St. Louis River area of concern contaminated sediment management sites

A comprehensive assessment of sediments in the St. Louis River estuary has identified sites requiring contaminated sediment management.

Minnesota Pollution Control Agency

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Foreword

The St. Louis River estuary area known as the St. Louis River Area of Concern (SLRAOC) is the second largest of 43 locations throughout the Great Lakes that were identified as Areas of Concern by the International Joint Commission in 1987. The designation of these areas involved identifying beneficial use impairments caused by decades of uncontrolled pollution that accrued before modern pollution laws went into effect. These impacts included physical loss of fish and wildlife habitat as well as riverbed sediments that are contaminated with mercury, dioxins, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and other toxins. These pollutants have settled out in sediments at the bottom of the St. Louis River estuary and continue to threaten public health, contaminate fish and wildlife, and make waterfronts unusable in Duluth and other coastal communities along Lake Superior. These impacts were documented by defining nine beneficial use impairments in 1987.

The St. Louis River Remedial Action Plan (RAP), required under the Great Lakes Water Quality Agreement, was adopted by both states and approved by the U.S. Environmental Protection Agency (EPA) in July 2013 (updated in 2014). The RAP was developed by collaboration involving 50 partner organizations from local, state, tribal, and federal units of government, nongovernmental groups, businesses, research institutions, and community groups. The RAP includes approximately 60 targeted action items required to remove the eight remaining beneficial use impairments. These actions include up to twelve Minnesota contaminated sediment sites which are the subject of this report. The goal is to complete the contaminated sediment management actions by 2020 and “delist” the SLRAOC by 2025.

Federal funds now available through the Great Lakes Restoration Initiative and the Great Lakes Legacy Act and will accelerate contaminated sediment management efforts and will help achieve the removal of several beneficial use impairments and fulfill the promise of economic revitalization, increased property values and improved quality of life.

This report addresses the status of Minnesota’s contaminated sediment management sites and describes the approach taken to determine Minnesota sites recommended for contaminated sediment management.

