,2-DCB	23		23
1,4-Dichlorobenzene	1,4-DCB	31	60.5	90
Benzene	Benzene	57	83.5	110
Toluene	Toluene	890	1345	1800
Xylene	Xylene	25	37.5	50
Total PAH18 ND=1/2RL	PAH18	1610	12205	22800
Total PCBs ND=0	PCBs	60	368	676
FISH TEQ (ND=1/2RL)	TCDD TEQ	0.85	11.2	21.5
Tributyltin	TBT	0.52	1.73	2.94

0 200 400
Feet

N

Figure 4-5
General Mills Slip - Organics
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetonnis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 4-5 General Mills Slip-Organics.mxd bpawling

ND20-GM14

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.48 U	2.9	0.18 J	14.1	9.4	14000.0	6.5	**461**	0.038 U	12	0.091 U	35.2
0.3-2 ft	0.59 U	3.4	0.43 J	18.9	18.9	17000.0	**70.7**	302	0.13 J	17.2	0.12 J	92
2-4 ft	0.52 U	3.6	0.26 J	28.8	25.5	**23300.0**	7.4	**588**	0.035 U	**28.5**	0.099 U	47.3
4-6 ft	0.57 U	3.9	0.28 J	32.5	27.3	**21200.0**	7	**521**	0.038 U	**28.3**	0.11 U	40.8

ND20-GM13

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.54 U	3.0	0.26 J	16.7	16.4	14600.0	10.2	425	0.052 J	14.3	0.1 U	50.9

ND20-GM12

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.57 U	3.1	0.3 J	19 J	16.9	17800.0	12.6	**535**	0.04 U	16.3 J	0.11 U	70.5
0.3-2 ft	0.66 U	3.9	0.32 J	17.6	16	15600.0	16.6	349	0.058 J	15.4	0.13 U	69.9
2-4 ft	0.76 U	2.5	0.25 J	14.2	15.1	10600.0	10.8	208	0.049 U	12.5	0.14 U	30.1
4-6 ft	0.51 U	3.0	0.32 J	13.2	**40.7**	12300.0	24	251	0.072 J	13.5	0.23 J	66.8

ND20-GM10

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.77 U	4.0	0.4 J	26.1 J	22.9	**23200.0**	14.5	**637**	0.046 U	**27.1 J**	0.15 U	82.5
0.3-2 ft	0.52 U	4.0	0.55 J	19.4	**41.5**	16300.0	**44.2**	245	0.099 J	16.8	0.16 J	**130**
2-4 ft	0.63 U	3.7	0.56 J	18.5	**47.3**	16700.0	**52.8**	244	0.14	16.5	0.12 U	**144**
4-6 ft	0.48 U	3.5	0.4 J	15.8	21.8	13100.0	**47.3**	216	0.095 J	13.9	0.091 U	94.7

ND20-GM08

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.71 U	4.6	0.43 J	24.7	31	**20800.0**	16.8	**463**	0.056 J	20.2	0.13 U	95.1
0.3-2 ft	0.82 J	6.3	0.81	27.6	129	**23400.0**	111	383	0.08 J	**23.2**	0.13 U	315
2-4 ft	0.78 U	4.3	0.78 J	24.8	**45.8**	**21100.0**	**50.1**	302	**0.22**	20.7	0.46 J	**204**
4-6 ft	0.56 U	4.6	0.68	23.5	**45.2**	**20600.0**	**47.5**	320	**0.19**	21.5	0.11 U	**168**
6-8 ft	0.55 U	2.2	0.21 J	11.2	11.4	10900.0	7.2	228	0.032 U	10.7	0.1 U	31.3
8-10 ft	0.42 U	2.0	0.15 J	9.9	6.6	9860.0	2.7	215	0.029 U	9.6	0.08 U	16.5

SW15-SLB05

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.51 J	4.5	0.52 J	25.9	28.3	**22300.0**	28.9	**575**	0.16 J-	21.9	0.12 U	104
0.5-2 ft	0.27 UJ	4.2	0.53 J	22.9	**32.6**	19600.0	31.1	326	0.13 J	17.3	0.074 U	119
2-4 ft	0.52 J	4.4	0.73 J	19.5	**42.9**	16100.0	**50.9**	255	**0.2**	16.7	0.14 J	**175**
4-6 ft	0.2 U	1.9	0.28 J	7	7.7	7300.0	4	218	0.032 UJ	8.5	0.055 U	26.5

ND20-GM06

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.74 U	4.7	0.43 J	28 J	**38.6**	**24800.0**	20	**508**	0.057 U	**23.1 J**	0.14 U	97
0.3-2 ft	0.91 U	5.3	0.52 J	25.2	**34.9**	**20900.0**	29.4 J	344	0.048 U	20.2	0.17 U	116
2-4 ft	0.66 U	4.8	0.8	23.7 J	**53.8**	**20200.0**	162 J	292	**0.22**	20.4	0.2 J	**196**
4-6 ft	0.68 J	4.8	0.63 J	18.9	**36.9**	17200.0	**63.7 J**	282	**0.23**	17.8	0.12 U	**162**
6-8 ft	0.74 J	5.2	0.91	20.7	**44.5**	19400.0	114 J	259	**0.27**	17.8	0.15 J	**215**
8-10 ft	1.1 J	6.0	**1.2**	23.5	**52.2**	**22000.0**	159 J	285	**0.35**	19.6	0.2 J	**286**

ND20-GM03

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.96 U	5.8	0.52 J	34 J	**70**	**30800.0**	24.6	**822**	0.071 U	**27.8 J**	0.22 J	117
0.3-2 ft	0.64 U	4.9	0.58 J	21.2	**45.8**	18200.0	**57.8 J**	285	0.039 U	18.3	0.14 J	**131**
2-4 ft	0.7 J	5.2	0.95	31	**76.5**	**24600.0**	**66.8 J**	360	0.048 U	**25**	0.33 J	**216**
4-6 ft	0.73 J	4.6	**1.3**	21.3	**48.6**	18900.0	**69.6 J**	279	**0.34**	18.4	0.15 J	**191**
6-8 ft	0.76 J	5.9	**1.1**	24.5	**78.5**	**21600.0**	131 J	267	**0.26**	19.7	0.15 J	**271**
8-10 ft	0.52 J	5.0	0.86	17.5	106	16400.0	155 J	216	0.038 U	17.6	0.11 J	**183**

ND20-GM01

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1 U	6.0	0.62 J	35.3 J	**48.5**	30600.0	32.6	**516**	0.13 J	**28.6 J**	0.19 U	**139**
0.3-2 ft	0.8 U	5.9	0.74 J	33.4	**62.9**	**25100.0**	**64.3**	363	0.058 U	**24**	0.16 J	**174**
2-4 ft	1 J	6.5	**1**	22	106	20000.0	90.7	273	**0.41**	18.8	0.15 U	**243**

SW15-SLB07

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.25 U	3.4	0.35 J	19.7	17.9	17500.0	14.2	**571**	0.046 UJ	17.1	0.068 U	56.5

ND20-GM11

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.65 J	3.5	0.32 J	21.9 J	17.4	**20800.0**	11.2	**687**	0.048 U	18.7 J	0.12 U	66
0.3-2 ft	0.5 U	3.6	0.3 J	18.3	15	17100.0	11.7	423	0.039 U	16	0.095 U	56.9
2-4 ft	0.59 U	4.0	0.41 J	20.5	21.5	18300.0	16.5	422	0.07 J	17.2	0.11 U	91.2
4-6 ft	0.43 U	4.0	0.37 J	18.5	18.8	16600.0	14.7	425	0.051 J	16.6	0.082 U	66.9

ND20-GM09

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.82 U	4.2	0.39 J	24.8	22.2	**22300.0**	16.1	**663**	0.058 J	20.2	0.16 U	82.4
2-4 ft	0.54 U	4.2	0.42 J	22.6	21.6	18300.0	21.9 J	410	0.04 U	17.2	0.1 U	96.5
4-6 ft	0.51 U	3.3	0.27 J	13.6	22.4	14000.0	18 J	231	0.032 U	12.9	0.097 U	66.3
6-8 ft	0.4 U	2.2	0.19 J	11.9	10.1	11300.0	3.5 J	243	0.031 U	12.4	0.075 U	21.3
8-10 ft	0.5 U	2.9	0.2 J	12	8.9	10700.0	3.3 J	274	0.026 U	11.2	0.095 U	20.5

