Item 5B.
BCWMC 6-17-21

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Memorandum

To: Bassett Creek Watershed Management Commission (BCWMC)
From: Barr Engineering Co.
Subject: Item 5B. Consider Approval of Feasibility Study and Choose Concept to Implement for Medley Park Stormwater Treatment Facility Project, Golden Valley (CIP 2022 ML-12) - BCWMC June 17, 2021 Meeting Agenda
Date: June 10, 2021
Project: 23270051.51

5B Consider Approval of Feasibility Study and Choose Concept to Implement for Medley Park Stormwater Treatment Facility Project, Golden Valley (CIP 2022 ML-12)

The BCWMC Commissioners reviewed and discussed the Draft Feasibility Report for the Medley Park Stormwater Treatment Facility Project at the May 2021 BCWMC meeting, and the draft report was approved with suggested revisions. This memorandum summarizes the changes made to the report based on the discussion and comments provided. Where appropriate, full paragraphs are included for context and the added language is underlined.

1. The Table of Contents was updated to reflect new page numbering caused by additional text and one figure.
2. Section 1.5 – Project impacts and estimated costs; new paragraph added as outlined below
    a. Of the project impacts, a second significant consideration is the improvement of water quality to downstream Medicine Lake. The proposed project will result in increased permanent pool volume and sediment storage volume in the new stormwater ponds and the expanded Medley Pond footprint and, therefore, reduce sediment and particulate phosphorus loading to all downstream water bodies, including Medicine Lake. Concepts 1 and 2 also include the construction of biofiltration basins, which will help to remove particulate and dissolved pollutants, such as dissolved phosphorus, through sorption to the soil and intake by plants. Dissolved inorganic phosphorus is the form directly used for photosynthesis. Other forms of phosphorus must be transformed before becoming useful for photosynthesis. Therefore, by removing dissolved inorganic phosphorus from stormwater runoff through biofiltration, less is available for algae and plants to grow in downstream waterbodies.
    Dissolved phosphorus can also be removed in stormwater ponds through uptake by submerged plants and phytoplankton. However, uptake of dissolved phosphorus by phytoplankton and plants is usually offset by death and decay of these organisms at the end of the growing season. The dead organic matter will settle as particulate phosphorus, and has the potential to re-release phosphorus due to decomposition by bacteria.

Through decomposition, phosphorus in the organic matter is converted from particulate phosphorus to dissolved phosphorus. Therefore, because the uptake and release of dissolved phosphorus can be net neutral in stormwater ponds over the course of a year, the removal of dissolved phosphorus by submerged plants and algae is not quantified for the stormwater pond expansions and additions in the three concepts presented.

3. Figure 2-1 – Project Area
    a. Flow arrows were added to the stormwater channels, Medley Pond outlet, and Kings Valley Pond outlet to clarify stormwater flow directions.
4. Figure 3-2 – Existing Conditions 100-year Inundation
    a. This is a new figure which shows the existing conditions Atlas-14 100-year 24-hour design storm event inundation extents to provide context for flooding concerns. Structure locations or aerial imagery was not used for homeowner confidentiality concerns.
    b. A figure showing the proposed conditions Atlas-14 100-year 24-hour inundation extents was not developed. The drop in the 100-year maximum water surface elevations were not great enough to show a significant change in the LiDAR-produce inundation area. It was determined that Table 6-3 provided a better representation of the impacts to at-risk flood structures.
5. Figure 3-4 – Site Conditions
    a. The wetland survey boundary was added to Figure 3-4.
6. Section 5.0 – Potential Improvements
    a. For discussions related to proposed increases to flood mitigation volumes, in-text clarification was added throughout the section confirming that increases in flood mitigation volumes are "up to the 100-year flood elevation."
7. Section 5.1 – Concept 1; added text is underlined
    a. Constructing a biofiltration basin downstream of the new stormwater pond. Two submerged and back-sloped storm sewer pipes would allow volume from the upstream new stormwater pond to enter the biofiltration basin while limiting the amount of floatable debris that can enter the basin. The storm sewer outlet to the biofiltration basin would be set one foot above the basin bottom to allow a minimum of one-foot treatment depth. A berm, with an emergency overflow, would be constructed to separate the pond and basin. The biofiltration basin would provide approximately 0.6 ac-ft of water quality treatment volume below the outlet rim elevation (2 feet above the basin bottom) and remove approximately 1.2 pounds of dissolved phosphorus per year through sorption to soils and sand. No filtration enhancements are proposed for the biofiltration basin substrate (i.e. iron-enhanced sand) to remove additional dissolved phosphorus. Limitations for the configuration of the basin and stormwater ponds, including existing stormwater infrastructure, existing topography, and the volume of stormwater runoff tributary to the park, results in a longer than recommended inundation period for iron-enhanced sand. Under longer periods of inundation, iron-enhanced sand removal efficiency decreases and can even release phosphorus under certain conditions.

8. Section 5.2 – Concept 2; added text is underlined
    a. Constructing a biofiltration basin in the eastern half of the construction area. The biofiltration basin would provide 0.7 ac-ft of water quality treatment volume below the outlet structures' rim elevations (1.5 feet above the basin bottom). Flows from the basin would discharge west to the new stormwater pond. The biofiltration basin would remove approximately 6.3 pounds of dissolved phosphorus per year through sorption to soils and sand. No filtration enhancements are proposed for the biofiltration basin substrate (i.e. iron-enhanced sand) to remove additional dissolved phosphorus. Limitations for the configuration of the basin and stormwater ponds, including existing stormwater infrastructure, existing topography, and the volume of stormwater runoff tributary to the park, results in a longer than recommended inundation period for iron-enhanced sand. Under longer periods of inundation, iron-enhanced sand removal efficiency decreases and can even release phosphorus under certain conditions.
9. Section 5.3 – Concept 3; added text is underlined
    a. Increasing the total water quality volume by 4.3 acre-feet to 4.6 acre-feet from existing conditions through the expansion of Medley Pond and the excavation and regrading of the western portion of Medley Park. Filtration BMPs that would remove dissolved phosphorus were not included in this concept due to considerable bounce of water levels and long inundation periods for smaller storm events (See Section 8.0 for further discussion on the limitations of dissolved phosphorus removal for Concept 3).
10. Table 6-1 – Medley Park Improvement Project Concept Matrix Summary
    a. Units added to the flood elevation items in Table 6-1 (ft, NAVD88)
    b. Footnote added: "Total flood mitigation volume summarized up to the 100-year flood elevation"
11. Section 6.3 Open water area creation; added text is underlined
    a. In all concepts, the total open water area within Medley Park would increase through the expansion of the existing Medley Pond footprint and through the installation of new stormwater ponds. Open water area provides permanent pool volume for water quality treatment and also allows for the expansion of aquatic habitat. Under existing conditions, Medley Park has approximately 0.5 acres of open water area (footprint of existing Medley Pond). Under Concepts 1, 2, and 3, the total area of open water in the park would be approximately 0.9, 1.0, and 1.5 acres, respectively. Options for submerged macrophyte restoration can also be considered to provide aquatic habitat and promote clearer water conditions.
12. Section 7.1.6 – 30-year cost; added text is underlined
    a. The 30-year cost for each alternative is calculated as the future worth of the initial capital cost (including contingency and engineering costs) plus the future worth of annual maintenance (see Table 7 1) and significant maintenance at the end of the alternative's life span. The life span for each proposed concept was assumed to be 30-years. A 4% rate

of inflation is assumed. The annualized cost for each alternative is calculated as the value of 30 equal, annual payments of the same future worth as the 30-year cost.

13. Section 7.2 – Funding sources; added text is underlined
    a. The City of Golden Valley may have up to $500,000 in funds available for use on this project. The exact amount will be determined during final design at the City of Golden Valley's December 2021 city council meeting.
14. Section 8.0 – Alternatives assessment and recommendations; added text is underlined
    a. Concept 3 resulted in the second highest removal of total phosphorus of the three concepts analyzed. The installation of the Concept 3 stormwater features within Medley Park would increase the phosphorus load reduction by 17.0 pounds per year to downstream water bodies, which includes Medicine Lake. Because Concept 3 currently does not include filtration features, dissolved phosphorus would not be removed with this design.

       Adding filtration features to Concept 3 would be accompanied by a number of trade-offs, which would include:

       - The loss of flood mitigation volume to develop water quality treatment areas in separate basins or benched features.
       - The loss of flood mitigation volume to develop enough elevation difference to adequately filtrate stormwater runoff.
       - Increased maintenance of the filtration media and draintiles due to substantial bounce of maximum water surface elevations in the stormwater ponds and prolonged periods of inundation for small storm events.
       - Limited options for filtration media due to prolonged periods of inundation for smaller storm events. Iron-enhanced sand is not recommended due to the risk of anoxic conditions and release of previously bound phosphate. Spent lime is not recommended due to the risk of media instability from prolonged periods of inundation. Biochar is not recommended because phosphorus removal efficiency is limited and the media is more appropriate for the removal of E. coli. Cleaned washed sand could be utilized within a filtration bench; however, the cost of including this filtration bench may outweigh the benefits due to the limited dissolved phosphorus removal efficiency.

       Rather than include filtration in Concept 3, the BCWMC may want to consider infiltration or filtration features at other locations in the Medicine Lake watershed, if dissolved phosphorus removal is desired in future projects.
    b. Members from the Barr Engineering Team attended the May 2021 Engineered Media Webinar hosted by the Minnesota Pollution Control Agency (MPCA) to see if current research provided alternative filtration options for the Medley Park Stormwater Treatment Facility. Unfortunately, information presented during the webinar did not provide additional viable options not already explored.

Item 5B.
BCWMC 6-17-21
Appendices Posted Separately

Medley Park Stormwater Treatment Facility Feasibility Study

Golden Valley, Minnesota

June 2021

Prepared for
Bassett Creek Watershed Management Commission

Medley Park Stormwater Treatment Facility Feasibility Study

Golden Valley, Minnesota

June 2021

Prepared for
Bassett Creek Watershed Management Commission

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Medley Park Stormwater Treatment Facility Feasibility Study

June 2021

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Certifications

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Minnesota.

June 10, 2021

Karen Chandler, PE
PE #: 19252

Date

1.0 Executive summary

1.1 Background

The Bassett Creek Watershed Management Commission's (BCWMC) current Capital Improvement Program (CIP) (Table 5-3 in the 2015-2025 Bassett Creek Watershed Management Plan, as revised) includes the Medley Park Stormwater Treatment Facility project (Project). At their August 2020 meeting, the Commission approved the BCWMC Engineer's proposal to conduct a feasibility study for the Project (2022 CIP Project ML-12).

As is required for BCWMC CIP Projects, a feasibility study must be completed prior to BCWMC holding a hearing and ordering the project. This study examines the feasibility of developing flood storage volumes and water quality treatment best management practices (BMPs) in the western portion of Medley Park adjacent to (and within) existing Medley Pond. The feasibility study includes examining the development of additional water quality treatment volume, the installation of biofiltration BMPs, re-aligning the existing channel north of Medley Pond, diverting small storm event flows from existing stormwater infrastructure, and removing accumulated sediment from Medley Pond. The goal of the project is to alleviate local flooding in the subdivision south of Medley Park and to improve water quality downstream of Medley Park by trapping additional sediment and pollutants in the pond, in biofiltration BMPs and within expanded storage areas, thus minimizing pollutants passing downstream to Medicine Lake. The proposed project will also improve ecology and wildlife habitat, enhance active and passive recreation opportunities, and provide educational opportunities.

Three conceptual designs were investigated during this feasibility study. The concept design layouts investigated various combinations of biofiltration basins, constructed stormwater ponds, the expansion and dredging of the existing Medley Pond, and the diversion of runoff from existing storm infrastructure upstream of the project area. All concept designs were developed to balance flood mitigation storage and water quality treatment. Flood benefits were assessed with the hydrologic and hydraulic model XPSWMM and water quality benefits were quantified by using the P8 model. Permitting requirements for each conceptual design were reviewed and cost estimates are provided.

If ordered, the CIP calls for implementing the project in 2022 and 2023. The BCWMC CIP funding (ad valorem tax levied by Hennepin County on behalf of the BCWMC), is not the sole source of funding for this project. The remainder of the funding will come from the City of Golden Valley and other sources (e.g. other grants, as appropriate).

1.2 Site conditions

Medley Park is located in the City of Golden Valley east of Highway 169 and south of Medicine Lake Road (Figure 2-1). Medley Park is a public, urban, walking park consisting of open green spaces, deciduous forest, open water, various wetland communities, playground equipment, and sporting facilities (e.g., basketball court, tennis court, ice skating rinks). The walking trails are used heavily by the single family and multi-family residential communities surrounding the park.

In the western portion of Medley Park is an existing open waterbody named Medley Pond, which has a surface area of approximately 0.5 acres. Medley Pond is not listed as a Minnesota Depart of Natural Resources (MnDNR) public water.

Medley Pond receives stormwater runoff from a drainage area of approximately 95 acres in Golden Valley and New Hope and discharges downstream to a small stormwater pond, Pond ML-2 (as named by the City of Golden Valley). Local residents also refer to this pond as Kings Valley Pond, which is named after the surrounding townhome community. Runoff from Pond ML-2 discharges to another small stormwater pond, Pond ML-3, which ultimately discharges to Medicine Lake. Any improvements to runoff water quality within Medley Park will result in improvements to Medicine Lake, which is currently listed as impaired for excess nutrients. Reductions in sediment and pollutant loads to the lake can likely help address this impairment.

1.3 Project alternatives

The BCWMC Engineer evaluated three conceptual designs for developing flood storage volume and water quality BMPs within Medley Park. All three concepts analyzed several stormwater runoff diversion alternatives from existing stormwater infrastructure and investigated various layouts of stormwater ponds, biofiltration basins, and Medley Pond expansion and dredging to balance flood storage management and water quality treatment. The three concepts are fully described in Section 5.0.

In addition, measures considered for potential implementation in all scenarios include the following:

- Increasing the Medley Pond open water area, and increasing associated water quality treatment volume through expanding contours below the normal water level (NWL) and dredging accumulated sediment. The proposed expansion and dredging of accumulated sediment would provide additional water quality treatment volume and provide additional habitat for aquatic life, such as turtles, frogs, macroinvertebrates, and aquatic plants.
- Creating additional stormwater pond(s) to provide additional water quality treatment volume, improve ease of maintenance, enhance water quality in downstream locations, and increase flood storage capacity.
- Diverting stormwater runoff from upstream stormwater infrastructure. Two diversions were assessed and include diverting low flows from storm sewer northeast of the project area and/or re-aligning the existing channel that currently discharges directly into Medley Pond. Diverting stormwater runoff from the existing stormwater infrastructure allows for biofiltration treatment of the runoff before discharging downstream, which would help to remove particulate and dissolved pollutants. Re-aligning the stormwater channel into new stormwater ponds allows for a longer detention time, which would promote enhanced sediment and particulate contaminant settling.
- Preserving trees on the west side of Medley Pond. Tree removal is expected within project disturbance limits. However, upland areas would be restored with native vegetation and replanted with trees to replace those removed during construction.