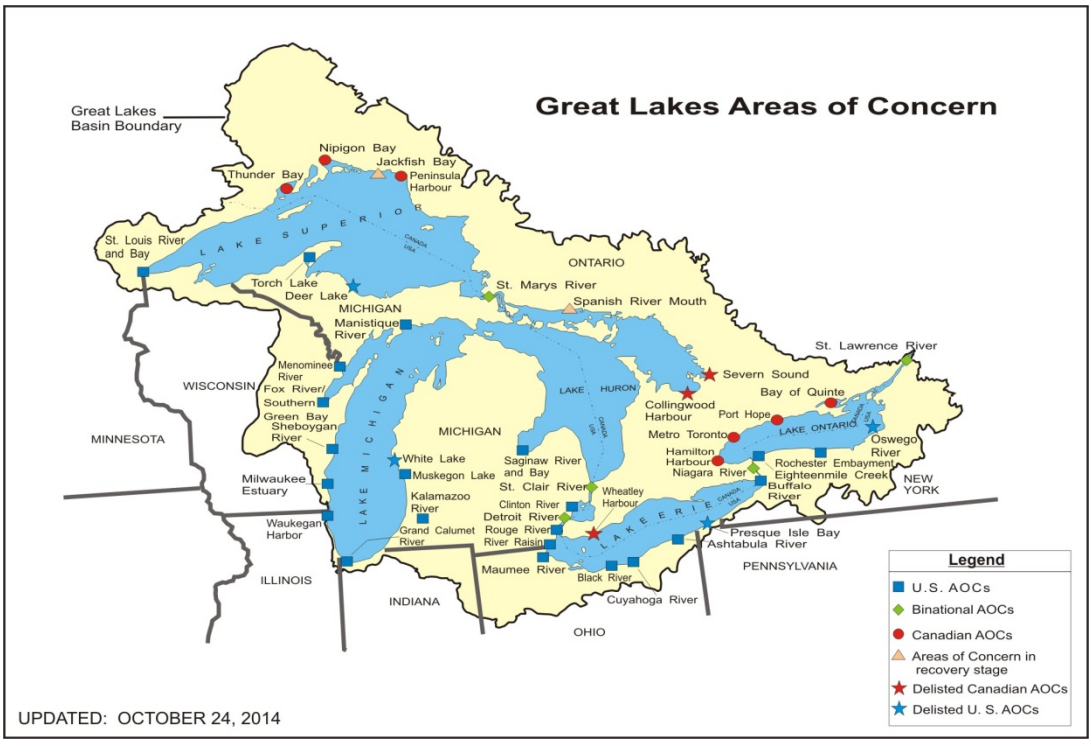

Figure 1. Great Lakes Areas of Concern

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Introduction

To support completion of the RAP, the Minnesota Pollution Control Agency (MPCA) in partnership with EPA and the U.S. Army Corps of Engineers (USACE) characterized the sediments in over 6,000 acres of the SLRAOC. The Wisconsin Department of Natural Resources (WIDNR) also brought sediment contaminant data to the table (Wisconsin is still characterizing several other areas in Wisconsin and that assessment work is expected to be completed by 2016). MPCA and WIDNR staff then analyzed this data to provide a planning-level view of the status of sediment contamination across the SLRAOC. The SLRAOC Sediment Technical Team, consisting of staff from MPCA and WIDNR, directed analyses and presentation of the data for their respective states.

To establish a common framework for assessing and displaying sediment contaminant data, the SLRAOC was divided into Sediment Assessment Areas (SAAs). Each SAA was given an individual number and unique name. The primary goal of the sediment characterization projects was to support MPCA and WIDNR staff in designating SAAs according to management action needs.

The following two documents attached to this report further illustrate the process and progress of the Minnesota SAAs as they have moved through site characterization and remedy determination by the MPCA Remediation Division:

Appendix A – *St. Louis River AOC Minnesota Sediment Assessment and Remedial Lead Site Progress*

Appendix B – *St. Louis River AOC Sediment Characterization and Remedial Process Flow Diagram*

Figure 2. Partners discussing elements of contaminated sediment information management for decision making.

SLRAOC wide preliminary assessment – Minnesota Context

From 2008 through 2012 the MPCA in partnership with the EPA and USACE collected 1,487 sediment chemistry samples at 489 core locations for 100-160 chemical parameters within 79 Minnesota SAAs in the SLRAOC. This effort produced over 167,000 individual chemical parameter results. The MPCA was charged with evaluating the characterization sampling results and assigning the SAAs into one of the following categories:

- **Yellow or green** – No action, restoration ready, or strategic restoration (63 SAAs)
- **Red/grey** – Additional site assessment sites: data gaps need to be filled to determine category (7 SAAs)
- **Red** – Remedial investigation sites: in need of management (9 SAAs)
- **Purple** – Contaminated sediment management actions completed (1 SAAs)

Minnesota Site status: State fiscal year 2015 end

Additional red/grey site assessment (7 SAAs)

In 2014 MPCA again partnered with the EPA to collect an additional 731 sediment chemistry samples at 68 core locations for 100-160 chemical parameters within the seven SAAs that had data gaps which needed to be filled before they could be fully evaluated for category placement. At the end of state fiscal year 2015 (June 2015), the MPCA assigned these seven SAAs into the following categories after further assessment had been completed:

Figure 3. Collection of sediment samples in the St. Louis River Area of Concern.

- Slip 3 (advance to enhanced Feasibility Study [FS])
- Slip near 21st Avenue West (no further remedial action needed and site moved to a yellow designation)
- Duluth Seaway Port Authority Slip D (Private navigation dredging will address contamination and risks, resulting in the site moving to a purple designation for construction completed without additional site assessment)
- Ponds behind Erie Pier (expedited to enhanced FS)
- End of Rice's Point (no further remedial action needed and site moved to a yellow designation)
- Thomson Reservoir (advance to enhanced FS)
- Scanlon Reservoir (advance to enhanced FS)

A summary of the technical analysis for the no further action determination for the two sites listed above is provided below.

SAA #37 – Slip near 21st Avenue West, 2.5 Acres

This assessment area is located in the Duluth-Superior Harbor, along the southwest shoreline of Rice's Point and the northeast side of the 21st Avenue West Bay Complex. This assessment area is bounded on the west by a 700 foot long wooden pier that has fallen into disrepair and is not currently being used for cargo ship docking. It is bordered on the east by a rip-rap shoreline and the Gerdau Ameristeel US metal fabrication and shipping facility. The bordering pier and shoreline form a partly enclosed docking slip defining the boundaries of this assessment area. The upland portion of Rice's Point in the general vicinity of this assessment is used for heavy industry, including ship docking, rail yards, metal fabrication, and a cement plant.

This area was selected for further assessment because it is a partially enclosed industrial slip and only one sample had been collected during a previous investigation of the area. Additional assessment sampling was conducted by the EPA Great Lakes National Program Office (GLNPO) in the summer of 2014. The water depth is about 20 feet across most of this area with a steeply sloping rip-rap shoreline along the bordering Gerdau facility. Sediment cores indicate a layer of non-native sediment ranging from about four to six feet deep underlain by a stiff sandy clay layer. A petroleum-like odor was noted in several of the cores associated with a layer of black/grey sediment layer ranging from four to six feet below the sediment surface; however high concentrations of PAHs or total petroleum hydrocarbons

were not detected in the associated samples. Small twigs also were observed in many of the cores at about four to six feet below the surface and above the basal sandy clay layer indicating the odor observed during the sampling may have been related to decaying organic matter.