ND20-GM07

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.82 U	4.5	0.42 J	26.2 J	**33.6**	**23800.0**	17.6	**603**	0.057 J	21.7 J	0.15 U	91.2
0.3-2 ft	0.78 U	5.1	0.54 J	24.4	**36.8**	**21900.0**	30.5	396	0.091 J	20.4	0.15 U	**125**
2-4 ft	0.68 U	4.9	0.74	22	**47.8**	19000.0	**51.5**	277	**0.21**	19.6	0.13 U	**192**
4-6 ft	0.55 U	3.6	0.52 J	15	**36.2**	13600.0	**56.1**	224	0.16	14.2	0.1 U	**144**
6-8 ft	0.4 U	2.8	0.18 J	11	10.1	10400.0	3.3	268	0.032 U	11.5	0.075 U	19.3
8-10 ft	0.45 U	2.6	0.14 J	9.9	7	11400.0	2.7	176	0.03 U	9.7	0.085 U	16.6

ND20-GM05

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.9 J	5.7	0.54 J	38.5 J	**35.6**	**34900.0**	21.9	**1130**	0.065 U	**31.4 J**	0.16 U	**121**
0.3-2 ft	0.82 U	5.4	0.52 J	30	**34**	**25400.0**	23 J	**592**	0.055 U	**24.2**	0.16 U	118
2-4 ft	0.67 U	5.8	0.58 J	28.9	**39.7**	**24400.0**	**37.2 J**	**484**	0.043 U	**23.2**	0.13 U	**136**
4-6 ft	0.48 U	2.1	0.15 J	8.8	6.3	8440.0	2.3 J	198	0.03 U	9	0.091 U	15.3
6-8 ft	0.47 U	2.7	0.19 J	11.7	10	11300.0	3.4 J	318	0.031 U	12.3	0.089 U	21.8

ND20-GM04

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.3 U	6.7	0.66 J	41.5	**47.8**	**36000.0**	29.1	**1060**	0.069 U	**32.1**	0.24 U	**135**
0.3-2 ft	0.59 U	5.0	0.54 J	24.6	**43.6**	**20700.0**	**45**	355	0.049 J	20.6	0.11 U	**136**
2-4 ft	0.75 U	4.8	0.67 J	26.2	**45.4**	**22600.0**	**68.4**	408	**0.27**	21.3	0.14 U	**157**
4-6 ft	0.66 U	5.6	0.91	19.6	**58.4**	16600.0	103	205	**0.2**	17	0.13 U	**254**
6-8 ft	0.46 U	3.2	0.2 J	10.6	27.9	11700.0	20.3	141	0.029 U	10.3	0.087 U	44.6
8-10 ft	0.49 U	2.1	0.15 J	9.5	7.8	9960.0	2.8	158	0.032 U	9.8	0.093 U	16.9

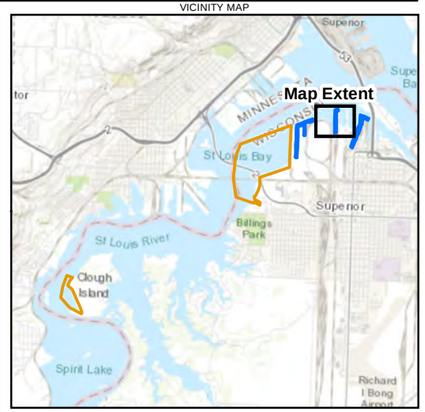
SW15-SLB06

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.48 U	5.4	0.71 J	37.4	**43.7**	32500.0	27.2	**629**	0.095 J-	**29.4**	0.13 U	**136**
0.5-2 ft	0.49 J	5.7	**1.1**	33.3	**59.7**	**24800.0**	**51.1**	**463**	0.059 UJ	**27.1**	0.27 J	**203**
2-4 ft	0.75 J	5.0	**1**	26.4	**58**	**21800.0**	**72.5**	337	**0.34**	21.7	0.29 J	**221**
4-6 ft	**2.2 J**	6.0	**1.4**	23.7	**85.8**	**22400.0**	115	290	**0.45**	19.9	0.26 J	408

ND20-GM02

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	1.1 U	6.2	0.61 J	40.7	**46.4**	36000.0	29.8	**708**	0.07 U	**32.2**	0.21 U	**140**
0.3-2 ft	1.2 J	7.0	0.99	32.9	**64.5**	30300.0	**78.8**	410	**0.31**	**26.4**	0.25 J	**209**
2-4 ft	0.72 J	4.9	0.85	27.2	**53.2**	**22400.0**	**61.2**	304	0.046 U	22.3	0.2 J	**214**
4-6 ft	0.7 U	5.1	0.89	26.2	**51.5**	**22000.0**	**64.2**	302	**0.54**	21.7	0.14 J	**222**
6-8 ft	0.82 J	6.5	**1.1**	23.7	**68.8**	**20500.0**	345	244	**0.46**	19.9	0.22 J	**265**
8-10 ft	0.54 U	3.6	0.29 J	11.3	26.2	9970.0	23.2	164	0.052 J	10.6	0.1 U	59.3

VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in mg/kg.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in blue exceed the MEC.
Concentrations shown in red exceed the PEC.

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
mg/kg - Milligrams per Kilogram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Phase Wisconsin North US Foot

Metal	TEC	MEC	PEC
	(mg/kg)		
Antimony	2	13.5	25
Arsenic	9.8	21.4	33
Cadmium	0.99	3	5
Chromium	43	76.5	110
Copper	32	91	150
Iron	20000	30000	40000
Lead	36	83	130
Manganese	460	780	1100
Mercury	0.18	0.64	1.1
Nickel	23	36	49
Silver	1.6	1.9	2.2
Zinc	120	290	460

0 200 400
Feet

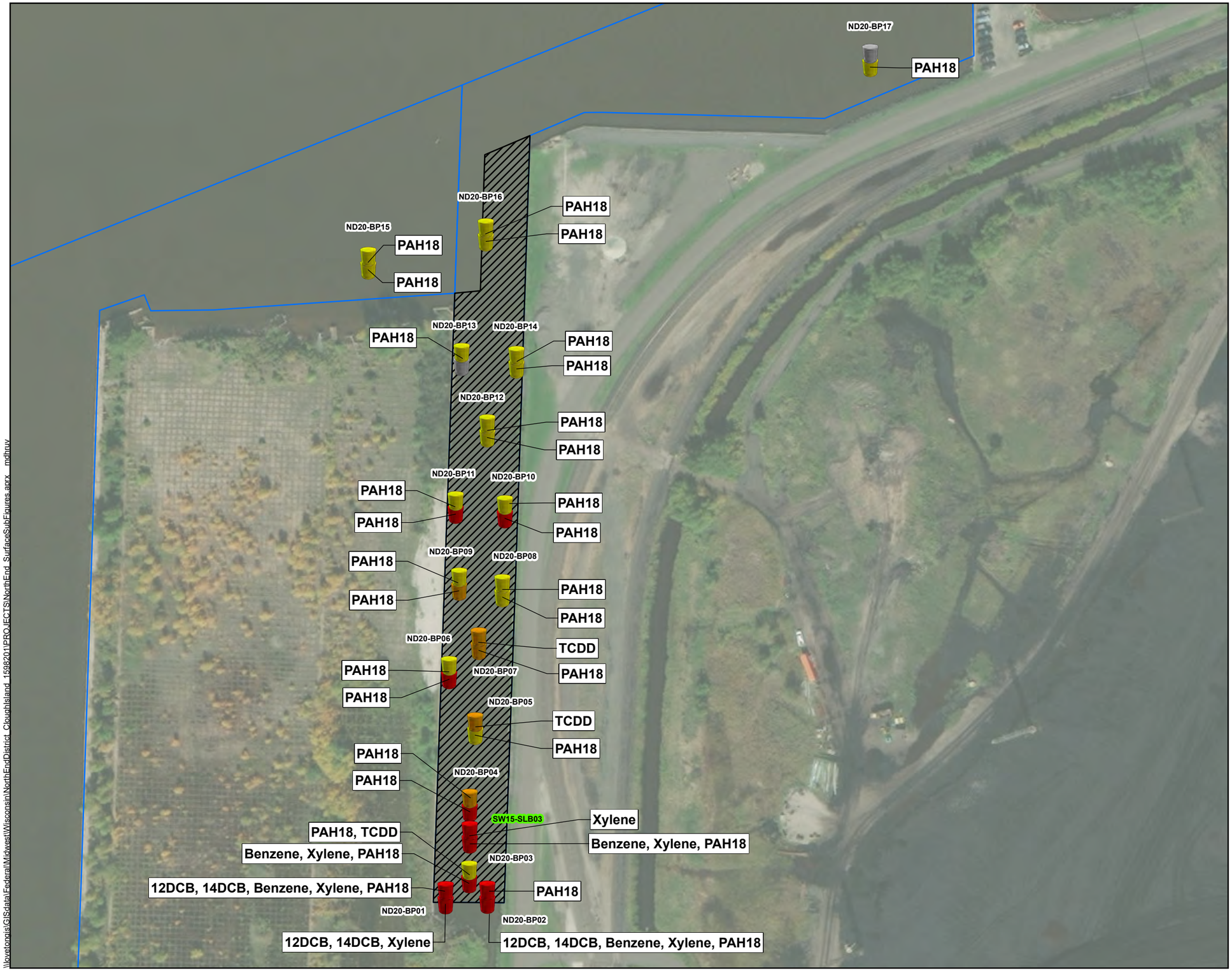
N

Figure 4-6
General Mills Slip - Metals
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_Cloughisland_1598201\MXD\Site Investigation Report\Figure 4-6 General Mills Slip-Metals.mxd bpawling