- Replacing disturbed trails with ADA-compliant trails to preserve park use, improve walking trail opportunities, and allow for maintenance access. For all concepts a looped trail around the stormwater features is provided.
- Restoring all disturbed areas with native plantings and pollinator friendly habitats.

The alternatives are discussed in more detail in Sections 5.0 and 6.0.

1.4 Relationship to Watershed Management Plan

The BCWMC included the Medley Park Stormwater Treatment Facility Project in its CIP, based on the following "gatekeeper" policy from the BCWMC Plan. Those items in bold italics represent those that directly apply to this project.

110. The BCWMC will consider including projects in the CIP that meet one or more of the following "gatekeeper" criteria.

- Project is part of the BCWMC trunk system (see Section 2.8.1, Figure 2-14 and Figure 2-15 of the report)
- ***Project improves or protects water quality in a priority waterbody***
- ***Project addresses an approved TMDL or watershed restoration and protection strategy (WRAPS)***
- ***Project addresses flooding concern***

The BCWMC will use the following criteria, in addition to those listed above, to aid in the prioritization of projects:

- Project protects or restores previous Commission investments in infrastructure
- ***Project addresses intercommunity drainage issues***
- Project addresses erosion and sedimentation issues
- ***Project will address multiple Commission goals (e.g., water quality, runoff volume, aesthetics, wildlife habitat, recreation, etc.)***
- ***Subwatershed draining to project includes more than one community***
- ***Addresses significant infrastructure or property damage concerns***

The BCWMC will place a higher priority on projects that incorporate multiple benefits, and will seek opportunities to incorporate multiple benefits into BCWMC projects, as opportunities allow.

The Medley Park Stormwater Treatment Facility meets multiple gatekeeper criteria— the project addresses flooding concerns and the project will improve water quality by reducing the amount of sediment and pollutants that reach Medicine Lake. Additionally, this project will address intercommunity drainage concerns, multiple communities (the Cities of Golden Valley and New Hope) are within the project's subwatershed, and the project will address multiple Commission goals by capturing increased

runoff volume, enhancing water quality, providing recreation opportunities, and improving wildlife habitat.

1.5 Project impacts and estimated costs

Potential impacts of the proposed project (increasing the flood storage and water quality treatment volumes of Medley Pond and developing a water quality BMP in the existing Medley Park area) are summarized in Table 1-1.

Of the project impacts, one of the most significant considerations is the development of the flood storage volume, the impact on flood elevations in surrounding areas, and the reduction in the number of structures at-risk of flooding. One of the main purposes of the project is to lower the flood depths on the roads in the subdivision south of the park and to protect structures around this area. The XP-SWMM results for this project indicate that for the 50-year, 24-hour recurrence interval the flood depth on the low point on Kings Valley Road is reduced from 3.3 feet to 2.7 – 3.0 feet, depending on the concept. For the 100-year, 24-hour flood event, the flood depth on Kings Valley Road is reduced from 4.0 feet to 3.5 – 3.7 feet, depending on the concept. Reductions in flood elevations can translate to structures no longer being at-risk of flooding. For the three concepts, 5 – 6 structures are expected to be removed from the at-risk properties list for the 25-year, 24-hour event, 4 – 5 structures for the 50-year, 24-hour event, and 3 structures for the 100-year, 24-hour event.

Of the project impacts, a second significant consideration is the improvement of water quality to downstream Medicine Lake. The proposed project will result in increased permanent pool volume and sediment storage volume in the new stormwater ponds and the expanded Medley Pond footprint and, therefore, reduce sediment and particulate phosphorus loading to all downstream water bodies, including Medicine Lake. Concepts 1 and 2 also include the construction of biofiltration basins, which will help to remove particulate and dissolved pollutants, such as dissolved phosphorus, through sorption to the soil and intake by plants. Dissolved inorganic phosphorus is the form directly used for photosynthesis. Other forms of phosphorus must be transformed before becoming useful for photosynthesis. Therefore, by removing dissolved inorganic phosphorus from stormwater runoff through biofiltration, less is available for algae and plants to grow in downstream waterbodies.

Dissolved phosphorus can also be removed in stormwater ponds through uptake by submerged plants and phytoplankton. However, uptake of dissolved phosphorus by phytoplankton and plants is usually offset by death and decay of these organisms at the end of the growing season. The dead organic matter will settle as particulate phosphorus, and has the potential to re-release phosphorus due to decomposition by bacteria. Through decomposition, phosphorus in the organic matter is converted from particulate phosphorus to dissolved phosphorus. Therefore, because the uptake and release of dissolved phosphorus can be net neutral in stormwater ponds over the course of a year, the removal of dissolved phosphorus by submerged plants and algae is not quantified for the stormwater pond expansions and additions in the three concepts presented.

Section 6.0 presents estimates of existing pollutant loadings. The estimated increase in total phosphorus removal ranges from approximately 14.0 pounds per year (Concept 1) to 18.6 pounds per year (Concept

2). The estimated increase in dissolved phosphorus removal ranges from 1.2 pounds per year (Concept 1) to 6.3 pounds per year (Concept 2). Dissolved phosphorus is not removed in Concept 3 because the proposed design only includes the construction of stormwater ponds and no biofiltration basins.

To develop the flood storage and water quality volumes, tree removals within the project disturbance/grading limits will be required. Because the project area is in a park and is a popular walking area, community resistance to tree removal is a concern. Wetland and upland restoration, including planting of new trees and shrubs, will occur in all areas disturbed by construction, and many existing trees will be preserved in key areas, such as on the west side of Medley Pond.

The feasibility-level opinion of costs for implementing the various concepts for the 2022-2023 Medley Park Stormwater Treatment Facility Project are present in Table 1-1. This table also lists the 30-year annualized total phosphorus reduction costs and the project costs per acre foot of flood mitigation volume developed.

For a complete summary of the estimated impacts, permitting requirements, disposal of contaminated sediment, closure of pedestrian trails, and costs of the concepts, including the methodology and assumptions used for the cost estimate, refer to Section 6.0, Section 7.0, and Table 6-1.

Table 1-1 Medley Park Stormwater Treatment Facility Impacts Summary

Category	Item	Existing Conditions	Concept 1	Concept 2	Concept 3
Flood Mitigation	Increase in Flood Mitigation Volume (ac-ft)	--	5.3	6	8.3
	# of Potentially At-Risk Structures (25-year)	6	1	1	0
	# of Potentially At-Risk Structures (50-year)	15	11	11	10
	# of Potentially At-Risk Structures (100-year)	20	17	17	17
Water Quality	Additional Water Quality Treatment Volume (ac-ft)	--	2.8	2.7	4.3
	Increase in Total Phosphorus Removal (lbs/yr)	--	14	18.6	17
	Dissolved Phosphorus Removal (lbs/yr)	0	1.2	6.3	0
Restoration	Number of Trees Removed	-	7	7	7
	Restored Wetland Area (ac)	--	0.56	0.69	0.56
	Restored Prairie Area (ac)	--	0.85	0.49	0.56
Project Costs	Feasibility Level Opinion of Cost	--	$1,848,000	$2,137,000	$1,845,000
	Cost per Acre-Ft of Flood Mitigation Volume	--	$349,000	$356,000	$222,000
	Annualized Cost per Pound of Total Phosphorus Removed (Water Quality Treatment)	--	$5,900	$4,500	$3,500

1.6 Recommendations

Based on review of the project impacts for each of the three concepts, the overall project costs, feedback from BCMWC staff, the City of Golden Valley, and residents during the public engagement efforts, the BCWMC Engineer recommends implementation of Concept 3, which best balances the development of flood mitigation volume with water quality treatment.

Concept 3 creates approximately 8.3 acre-feet of additional flood storage for the 100-year, 24-hour flood frequency event, which reduces the 100-year, 24-hour maximum water surface elevations by 0.5 feet within Medley Park and the downstream Kings Valley Pond (ML-2). This reduction in flood elevation removes three structures from being at-risk of flooding for the 100-year, 24-hour storm event. For the 25-year, 24-hour storm event, the maximum water surface elevations within Medley Park and on Kings Valley Pond are reduced by 0.6 feet, which removes six structures from being at-risk of flooding for the 25-year, 24-hour event.

Reducing the maximum water surface elevations of Medley Pond and the Kings Valley Pond during larger storm events also results in reduced road flooding depths near the Kings Valley Townhomes. For the 100-year, 24-hour storm event, the maximum flood depth at the low point on Kings Valley Road is reduced from approximately 4.0 feet to 3.5 feet. For the 50-year, 24-hour storm event, the maximum flood depth at the low point is reduced from approximately 3.3 feet to 2.7 feet. For the 25-year, 24-hour storm event, the maximum flood depth is reduced from approximately 2.5 feet to 1.9 feet.

Concept 3 also increases the phosphorus load reduction by 17.0 pounds per year and restores 0.6 acres of wetland and 0.6 acres of upland, prairie habitat. Disturbed trails would be replaced with a looped ADA paved trail to provide active recreation and habitat viewing opportunities for park users and to provide maintenance access.

The planning level estimated cost for Concept 3 is $1.8 million (-20%/+30%). The revised BCWMC CIP budget for this project is $1.5 million (originally $500,000, but updated March 2021). The BCWMC CIP funding (ad valorem tax levied by Hennepin County on behalf of the BCWMC), is not the sole source of funding for this project. The remainder of the funding may come from a variety of sources, including the City of Golden Valley and other sources (e.g. other grants, as appropriate). The City of Golden Valley may have up to $500,000 in funds available for use on this project. The exact amount will be determined during final design.

2.0 Background and objectives

The Medley Park Stormwater Treatment Facility is included in the BCWMC's current CIP as ML-12 (Table 5-3, as amended in 2018). The proposed project is located in Golden Valley and the goals are to address community flooding issues and improve water quality in Medicine Lake. The feasibility study will aid in the future development of designs for anticipated construction and implementation of the project in 2022 and 2023. The proposed facility would help achieve the goals of the Medicine Lake Total Maximum Daily Load (TMDL) for nutrients.

The proposed project would create flood storage within the project area (approximately 3.6 acres of existing park area) adjacent to the existing Medley Pond, develop additional water quality treatment volume for total suspended solids (TSS) and particulate phosphorus removal, and develop opportunities to enhance dissolved phosphorus removal. The project would help alleviate flooding of residential structures and streets south of the park by expanding the existing Medley Pond footprint and creating additional stormwater ponds within the project area. Additionally, the project would improve water quality downstream by trapping sediment and suspended particulates in the expanded storage, thus minimizing sediment and solids transferred to downstream stormwater ponds and Medicine Lake. Additional stormwater features that target the removal of dissolved phosphorus were also investigated (e.g., biofiltration basins). Furthermore, the proposed project would improve ecology and wildlife habitat, enhance active and passive recreation opportunities within the park, and provide educational opportunities to park users.

2.1 Project area description

Medley Park is located east of Highway 169 and south of Medicine Lake Road. In the western portion of Medley Park is an existing open waterbody named Medley Pond, which has a surface area of approximately 0.5 acres. Approximately 95 acres of urban drainage area in Golden Valley and New Hope discharges into Medley Pond through a constructed stormwater channel north of the pond.

Medley Park is a public, urban, walking park consisting of open green spaces, deciduous forest, open water, various wetland communities, playground equipment, and sporting facilities (e.g., basketball court, tennis court, ice skating rinks). The walking trails are used heavily by the single family and multi-family residential communities surrounding the park.

Figure 2-1 shows the Medley Park project area. Figure 2-2 shows the project site tributary drainage areas.

2.2 Goals and objectives

This project is consistent with the goals (Section 4.1) and policies (Sections 4.2.1, 4.2.2, 4.2.8, and 4.2.10) in the 2015 – 2025 BCWMC Watershed Management Plan.

The goals and objectives of the feasibility study were to:

1. Review the feasibility of developing increased flood storage areas and water quality treatment best management practices (BMPs) in Medley Park, and identify and evaluate three alternatives.

2. Develop three conceptual designs, including preliminary grading in AutoCAD Civil 3D, modeling hydrology and hydraulics using XP-SWMM, and modeling water quality improvements using P8.
3. Provide a planning level opinion of cost for design and construction of the alternatives.
4. Identify potential project impacts and permitting requirements.
5. Develop visual representations of the three alternatives for public input.

The goals and objectives of the flood mitigation and water quality improvement project are to:

1. Develop additional flood mitigation volume in the project area to help reduce flooding in the residential neighborhood south of the project site and reduce flood elevations on Pond ML-2.
2. Develop stormwater BMPs in the project area to remove sediment and particulate and dissolved nutrients to improve water quality of downstream waterbodies, including Medicine Lake.
3. Reduce sediment and particulate nutrient loading to Medicine Lake and improve downstream water quality by providing additional water quality treatment volume in an expanded Medley Pond footprint and within new stormwater ponds in the project area.
4. Reduce dissolved nutrient loading to Medicine Lake and improve downstream water quality by providing biofiltration BMPs in the project area.
5. Remove accumulated, contaminated sediment within Medley Pond to restore water quality treatment capacity and provide enhanced aquatic habitat.
6. Preserve existing trees on the west shoreline of Medley Pond.
7. Restore natural habitat quality and species diversification by restoring wetland and upland habitat within the project disturbance limits, including investigation of various flooding frequencies for the restoration of habitat within the park (e.g., wetland fringe zones).
8. Replace trails disturbed by project construction with accessible trails that are positioned above the 10-year flood frequency event to ensure at least one loop of the park trails can be utilized following larger precipitation events. This will allow the park habitat to be enjoyed more frequently by the surrounding residents.

2.3 Scope

The feasibility study addresses and includes the feasibility study criteria adopted by the BCWMC in October 2013:

- Analysis of multiple alternatives within the context of Commission objectives, including the following for each alternative:
    - Pros and cons analysis
    - Cost estimate for construction and a "30-year cost"
    - Analysis of life expectancy
    - Summary of each alternative for the Commission to judge its merits
    - Cost estimate for annualized cost per pound of pollutant removal

- Evaluation of new and/or innovative approaches
- Identification of permitting requirements

The BCWMC developed the above criteria when the BCWMC's CIP was limited to water quality improvement projects, so they do not specifically address flood mitigation aspects of CIP projects. Therefore, in addition to the criteria above, the following will also be analyzed as part of each alternative:

- Evaluation of flood reduction benefits of each alternative, including acre-feet of additional flood storage provided, lowering of 2, 10, 25, 50, and 100-yr flood elevations at key locations, and quantification of homes and other structures and infrastructure impacted (e.g., homes/households no longer within 1% annual chance floodplain, reduced inundation depth at adjacent roadways, etc.).