The 2014 assessment detected the presence of multiple contaminants in most of the non-native sediment samples from this area including, PAHs, chromium, lead, mercury, and zinc at concentrations above typical ambient concentrations for this part the Duluth-Superior Harbor. However, the contaminant concentrations detected are generally low with only a few instances of concentrations slightly exceeding the Level II Sediment Quality Targets (SQTs). It is also significant that most of the high contaminant concentrations were detected from this area were in deeper samples below the bioactive zone indicating active deposition of cleaner sediment has been occurring at this area in more recent years. Concentrations of dioxin/furans were detected above Level II SQTs in most of the samples from this area, but at concentrations consistent with typical ambient levels for this portion of the Duluth-Superior Harbor.

The recent assessment results for this area indicate up to six feet of non-native sediment with slightly elevated concentrations of multiple contaminants are present in this assessment; however, the concentrations detected are not high enough to present a significant risk to benthic organisms dwelling in this area. Based on these findings this area is not recommended for remedial action, and it is being moved to a yellow designation.

SAA #30 – Rice's Point Off-Channel East, 14 Acres

This area is located along the shoreline at the southeast end of Rice's Point on the Duluth side of the Duluth-Superior Harbor. This assessment area borders a narro channel separating the Minnesota and Wisconsin sides of harbor that is used as the main shipping channel connecting Superior Bay to the inner harbor of the St. Louis River Bay. The Blatnik Bridge of US Highway 53 crosses Rice's Point and this area connecting the Minnesota and Wisconsin sides of the Duluth-Superior Harbor.

The western half of this area is occupied by a small craft public boat launch maintained by the Minnesota Department of Natural Resources. There is a public fishing pier constructed on the foundation of a former railroad bridge that extends about 700 feet out into the harbor from the shoreline of this area. The eastern half of this assessment area is used for docking large cargo ships along the Duluth-Superior Port Authority terminal shipping facility.

This area is located in a relatively high energy environment used by a busy public small craft boat launch and a docking area for large cargo ships that is dredged to maintain draft depths about 29 feet. It is also located adjacent to a major shipping channel passing through a narrow area of the harbor. Most of the sediment samples from this area consisted of silt and very fine sandy silts; however, a relatively high level of re-occurring suspension and movement of sediment in this area is anticipated based its exposed location and proximity to heavy marine traffic.

The Rice's Point Off-Channel East Assessment Area was identified as an area of interest for further assessment based on detections of lead, PAHs, and dioxin/furans. Detections of these contaminants at levels slightly above Level II SQTs occurred in several samples collected in previous sediment investigations conducted in this area of the harbor. The previous investigation reports concluded that elevated concentrations of PAHs and dioxins detected in this area could be related to the wooden pilings from the former bridges that extended off the end of Rice's Point.

Additional sediment assessment sampling conducted in by the EPA GLNPO in 2014 found low concentrations of several contaminants including PAHs dioxins/furans, lead, mercury, and zinc exceeding Level I SQTs in most of 14 additional samples collected; however, no Level II exceedance were detected.

The slightly elevated levels of these common contaminants appear to be similar to ambient levels in this area of the harbor, and do not indicate this area is a significant source area for contaminated sediments or a contaminated sediment hot spot. It is likely that shallow sediment in this area are often re-suspended and mobilized due to the exposed environment and proximity to shipping and boating activity. Based on these findings, this area is not recommended for remedial action, and it has been moved to a yellow designation.

Remedial Investigation Sites (9 SAAs)

In the individual Remedial Investigation (RI) phase the MPCA contractor collected sediment chemistry, physical parameters, geotechnical data, and bathymetry on seven of the nine sites previously identified as needing managements. This data was compared to screening criteria, ambient contaminant levels and the risk to ecological and human receptors was assessed. A conceptual site model was developed for each site. At the end of state fiscal year 2015 (June 2015), the MPCA assigned these seven SAAs to the following categories:

- Slip 2 (moving to a purple designation after construction completed by private partner)
- Slip C (advance to enhanced FS)
- Northland Pier/AGP Slip (advance to enhanced FS)
- Azcon/DSPA Slip C (advance to enhanced FS)
- Munger Landing (advance to enhanced FS)
- Mud Lake West (advance to enhanced FS)
- Ponds behind Erie Pier (advance to enhanced FS)

The status at the end of state fiscal year 2015 of the remaining two SAAs that were identified as needing management is as follows:

- U.S. Steel: The U.S. Steel site is located along the St. Louis River in West Duluth adjacent to the Morgan Park neighborhood. The U.S. Steel plant was constructed starting in 1907. Steel and coking production commenced in 1915 and continued until the majority of the plant shut down in 1979. U.S. Steel became a Federal and State Superfund Site and was placed on the EPA National Priority List and the MPCA Permanent List of Priorities in 1985.