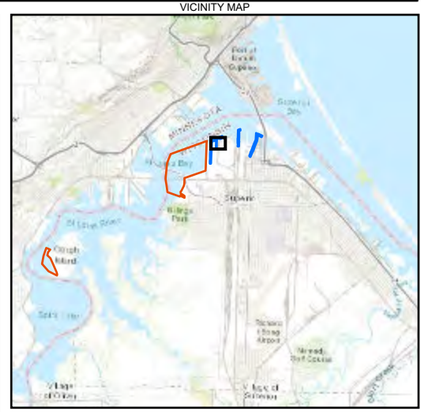
Appendix 2 – Contaminant Distribution Figures

Oils Barge Dock



\\lovetopnas\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv

VICINITY MAP



Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

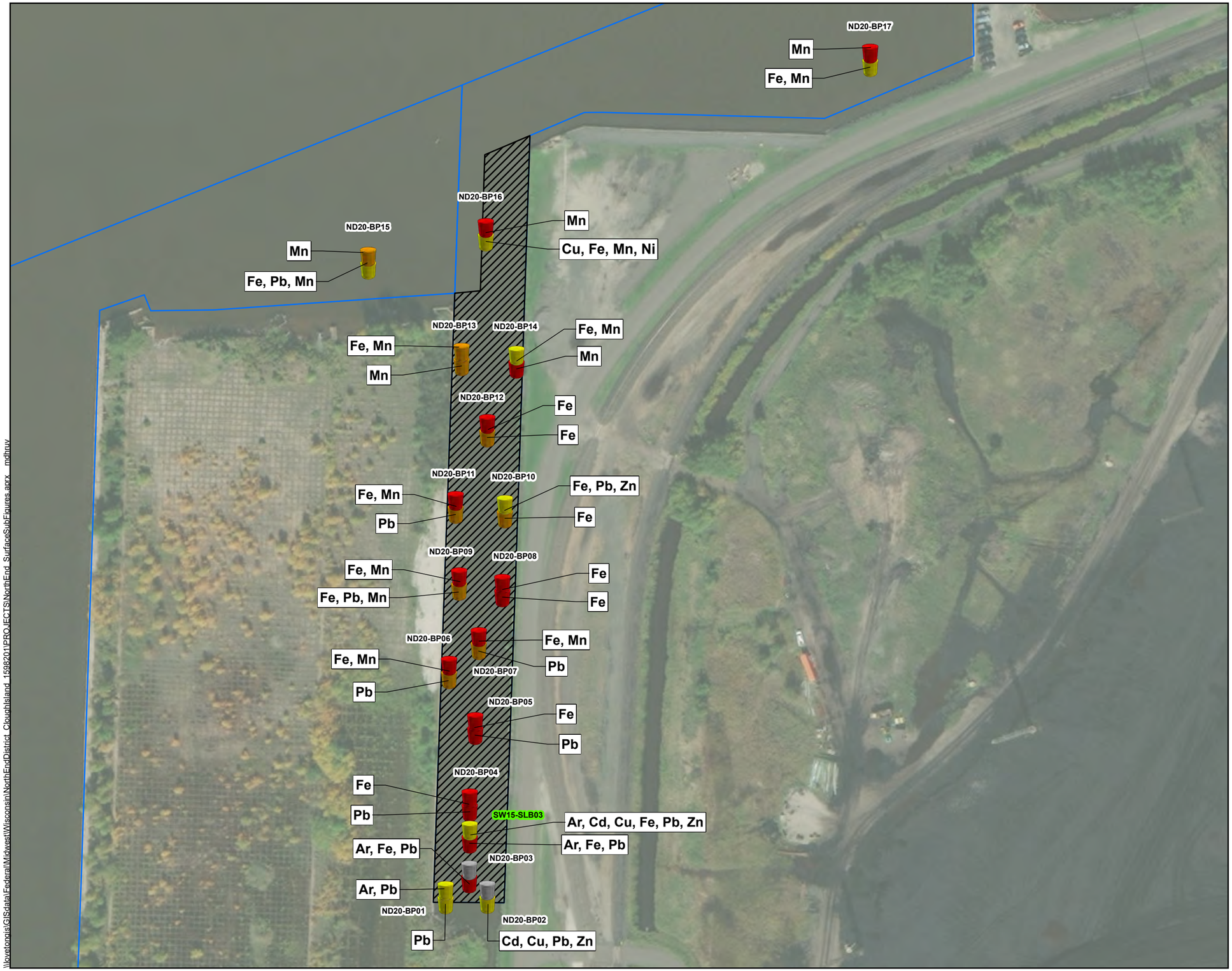
Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

0 150 300
Feet

Figure 6-3
Summary of SQG Exceedance for Surface and Subsurface Organics
Oil Barge Dock Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin



VICINITY MAP

Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

0 150 300
Feet

Figure 6-4
Summary of SQG Exceedance for Surface and Subsurface Metals
Oil Barge Dock Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetopols\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv

St. Louis Bay

ND20-BP17

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	9.1 U	4.9 U	2.5 U	4.8 U	4.1 U	11 U	1439.3	NT	NT	NT
0.3-2 ft	6.7 UJ	3.6 U	1.8 U	3.5 U	3 U	7.7 U	1073.0	NT	NT	NT
2-4 ft	6.1 U	3.3 U	1.7 U	3.2 U	2.8 U	7.1 U	1101.0	NT	NT	NT
4-6 ft	6.1 U	3.3 U	1.7 U	3.2 U	2.8 U	7 U	**2760.0**	NT	NT	NT
6-8 ft	4.4 U	2.4 U	1.2 U	2.3 U	2 U	5.1 U	770.7	NT	NT	NT
8-10 ft	4.3 U	2.3 U	1.2 U	2.3 U	2 U	5 U	482.7	NT	NT	NT

ND20-BP15

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	7.3 U	3.9 U	2 U	3.8 U	3.3 U	8.4 U	**1905.0**	NT	NT	NT
0.3-2 ft	5.8 U	3.1 U	1.6 U	3.1 U	2.6 U	6.8 U	**5357.0**	NT	NT	NT
2-4 ft	5.4 U	2.9 U	1.5 U	2.9 U	2.5 U	6.3 U	**9538.0**	NT	NT	NT
4-6 ft	5.7 U	3.1 U	1.6 U	3 U	2.6 U	6.6 U	**5941.0**	NT	NT	NT
6-8 ft	0.8 J	2.6 U	1.3 U	2.5 U	2.2 U	5.6 U	**2982.0**	NT	NT	NT
8-10 ft	5.5 U	3 U	1.5 U	2.9 U	2.5 U	6.4 U	**3097.0**	NT	NT	NT

ND20-BP13

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	13 U	7.1 U	3.6 U	7 U	6 U	15 U	**1824.0**	NT	NT	NT
0.3-2 ft	5.2 U	2.8 U	1.4 U	2.8 U	2.4 U	6 U	860.0	NT	NT	NT
2-4 ft	4.8 U	2.6 U	1.3 U	2.5 U	2.2 U	5.6 U	17.885	NT	NT	NT
4-6 ft	5.1 U	2.8 U	1.4 U	2.7 U	2.3 U	5.9 U	15.69	NT	NT	NT
6-8 ft	4.7 U	2.5 U	1.3 U	2.5 U	2.1 U	5.5 U	15.425	NT	NT	NT
8-10 ft	270 U	150 U	75 U	140 U	120 U	320 U	47.35	NT	NT	NT

ND20-BP12

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	10 U	5.5 U	2.8 U	5.4 U	4.6 U	12 U	**3137.0**	NT	NT	NT
0.3-2 ft	6.7 U	3.6 U	1.8 U	3.5 U	3 U	7.8 U	**6468.0**	NT	NT	NT
2-4 ft	6.3 U	3.4 U	1.7 U	3.3 U	2.9 U	7.3 U	**2448.0**	NT	NT	NT
4-6 ft	5.9 U	3.2 U	1.6 U	3.1 U	2.7 U	6.9 U	994.0	NT	NT	NT
6-8 ft	6.1 U	3.3 U	1.7 U	3.2 U	2.7 U	7 U	165.3	NT	NT	NT
8-10 ft	5.9 U	3.2 U	1.6 U	3.1 U	2.7 U	6.8 U	80.9	NT	NT	NT