As is required for BCWMC CIP Projects, a feasibility study must be completed prior to BCWMC holding a public hearing and ordering the project. This feasibility study developed conceptual designs of the flood mitigation and water quality improvement project, reviewed the permitting requirements, reviewed the field investigation results, considered input from residents and city staff, and developed concept plans and cost estimates for the project.

The BCWMC completed a Resource Management Plan (RMP) in 2009 through which the U.S. Army Corps of Engineers (USACE) and the BCWMC agreed on a series of steps, work items, deliverables (called "protocols") that must be accomplished and submitted to complete the RMP process and USACE review/approval process. Although this project was not included in the RMP, the USACE has allowed the RMP protocols to be applied to other projects not specifically included in the RMP. With the completion of the protocols, we expect the USACE application process to move more quickly than it would otherwise. Most of the protocols must be addressed as part of the feasibility study, in addition to the usual tasks that would be performed as part of a BCWMC feasibility study. In general, the protocols require compliance with Section 106 of the National Historic Preservation Act, compliance with Section 404 of the Clean Water Act, and Clean Water Act Section 401 Water Quality Certification. Compliance with Section 106 typically requires a cultural resources inventory.

In addition to the tasks above, the feasibility study included identifying wetland impacts to meet the RMP pre-application protocols and gathering stakeholder input. The BCWMC Engineer worked with the BCWMC Administrator and City of Golden Valley staff to identify and implement effective measures for gathering input from the public and other affected stakeholders.

2.4 Considerations

Key considerations for project alternatives included:

1. Maximizing the amount of permanent pool storage for water quality benefit and maximizing flood storage up to the 100-year event.
2. Maximizing the amount of sediment and particulate and dissolved phosphorus removed during frequent storm events.
3. Minimizing the permitting required to construct the project.

4. Maintaining or improving the functionality of Medley Pond, including water quality, flood control, and habitat functions.
5. Minimizing wetland impacts.
6. Balancing tree loss and flood storage development and/or replacing removed trees to the extent feasible.
7. Maintaining or improving the functionality of the walking trails and enhancing the park experience.

The considerations listed above played a key role in developing final recommendations and will continue to play a key role through final design.

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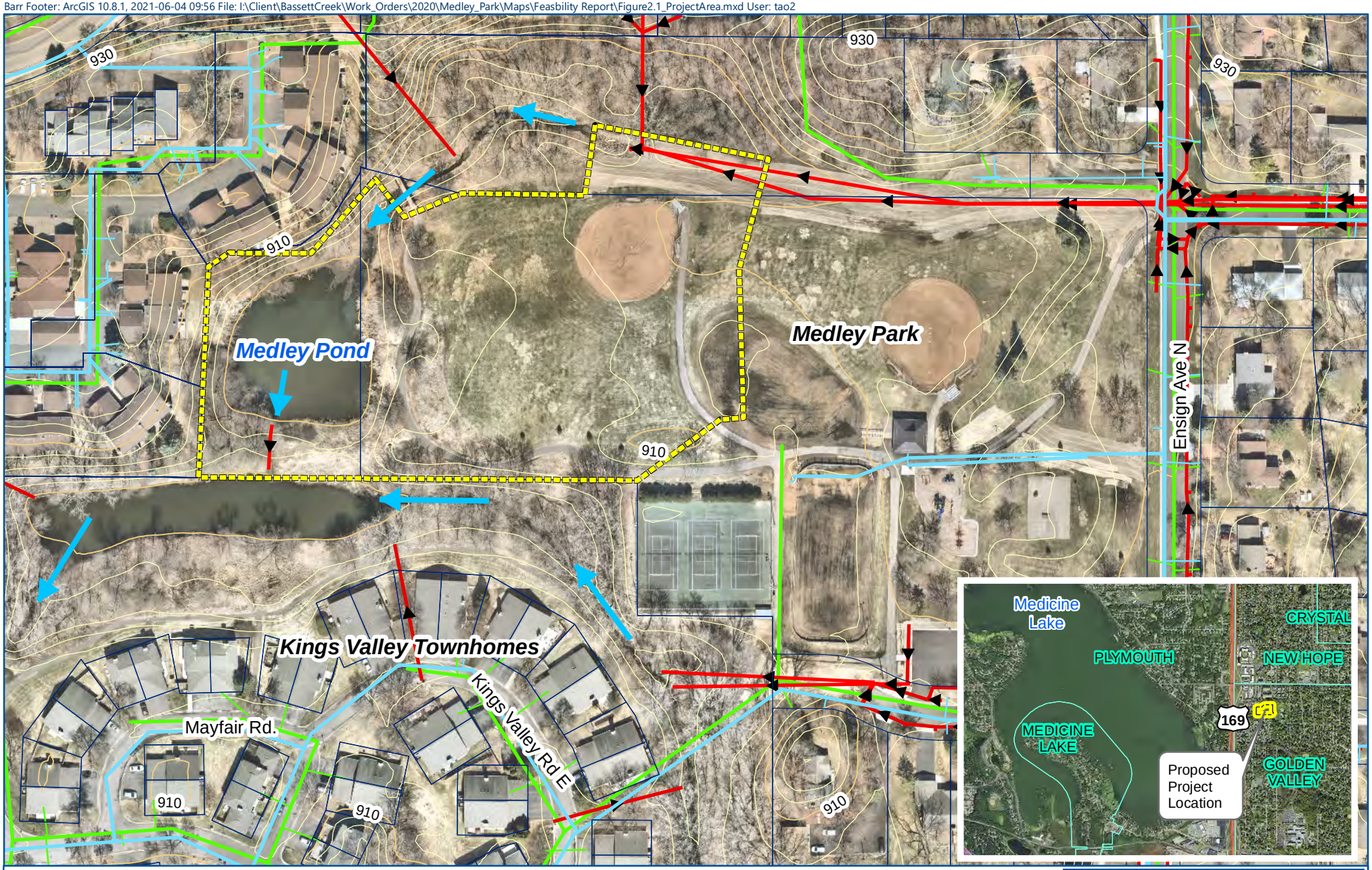

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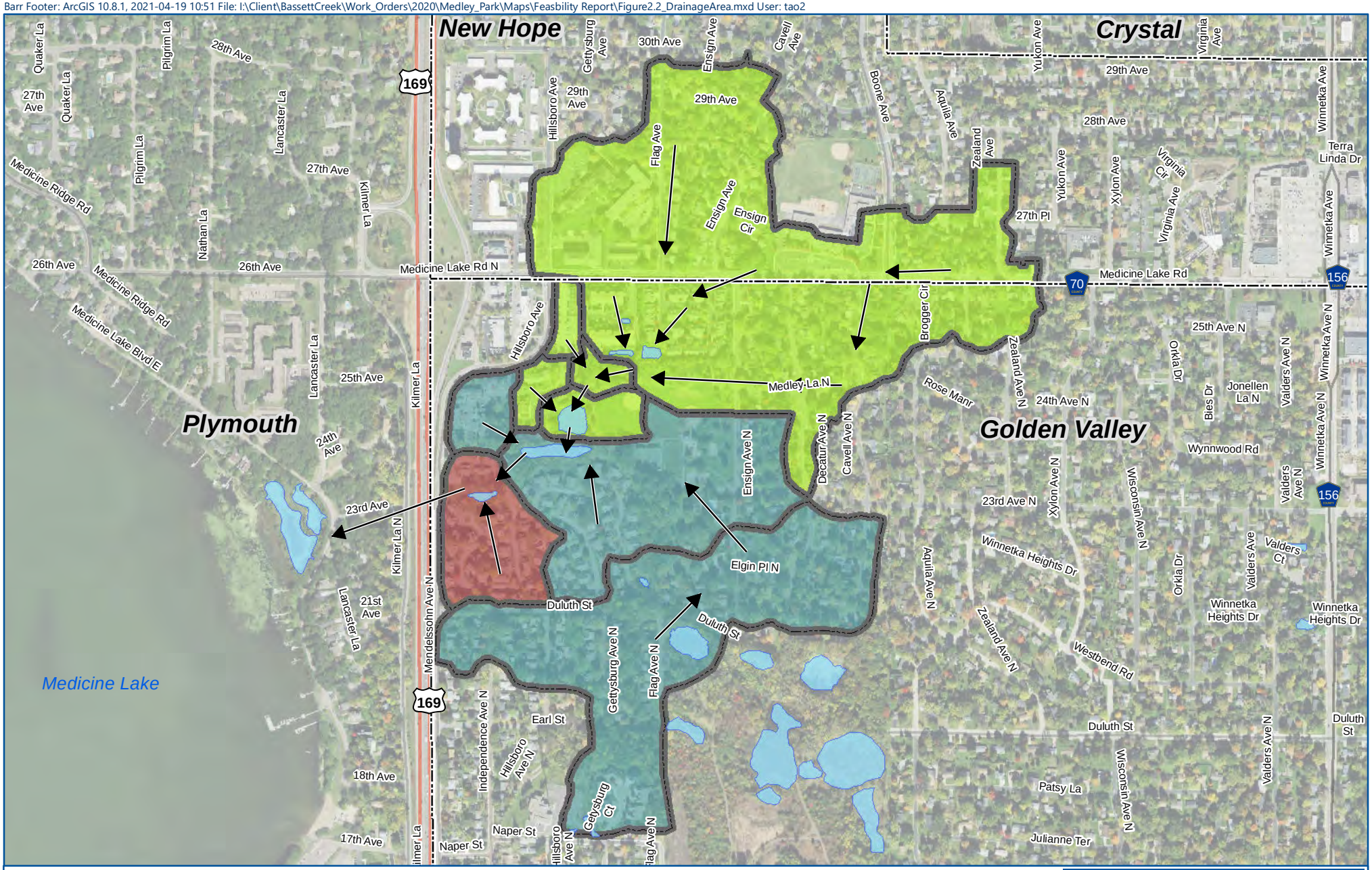

MEDLEY PARK WATERSHED AREAS
Cities of Golden Valley and New Hope

FIGURE 2-2

3.0 Site conditions

3.1 Proposed project location and characteristics

The 95-acre watershed area tributary to Medley Pond drains portions of the cities of Golden Valley and New Hope. Medley Pond, is not classified as a public water by the Minnesota Department of Natural Resources (MnDNR). The watershed is fully-developed; the existing land use includes a mixture of single-family residential, multi-family residential, commercial/industrial, parks and open spaces, and open water.

Stormwater runoff discharges from Medley Pond through a 36"-diameter storm sewer pipe south to a downstream stormwater pond, ML-2 (locally known as Kings Valley Pond). Not including the area tributary to Medley Pond, the additional area tributary to Pond ML-2 is approximately 77 acres and drains portions of the City of Golden Valley. This tributary area is fully-developed; the existing land use includes a mixture of single-family and multi-family residential and commercial properties.

Pond ML-2 discharges southwest to another small stormwater pond, ML-3, which eventually discharges to Medicine Lake.

3.1.1 Medicine Lake water quality concerns

Medicine Lake is a deep-water lake located within the Bassett Creek watershed west of Highway 169 and north of Highway 55. The water quality in Medicine Lake does not meet state standards and is considered poor due to high amounts of nutrients, like phosphorus, which generate excess algae growth. Over the past 20 years, algae levels in the lake have notably increased, impacting aquatic life, and recreation like swimming, boating, and fishing. The monitored concentrations of total phosphorus and chlorophyll-*a* within Medicine Lake over time are presented in Figure 3-1.

Medicine Lake is included on the Minnesota Pollution Control Agency's (MPCA) impaired waters list for mercury, chlorides, and excess nutrients (based on total phosphorus chlorophyll-a and Secchi disc transparency). The United States Environmental Protection Agency (EPA) approved a Total Maximum Daily Load (TMDL) for the excess nutrient impairments in 2011.

Much of the phosphorus load is coming from within the lake itself as aquatic plants die and as phosphorus is released from sediment in the bottom of the lake. In addition to this internal nutrient loading, there are external sources of nutrients coming from the tributary watershed. This occurs through direct urban runoff and from storm sewer systems that collect and convey stormwater to the lake.

The BCWMC and its member cities have completed stormwater projects to help reduce the amount of polluted runoff reaching Medicine Lake. However, as shown in Figure 3-1, investigating additional water quality treatment opportunities is warranted to bring the lake closer to compliance with state standards.

Medley Park is located within the Medicine Lake watershed. Stormwater runoff from the surrounding neighborhoods funnels through Medley Pond and eventually flows to Medicine Lake. One of the goals of

this project is to further reduce the amount of phosphorus reaching Medicine Lake. Medley Park provides a unique opportunity to meet that goal.