  Remedial investigation has been completed to identify the magnitude and extent of contaminated sediments in the upland areas and in the estuary adjacent to the site. A total of approximately 1.7 million cubic yards of sediments exceed the MPCA preliminary remediation goals for PAHs and metals at the site. Of that total, about six hundred thousand cubic yards within a three hundred acre study area are located in the Spirit Lake section of the St. Louis River Estuary. The remaining one million plus cubic yards are within the 500 acre upland portion of the site in ponds, wetlands, and stream corridors that are adjacent to, and discharge to Spirit Lake.

  The results of that investigation were used to develop twelve remedial alternatives as part of a FS, completed in July 2015. The alternatives were developed as part of a collaborative process incorporating input from various site stakeholders. Five of the twelve alternatives have advanced through to detailed screening of alternatives.

  MPCA is currently gathering additional stakeholder input that will be used to select the remedy for the site. U.S. Steel, the responsible party, has partnered with EPA GLNPO for the RI, FS, and design. Following final remedy selection by the MPCA, U.S. Steel and EPA GLNPO plan to enter into an agreement for remedial implementation, currently planned for start of construction in 2016.

- St. Louis River Interlake Duluth Tar Sediment Operable Unit: The St. Louis River/Interlake/Duluth Tar State Superfund (SLRIDT) site was a former pig iron and coking plants and a water/gas (coal gasification) plant. The SLRIDT site is on both the Federal National Priority List and the State of Minnesota Permanent List of Priorities.

  The SLRIDT site is located within the city of Duluth, on the north bank of the St. Louis River, approximately four river miles upstream of Lake Superior. The site includes approximately 255 acres of land and river embayments, wetlands and boat slips.

  The SLRIDT site has three Operable Units (OU) including the Tar Seeps Operable Unit (TSOU), Soil Operable Unit (SOU), and the Sediment Operable Unit (SedOU). A Record of Decision (ROD) Document specifying management activities has been implemented for the all OUs. The ROD also specifies management levels, developed by the MPCA that must be met upon completion of remedial actions and maintained into the future.

  As of 2011 the remedial construction on the SedOU was completed. This site is subject to Five-Year Reviews that determine the protectiveness of the remedial actions. The most recent review was completed in 2013.

  In 2004, it was determined that the proposed plan for the SedOU would be the Dredge/Cap Hybrid (Alternative 3) in accordance with the ROD. The ROD presented the Dredge/Cap Hybrid alternative as the remedial action for the SLRIDT site in order to protect public health and the environment by minimizing exposure to the SLRIDT site contaminants. The ROD presents information about the SLRIDT site background and characterization including the areas of contaminated sediment and summary of human health and ecological risks, Response Action Objectives (RAOs) and management levels, and other requirements in accordance with the selected remedy. In 2005, in accordance with the ROD, a Remedial Design/Response Action Plan (RD/RAP) was prepared and submitted to the MPCA for review and approval. The RD/RAP specified the RA work required, in accordance with the ROD RAOs and management levels, to successfully complete the remediation of the SLRIDT site in accordance with the ROD. The MPCA approved the Final RD/RAP in 2005. The SLRIDT Site RA construction activities were conducted in 2004 and 2006 through 2010.

  In 2004, Erie Pier capping material and maintenance dredging sand from the lower harbor of St. Louis Bay was delivered to the SLRIDT site. This material was used as capping material in Slip 7 for a pilot capping project during the fall of 2004.

  In 2006, a temporary sheet pile containment wall was installed, and cap/surcharge sand along with an activated carbon mat (ACM) was placed in Stryker Bay. In addition, a confined aquatic disposal (CAD) end dike was constructed at the southern boundary of Slip 6 to separate contaminated dredge sediments and overlying water from the St. Louis River.

  In 2007, an on-site water filtration plant was constructed and operated to filter excess water in the CAD prior to discharge. Approximately 122,600 yd3 of contaminated sediments were mechanically dredged from portions of Stryker Bay, transported, and placed in the CAD. A minimum of six inches of cover sand were then placed in Stryker Bay. In addition, approximately 14,000 yd3 of impacted sediments were excavated from two wetland work areas along the 54th Avenue peninsula.