ND20-BP11

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	11 U	5.8 U	3 U	5.7 U	4.9 U	12 U	**3048.0**	NT	NT	NT
0.3-2 ft	6.6 U	3.6 U	1.8 U	3.5 U	3 U	7.7 U	**33181.0**	NT	NT	NT
2-4 ft	6 U	3.2 U	1.6 U	3.2 U	2.7 U	6.9 U	42.36	NT	NT	NT
4-6 ft	7.5 U	4 U	2.1 U	4 U	3.4 U	8.7 U	27.1	NT	NT	NT
6-8 ft	5.2 U	2.8 U	1.4 U	2.7 U	2.3 U	6 U	16.9	NT	NT	NT
8-10 ft	5.4 U	2.9 U	1.5 U	2.9 U	2.4 U	6.3 U	14.14	NT	NT	NT

ND20-BP09

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	8.4 U	4.5 U	2.3 U	4.4 U	3.8 U	9.8 U	**2600.0**	NT	NT	NT
0.3-2 ft	7 UJ	3.8 U	1.9 U	3.7 U	3.2 U	8.1 U	**5174.0**	NT	NT	NT
2-4 ft	6.6 UJ	3.5 U	1.8 U	3.5 U	3 U	7.6 U	**17850.0**	NT	NT	NT
4-6 ft	5.6 UJ	3 U	1.5 U	3 U	2.5 U	6.5 U	**6789.5**	NT	NT	NT
6-8 ft	5.9 UJ	3.2 U	1.6 U	3.1 U	2.7 U	6.8 U	214.85	NT	NT	NT
8-10 ft	6 U	3.2 U	1.7 U	3.2 U	2.7 U	7 U	136.15	NT	NT	NT
10-12 ft	0.65 J	2.9 U	1.5 U	2.9 U	2.5 U	6.3 U	59.8	NT	NT	NT
12-14 ft	5.1 UJ	2.7 U	1.4 U	2.7 U	2.3 U	5.9 U	29.14	NT	NT	NT

ND20-BP06

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	1.3 J	0.48 J	0.44 J	5.3 U	0.43 J	0.6 J	**5459.0**	NT	NT	NT
0.3-2 ft	6.1 UJ	3.3 U	1.7 U	3.2 U	2.7 U	7 U	**25925.5**	NT	NT	NT
2-4 ft	5 UJ	2.7 U	1.4 U	2.7 U	2.3 U	5.8 U	35.485	NT	NT	NT
4-6 ft	4.7 UJ	2.5 U	1.3 U	2.5 U	2.1 U	13 J	47.565	NT	NT	NT
6-8 ft	5 UJ	2.7 U	1.4 U	2.6 U	2.3 U	5.8 U	36.985	NT	NT	NT
8-10 ft	4.5 UJ	2.4 U	1.2 U	2.4 U	2.1 U	5.2 U	28.165	NT	NT	NT
10-12 ft	4.7 UJ	2.5 U	1.3 U	2.5 U	2.1 U	5.4 U	13.165	NT	NT	NT
12-14 ft	4.8 UJ	2.6 U	1.3 U	2.6 U	2.2 U	5.6 U	13.42	NT	NT	NT

SW15-SLB03

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.5 ft	420 UJ	320 UJ	330 UJ	310 UJ	740 J	**950**	**8447.5**	0	NT	NT
0.5-2 ft	110 U	84 U	87 U	**510 J**	810	**1790**	**22132.5**	21	NT	NT
2-4 ft	240 U	180 U	190 U	170 U	640 J	**1750**	**25787.5**	15	NT	NT
4-6 ft	100 U	77 U	79 U	74 U	270 J	**780**	**20298.5**	12	NT	NT
6-8 ft	88 U	66 U	68 U	64 U	180 J	**390**	**11965.5**	**112**	NT	NT
8-10 ft	79 U	59 U	61 U	57 U	120 J	**229**	**15101.0**	0	NT	NT

ND20-BP01

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	280 U J	**110 J**	**100 J**	**130 J**	490 J	**770 J**	**37764.0**	NT	NT	NT
0.3-2 ft	380 U J	**130 J**	**120 J**	200 U	46 J	**76 J**	**13354.8**	NT	NT	NT
2-4 ft	5.1 U	2.8 U	1.4 U	2.7 U	2.3 U	6 U	**2521.0**	NT	NT	NT
4-6 ft	330 U J	**130 J**	**120 J**	46 J	420 J	**290 J**	68.0	NT	NT	NT
6-8 ft	5.1 U	2.7 U	1.4 U	2.7 U	2.3 U	5.9 U	19.18	NT	NT	NT
8-10 ft	5.3 U J	2.8 U	1.5 U	2.8 U	2.4 U	6.1 U	28.4	NT	NT	NT
10-12 ft	4.6 U	2.5 U	1.3 U	2.4 U	2.1 U	5.3 U	13.62	NT	NT	NT
12-14 ft	350 U J	**110 J**	**120 J**	180 U	38 J	400 U	29.23	NT	NT	NT

ND20-BP03

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	290 U J	3.3 U	1.7 U	19 J	35 J	7.1 U	**4742.0**	3	**2.7808**	2.5 U
0.3-2 ft	290 U J	160 U	81 U	46 J	160 J	**190 J**	**46580.5**	NT	NT	NT
2-4 ft	5.7 U	3.1 U	1.6 U	3 U	2.6 U	6.6 U	**51468.5**	NT	NT	NT
4-6 ft	420 U J	230 U	110 U	**550 J**	770 J	**1600 J**	**37870.0**	NT	NT	NT
6-8 ft	290 U J	150 U	78 U	**850 J**	810 J	**2000 J**	**40975.0**	NT	NT	NT
8-10 ft	480 U J	260 U	130 U	**820 J**	640 J	**2100 J**	**82960.0**	NT	NT	NT
10-12 ft	560 U J	300 U	150 U	**79 J**	220 J	**460 J**	**93410.0**	NT	NT	NT
12-14 ft	440 U J	240 U	120 U	35 J	140 J	**530 J**	**61420.0**	NT	NT	NT
14-16 ft	6.3 U	3.4 U	1.7 U	3.3 U	2.9 U	7.3 U	**34931.5**	NT	NT	NT
16-16 ft	5.2 U	2.8 U	1.4 U	2.7 U	2.3 U	6 U	**12725.0**	NT	NT	NT
18-20 ft	5 U	2.7 U	1.4 U	2.6 U	2.2 U	5.7 U	131.75	NT	NT	NT

ND20-BP16

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	7.8 U	4.2 U	2.1 U	4.1 U	3.5 U	9 U	**2939.0**	NT	NT	NT
0.3-2 ft	6.6 U	3.5 U	1.8 U	3.5 U	3 U	7.6 U	**2861.0**	NT	NT	NT
2-4 ft	6.6 U	3.6 U	1.8 U	3.5 U	3 U	7.6 U	**2351.0**	NT	NT	NT
4-6 ft	5.5 U	3 U	1.5 U	2.9 U	2.5 U	6.4 U	**6768.0**	NT	NT	NT
6-8 ft	4.9 U	2.6 U	1.3 U	2.6 U	2.2 U	5.7 U	151.95	NT	NT	NT
8-10 ft	4.5 U	2.4 U	1.2 U	2.4 U	2 U	5.2 U	27.35	NT	NT	NT

ND20-BP14

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	6.3 U	3.4 U	1.7 U	3.3 U	2.9 U	7.3 U	**1682.5**	NT	NT	NT
0.3-2 ft	4.5 U	2.4 U	1.2 U	2.4 U	2 U	5.2 U	1475.0	NT	NT	NT
2-4 ft	3.9 U	2.1 U	1.1 U	2 U	1.7 U	4.5 U	**2155.0**	NT	NT	NT
4-6 ft	5.5 U	3 U	1.5 U	2.9 U	2.5 U	6.4 U	153.7	NT	NT	NT
6-8 ft	4.7 U	2.6 U	1.3 U	2.5 U	2.1 U	5.5 U	220.7	NT	NT	NT
8-10 ft	5.1 U	2.7 U	1.4 U	2.7 U	2.3 U	5.9 U	735.0	NT	NT	NT

ND20-BP10

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	0.9 J	3.8 U	2 U	3.8 U	3.2 U	8.3 U	**3619.0**	NT	NT	NT
0.3-2 ft	7 U	3.8 U	1.9 U	3.7 U	3.2 U	8.1 U	**24933.5**	NT	NT	NT
2-4 ft	4.4 U	2.4 U	1.2 U	2.3 U	2 U	5.1 U	16.06	NT	NT	NT
4-6 ft	4 U	2.2 U	1.1 U	2.1 U	1.8 U	4.7 U	12.265	NT	NT	NT
6-8 ft	4.2 U	2.3 U	1.1 U	2.2 U	1.9 U	4.8 U	312.4	NT	NT	NT
8-10 ft	5.8 U	3.1 U	1.6 U	3 U	2.6 U	6.7 U	348.85	NT	NT	NT