For additional details on the nutrient concerns for Medicine Lake, information on Medicine Lake's Total Maximum Daily Load (TMDL) study and TMDL implementation plan can be viewed here: https://www.pca.state.mn.us/water/tmdl/medicine-lake-excessive-nutrients-tmdl-project

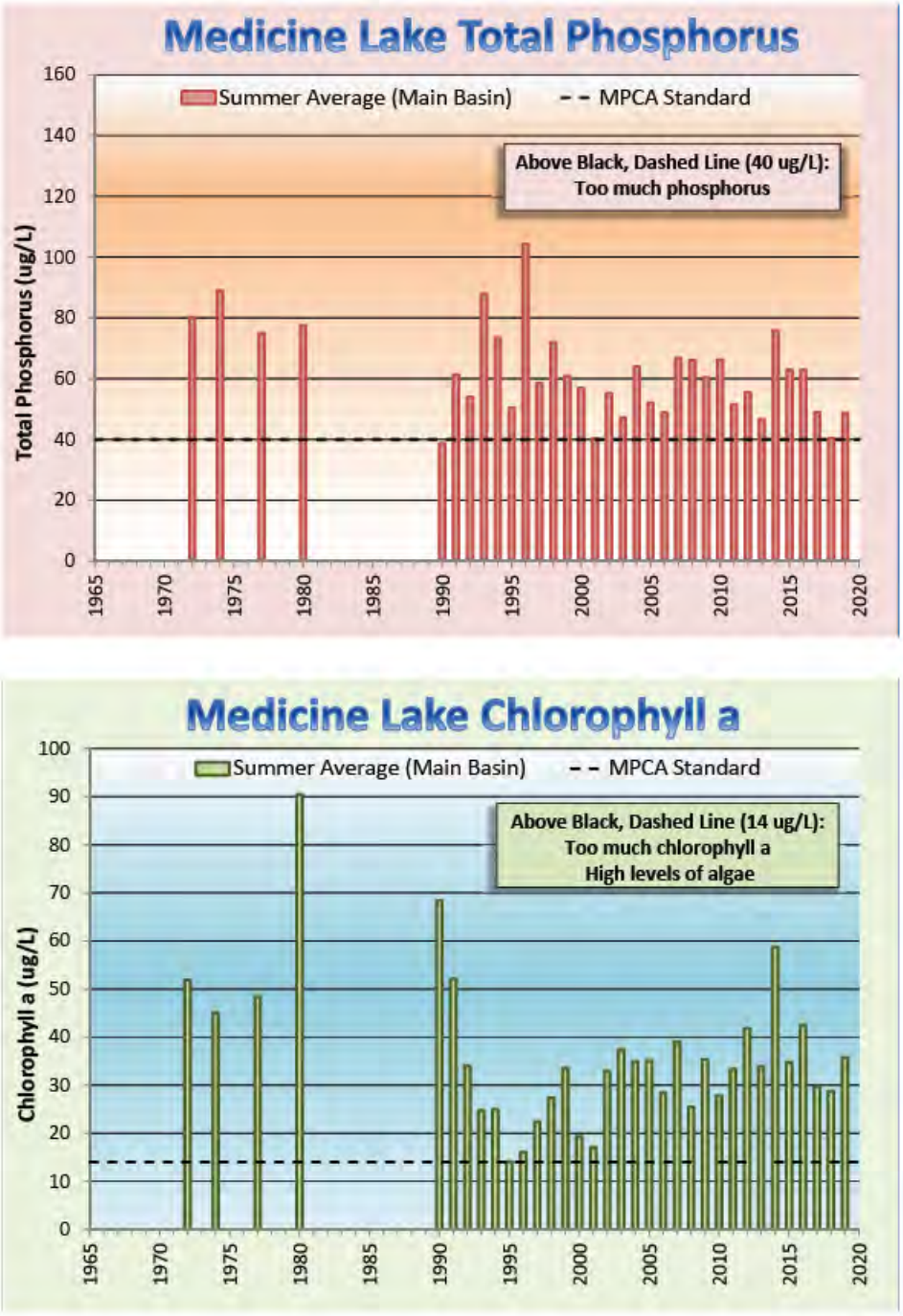

Figure 3-1 Medicine Lake Total Phosphorus and Chlorophyll-*a* Concentrations

3.1.2 Existing flooding conditions

During public input processes in 2019/2020 when the City of Golden Valley engaged with the surrounding neighborhoods about proposed amenity changes in Medley Park, many residents indicated that Medley Park and the surrounding areas experience flooding and drainage issues during large, intense storm

events. Of those who responded to the engagement efforts, a few of the residents indicated that the park trails and low-lying open green spaces are inundated following larger storm events and that the low-lying green space areas remain wet for extended periods of time.

The City documented flooding impacts for the major storm event that occurred in 1987, where 12 known existing structures had basements or first floors with standing water. During the July 1987 storm event, approximately 8 inches of precipitation fell in 6 hours near the City of Golden Valley. Of the 12 known structures with flood impacts, two of these structures had approximately 12 inches of standing water in the basements and four of the structures had up to 18 inches of standing water. For additional information on local flooding, please contact the City of Golden Valley.

Furthermore, existing conditions hydrologic and hydraulic modeling indicates that the depth of flooding that occurs at the low point on Kings Valley Road East for events greater than or equal to the 25-year 24-hour Atlas-14 storm event creates public safety and access issues (with depths of flooding that do not allow for the passage of emergency vehicles). Existing conditions modeling shows that the depth of flooding at the low point on Kings Valley Road East ranges from 2.5 feet for the 25-year event to 4.0 feet for the 100-year event. This depth of flooding will also result in damages to adjacent structures. The existing conditions 100-year flooding inundation is shown in Figure 3-2.

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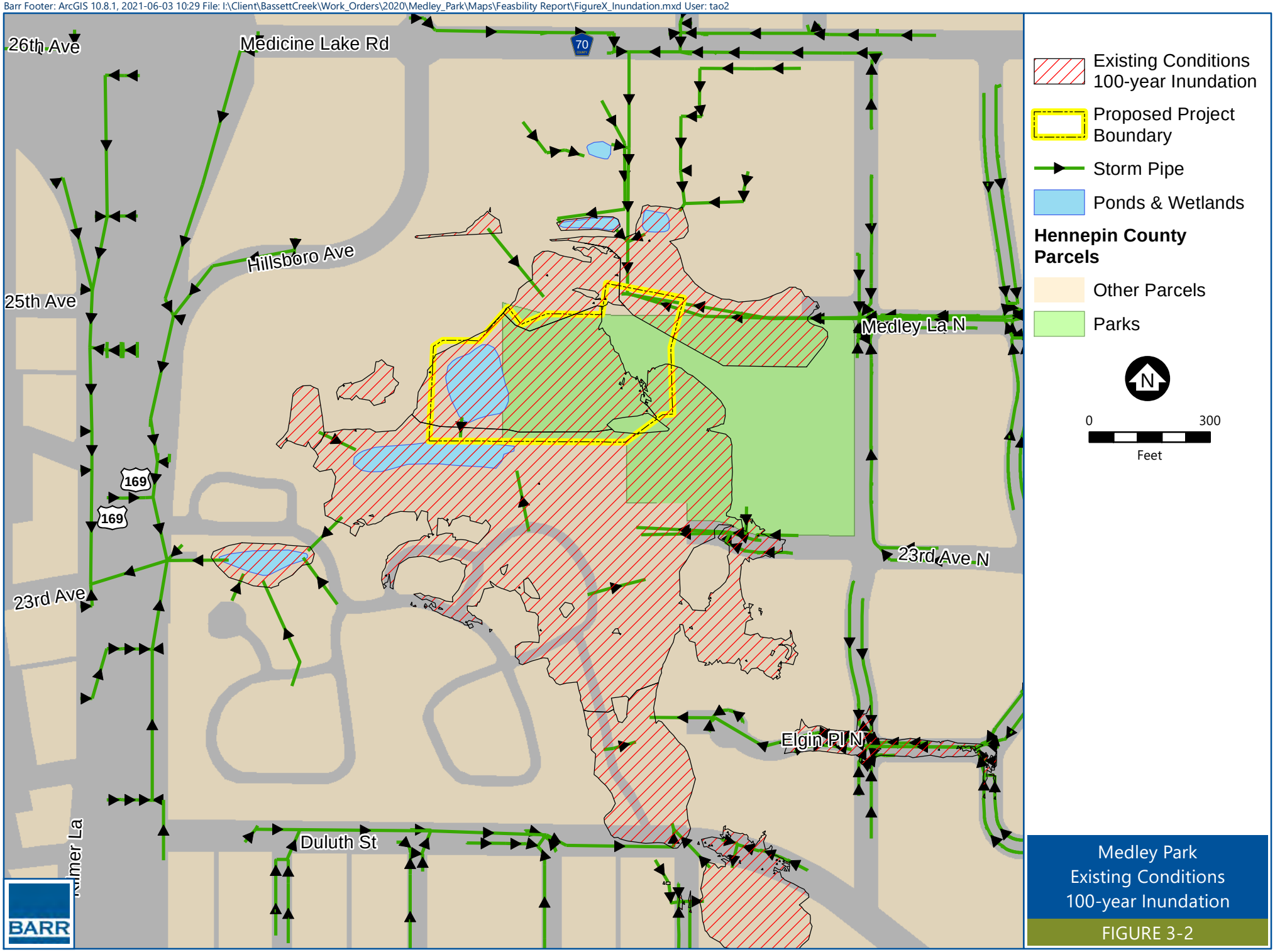

3.1.3 Site access

Construction access will be straightforward because the project is located on public property (Medley Park). Relatively few obstacles or infrastructure elements block access to the proposed work areas. Potential site access locations are at the northeastern portion of the park off of Ensign Avenue North at the existing maintenance access road.

3.1.4 Sediment sampling and bathymetric survey – 2020

In 2020, the BCWMC Engineer completed sediment characterization work and bathymetric surveys for Medley Pond as part of this feasibility study. Sediment sampling was conducted in accordance with the MPCA's *Managing Stormwater Sediment, Best Management Practice Guidance May 2017* (MPCA, 2017). This document provides technical guidance for characterizing sediment in stormwater ponds, including the number of samples that should be collected and potential contaminants to be analyzed. The baseline parameters listed in the MPCA guidance are arsenic, copper, and polycyclic aromatic hydrocarbons (PAHs). PAHs are organic compounds that are formed by the incomplete combustion of organic materials, such as wood, oil, and coal. They are also naturally occurring in crude oil and coal. The MPCA determined that coal tar-based sealants were the largest source of PAHs to stormwater ponds, and a state-wide ban of coal tar-based sealants took effect January 1, 2014. Additional parameters analyzed included all eight Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver); diesel range organics (DRO); and gasoline range organics (GRO) to assess if the sediment, if excavated, could be considered Unregulated Fill and reused as fill offsite. Stormwater pond sediment that does not meet Unregulated Fill criteria is typically disposed in a landfill.

The objectives of this work were to (1) collect bathymetric survey data to assess the current volume of the pond and identify areas of accumulated sediment; (2) characterize sediment contamination for dredging and filling purposes; and (3) identify the native pond bottom due to the lack of available construction drawings for the original excavation of Medley Pond.

Appendix A provides supplementary tables and figures of the sediment sampling and bathymetric survey process and results.

3.1.4.1 Bathymetric Survey

The BCWMC Engineer performed a bathymetric survey of Medley Pond in September 2020. The survey indicated that much of the northern portion of the pond is shallow due to a large volume of accumulated sediment. Current bottom elevations generally range from 897 feet (NAVD88) in the center of Medley Pond to 898 feet at the northeastern channel inlet.

GPS and elevation data from the stormwater pond survey were imported into AutoCAD Civil 3D software. The geographically-referenced survey data points were used to create elevation contours, which represent the current pond bottom conditions. These contours were used to calculate the existing permanent flood pool storage and to assist in calculating the sediment volume removals in the proposed dredging locations.

Figure 3-3 shows a conceptual profile of a typical stormwater pond. The permanent pool, or dead storage volume, is the volume below the pond's outlet elevation. The flood pool is the volume between the outlet elevation and the flood elevation. The permanent pool volume and wetted surface area of Medley Pond were calculated using AutoCAD Civil 3D contours and volume calculation tools, and the outlet elevation data.

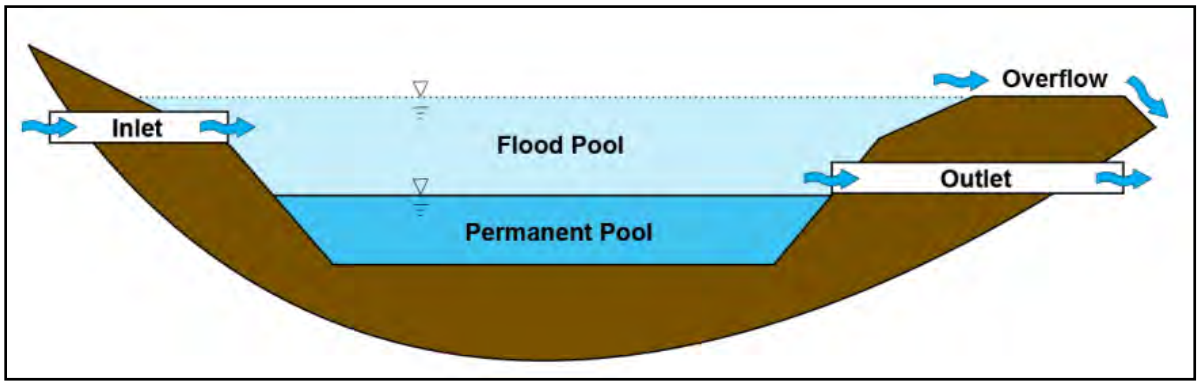

Figure 3-3 Typical storm water pond configuration

3.1.4.2 Native Pond Bottom

As noted in Section 3.1.4, there are no as-built drawings available for Medley Pond, so the native or original constructed pond bottom are not known. However, a September 2005 construction plan set shows a proposed bottom excavation elevation of 895.0 feet (NAVD88) at the northeast inlet channel. If the northeastern portion of Medley Pond was dredged to elevation 895.0 feet as shown in the plan set, then approximately 3.0 feet of sediment has accumulated at the channel inlet to Medley Pond over the past 15 years, based on the 2020 bathymetric survey.

To help further understand the native or original constructed pond bottom, the survey crew recorded the depth of "soft sediment" by measuring the depth they could push a pole by hand into the sediment. The depth of soft sediment can help approximate the depth of accumulated sediment that has settled on the pond bottom over time. The measured soft sediment depth may represent the survey rod hitting a firm substrate like sand or clay, or may represent increasingly dense or cohesive sediments that resists further push of the survey rod by hand. The soft sediment depths recorded by the survey crew ranged from approximately 0.5 – 1.5 feet in the northeast area of the pond to as much as 5 feet in the southern and northwestern areas of the pond (push depth elevation of 893.0 feet, NAVD88). The average soft sediment push depth was approximately 3.0 feet. It is hypothesized that smaller soft sediment depths were recorded in the northeast portion of the pond because larger diameter sediment, such as gravel and sand, settles more readily at the channel outlet to the pond and would restrict the depth that the rod could be pushed down by hand.

The BCWMC Engineer also used sediment core logs to estimate the native pond bottom. Sediment cores were collected at two locations in Medley Pond. The sediment cores were visually logged in the field, and sediment core logs are included in Appendix A. Based on sediment coring logs, there is a transition from soft organic silt to peat at a depth of approximately 4.5-5.0 feet below the pond water surface. Thus, the soil transition elevation, based on the sediment core logs, is approximately 893.5 feet, NAVD88.

Without an as-built survey of the original Medley Pond construction, it is difficult to approximate the original, native bottom elevation before the watershed was urbanized. However, based on the soft sediment push methodology conducted during bathymetric survey and analysis of the sediment cores, we can estimate that the native bottom elevation was at 893.5, based on the sediment layer transition that occurs at that elevation.