  In 2008, a series of push cores were advanced to determine previously dredged areas of Stryker Bay that did not receive placement of cover sand. The tar layer and approximately 500 yd3 of associated sediments on the west side of Stryker Bay, near the residences, were dredged and disposed in the CAD. Additional aggregate material was delivered and blended for Stryker Bay, then placed in multiple areas within Stryker Bay. A cap was also placed in a portion of the 54th Avenue peninsula.

Dredging and/or capping occurred on portions of Slip 6 and in the Minnesota Channel. The CAD end dike was inspected and repaired.

In 2009, response action construction activities included additional south wetland dredging, Minnesota Channel dredging, Slip 7/Minnesota Channel aggregate material placement, CAD leveling, Stryker Bay aggregate material placement, Stryker Bay sheet pile wall removal, Stryker Bay cap/surcharge excavation, Stryker Bay (SB-7) armor sand placement, and CAD isolation zone sand placement.

In 2010 to 2011, response action construction activities included Tallas Island Winter Work, CAD capping using an ACM and a minimum thickness of 4.5 feet of aggregate material, environmental media (EM) placement in upland work areas, Tallas Island EM dredging and placement, CAD end dike modification, Riparian Buffer Zone earthwork designated into four areas with a width of approximately 200 feet from the shoreline (including the Wisconsin portion), and SLRIDT site restoration activities.

Current activities include performing tasks in accordance with the Long Term Monitoring and Maintenance Plan. Monitoring includes: vegetation, benthic invertebrates, sediment chemistry and bathymetry. Results are compared to target performance goals.

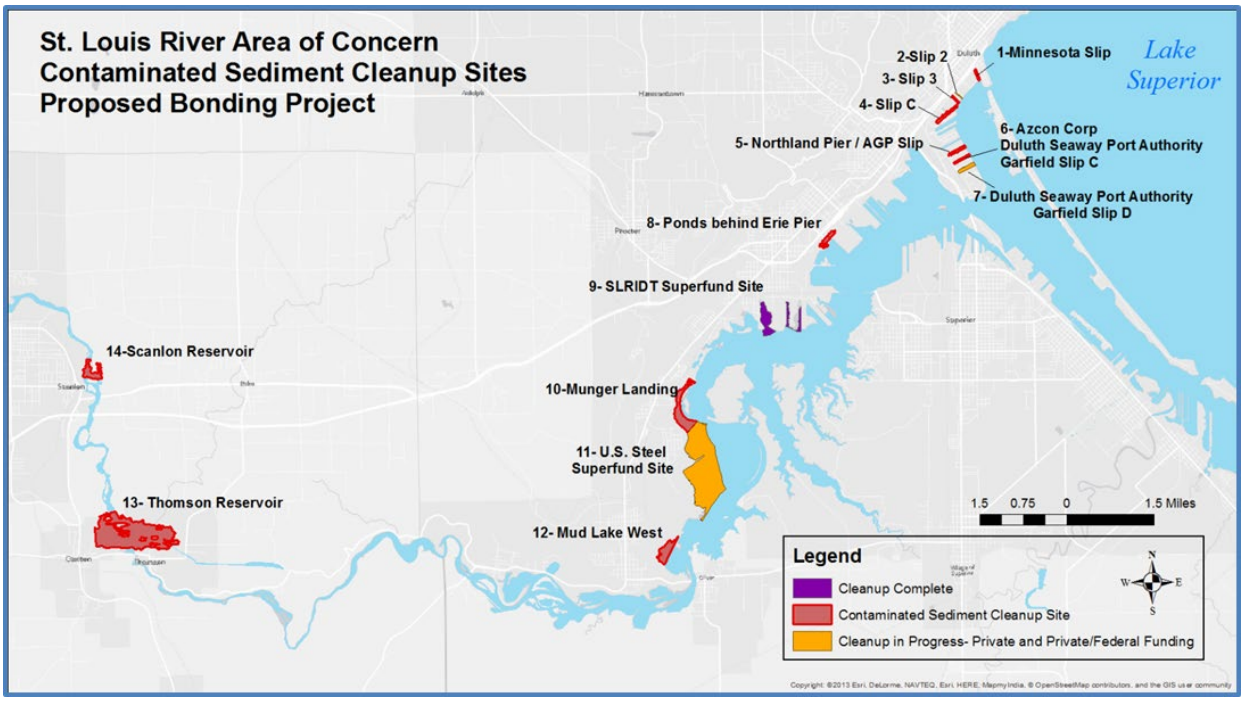


Figure 4. Minnesota contaminated sediment sites and status – all sites.