ND20-BP08

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	10 U	5.4 U	2.8 U	5.3 U	4.6 U	12 U	**5075.0**	NT	NT	NT
0.3-2 ft	12 U	6.5 U	3.3 U	6.4 U	5.5 U	2.9 J	**3391.0**	NT	NT	NT
2-4 ft	4.2 U	2.2 U	1.1 U	2.2 U	1.9 U	4.8 U	**2047.0**	NT	NT	NT
4-6 ft	4.4 U	2.3 U	1.2 U	2.3 U	2 U	5.1 U	409.1	NT	NT	NT
6-8 ft	5.7 U	3.1 U	1.6 U	3 U	2.6 U	6.7 U	594.1	NT	NT	NT
8-10 ft	5.7 U	3.1 U	1.6 U	3 U	2.6 U	6.6 U	628.6	NT	NT	NT
10-12 ft	5.2 U	2.8 U	1.4 U	2.8 U	2.4 U	6.1 U	591.7	NT	NT	NT
12-14 ft	5.3 U	2.8 U	1.4 U	2.8 U	2.4 U	6.1 U	464.7	NT	NT	NT

ND20-BP07

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	8.8 UJ	4.7 U	2.4 U	4.6 U	4 U	10 U	**4552.0**	16	**13.5975**	4.4 U
0.3-2 ft	6.4 U	3.5 U	1.8 U	3.4 U	2.9 U	7.5 U	**21164.5**	NT	NT	NT
2-4 ft	5.1 U	2.8 U	1.4 U	2.7 U	2.3 U	5.9 U	**2774.95**	NT	NT	NT
4-6 ft	5.8 U	3.1 U	1.6 U	3 U	2.6 U	6.7 U	1458.3	NT	NT	NT
6-8 ft	5.3 U	2.9 U	1.5 U	2.8 U	2.4 U	6.2 U	**2012.3**	NT	NT	NT
8-10 ft	4.6 U	2.5 U	1.3 U	2.4 U	2.1 U	5.4 U	**1759.95**	NT	NT	NT
10-12 ft	5.6 U	3 U	1.5 U	2.9 U	2.5 U	6.5 U	52.88	NT	NT	NT
12-14 ft	4.9 U	2.7 U	1.4 U	2.6 U	2.2 U	5.7 U	57.0	NT	NT	NT

ND20-BP05

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	9 UJ	4.8 U	2.5 U	4.8 U	4.1 U	10 U	**8483.0**	20	**13.2655**	4.5 U
0.3-2 ft	5.4 U	2.9 U	1.5 U	2.8 U	2.4 U	6.2 U	**6349.0**	NT	NT	NT
2-4 ft	4.8 U	2.6 U	1.3 U	2.5 U	2.2 U	5.5 U	**2664.0**	NT	NT	NT
4-6 ft	4.2 U	2.3 U	1.2 U	2.2 U	1.9 U	4.9 U	**2322.5**	NT	NT	NT
6-8 ft	5.7 U	3.1 U	1.6 U	3 U	2.6 U	6.6 U	353.25	NT	NT	NT
8-10 ft	5.2 U	2.8 U	1.4 U	2.7 U	2.3 U	6 U	253.15	NT	NT	NT
10-12 ft	4.5 U	2.4 U	1.2 U	2.4 U	2.1 U	5.2 U	17.805	NT	NT	NT
12-14 ft	4.6 U	2.5 U	1.3 U	2.4 U	2.1 U	5.3 U	13.27	NT	NT	NT

ND20-BP04

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	12 U	6.6 U	3.4 U	6.5 U	5.6 U	14 U	**16410.0**	NT	NT	NT
0.3-2 ft	6 U	3.2 U	1.6 U	3.1 U	2.7 U	6.9 U	**30543.5**	NT	NT	NT
2-4 ft	5.6 U	3 U	1.5 U	2.9 U	2.5 U	6.4 U	**12627.5**	NT	NT	NT
4-6 ft	5.6 U	3 U	1.5 U	2.9 U	0.65 J	6.5 U	**17065.0**	NT	NT	NT
6-8 ft	5.2 U	2.8 U	1.4 U	2.7 U	0.58 J	6 U	**10753.0**	NT	NT	NT
8-10 ft	6.6 U	3.6 U	1.8 U	3.5 U	3 U	7.6 U	**21342.5**	NT	NT	NT
10-12 ft	6.2 U	3.3 U	1.7 U	3.3 U	2.8 U	7.2 U	**44612.0**	NT	NT	NT
12-14 ft	4.5 U	2.4 U	1.2 U	2.4 U	2 U	5.2 U	40.72	NT	NT	NT

ND20-BP02

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	4.7 U	2.5 U	1.3 U	2.5 U	2.1 U	5.5 U	**31278.5**	25	**4.707**	3.1 U
0.3-2 ft	230 U J	**92 J**	**87 J**	**256 J**	340 J	**710 J**	**9095.5**	NT	NT	NT
2-4 ft	5.1 U J	2.7 U J	1.4 U J	2.7 U	2.3 U	5.8 U	**30106.5**	NT	NT	NT
4-6 ft	5.6 U	3 U	1.5 U	3 U	2.5 U	6.5 U	**4292.3**	NT	NT	NT
6-8 ft	5 U	2.7 U	1.4 U	2.6 U	2.3 U	5.8 U	180.05	NT	NT	NT
8-10 ft	5 U	2.7 U	1.4 U	2.6 U	2.3 U	5.8 U	100.05	NT	NT	NT
10-12 ft	4.5 U	2.4 U	1.2 U	2.4 U	2.1 U	5.3 U	34.45	NT	NT	NT
12-14 ft	260 U J	**98 J**	**98 J**	17 J	28 J	**49 J**	36.95	NT	NT	NT

VICINITY MAP

Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in ug/kg.
Fish TEQ results are in pg/g.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in **blue** exceed the MEC.
Concentrations shown in **red** exceed the PEC.
TCDD TEQ in text boxes calculated as Fish TEQ (ND=1/2RL)

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
NT = Not tested.
ug/kg - Micrograms per kilogram
pg/g - Picograms per gram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

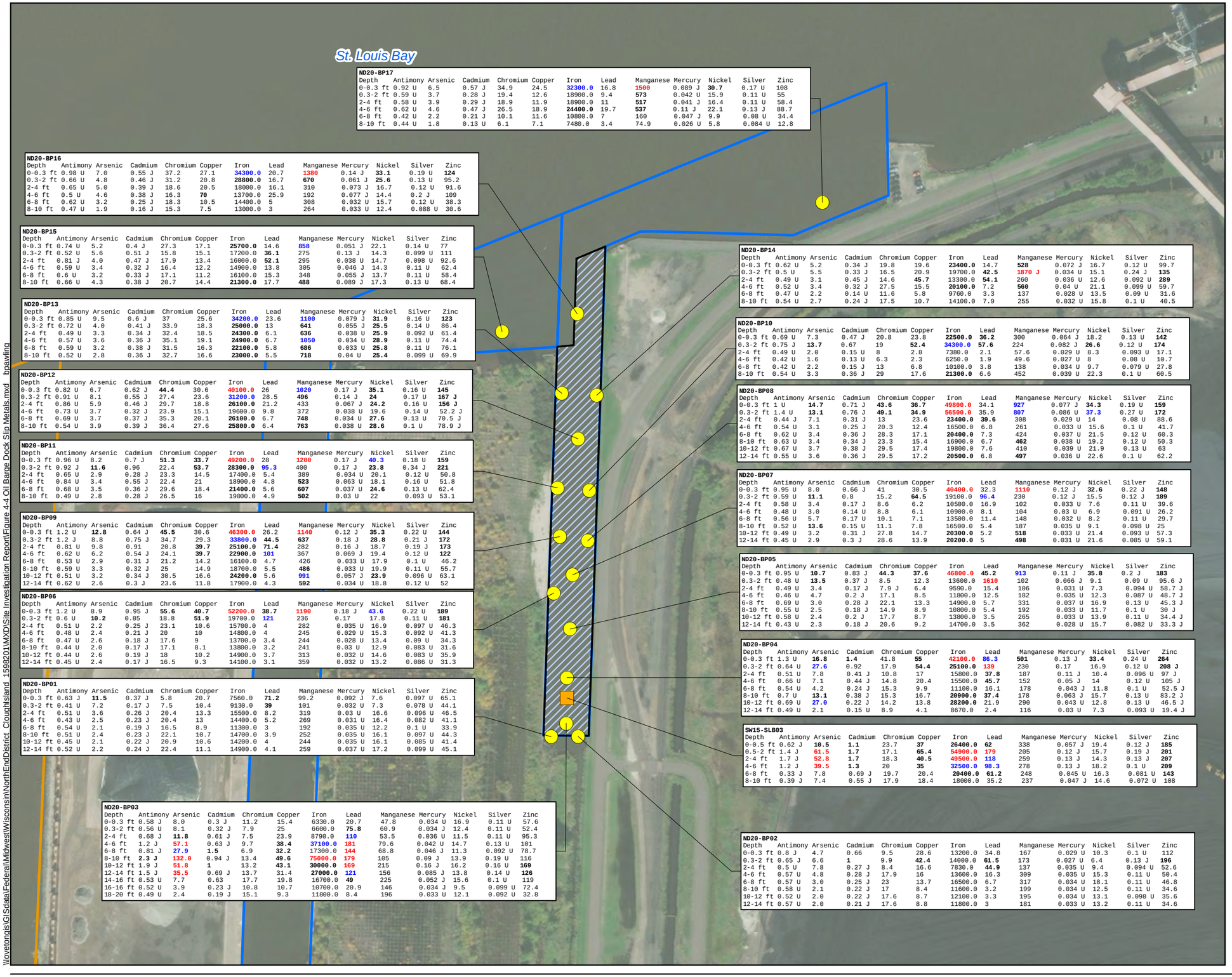
Analyte	Abbreviation	TEC	MEC	PEC
		(ug/kg)		
1,2,4-Trichlorobenzene	1,2,4-TCB	8	13	18
1,2-Dichlorobenzene	1,2-DCB	23		23
1,4-Dichlorobenzene	1,4-DCB	31	60.5	90
Benzene	Benzene	57	83.5	110
Toluene	Toluene	890	1345	1800
Xylene	Xylene	25	37.5	50
Total PAH18 ND=1/2RL	PAH18	1610	12205	22800
Total PCBs ND=0	PCBs	60	368	676
FISH TEQ (ND=1/2RL)	TCDD TEQ	0.85	11.2	21.5
Tributyltin	TBT	0.52	1.73	2.94