3.1.4.3 Sediment Characterization

Sediments from the pond were tested for a variety of contaminants to determine whether sediment, if excavated, could be used as fill or should be disposed in a landfill. The BCWMC Engineer collected the sediment samples and sent them to Pace Analytical to analyze for the following parameters:

- Metals: arsenic, barium, cadmium, chromium, copper, lead, selenium, silver and mercury
- Polycyclic aromatic hydrocarbons (PAHs)
- Diesel range organics (DRO)
- Gasoline range organics (GRO)
- Benzene, toluene, ethylbenzene, and xylene (BTEX)

Results of sediment testing in Medley Pond indicate concentrations of PAHs in the pond sediments exceed Minnesota's Residential SRV for BaP equivalents (2 mg/kg). The PAHs that were analyzed can be grouped into two categories: carcinogenic (i.e., cancer causing) and general. To assess the contamination level of the carcinogenic PAHs in stormwater pond sediment, the MPCA requires the calculation of a "BaP equivalents value." The BaP equivalents value is a single value representing the combined potency of 17 individual carcinogenic PAH compounds with BaP (benzo[a]pyrene) acting as the reference compound. The MPCA guidance document (MPCA 2017) lists the compounds and their respective potency equivalents factors that are used to calculate the BaP equivalents value, along with methods for addressing constituents at concentrations below the detection limit. Concentrations of BaP equivalents in Medley Pond sediment ranged from 4.6 mg/kg to 6.5 mg/kg, which is above Minnesota's Residential SRV (2 mg/kg) but below Minnesota's Industrial SRV (23 mg/kg).

Minnesota does not have SRVs for DRO. However, the MPCA's memorandum on Unregulated Fill lists a Total Petroleum Hydrocarbons (TPH) threshold of 100 mg/kg for soil/sediment to be considered Unregulated Fill (MPCA, 2012). The DRO concentrations in the Medley Pond sediment ranged from 79.4 mg/kg to 129 mg/kg. The results of the DRO testing are estimated values, as concentrations were above the method detection limit but below the method reporting limit.

The Medley Pond sediment test results indicate the sediment does not meet the MPCA's guidelines for Unregulated Fill. BaP equivalents values exceeded the MPCA's Residential (SRV) in all sediment samples; additionally, the DRO concentration exceeded the MPCA's Unregulated Fill TPH threshold of 100 mg/kg in sample SED-01. Medley Pond sediment could potentially be reused as Regulated Fill on a property with industrial or commercial land use designation; however, the additional costs associated with finding a suitable property to accept the material and obtaining MPCA approval to reuse the sediment as Regulated Fill are likely to exceed the costs of landfilling the sediment. Therefore, the BCWMC Engineer recommends that the Medley Pond sediment, if excavated, be disposed in a landfill.

During final design, it is recommended that the sediment characterization data be reevaluated and compared to the MPCA SRVs in effect at that time.

3.1.5 Geotechnical investigation

The BCWMC Engineer subcontracted with Haugo GeoTechnical Services (Haugo) to collect soil borings in Medley Park, east of Medley Pond, to assess infiltration opportunities. Haugo collected two geotechnical borings (SB-North and SB-South) in the areas anticipated to incorporate water quality infiltration/filtration practices. The geotechnical borings were each completed using a hollow stem auger and Standard Penetration Testing (SPT) using an 18" split spoon, and sampling continuously to a depth of 12 feet below ground surface. SPT blow counts indicated a low strength soil, commonly identified with clays and silts. Soils encountered were mostly organic lean clays above a native peat layer near the water table. The peat encountered is at a similar elevation to the peat encountered in the pond sediment cores. The geotechnical investigation showed limited opportunities for infiltration best management practices.

Soils were also field screened for debris and environmental impacts (odor, sheen, and discoloration). No debris was encountered in either boring. No environmental impacts were identified in either of these

borings. Soils were also screened for volatile organic headspace readings using a 10.6 eV photo ionization detector. All headspace readings were below 10ppm, suggesting there are no volatile organic compound impacts to the soils in the borings. Based on the absence of field screening observations indicating potential contamination, no environmental analytical samples were collected during the geotechnical investigation.

Soil boring logs and a map of the boring locations are included in Appendix B.

3.1.6 Environmental review

The BCWMC Engineer completed an environmental desktop review to assess the potential for contamination in the project area. The review included MPCA's What's in My Neighborhood (WIMN) web map of environmental sites (https://www.pca.state.mn.us/data/whats-my-neighborhood), Minnesota Department of Agriculture WIMN map of known and potential sources of agricultural contamination, and a review of historical maps and aerial photos. MPCA WIMN identified one contaminated site near the project area, the AMSTAR petroleum leak site #LS0000183 (Leak Site 183), a gasoline service station located at 9405 Medicine Lake Road in Golden Valley, about 600 feet northwest of the project area. Barr reviewed MPCA files for Leak Site 183. Petroleum releases at the site were discovered in 1987 and 1992. On both occasions, contaminated soil was excavated and removed from the site. Groundwater monitoring performed from 1987 through 1989 at three locations north, west and southwest of the release did not identify concentrations of concern and no free product was documented at the site. Groundwater flow direction was reportedly to the southwest, toward Medicine Lake, away from Medley Park. The 1992 soil excavation removed 791 cubic yards of contaminated soil and left petroleum impacts in place along the western and northeastern edges of the excavation, but impacts to the south and east of the excavation appear to be contained within the leak site property boundaries. Based on the absence of documented free product or groundwater impacts, the distance from the project area, and the inferred direction of groundwater flow being side gradient to Medley Park, the petroleum releases are unlikely to have impacted soils or groundwater at the Medley Park project area. However, there is potential for Medley Pond sediments to be impacted by contaminants through storm sewer inputs or direct runoff, as is common for stormwater ponds in suburban areas.

Historical aerial photos and topographic maps of the project area were reviewed to assess the potential that dumping or filling occurred in the project area. Excavation and filling at the site occurred in the past, as evidenced by the historical presence of wetlands and construction of Medley Pond some time prior to 1991. The source of fill at the site is unknown, however, field observations at two geotechnical boring locations completed did not show evidence of debris or impacts.

Based on the environmental desktop review, there is potential for contamination in the Medley Pond sediments. The sediment investigation described in Section 3.1.4.3 addresses these potential impacts. Based on the historical filling at the site, the BCWMC Engineer recommends preparation of a site contingency plan to address potential impacts of contamination that may be identified in the fill or debris during the project construction.

3.1.7 Topographic, utility, and tree surveys

The BCWMC Engineer subcontracted with Egan, Field and Nowak, Inc. (EFN) to complete a topographic, tree, and utility survey within the project extents in fall 2020. EFN collected topographic information in Hennepin County NAD83 horizontal datum and NAVD88 vertical datum, and imported the information into AutoCAD Civil 3D to create an existing conditions surface for this feasibility study. They located underground utilities based on the location of manhole structures, as-built/construction plan drawings from the City, and through a Gopher State One Call utility locate.

This project would incur some tree loss and some tree replacement. Therefore, trees larger than 4 inches in diameter were surveyed and the species, condition, and diameter data were collected. A total of 79 trees were surveyed within Medley Park. Figure 3-4 shows the location of the surveyed trees. The tree survey covered only the portion of Medley Park where proposed excavation would occur. As a result, the tree removal summaries presented in Table 6-1 are based on the percentage of trees removed in the proposed excavation areas only, not the entire park.

Based on the survey data collected, trees were classified according to the City of Golden Valley's tree ordinance (see Table 3-1). The survey showed that 43 of the trees 4" and greater in diameter in the surveyed portion of Medley Park are elm, 22 are boxelder, and 4 are spruce. The remaining 10 trees surveyed consist of species such as basswood, poplar, locust, hackberry, and maple. Of the 79 trees surveyed, 72 trees were found in good condition, 4 trees in fair condition, and 3 dead or dying. Additionally, 42 of the trees surveyed were significant and 0 were legacy. Section 6.6.2 discusses the anticipated tree impacts from the proposed Project.

Table 3-1 City of Golden Valley Tree Ordinance Definitions

Tree Type[1]	Significant	Legacy	Other
Hardwood Deciduous	6" ≤ Diameter < 30"	Diameter ≥ 30"	Diameter < 6"
Softwood Deciduous	Diameter ≥ 12"	-	Diameter < 12"
Coniferous	4" ≤ Diameter < 24"	Diameter ≥ 24"	Diameter < 4"

[1] A healthy tree not considered a nuisance under City regulations

3.1.8 Wetland delineations

The BCWMC Engineer completed a wetland delineation for the Medley Park project area on September 14, 2020. The wetland delineation area included Medley Pond, the northern edge of the downstream stormwater pond (City of Golden Valley Pond ML-2), and the Medley Park area. One wetland (Wetland 1) was delineated within the project area. The descriptions and assessments of the wetland is provided in Section 3.1.8.1. Appendix C provides a full summary of the wetland delineation, including figures and wetland data sheets.

The wetland delineation report was prepared in accordance with the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual ("1987 Manual," USACE, 1987), the Regional Supplement to the Corps of

Engineers Wetland Delineation Manual: Midwest Region (USACE, 2010) and the requirements of the Minnesota Wetland Conservation Act (WCA) of 1991.

The delineated wetland boundary and sample points were surveyed using a Global Positioning System (GPS) with sub-meter accuracy. Wetlands were classified using the U.S. Fish and Wildlife Service (USFWS) Cowardin System (Cowardin et al., 1979), the USFWS Circular 39 system (Shaw and Fredine, 1956), and the Eggers and Reed Wetland Classification System (Eggers and Reed, 1977).

3.1.8.1 Wetland 1

Wetland 1 included both Medley Pond and City of Golden Valley Pond ML-2 as the two wetland segments are connected through a culvert located underneath the upland berm between the two ponds. Both segments of the wetland were classified as a deep marsh bordered with a seasonally flooded basin (PUBGx/PEMC). Vegetation along the wetland boundary was dominated by cattails (Typha spp.; OBL), and bordered by reed canary grass (Phalaris arundinacea; FACW), jewel weed (Impatiens capensis; FACU), and water smartweed (Persicaria amphibia; OBL). Woody vegetation such as boxelder (Acer negundo; FAC) and common buckthorn (Rhamnus cathartica; FAC) were also present. Duckweed was observed floating within the deep marsh portion of the wetland.

Using the Minnesota Routine Assessment Method (MnRAM) wetland assessment methodology, the wetland area was classified as a Manage 2 wetland as the wetland is rated low for amphibian habitat. Refer to Appendix C for the MnRAM Excel spreadsheet.

3.1.9 Threatened and endangered species

Through a license agreement (LA-898) with the MnDNR for access to the Natural Heritage Information System (NHIS) database, the BCWMC Engineer queried the NHIS database in October 2020 to assess if any rare species could potentially be affected by the proposed project. The NHIS database did not identify any state listed species within one mile of the project area.

The US Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation System (IPaC) website identified one federally listed species potentially occurring in the project area: the northern long-eared bat (*Myotis septentrionalis;* threatened). No designated critical habitat for any federally listed species is located within the project area.

According to GIS data obtained from the MnDNR, there are no Minnesota County Biological Survey (MCBS) Sites located within one mile of the proposed project site. Additionally, no state-owned wildlife management areas (WMA), Scientific Natural Areas (SNA), or native plant communities are present within one mile of the proposed project area.

Impact Analysis

The northern long-eared bat hibernates in caves during the winter and utilizes forested areas for roosting and foraging during the bat's active season of April through September. Suitable roost trees for this species have trunks measuring greater than 3-inch diameter at breast height with loose, peeling bark or

crevices. Less than ten trees exceeding 3 inches at breast height are proposed for clearing as part of this project. According to data provided by the MnDNR, there are no known, occupied roost trees or hibernacula located with the project area. The nearest known hibernacula are located over 14 miles southeast of the project area. However, because the project occurs within the range of the northern long-eared bat and potentially up to ten trees will be cleared for the development of flood storage, the possibility of direct and indirect impacts cannot be completely discounted. As a result, the project may affect, but is not likely to adversely affect, the federally threatened northern long-eared bat and is not expected to cause a prohibited take of this species. A prudent, but not mandatory, measure to avoid all direct impacts to the northern long-eared bat is to remove the proposed trees outside of the active season (outside of April—September).

In summary, this project is not expected to impact state-listed species. The project is not anticipated to adversely affect or cause prohibited take of the federally listed northern long-eared bat.

3.1.10 Cultural resources

In September 2020, the BCWMC Engineer requested a file search from the Minnesota State Historic Preservation Office (SHPO) Standing Structures (Historic) and Archaeology Inventories for all public land survey sections located within one mile of the project area.

SHPO responded to the data request with information indicating that there are numerous historical sites located within a mile of the project area; however, no previously recorded archaeological sites are located within a mile of the project area. Most of the project area has been previously disturbed from the construction of the existing stormwater pond, paved bike trail and baseball field. During these disturbances no archaeological resources were identified. The proposed project would not impact any previously recorded standing structures or archaeological sites.

This review only reflects currently known cultural resources; it is possible that unidentified cultural resources may be present within the project area. Further cultural resources evaluation may be required as part of future design and permitting efforts.

