# TECHNICAL MEMORANDUM

**To:** Daniel Elias, Project Manager (Minneapolis Park and Recreation Board)

**From:** Jonathon Kusa, PE and Maren Hancock, PE (Inter-Fluve, Inc.)

**Date:** May 27, 2020 **Project:** Kenilworth Channel Stabilization

**Re:** Existing Conditions Assessment and Proposed Performance Criteria

This memorandum summarizes the existing conditions and proposes project performance criteria for the restoration and long-term stabilization of the Kenilworth Channel in the City of Minneapolis. Inter-Fluve, Inc. (Inter-Fluve) and their subconsultant Alliant Engineering (Alliant), are contracted by the Minneapolis Park and Recreation Board (MPRB) for design and construction oversight services for the Kenilworth Channel Stabilization Project to remove or replace the existing timber retaining wall lining the channel. As an initial step in the design effort for this project, Inter-Fluve reviewed existing documentation and survey data, and completed an initial field investigation to identify potential constraints and performance criteria to guide development of conceptual design alternatives. This memorandum summaries Inter-Fluve's existing documentation review and field investigations, and lists the project performance criteria that have been reviewed and approved by the MPRB.

## EXISTING DOCUMENTATION REVIEW

Inter-Fluve reviewed existing documents provided by the MPRB which inform the development of performance criteria and conceptual designs. The following summary of the history of the channel and timber walls is paraphrased from documents obtained from the Minnesota Architecture-History Inventory Form [1] and the Kenilworth Lagoon/Channel Context, History, and Physical Description [2] prepared by CH2M HILL, Inc. for the Southwest LRT Project.

- Prior to channel construction, the water surface level in Cedar Lake was approximately 5 feet higher than the water elevation of Lake of the Isles. Cedar Lake was lowered by the construction of Kenilworth Channel, and fill was imported to build up shoreline around the lake.
- 1911-1913: Kenilworth Channel was dredged and spoils were used to raise the banks and shoreline along the lagoon. There were difficulties during dredging due to "extensive depth of the peat beds at the bottom of the lakes" [2]. The railroad bridges were a particular point of concern, and Wirth said about the railroad bridge that "after permanent ornamental bridges have been established to replace the present unsightly wooden structures, this waterway between the two lakes will be one of the most attractive features of the entire park system." [2]
- 1913- 1914: Both sides of the channel were graded, loamed and seeded. A 12-foot walking path was constructed on both sides of the channel.

- 1915: While Wirth's original intent was to have unlined natural shorelines to the channel, the shorelines began to erode, which was attributed to boat wake activity. In 1915, wood sheet pile was installed to protect the channel banks. Riprap may have been placed at this time as well.
- 1936: Channel repair work occurred under the Works Progress Administration (WPA) and included stone and riprap retaining walls in the eastern portions of the channel, riprap around the bridges, and resurfacing and seeding/sodding along the banks. At this time new timber "breakwaters" were installed along both sides of the western portion of the channel [2]. The walls were anchored to the adjacent shore with tie rods and anchor rods.
- 1941: The pumphouse west of Burnham Bridge was constructed.
- 1961: MPRB replaced the timber wall on the north side of the channel [1]. (*Note:* While the documentation indicates that only the north wall was replaced, the walls on both sides of the channel appear to be the same age. It is suspected that both walls were replaced.)
- Recently, as part of the SWLRT Project investigation, evidence of a sheet pile wall was found behind (upland) of the existing timber wall. It is not known if that is a remnant from an earlier wall, part the 1961 timber wall, or the 1936 WPA wall.

## FIELD ASSESSMENT AND SURVEY DATA REVIEW

On April 29, Dan Elias (MPRB), Craig Pinkalla (MPRB), Jonathon Kusa (Inter-Fluve), Maren Hancock (Inter-Fluve) and Eric Nelson (Alliant) completed an on-site project kickoff meeting to walk the site and discuss next steps for the project. Notes from the meeting and field assessment include:

- Proposed construction access routes were identified.
- Tree protection and removal in access areas and work areas along the channel were discussed. Per Craig's direction, most, if not all of the trees overhanging the channel could be saved where feasible. Some trees that have grown into to the voids in the timber wall may need to be removed in order to remove the wall. Trees along the access route will be protected with 2"x6" boards, as determined necessary.
- Proposed eastern and western tie in points for extent of channel bank reconstruction were identified.
- It was noted that in several locations the current shoreline is approximately two-to-four feet landward of the timber wall. In some locations this will allow for the designed shoreline to be located outside of the current channel width.
- The team discussed that the designed channel could be of varying width to accommodate existing trees or slopes in pinch points, and allow for wider channel segments where adjacent grade and site features allow.
- Minimum allowable channel width needs to be determined by MPRB based on conversations with internal departments and emergency response (fire/law enforcement). The team proposed a potential minimum width of approximately 20 feet to allow for two-way traffic for canoes,

kayaks, and small electric-motored boats. To date, Inter-Fluve has not found specific guidance on the minimum width required for the project's specific conditions (i.e., non-motorized recreational vehicles in confined corridors) *(Note: Inter-Fluve researched guidance on recreational boating channel design to help inform the discussion of an appropriate minimum design channel width. Three states' guidelines were found and reviewed: California [5], Ohio [6], and Oregon [7]. None of these guidance documents had applicable guidance for non-motorized boats.*