0 100 200
Feet

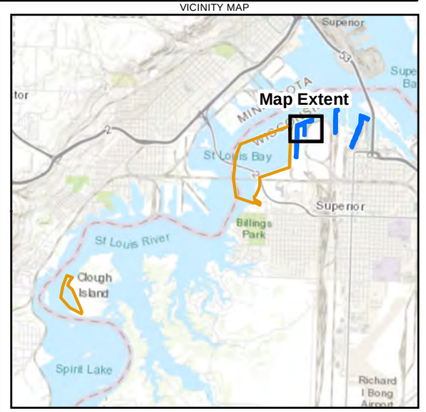
N

Figure 4-3
Oil Barge Dock Slip - Organics
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetonqis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 4-3 Oil Barge Dock Slip Organics.mxd bpawling



VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in mg/kg.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in blue exceed the MEC.
Concentrations shown in red exceed the PEC.

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
mg/kg - Milligrams per Kilogram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

Metal	TEC	MEC	PEC
	(mg/kg)		
Antimony	2	13.5	25
Arsenic	9.8	21.4	33
Cadmium	0.99	3	5
Chromium	43	76.5	110
Copper	32	91	150
Iron	20000	30000	40000
Lead	36	83	130
Manganese	460	780	1100
Mercury	0.18	0.64	1.1
Nickel	23	36	49
Silver	1.6	1.9	2.2
Zinc	120	290	460

0 100 200
Feet

N

Figure 4-4
Oil Barge Dock Slip - Metals
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\FederalMidwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 4-4 Oil Barge Dock Slip Metals.mxd bpawling

Appendix 2 – Contaminant Distribution Figures

Hallet Dock 8 / C. Reiss Slip

VICINITY MAP

Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

0 200 400
Feet

Figure 6-1
Summary of SQG Exceedance for Surface and Subsurface Organics
Hallet Dock 8 Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\ovetongis\GISdata\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv

VICINITY MAP

Legend

Exceedance

- No Exceedance
- ≥ TEC
- ≥ MEC
- ≥ PEC
- Dock Walls Acoustic Survey Area
- Sediment Characterization Area
- Sediment Characterization and Survey Area

Notes:
Top tier symbol indicates surface sample exceedance (0-0.3 ft).
Lower tier symbol indicates subsurface exceedance.
Compounds indicated in text box exceed either the TEC, MEC, or PEC.
Green halo on location tag indicates historical sample.

Map Date: 3/4/2021
Source: Esri Aerial 2019
Projection: NAD83 StatePlane WI North

N

0 200 400
Feet

Figure 6-2
Summary of SQG Exceedance for Surface and Subsurface Metals
Hallet Dock 8 Slip
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\ovetongis\GISdata\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\PROJECTS\NorthEnd_SurfaceSubFigures.aprx mdhruv

St. Louis Bay

ND20-HD06

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	5.7 U	3.1 U	1.6 U	3 U	2.6 U	6.6 U	1233.0	NT	NT	NT
0.3-1 ft	6.1 U	3.3 U	1.7 U	3.2 U	2.8 U	7.1 U	302.5	NT	NT	NT
1-2 ft	NT	NT	NT	NT	NT	NT	**2040.0**	NT	NT	NT
2-3 ft	NT	NT	NT	NT	NT	NT	1381.1	NT	NT	NT
3-4 ft	NT	NT	NT	NT	NT	NT	188.6	NT	NT	NT

ND20-HD05

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	5.2 U	2.8 U	1.4 U	2.7 U	2.4 U	6 U	1162.35	NT	NT	NT
0.3-1 ft	4.6 U	2.5 U	1.3 U	2.4 U	2.1 U	5.3 U	1566.0	NT	NT	NT
1-2 ft	5.8 U	3.1 U	1.6 U	3.1 U	2.6 U	6.7 U	**4342.0**	NT	NT	NT
2-3 ft	NT	NT	NT	NT	NT	NT	**3898.0**	NT	NT	NT
3-4 ft	NT	NT	NT	NT	NT	NT	1420.0	NT	NT	NT
4-5 ft	NT	NT	NT	NT	NT	NT	23.67	NT	NT	NT

ND20-HD04

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	7.8 U	4.2 U	2.1 U	4.1 U	3.6 U	9.1 U	**6154.0**	7.2	**5.4684**	2.3 UJ
0.3-1 ft	5.5 U	3 U	1.5 U	2.9 U	2.5 U	6.4 U	**20290.0**	NT	NT	NT
1-2 ft	NT	NT	NT	NT	NT	NT	**13969.0**	NT	NT	NT
2-3 ft	NT	NT	NT	NT	NT	NT	**13109.0**	NT	NT	NT
3-4 ft	NT	NT	NT	NT	NT	NT	**8687.5**	NT	NT	NT

ND20-HD03

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	5.6 U	3 U	1.5 U	3 U	2.5 U	6.5 U	**7231.0**	8.3	**5.6371**	2.3 UJ
0.3-1 ft	4.7 U	2.5 U	1.3 U	2.5 U	2.1 U	5.5 U	**22090.0**	NT	NT	NT
1-2 ft	NT	NT	NT	NT	NT	NT	**14150.0**	NT	NT	NT
2-3 ft	NT	NT	NT	NT	NT	NT	547.31	NT	NT	NT
3-4 ft	NT	NT	NT	NT	NT	NT	63.21	NT	NT	NT

SW15-SLB02

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.5 ft	160 U	120 U	120 U	110 U	650 J	240 U	**7881.0**	12	NT	NT
0.5-2 ft	53 U	40 U	41 U	38 U	36 U	82 U	104.65	0	NT	NT
2-4 ft	56 U	42 U	44 U	41 U	38 U	88 U	105.75	0	NT	NT
4-6 ft	NT	NT	NT	NT	NT	NT	107.85	NT	NT	NT
6-8 ft	NT	NT	NT	NT	NT	NT	101.35	NT	NT	NT

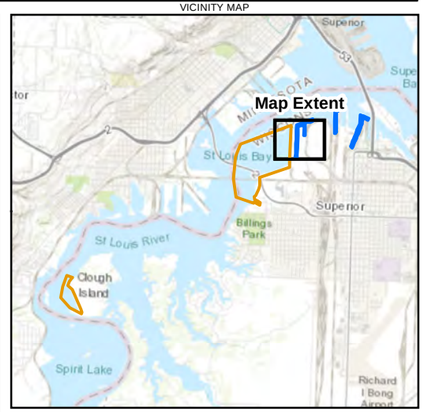
ND20-HD02

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	4.8 U	2.6 U	1.3 U	2.6 U	2.2 U	5.6 U	**1832.5**	NT	NT	NT
0.3-1 ft	4.8 U	2.6 U	1.3 U	2.5 U	2.2 U	5.6 U	**2716.2**	NT	NT	NT
1-2 ft	NT	NT	NT	NT	NT	NT	261.0	NT	NT	NT
2-3 ft	NT	NT	NT	NT	NT	NT	166.8	NT	NT	NT
3-4 ft	NT	NT	NT	NT	NT	NT	137.9	NT	NT	NT