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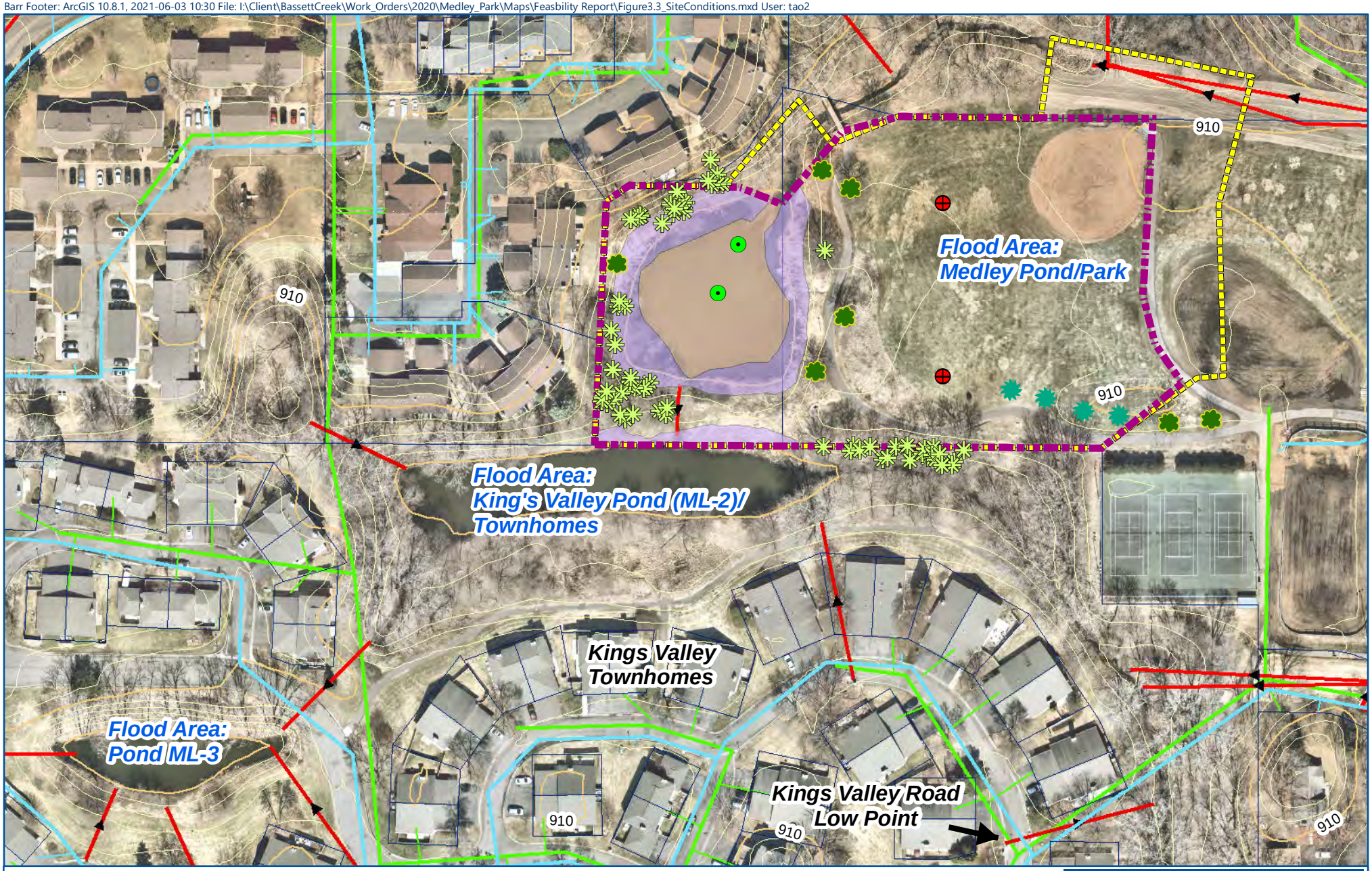


Proposed Project Boundary
Wetland Survey Boundary
Hennepin County Parcels
Soil Boring Locations
Sediment Sampling Locations
Storm Sewer Pipe
Watermain
Sanitary Sewer Main

Surveyed Trees
Significant Coniferous
Significant Hardwood
Significant Softwood

Delineated Wetlands
PEMC
PUBGx

Existing Contours
10-foot contour
2-foot contour

N

120 0 120
Feet

BARR

MEDLEY PARK
SITE CONDITIONS

FIGURE 3-4

4.0 Stakeholder input

4.1 Public stakeholder meetings

Because the proposed flood mitigation and water quality BMPs will impact Medley Park, input from two public stakeholder engagement events was compiled and considered before refining the flood mitigation concepts. As a result of the ongoing Covid-19 pandemic and public safety concerns, online materials and surveys rather than in-person public open houses were held to gather public input about the stormwater retrofit project within Medley Park.

4.1.1 Public stakeholder engagement 1

The first virtual public engagement activity included a pre-recorded presentation offering background information on the proposed project. After watching the pre-recorded presentation, participants were invited to complete an online survey. Within the survey, participants could describe their views on issues, concerns, and needs for the park area. This first activity was available online from the end of November 2020 through mid-December 2020. A letter was mailed to residents informing them of the presentation and online survey. Web links were provided on the City of Golden Valley's Medley Park Project webpage, the City's website news feed, social media, and on the BCWMC's project webpage to promote participation.

The comments received were grouped into several themes including the following:

- General support for flood mitigation, protection of structures from flooding, and preservation of the neighborhood
- Desire for trail accessibility and maintenance
- Concerns about wet or water-logged open green space areas
- General support for Medley Pond expansion and/or more open water area
- Support of restoration with native species and pollinator species
- Support of invasive species management
- Concerns related to tree management
- Concerns related to special assessment for property owners

Following closure of the survey, a Medley Park Stormwater Feasibility Study Community Input report was developed summarizing all of the responses. This report can be reviewed at the following location:

http://www.goldenvalleymn.gov/stormwater/pdf/medley-input-report.pdf

These comments were considered as part of the development of the feasibility study concepts and will continue to be considered as the project progresses through final design.

4.1.2 Public stakeholder engagement 2

A second public stakeholder virtual presentation was posted from April 16 to May 7, 2021, which provided background details on the feasibility study and presented the three concept designs. Public feedback was

received through online forms and email correspondence. A total of nine participants provided feedback and/or asked questions about the concept designs. One participant noted preference for Concepts 1 or 2 because of the biofiltration basin's ability to remove dissolved phosphorus. Another participant noted Concept 2 as a preference and stated their excitement for natural plantings. Two other participants noted Concept 3 as preferential for flood benefits. One participant asked that the park remain as it looks now. The remaining four participants provided feedback and asked questions, but did not indicate a preference for any of the alternatives.

In addition, City of Golden Valley staff engaged with the City's Environmental Commission and Open Space and Recreation Commission for comments and feedback. Both were supportive of the concepts and the potential project, and no preferred concept was identified.

4.2 Technical stakeholder meeting

A technical stakeholder meeting with regulatory agencies was held virtually on December 16, 2020 to solicit feedback on and discuss permitting requirements for the proposed Medley Park stormwater retrofit designs. Attendees included representatives from the BCWMC, the City of Golden Valley, the United States Army Corps of Engineers (USACE) and the Minnesota Pollution Control Agency (MPCA). MnDNR staff were not included since Medley Pond is not mapped as a public water.

The BCWMC Engineer presented background information on the flooding, water quality concerns, and general goals and design concepts for the Medley Park Stormwater Project, which was followed by discussion related to technical feedback and permitting input. The items discussed included:

- Review of project background and history
- Review of site information compiled to-date and site investigation work completed
- Review of potential design concepts
- Discussion of regulatory issues and potential permit requirements
- Discussion of feasibility study

Section 6.4 summarizes the anticipated permitting requirements as discussed at the meeting.

5.0 Potential improvements

This section outlines the components of each of the three conceptual designs developed and evaluated for the Medley Park Stormwater Treatment Facility. The primary focus of all three concepts was to add flood storage in Medley Park and provide water quality treatment for small events by diverting stormwater runoff from existing storm infrastructure.

Section 6.0 summarizes the impacts of the conceptual designs.

5.1 Concept 1

Figure 5-1 shows a visual representation of the proposed features of Concept 1. This alternative includes the following design components:

- Installing a diversion weir structure at the existing manhole upstream of the park's intermittent stream. Under proposed conditions, stormwater runoff would be directed south to a new stormwater pond during smaller storm events. During larger storm events, stormwater runoff would overtop the weir wall in the diversion structure, discharge into the existing channel, and flow towards Medley Pond.

- Constructing a new stormwater pond (open water with fringe wetland) downstream of the diversion weir structure with a normal water level at 902.5 ft MSL. The proposed water quality treatment volume of the new pond is approximately 0.8 ac-ft, and the proposed flood volume is 3.1 ac-ft (up to the 100-year flood elevation). The primary outlet of the new pond would consist of a submerged, back-sloped storm sewer pipe to prevent accumulation of debris at the outlet. An outlet control structure would be positioned downstream of the back-sloped pipe and consist of a 6-inch diameter orifice (invert 902.5 ft MSL) and concrete weir wall that is the full height of the structure. The manhole would also have a grate positioned approximately 0.8 feet below the proposed trail low point to act as an overflow for larger storm events.

- Constructing a biofiltration basin downstream of the new stormwater pond. Two submerged and back-sloped storm sewer pipes would allow volume from the upstream new stormwater pond to enter the biofiltration basin while limiting the amount of floatable debris that can enter the basin. The storm sewer outlet to the biofiltration basin would be set one foot above the basin bottom to allow a minimum of one-foot treatment depth. A berm, with an emergency overflow, would be constructed to separate the pond and basin. The biofiltration basin would provide approximately 0.6 ac-ft of water quality treatment volume below the outlet rim elevation (2 feet above the basin bottom) and remove approximately 1.2 pounds of dissolved phosphorus per year through sorption to soils and sand. No filtration enhancements are proposed for the biofiltration basin substrate (i.e. iron-enhanced sand) to remove additional dissolved phosphorus. Limitations for the configuration of the basin and stormwater ponds, including existing stormwater infrastructure, existing topography, and the volume of stormwater runoff tributary to the park, results in a longer than recommended inundation period for iron-enhanced

sand. Under longer periods of inundation, iron-enhanced sand removal efficiency decreases and can even release phosphorus under certain conditions.

- Dredging Medley Pond to a bottom elevation of 894 ft MSL and landfilling approximately 1,500 cubic yards of contaminated sediment.
- Expanding Medley Pond to increase the open water area of the existing pond by 0.2 acres to 0.7 acres.
- Increasing the total open water area in Medley Park by 0.48 acres from existing conditions with the expansion of Medley Pond and the installation of a new stormwater pond. The total open water area under Concept 1 is 0.94 acres.
- Increasing the total water quality volume by 2.8 acre-feet to 3.2 acre-feet from existing conditions through expansion of Medley Pond and excavation and regrading of the western portion of Medley Park.
- Increasing the total flood mitigation volume by 5.3 acre-feet to 18.3 acre-feet (up to the 100-year flood elevation) from existing conditions through expansion of Medley Pond and excavation and regrading of the western portion of Medley Park.
- Removing 7 trees within the proposed project area and preserving trees on the western side of Medley Pond.
- Replacing disturbed trails with a looped, ADA-compliant paved trail above elevation 906 (above the 10-year flood elevation) and around the proposed features. An emergency overflow at elevation 906 would be positioned in the western trail profile to allow preferential flow from the new stormwater pond into Medley Pond during overflow conditions.
- Restoring 0.9 acres of prairie habitat and 0.6 acres of wetland habitat surrounding the new project features.
- Reducing the size of the existing ice-skating rink by approximately 20% to allow for creation of additional flood mitigation volume.
- Protecting the existing stream and pedestrian bridge north of Medley Pond.

5.2 Concept 2

Figure 5-2 shows a visual representation of the proposed features of Concept 2. This alternative includes the following design components:

Components from Concept 1:

- Dredging Medley Pond to a bottom elevation of 894 ft MSL and landfilling approximately 1,500 cubic yards of contaminated sediment.

- Removing 7 trees within the proposed project area and preserving trees on the western side of Medley Pond.

- Replacing disturbed trails with a looped, ADA-compliant paved trail above elevation 906 (above the 10-year flood elevation) and around the proposed features. An emergency overflow at elevation 906 would be positioned in the western trail profile to allow preferential flow from the new stormwater pond into Medley Pond during overflow conditions.

- Protecting the existing stream and pedestrian bridge north of Medley Pond.

Components unique to Concept 2:

- Installing a new manhole and diversion weir structure 175 ft upstream of the storm sewer outlet to the park's intermittent stream. Under proposed conditions, stormwater runoff would be directed southwest to a biofiltration basin during smaller storm events. During larger storm events, stormwater runoff would overtop the weir wall in the diversion structure, discharge into the existing channel, and flow towards Medley Pond.

- Constructing a biofiltration basin in the eastern half of the construction area. The biofiltration basin would provide 0.7 ac-ft of water quality treatment volume below the outlet structures' rim elevations (1.5 feet above the basin bottom). Flows from the basin would discharge west to the new stormwater pond. The biofiltration basin would remove approximately 6.3 pounds of dissolved phosphorus per year through sorption to soils and sand. No filtration enhancements are proposed for the biofiltration basin substrate (i.e. iron-enhanced sand) to remove additional dissolved phosphorus. Limitations for the configuration of the basin and stormwater ponds, including existing stormwater infrastructure, existing topography, and the volume of stormwater runoff tributary to the park, results in a longer than recommended inundation period for iron-enhanced sand. Under longer periods of inundation, iron-enhanced sand removal efficiency decreases and can even release phosphorus under certain conditions.

- Constructing a new stormwater pond (open water with fringe wetland) with a normal water level at 900 ft MSL. The water quality treatment volume of the new pond would be 1.0 ac-ft, and the flood storage volume would be 6.6 ac-ft (up to the 100-year flood elevation). The primary outlet of the new pond would consist of a 30-inch RCP with a trash rack.

- Constructing a berm between the biofiltration basin and new stormwater pond with an emergency overflow set at 906 ft MSL.

- Diverting the existing intermittent stream into the constructed stormwater pond by constructing a berm at the mouth of the existing stream with a crest elevation of 904.5 ft MSL and installing a

14′ x 5′ box culvert (invert 899.5 ft MSL) that would connect the stream diversion to the new stormwater pond.

- Expanding Medley Pond to increase the open water area of the existing pond by 0.1 acres to 0.6 acres.
- Increasing the total open water area in Medley Park by 0.58 acres from existing conditions through the expansion of Medley Pond and the installation of a new stormwater pond. The total open water area under Concept 2 is 1.04 acres.
- Increasing the total water quality volume by 2.7 acre-feet to 3.0 acre-feet from existing conditions through the expansion of Medley Pond and the excavation and regrading of the western portion of Medley Park.
- Increasing the total flood mitigation volume by 6.0 acre-feet to 19.0 acre-feet (up to the 100-year flood elevation) from existing conditions through the expansion of Medley Pond and the excavation and regrading of the western portion of Medley Park.
- Restoring 0.5 acres of prairie habitat and 0.7 acres of wetland habitat surrounding the new project features.
- No planned impacts to the existing ice-skating rink.

5.3 Concept 3

Conceptual design 3 consists of creating a design that maximizes flood storage volume by the addition of stormwater ponds. Figure 5-3 shows a visual representation of the proposed features of Concept 3. This alternative includes the following design components:

Components from Concepts 1 and 2:

- Dredging Medley Pond to a bottom elevation of 894 ft MSL and landfilling approximately 1,500 cubic yards of contaminated sediment.
- Removing 7 trees within the proposed project area and preserving trees on the western side of Medley Pond.
- Replacing disturbed trails with a looped, ADA-compliant paved trail above elevation 906 (above the 10-year flood elevation) and around the proposed features. An emergency overflow at elevation 906 would be positioned in the western trail profile to allow preferential flow from the new stormwater pond into Medley Pond during overflow conditions.
- Protecting the existing stream and pedestrian bridge north of Medley Pond.