Inter-Fluve completed a depth-of-refusal subsurface investigation on May 6th, 2020. The intention of this investigation is to characterize subsurface sediments within the channel, and to survey the thickness of those deposits. In addition to the depth-of-refusal survey, Sunde Land Survey (under contract to MPRB) completed a topographic and bathymetric survey of the project area on April 30th, 2020. Key findings of the depth-of-refusal survey and the topographic/bathymetric survey include:

- The wall-to-wall width of the channel west of the Burnham Bridge is 40 feet, and the channel's wetted width extends behind the existing retaining wall in many places and ranges from 40 to 45 feet.
- Maximum channel depth within the project area ranges from 2.5 to 4.1 feet.
- Channel bottom substrate is principally composed of unconsolidated organic material which in the center of the channel ranges from two to four feet thick. A sandy layer of unknown thickness underlies the organic sediments and constitutes the refusal surface.
- Near the channel margins and the entrance to Cedar Lake, surficial materials are composed of a fine sandy layer. Sand and gravel were found to be present at the surface along cross sections immediately adjacent to Burnham Bridge.
- Underlying sediments are likely composed of glacially derived fine-grained sand to gravel [4], and the depth to native sediments depends on local dredging depths and subsequent filling.

## PROJECT PERFORMANCE CRITERIA

The established performance criteria for the project are listed below.

- Promote ecological uplift throughout the corridor and maximize naturalized shoreline habitat for as much of the channel shoreline as feasible.
- Design a channel that allows a minimum of two-way direction, single file recreational usage for non-motorized boats and boats with electric trolling motors.
- Use existing shoreline tie-in locations and ecologically appropriate shoreline sloping, maintain as much open water as feasible. At a minimum maintain an "operational" channel width of 20 feet with a minimum depth of 2.5 feet based on April 30, 2020 water levels, which is equivalent to a proposed channel bottom elevation of 850.2 ft. Maintain a minimum total open-water width, including shallower side-slope areas, of approximately 30 feet. Channel width may vary throughout the corridor and should be maximized wherever possible. If certain areas require

narrower widths than described, the proposed lesser width and structured wall solutions shall be analyzed and presented to MPRB.

- Maintain a vegetated buffer of at least 10 feet from the shoreline up toward the private property line, using April 30, 2020 water levels. This area will ideally be planted with native vegetation. *This criterion will need to take into consideration the proposed future sewer work and maintenance in this area.*
- Design a channel that does not preclude future proposed improvements associated with the Chain of Lakes Master Plan.
- Design a solution that will require as minimal long-term maintenance, ideally only fallen tree removal.
- Re-use trees removed for access within bank designs for woody habitat and ecological complexity.
- Minimize desirable tree removal and have no resulting canopy gaps. Provide a minimum 1:1 replacement (per tree) for any removed trees (regardless of species) and replace with trees determined to be appropriate for each specific location. Provide additional tree plantings to fill canopy gaps and enhance ecology of corridor.
- Design proposed improvements to be resilient in both low water and flood water conditions.

## INITIAL ASSESSMENT OF PROJECT FEASIBILITY

Given the existing conditions information collected to date and described above, Inter-Fluve believes that the channel can be designed with mostly naturalized bioengineering and rock shorelines, though retaining walls or other measures may be required in key locations along the channel. Walls may be required at the western tie-in location on the south side of the channel adjacent to the existing private wall, and in the section nearest the Burnham Road bridge. Finalized performance criteria will be necessary to develop feasible conceptual alternative layouts. As design progresses, hydraulic and subsurface conditions will be evaluated to further vet the feasibility of the proposed solutions, and to inform the design.

## References

1) Minnesota Architecture-History Inventory Form. Grand Rounds Parkway System, Minneapolis, Hennepin County Minnesota. HE-MPC-01822. Chain of Lakes, Lake of the Isles, Kenilworth Lagoon.

2) CH2M HILL, Inc. (2014). Kenilworth Lagoon/Channel Context, History, and Physical Description: Southwest LRT Project. Project No, 474576. November 2014.

3) (2016) Southwest LRT (Metro Green Line Extension) Final Environmental Impact Statement. Executive Summary. May 2016.

4) Steenberg, Julia R.; Bauer, Emily J; Chandler, V.W.; Retzler, Andrew J; Berthold, Angela J; Lively, Richard S. (2018). C-45, Geologic Atlas of Hennepin County, Minnesota. Minnesota Geological Survey. Retrieved from the University of Minnesota Digital Conservancy, http://hdl.handle.net/11299/200919.

5) California Department of Boating and Waterways: Boating Facilities Division (1991). Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities. March 1991. Retrieved online on May 7, 2020 at https://dbw.parks.ca.gov/pages/28702/files/lramps.pdf

6) Ohio Department of Natural Resources Division of Watercraft Resource Planning Section (2003). Ohio Boating Facilities Standards and Guidelines: First Edition. October 2003. Retrieved online on May 7, 2020 at http://watercraft.ohiodnr.gov/Portals/watercraft/PDFs/FacilityStandards.pdf.

7) Oregon State Marine Board: Boating Facilities Section (2011). Guidelines for Recreational Boating Facilities: Third Edition. September 2011. Retrieved online on May 7, 2020 at https://www.oregon.gov/osmb/boating-facilities/Documents/DesignGuidelinesComplete.pdf.