Planned activities: State fiscal year 2016

Feasibility study

The FS is the current phase for most of the MPCA SAAs. The MPCA contractor will determine extent and magnitude of contamination and fill data gaps necessary to evaluate potential management actions. This includes but is not limited to the following: Collect toxicity and contaminant uptake testing to quantify risk, evaluate sediment stability and redistribution potential, and refine the conceptual site model.

The potential management options, including but not limited to, no action and monitored natural recovery, will be evaluated for each SAA.

Feasibility study sites (9 SAAs)

- Slip C
- Northland Pier/AGP Slip
- Azcon/DSPA Slip C
- Munger Landing
- Mud Lake West
- Slip 3
- Ponds behind Erie Pier
- Thomson Reservoir
- Scanlon Reservoir

Design/construction

If private partners agree to cooperate, EPA and MPCA may coordinate a site decision document and oversee design and construction with the partner. EPA and MPCA may also develop remedy design documents, secure all necessary permits and approvals, and implement construction of the remedy for the sites without private partnerships. After construction is completed the long-term monitoring and contingency plans are developed, if necessary.

Design/construction sites (4 SAAs)

- MN Slip: FS completed and approved, final remedy selection and design pending partner recruitment and stakeholder input.
- Slip 2 and Pier B: remedy approved and initiated with private partner, currently under construction.
- DSPA Slip D: remedy approved and initiated with private partner, currently under construction.
- U.S. Steel: FS completed and approved, final remedy selection and design pending stakeholder input.

Completed

These sites are sites that require either no further action, are ready for strategic restoration, or the construction of the management remedy selected has been completed.

Completed sites (3 SAAs)

- End of Rice's Point: either no action or strategic restoration.
- Slip near 21st Avenue West: either no action or strategic restoration.
- St. Louis River Interlake Duluth Tar: construction complete, long term monitoring continues.

MPCA bonding proposal sites

Minnesota state bonding dollars are proposed for management (both design and construction activities) of the contaminated sites listed on the map starting in state fiscal year 2017. Contaminants at all sites shown exist at concentrations of concern. The bonding dollars will be used as the state match for federal cost share funds available from the EPA through the Great Lakes Legacy Act.

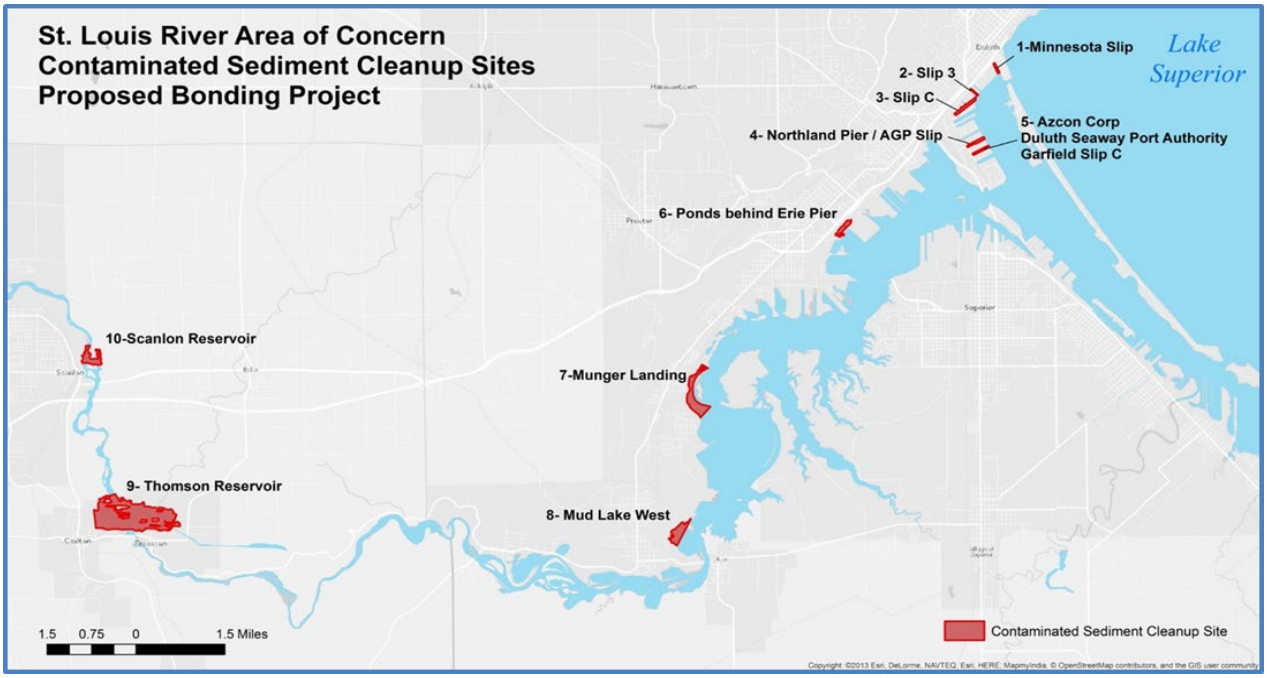


Figure 5. Sites included for contaminated sediment cleanup in 2016 bonding request.