- Diverting the existing intermittent stream into the constructed stormwater pond by constructing a berm at the mouth of the existing stream with a crest elevation of 904.5 ft MSL and installing a 14′ x 5′ box culvert (invert 899.5 ft MSL) that would connect the stream diversion to the new stormwater pond.

Components unique to Concept 3:

- Constructing two new stormwater ponds (open water areas with wetland fringe) downstream of the stream diversion. The first stormwater pond would have a normal water level at 900 ft MSL. The water quality treatment volume would be 2.1 ac-ft, and the flood storage volume would be 8.1 ac-ft (up to the 100-year flood elevation). The primary outlet of the new pond would consist of a 24-inch RCP with a trash rack. The second stormwater pond would have a normal water level at 899 ft MSL. The water quality treatment volume would be 0.5 ac-ft and the flood storage volume would be 3.7 ac-ft. The primary outlet of the second stormwater pond would consist of a 24-inch RCP with a trash rack.

- Expanding Medley Pond to increase the open water area of the existing pond by 0.1 acres to 0.6 acres.

- Increasing the total open water area in Medley Park by 1.01 acres from existing conditions through the expansion of Medley Pond and the installation of two new stormwater ponds. The total open water area under Concept 3 is 1.47 acres.

- Increasing the total water quality volume by 4.3 acre-feet to 4.6 acre-feet from existing conditions through the expansion of Medley Pond and the excavation and regrading of the western portion of Medley Park. Filtration BMPs that would remove dissolved phosphorus were not included in this concept due to considerable bounce of water levels and long inundation periods for smaller storm events (see Section 8.0 for further discussion on the limitations of dissolved phosphorus removal for Concept 3).

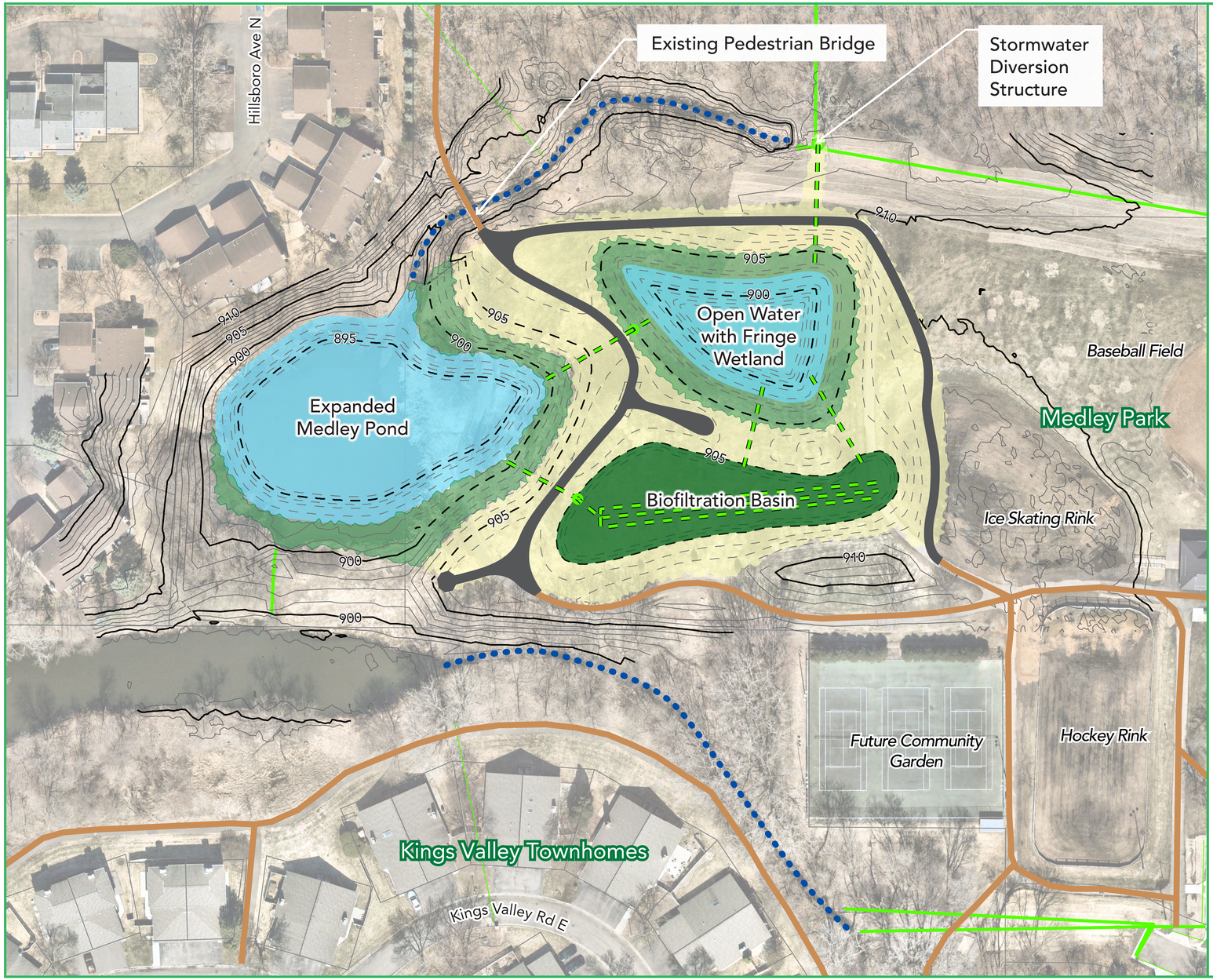
- Increasing the total flood mitigation volume by 8.3 acre-feet to 21.3 acre-feet (up to the 100-year flood elevation) from existing conditions through the expansion of Medley Pond and the excavation and regrading of the western portion of Medley Park.

- Restoring 0.6 acres of prairie habitat and 0.6 acres of wetland habitat surrounding the new project features.

- Reducing the size of the existing ice-skating rink by approximately 10% to allow for additional flood mitigation volume.

Concept 1

Estimated Cost = $1.8 million



LEGEND

- Open Water
- Biofiltration Basin
- Wet Meadow
- Prairie
- Existing 1′ Contour
- Existing 5′ Contour
- Proposed 1′ Contour
- Proposed 5′ Contour
- Existing Storm Sewer Pipe
- Proposed Storm Sewer Pipe
- Existing Stream
- Existing Paved Trail
- Proposed Paved Trail
- Parcel Boundary Lines

N

0 50 100 200

Feet

Concept Summary

Additional Flood Storage Created:
5.3 acre-feet

Improved Water Quality:
Additional 14.0 lbs/yr phosphorus removed (1.2/lbs/yr dissolved phosphorus)

Restored Wetland and Prairie habitat:
1.4 acres total

Open Water Area:
0.9 acres total

Tree Removal Estimate
7 trees total

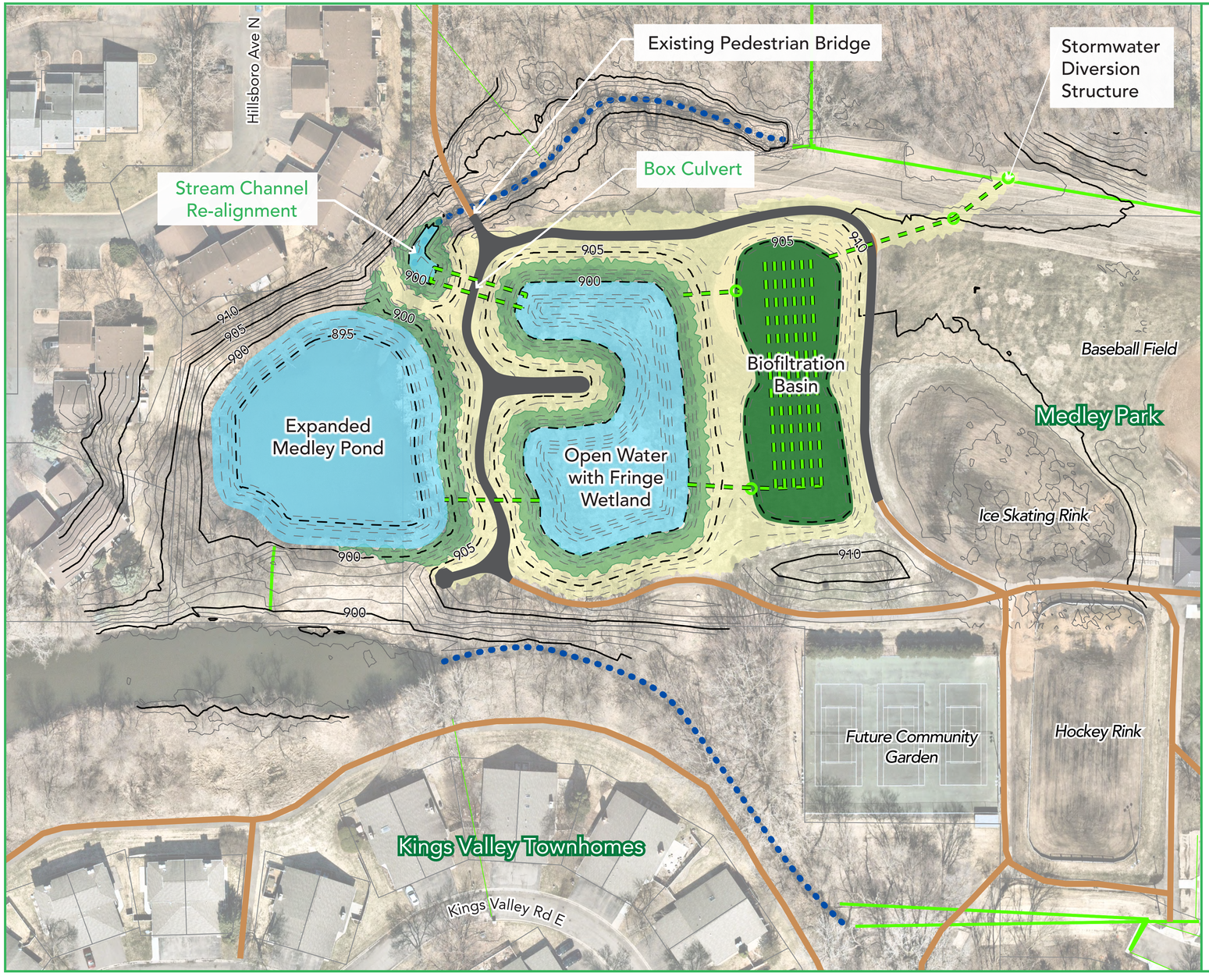
At-Risk Flooded Structures (existing/proposed):

25-yr	50-yr	100-yr
6/1	15/11	20/17

Figure 5.1

Concept 2

Estimated Cost = $2.1 Million



LEGEND

- Open Water
- Biofiltration Basin
- Wet Meadow
- Prairie
- Existing 1′ Contour
- Existing 5′ Contour
- Proposed 1′ Contour
- Proposed 5′ Contour
- Existing Storm Sewer Pipe
- Proposed Storm Sewer Pipe
- Existing Stream
- Existing Paved Trail
- Proposed Paved Trail
- Parcel Boundary Lines

N

0 50 100 200

Feet

Concept Summary

Additional Flood Storage Created:
6.0 acre-feet

Improved Water Quality:
Additional 18.6 lbs/yr phosphorus removed (6.3/lbs/yr dissolved phosphorus)

Restored Wetland and Prairie habitat:
1.2 acres total

Open Water Area:
1.0 acres total

Tree Removal Estimate
7 trees total

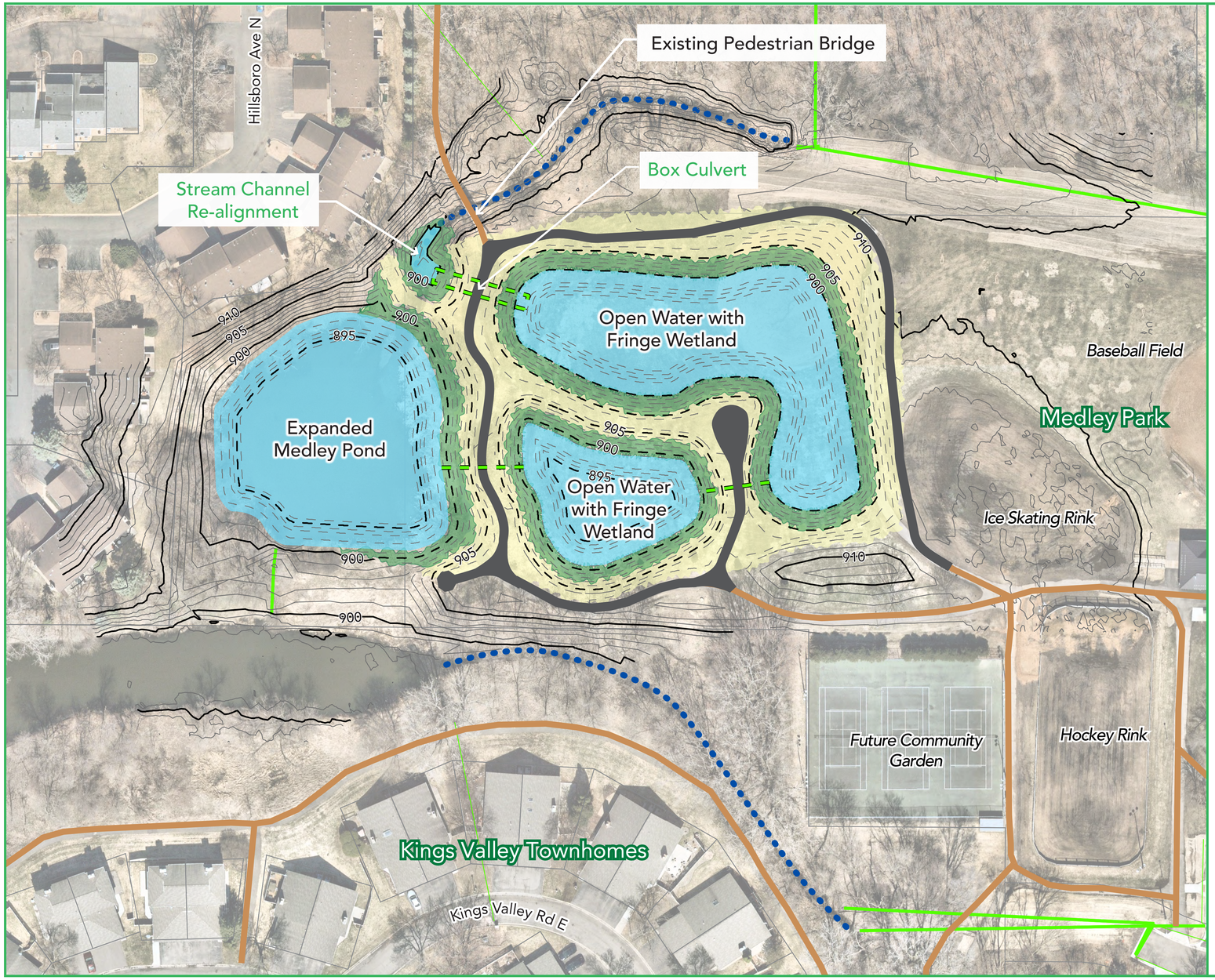
At-Risk Flooded Structures (existing/ proposed):

25-yr	50-yr	100-yr
6/1	15/11	20/17

Figure 5.2

Concept 3

Estimated Cost = $1.8 Million



LEGEND

- Open Water
- Wet Meadow
- Prairie
- Existing 1′ Contour
- Existing 5′ Contour
- Proposed 1′ Contour
- Proposed 5′ Contour
- Existing Storm Sewer Pipe
- Proposed Storm Sewer Pipe
- Existing Stream
- Existing Paved Trail
- Proposed Paved Trail
- Parcel Boundary Lines

N

0 50 100 200

Feet

Concept Summary

Additional Flood Storage Created:
8.3 acre-feet

Improved Water Quality:
Additional 17.0 lbs/yr phosphorus removed (0.0/lbs/yr dissolved phosphorus)

Restored Wetland and Prairie habitat:
1.1 acres total

Open Water Area:
1.5 acres total

Tree Removal Estimate
7 trees total

At-Risk Flooded Structures (existing/proposed):

25-yr	50-yr	100-yr
6/0	15/10	20/17

Figure 5.3

6.0 Project modeling results and potential impacts

This section discusses the results of the hydrologic, hydraulic, and water quality modeling and provides information on potential project impacts, including permitting requirements. Table 6-1 summarizes the design features and potential impacts of the three concepts, in comparison to the project area's existing conditions.