ND20-HD01

Depth	1,2,4-TCB	1,2-DCB	1,4-DCB	Benzene	Toluene	Xylene	PAH18	PCBs	TCDD TEQ	TBT
0-0.3 ft	5.9 U	3.2 U	1.6 U	3.1 U	2.7 U	6.8 U	**19108.0**	47.3	**5.8883**	2.5 UJ
0.3-1 ft	4.3 U	2.3 U	1.2 U	2.3 U	1.9 U	4.9 U	144.07	NT	NT	NT
1-2 ft	NT	NT	NT	NT	NT	NT	11.995	NT	NT	NT
2-3 ft	NT	NT	NT	NT	NT	NT	12.535	NT	NT	NT
3-4 ft	NT	NT	NT	NT	NT	NT	13.06	NT	NT	NT

VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in ug/kg.
Fish TEQ results are in pg/g.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in **blue** exceed the MEC.
Concentrations shown in **red** exceed the PEC.
TCDD TEQ in text boxes calculated as Fish TEQ (ND=1/2RL)

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
NT = Not tested.
ug/kg - Micrograms per kilogram
pg/g - Picograms per gram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 2/16/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

Analyte	Abbreviation	TEC	MEC	PEC
		(ug/kg)		
1,2,4-Trichlorobenzene	1,2,4-TCB	8	13	18
1,2-Dichlorobenzene	1,2-DCB	23		23
1,4-Dichlorobenzene	1,4-DCB	31	60.5	90
Benzene	Benzene	57	83.5	110
Toluene	Toluene	890	1345	1800
Xylene	Xylene	25	37.5	50
Total PAH18 ND=1/2RL	PAH18	1610	12205	22800
Total PCBs ND=0	PCBs	60	368	676
FISH TEQ (ND=1/2RL)	TCDD TEQ	0.85	11.2	21.5
Tributyltin	TBT	0.52	1.73	2.94

0 200 400
Feet

N

Figure 4-1
Hallet Dock **8** Slip Results - Organics
North End District and Clough Island Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetonnis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 4-1 Hallet Dock Slip 8 Results Organics.mxd bpawling

St. Louis Bay

ND20-HD06

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.54 U	2.6	0.16 U	11.3	7.2	13300.0	5.7	255	0.035 U	10.6	0.1 U	36.2
0.3-1 ft	0.59 U	2.4	0.18 U	12.3	7.5	12100.0	5.8 J	212 J	0.028 U	10.6 J	0.11 U	33.2 J
1-2 ft	0.69 U	3.6	0.37 J	19.5	15.1	18500.0	15.6 J	318 J	0.067 J	16.8 J	0.13 U	74 J
2-3 ft	0.44 U	3.8	0.24 J	11	15.4	16800.0	23.8 J	353 J	0.047 J	**49.9 J**	0.084 U	83.3 J
3-4 ft	0.53 U	4.5	0.34 J	12.5	10.1	14100.0	**106 J**	139 J	0.031 U	**37 J**	0.1 U	86.7 J

ND20-HD05

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.48 U	2.2	0.14 U	10.5	6.3	11000.0	4.5	140	0.032 U	9.2	0.091 U	26.6
0.3-1 ft	0.57 U	3.0	0.26 J	16.1	10.7	16000.0	10.3 J	207 J	0.033 U	13.4 J	0.11 U	50.9 J
1-2 ft	0.63 U	4.3	0.46 J	19.2	17.1	18600.0	21.1 J	201 J	0.081 J	16.6 J	0.12 U	90.4 J
2-3 ft	0.76 U	6.1	0.58 J	23	25.4	**24200.0**	32.5 J	221 J	0.16	19.4 J	0.14 U	**141 J**
3-4 ft	0.5 U	3.7	0.26 J	13.3	10.8	14000.0	31.5 J	138 J	0.082 J	13.2 J	0.095 U	60 J
4-5 ft	0.51 U	1.7	0.15 U	10.6	6	9380.0	2.8 J	119 J	0.029 U	9.6 J	0.096 U	19.3 J

ND20-HD04

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.56 U	3.3	0.3 J	14.5	10.2	15100.0	23.4 J	356 J	0.05 J	13.4 J	0.11 U	57.7 J
0.3-1 ft	0.61 U	3.9	0.33 J	14.5	12.8	14800.0	13.3 J	213 J	0.041 J	13.7 J	0.12 U	54.8 J
1-2 ft	0.52 U	5.0	0.44 J	16.6	17.4	18200.0	23 J	198 J	0.075 J	17.2 J	0.098 U	88.6 J
2-3 ft	0.53 U	6.0	0.39 J	14	16.3	16000.0	27.1 J	141 J	0.1 J	15.9 J	0.1 U	84.8 J
3-4 ft	0.52 U	6.9	0.56	13.6	20.8	17300.0	27.9 J	188 J	**0.23**	15.9 J	0.099 U	**125 J**

ND20-HD03

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.62 U	3.1	0.25 J	13.9	10.8	14300.0	8.9 J	332 J	0.064 J	12.4 J	0.12 U	46.1 J
0.3-1 ft	0.52 U	4.6	0.18 J	9.7	9.7	11500.0	11.7	120	0.057 J	9.7	0.099 U	37.9
1-2 ft	0.59 U	6.2	0.2 J	11.9	15.3	10200.0	21.3	122	0.086 J	11.3	0.11 U	43.4
2-3 ft	0.44 U	1.8	0.13 U	8.2	5.1	8160.0	3	118	0.03 U	7.3	0.083 U	14.5
3-4 ft	0.49 U	1.5	0.15 U	7.9	4	7830.0	2.3	94.2	0.031 J	6.3	0.093 U	12.5

SW15-SLB02

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.5 ft	0.42 UJ	6.4	0.69 J	28.3	22.1	**28700.0**	17.3	**720**	0.063 U	22.4	0.12 U	90.3
0.5-2 ft	0.21 UJ	3.5	0.3 J	14.9	13.5	14800.0	4.5	360	0.032 U	13.9	0.058 U	27.9
2-4 ft	0.21 UJ	2.3	0.31 J	14.4	13.7	11900.0	4.6	415	0.034 U	13.1	0.057 U	27.5
4-6 ft	0.22 UJ	1.9	0.22 J	10.5	8.2	9860.0	3.2	244	0.035 U	10	0.061 U	19.1
6-8 ft	0.25 UJ	1.9	0.26 J	9	5.7	9010.0	2.5	196	0.031 U	8.2	0.069 U	15.6

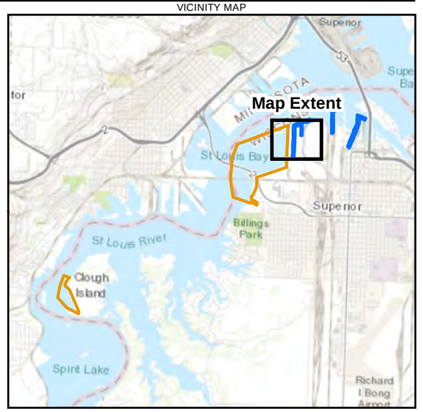
ND20-HD02

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.49 U	2.8	0.2 J	14	10.7	13600.0	15.2	247	0.034 U	12	0.092 U	42.1
0.3-1 ft	0.53 U	2.5	0.2 J	14.3	17.9	13000.0	5.5	283	0.048 J	13.1	0.1 U	25.1
1-2 ft	0.53 U	2.2	0.16 U	14.2	10.2	12300.0	5.1	205	0.028 U	12.5	0.1 U	21.9
2-3 ft	0.49 U	1.8	0.14 U	11.7	8.4	10300.0	4.5	186	0.032 U	10.7	0.092 U	19.4
3-4 ft	0.39 U	2.2	0.11 U	12.3	8.9	11400.0	6.2	161	0.027 U	11.1	0.073 U	21.3

ND20-HD01

Depth	Antimony	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Silver	Zinc
0-0.3 ft	0.65 U	3.1	0.29 J	15.1	14.6	17000.0	13.2 J	387 J	0.083 J	13.2 J	0.12 U	54.5 J
0.3-1 ft	0.44 U	3.0	0.2 J	**50.3**	9.5	15000.0	22.3	**1420**	0.028 U	9.8	0.084 U	30.7
1-2 ft	0.51 U	2.1	0.17 J	10.4	8	9140.0	3	184	0.029 U	9.7	0.096 U	18.5
2-3 ft	0.53 U	2.6	0.18 J	12.9	9.9	11500.0	3.6	227	0.037 J	11.7	0.1 U	22.6
3-4 ft	0.47 U	2.5	0.16 J	11.2	8.9	10700.0	3.3	213	0.03 U	11.4	0.088 U	21.5

VICINITY MAP



Legend

- Sediment Sample Location
- Historical Sediment Sample Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Notes:
Sample results are in mg/kg.
Concentrations shown in **BOLD** exceed the TEC.
Concentrations shown in blue exceed the MEC.
Concentrations shown in red exceed the PEC.