1. SAA #20 – Minnesota Slip: This is a four acre former industrial slip that has not been used for shipping for several decades now. Sediments contaminated with PAHs, lead, mercury, zinc and other metals are wide-spread beneath most of the slip. A remedial action FS report completed in 2014 indicates approximately 38,000 cubic yards of contaminated sediment are present in layers up to 12 feet thick.
2. SAA #22 – Slip 3: A 2.75 acre commercial slip, currently not being used for shipping. Sediment with contaminants including PAHs, lead, zinc, and mercury, exceeding Level II SQTs, have been identified in samples collected from the approximate inner third of slip at depths of over five feet thick.
3. SAA #23 – Slip C: An approximately 13 acre industrial slip currently used for docking large cargo ships. Primary contaminants with concentrations exceeding Level II SQTs in many samples are lead and PAHs. Other contaminants including mercury, zinc also are elevated above the Level I-Level II SQT midpoint.
4. SAA #27 – Northland Pier/AGP Slip: This is an approximately nine acre industrial slip currently used for docking large cargo ships. Assessment results indicated scattered areas with contaminated sediments across the approximate inner third of the slip where water depths are generally shallower. Primary contaminants, with concentrations exceeding Level II SQTs at scattered locations, include PAHs, lead, and cadmium.
5. SAA #28 – Azcon Corp/Duluth Seaway Port Authority Garfield Slip C: A 6.4 acres in size and is currently used for docking ships along the south wall. A scrap yard is currently operating on the land north of the slip. Sediment with contaminants including PAHs, lead, zinc, and dioxins have concentrations exceeding Level II SQTs have been identified in samples collected from this area. Contaminated sediments are mainly confined to the back one third of the slip that has not been maintained to full navigational depth and along the northern dock wall.
6. SAA #59 – Ponds behind Erie Pier: An approximately 20 acre backwater impoundment separated from the main body of the St. Louis Bay by a man-made railroad grade. Contaminated sediment with high concentrations of PAHs, PCBs, lead, mercury, chromium, cadmium, zinc and nickel, exceeding Level II SQTs are wide spread across this area. Contaminated sediments are mixed with layers of wood waste and peat up seven feet thick.

7. SAA #75.1 – Munger Landing: The site is 77 acres in size and is a cut-off river channel located adjacent to the Smithville and Morgan Park neighborhoods of West Duluth. Sediment with contaminants including PAHs, lead, nickel, zinc, PCBs, and dioxins have concentrations exceeding Level II SQTs have been identified in samples collected from this area. Contamination is widespread and spotty at levels only slightly exceeding Level II SQTs within a well-developed habitat setting.
8. SAA #83 – Mud Lake West: The site is 42 acres in size and is comprised of a shallow bay and wetland complex isolated by a railroad causeway adjacent to the U.S. Steel Superfund Site. A large embankment of waste material (predominantly slag) is located along the western shore of the bay. All initial sediment samples analyzed for dioxins exceeded the Level II SQTs. Several other metals were found at levels approaching Level II SQTs.
9. SAA #99 – Thomson Reservoir: An approximately 400 acre reservoir impounded behind a Minnesota Power Co. dam and hydro-electric generating plant. The most current assessment completed in 2014 found elevated concentrations of dioxin/furans, exceeding Level II SQTs are wide spread in sediments across all areas of this reservoir.
10. SAA #102 – Scanlon Reservoir: This is an approximately 25 acre reservoir impounded behind a Minnesota Power Company dam and hydro-electric generating plant The most current 2014 assessment found elevated concentrations of dioxin/furans, exceeding Level II SQTs, in samples from lower energy backwater portions of this reservoir.

Conclusion

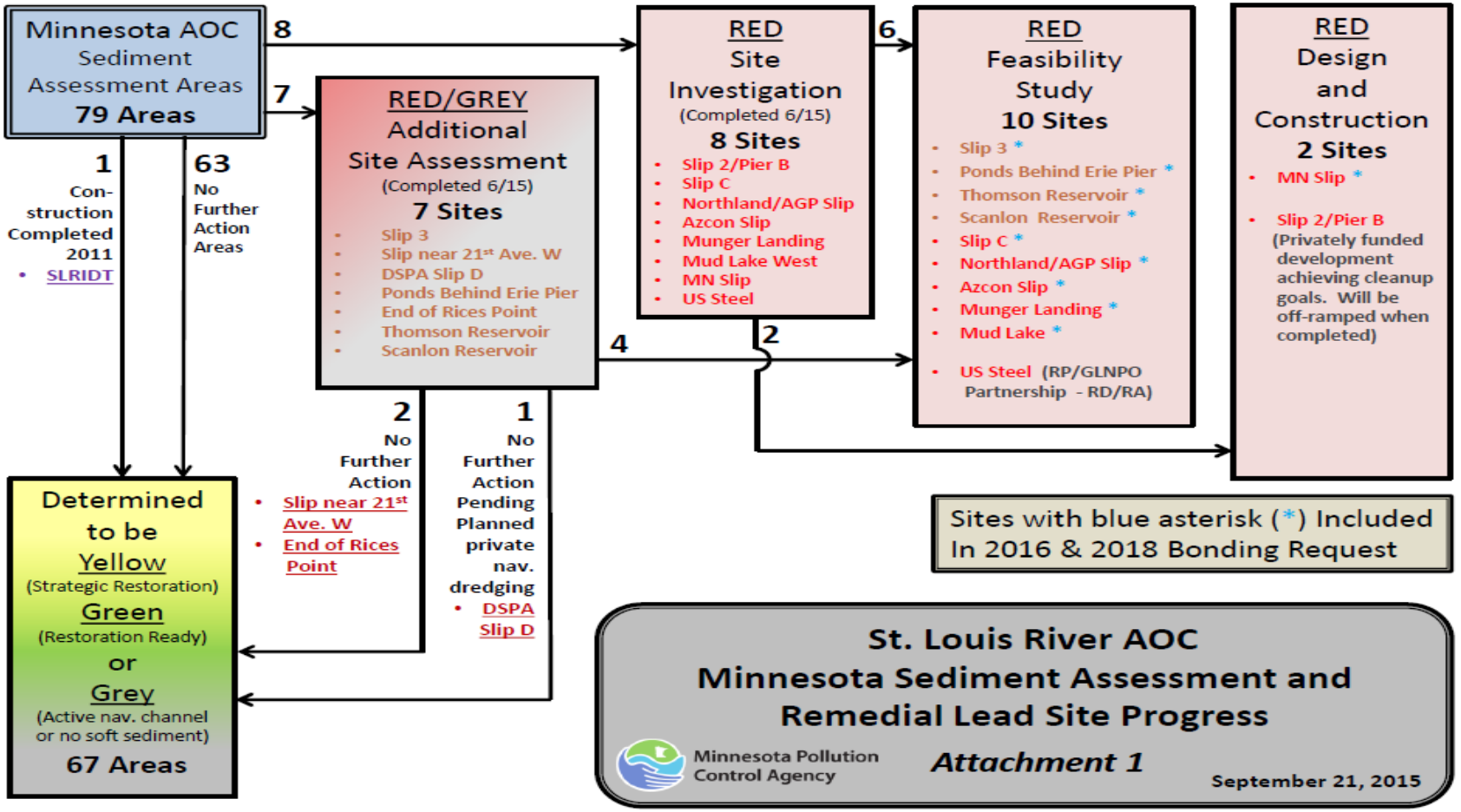
A comprehensive assessment of contaminated sediments in the Minnesota portion of the SLRAOC has resulted in the inclusion of five of the seven red-gray sites identified in the SLRAOC Remedial Action Plan (July 2013) as sites requiring contaminated sediment cleanup.

The report identifies a total 10 sites that may need attention in the next five years to implement Minnesota actions identified in the SLRAOC Remedial Action Plan (July 2013).

MPCA has chosen to utilize the Great Lakes Legacy Act Partnership Agreement approach and/or an EPA-Great Lakes Restoration Initiative (GLRI) Economy Act approach to complete site cleanup design and construction at the identified sites. State of Minnesota is pursuing a state bonding proposal to fund its 35% share of the anticipated cost associated with cleaning up these 10 sites. EPA has indicated that GLRI/Great Lakes Legacy Act funds will be available to match these state funds in a time frame to complete work on all of these sites by 2020.

Appendices

Appendix A: St. Louis River AOC Minnesota Sediment Assessment and Remedial Lead Site Progress



Appendix B: St. Louis River AOC Remedial Assessment Area Status