Acronyms:
J = Indicates that the concentration is an estimated value.
U = Indicates the analyte was analyzed for but not detected.
mg/kg - Milligrams per Kilogram
TEC = Threshold Effect Concentration
MEC = Midpoint Effect Concentration
PEC = Probable Effect Concentration

Map Date: 3/3/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

Metal	TEC	MEC	PEC
	(mg/kg)		
Antimony	2	13.5	25
Arsenic	9.8	21.4	33
Cadmium	0.99	3	5
Chromium	43	76.5	110
Copper	32	91	150
Iron	20000	30000	40000
Lead	36	83	130
Manganese	460	780	1100
Mercury	0.18	0.64	1.1
Nickel	23	36	49
Silver	1.6	1.9	2.2
Zinc	120	290	460

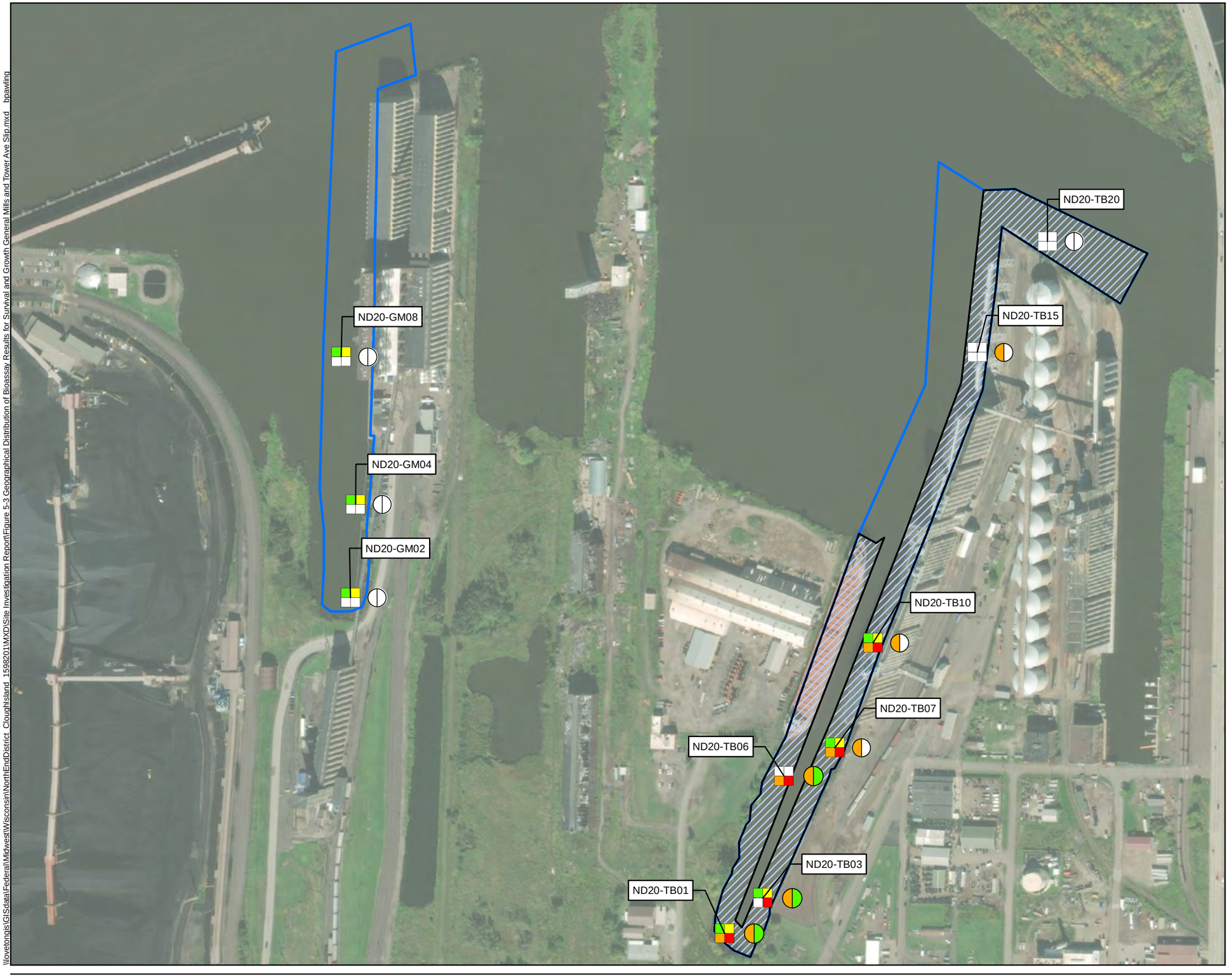
0 200 400
Feet

N

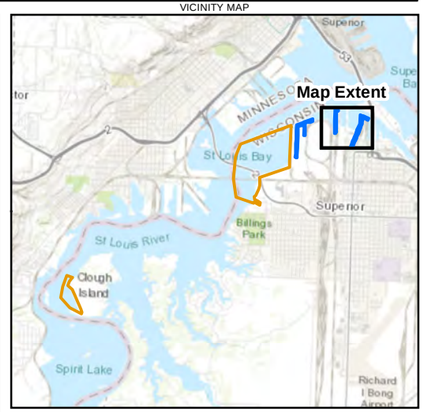
Figure 4-2
Hallet Dock **8** Slip Results - Metals
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 4-2 Hallet Dock Slip 8 Results Metals.mxd bpawling

Appendix 3 – Benthic Toxicity Test Locations and Results



VICINITY MAP



Legend

- Sampling Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Shading indicates bioassay results were significantly different (p=0.05) from reference sample.

1 = Survival Significance for *H. azteca*
2 = UV Survival Significance for *H. azteca*
3 = Fedundity Significance for *H. azteca*
4 = Growth Significance for *H. azteca*

1 = Survival Significance for *C. dilutus*
2 = Growth Significance for *C. dilutus*

Map Date: 2/10/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

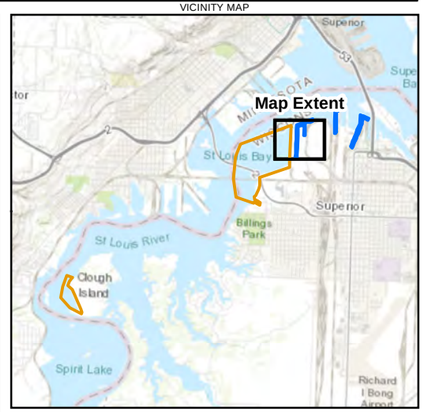
0 200 400
Feet

N

Figure 5-**5**
General Mills and Tower Avenue Slip - Geographical Distribution of Bioassay Results for Survival and Growth
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 5-3 Geographical Distribution of Bioassay Results for Survival and Growth General Mills and Tower Ave Slip.mxd bpawling

VICINITY MAP

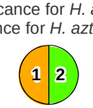


Legend

- Sampling Location
- Sediment Characterization Area (468.74 ac)
- Sediment Characterization and Survey Area (39.65 ac)
- Dock Walls Acoustic Survey Area (11.28 ac)

Shading indicates bioassay results were significantly different (p=0.05) from reference sample.

1 = Survival Significance for *H. azteca*
2 = UV Survival Significance for *H. azteca*
3 = Fedundity Significance for *H. azteca*
4 = Growth Significance for *H. azteca*



1 = Survival Significance for *C. dilutus*
2 = Growth Significance for *C. dilutus*

Map Date: 2/10/2021
Source: ESRI Basemap 2019, City of Superior 2016
Projection: NAD 1983 State Plane Wisconsin North US Foot

0 200 400
Feet

N

Figure 5-**4**
Hallet Dock **8** Slip and Oil Barge Dock Slip - Geographical Distribution of Bioassay Results for Survival and Growth
North End District and Clough Island
Sediment Characterization
St. Louis River Area of Concern
Superior, Wisconsin

\\lovetongis\GIS\data\Federal\Midwest\Wisconsin\NorthEndDistrict_CloughIsland_1598201\MXD\Site Investigation Report\Figure 5-2 Geographical Distribution of Bioassay Results for Survival and Growth Hallet Dock Slip 8 and Oil Barge Dock Slip.mxd bpawling