6.1 Hydrologic, hydraulic, and water quality modeling

6.1.1 Available models

Hydrologic and hydraulic information and water quality information are available for the project area in the form of a XP-SWMM hydrologic and hydraulic model and a P8 water quality model, respectively. The BCWMC completed the Phase 2 XP-SWMM model in 2017 for Bassett Creek and its contributing watersheds. The BCWMC developed the P8 model in 2012 for Bassett Creek and its contributing watersheds and updates the model regularly.

The BCWMC Engineer used the 2017 BCWMC Phase 2 XP-SWMM model to perform hydrologic and hydraulic modeling for this project. The existing BCWMC Phase 2 Model was updated to reflect more detailed hydrology (i.e. subwatershed divides) in the proposed project area. Also, detailed survey information including existing infrastructure and bathymetric data were added to the existing conditions model. This updated model was used to represent existing conditions for the project area and its flood elevation results were used as a basis of comparison for the proposed conceptual designs.

The updated existing conditions BCWMC Phase 2 XP-SWMM model was hydrologically and hydraulically modified to model the three conceptual designs. Watershed parameters, storage curves, storm sewer routing, and outlet control structures were revised to represent the proposed grading contours and culvert designs for the three concepts. Maximum flood elevations for the 2-, 10-, 25-, 50- and 100-year 24-hour recurrence intervals were analyzed and compared for the conceptual designs.

This study also included updating the P8 model to match the hydrology updates made to the XPSWMM model. The BCWMC Engineer used the updated P8 water quality model to estimate the water quality improvement expected from each proposed alternative at each pond location.

Final design efforts should include additional refinements to the XP-SWMM and P8 water quality modeling. The improvements that will ultimately be constructed should also be incorporated into the official BCWMC XP-SWMM model and the P8 model after completion of the project.

6.1.2 XP-SWMM flood elevation results

Table 6-1 (the comparative matrix) provides the maximum 10-year and 100-year 24-hour flood elevations for existing conditions and the three conceptual designs for the following key flood locations (as shown on Figure 3-3):

1) Medley Pond/Park
2) King's Valley Pond/Townhomes (ML-2)

3) Pond downstream of King's Valley Pond (ML-3)

Table 6-2 provides the 2-, 10-, 25-, 50-, and 100-year 24-hour flood elevations for existing conditions and the three conceptual designs for key flood areas.

One primary goal of the proposed Medley Park Stormwater Treatment Facility Project is to lower the flood depths in Medley Park and downstream in the King's Valley Pond and neighborhood. The XP-SWMM modeling results indicate that for all three concepts the 25-year recurrence interval flood depth in Medley Park and King's Valley Pond and townhomes is reduced by 0.3 feet to 0.6 feet, depending on the concept. For the 100-year flood event, the flood depth in Medley Park and King's Valley Pond and townhomes is reduced by 0.3 feet to 0.5 feet, depending on the concept.

Reductions in flood elevations translate into reductions in flood risk for structures. Table 6-3 lists the potentially at-risk properties. The table summarizes the 25-year, 50-year, and 100-year 24-hour flood elevations and depth of flooding over the low opening elevation at each structure for existing conditions and for each of the conceptual designs. The BCWMC Engineer estimated the low opening elevation for each structure by analyzing each structure's perimeter for the minimum elevation based on 2011 LiDAR data. Based on the minimum elevation analysis, no structures are at-risk of flooding for the 10-year 24-hour or smaller events.

For all three concepts, three structures are removed from the list of at-risk properties for the 100-year event (i.e., no longer at risk of flooding). For concepts 1 and 2, four structures are no longer at risk of flooding for the 50-year event. Concept 3 provides enough flood storage to remove five structures from being at-risk of flooding for the 50-year event. For the 25-year event, Concepts 1 and 2 remove five structures from being at-risk of flooding, and six structures are removed for concept 3.

Lowering flood depths within Medley Park and the downstream King's Valley Pond also translates to lower flood depths on the roads near the Kings Valley Townhomes. The XP-SWMM model results for this project indicate that for the 25-year recurrence interval event, the flood depth on the low point on Kings Valley Road is reduced from 2.5 feet to 1.9 – 2.2 feet, depending on the concept. For the 50-year recurrence interval event, the flood depth on the low point on Kings Valley Road is reduced from 3.3 feet to 2.7 – 3.0 feet, depending on the concept. For the 100-year flood event, the flood depth at the low point on Kings Valley Road is reduced from 4.0 feet to 3.5 – 3.7 feet, depending on the concept. Additional flood mitigation projects may be warranted to further lower the flood depths at the low point on King's Valley Road to allow passage of emergency vehicles during larger storm events. A maximum flood depth of 1.5 feet is generally recommended for the safe passage of emergency vehicles.

Table 6-1 Medley Park Improvement Project Concept Matrix Summary

Category	Item	Existing Conditions	Concept 1	Concept 2	Concept 3
Outlet Modifications	Normal Water Level (NWL) (ft, NAVD88)	898.57	898.57	898.57	898.57
	Overflow Elevation (Medley Pond) (ft, NAVD88)	902.5	902.5	902.5	902.5
Flood Mitigation	Total Flood Mitigation Volume (ac-ft) in Medley Park[1]	13	18.3	19	21.3
	Increase in Flood Mitigation Volume (ac-ft)[1]	--	5.3	6	8.3
	25-year Flood Elevation in Medley Park (ft, NAVD88)	907.0	906.7	906.7	906.4
	25-year Flood Elevation in King's Valley Pond (ft, NAVD88)	907.0	906.7	906.7	906.4
	# of Potentially At-Risk Structures (25-year)	6	1	1	0
	50-year Flood Elevation in Medley Park (ft, NAVD88)	907.8	907.5	907.5	907.2
	50-year Flood Elevation in King's Valley Pond (ft, NAVD88)	907.8	907.5	907.5	907.2
	# of Potentially At-Risk Structures (50-year)	15	11	11	10
	100-year Flood Elevation in Medley Park (ft, NAVD88)	908.5	908.2	908.2	908.0
	100-year Flood Elevation in King's Valley Pond (ft, NAVD88)	908.5	908.2	908.2	908.0
	Depth of Flooding at King's Valley Road Low-Point (100-year) (ft)	4.0	3.7	3.7	3.5
	# of Potentially At-Risk Structures (100-year)	20	17	17	17
Water Quality	Open Water Surface Area (ac) in Medley Park	0.46	0.94	1.04	1.47
	Increase in Open Water Surface Area (ac) in Medley Park	--	0.48	0.58	1.01
	Total Water Quality Treatment Volume (Permanent Pool + Filtration) (ac-ft)	0.3	3.2	3.0	4.6
	Additional Water Quality Treatment Volume (ac-ft)	--	2.8	2.7	4.3
	Total Phosphorus Removal (lbs/yr)	12.4	26.4	31	29.4
	Increase in Total Phosphorus Removal (lbs/yr)	--	14	18.6	17
	Dissolved Phosphorus Removal (lbs/yr)	0	1.2	6.3	0
	Accumulated Sediment Removal Volume in Medley Pond (Cu. Yd.)	--	1500	1500	1500
Trails	Length of Trail to be Removed (ft)	--	530	270	530
	Length of Constructed Paved Trail (ft)	--	915	650	967
Restoration	Number of Trees Removed	-	7	7	7
	Restored Wetland Area (ac)	--	0.56	0.69	0.56
	Restored Prairie Area (ac)	--	0.85	0.49	0.56
Project Costs	Feasibility Level Opinion of Cost	--	$1,848,000	$2,137,000	$1,845,000
	Feasibility Level Opinion of Cost Range (-20% to +30%)	--	$1,479,000 to $2,403,000	$1,710,000 to $2,779,000	$1,476,000 to $2,399,000
	30-Year Annualized Cost Estimate	--	$121,000	$138,000	$122,000
	Cost per Acre-Ft of Flood Mitigation Volume	--	$349,000	$356,000	$222,000
	Annualized Cost per Pound of Total Phosphorus Removed (Total Project)	--	$8,600	$7,400	$7,200
	Annualized Cost per Pound of Total Phosphorus Removed (Water Quality Treatment)	--	$5,900	$4,500	$3,500

1. Total flood mitigation volume summarized up to the 100-year flood elevation

Table 6-2 Medley Park Project Area Key Flood Areas and Flood Elevation Summary

Flood Area Description	Flood Elevation (ft-NAVD88)																			
	Existing Conditions					Concept 1					Concept 2					Concept 3				
	2-yr	10-yr	25-yr	50-yr	100-yr	2-yr	10-yr	25-yr	50-yr	100-yr	2-yr	10-yr	25-yr	50-yr	100-yr	2-yr	10-yr	25-yr	50-yr	100-yr
Medley Park	903.4	905.9	907.0	907.8	908.5	902.9	905.5	906.7	907.5	908.2	903.2	905.5	906.7	907.5	908.2	902.5	905.2	906.4	907.2	908.0
King's Valley Pond (ML-2) /Townhomes	903.4	905.9	907.0	907.8	908.5	902.9	905.5	906.71	907.5	908.2	903.2	905.5	906.7	907.5	908.2	902.5	905.2	906.4	907.2	908.0
ML-3 Pond	900.7	902.2	903.2	904.1	905.1	900.4	901.9	902.9	903.8	904.9	900.4	901.8	902.8	903.7	904.7	900.1	901.6	902.7	903.5	904.6

Table 6-3 Medley Park Project Area At-Risk Properties[1]

Address	City	Property Type	Elevation of Lowest Opening (ft - NAVD88)[2]	Existing Conditions[3]			Concept 1			Concept 2			Concept 3		
				25-Year Flood Elevation (Flood Depth) [ft]	50-Year Flood Elevation (Flood Depth) [ft]	100-Year Flood Elevation (Flood Depth) [ft]	25-Year Flood Elevation (Flood Depth) [ft]	50-Year Flood Elevation (Flood Depth) [ft]	100-Year Flood Elevation (Flood Depth) [ft]	25-Year Flood Elevation (Flood Depth) [ft]	50-Year Flood Elevation (Flood Depth) [ft]	100-Year Flood Elevation (Flood Depth) [ft]	25-Year Flood Elevation (Flood Depth) [ft]	50-Year Flood Elevation (Flood Depth) [ft]	100-Year Flood Elevation (Flood Depth) [ft]
English Circle Structure #1	Golden Valley	Residential	908.2	907.0 (0.00)	907.8 (0.00)	908.5 (0.26)	906.7 (0.00)	907.5 (0.00)	908.2 (0.00)	906.7 (0.00)	907.5 (0.00)	908.2 (0.00)	906.4 (0.00)	907.2 (0.00)	908.0 (0.00)
English Circle Structure #2	Golden Valley	Residential	908.2	908.1 (0.00)	908.2 (0.03)	908.5 (0.30)	908.1 (0.00)	908.2 (0.03)	908.2 (0.07)	908.1 (0.00)	908.2 (0.02)	908.2 (0.07)	908.1 (0.00)	908.2 (0.02)	908.2 (0.07)
English Circle Structure #3	Golden Valley	Residential	907.2	907.0 (0.00)	907.8 (0.62)	908.5 (1.30)	906.7 (0.00)	907.5 (0.32)	908.2 (1.04)	906.7 (0.00)	907.5 (0.32)	908.2 (1.04)	906.4 (0.00)	907.2 (0.07)	908.0 (0.83)
Kings Valley Rd E Structure #1	Golden Valley	Residential	907.0	907.0 (0.02)	907.8 (0.77)	908.5 (1.46)	906.7 (0.00)	907.5 (0.48)	908.2 (1.19)	906.7 (0.00)	907.5 (0.48)	908.2 (1.19)	906.4 (0.00)	907.2 (0.22)	908.0 (0.99)
Kings Valley Rd E Structure #2	Golden Valley	Residential	906.7	907.0 (0.32)	907.8 (1.07)	908.5 (1.76)	906.7 (0.00)	907.5 (0.78)	908.2 (1.50)	906.7 (0.00)	907.5 (0.78)	908.2 (1.49)	906.4 (0.00)	907.2 (0.52)	908.0 (1.29)
Kings Valley Rd E Structure #3	Golden Valley	Residential	907.7	907.0 (0.00)	907.8 (0.05)	908.5 (0.73)	906.7 (0.00)	907.5 (0.00)	908.2 (0.47)	906.7 (0.00)	907.5 (0.00)	908.2 (0.47)	906.4 (0.00)	907.2 (0.00)	908.0 (0.27)
Kings Valley Rd E Structure #4	Golden Valley	Residential	907.1	907.0 (0.00)	907.8 (0.64)	908.5 (1.32)	906.7 (0.00)	907.5 (0.35)	908.2 (1.06)	906.7 (0.00)	907.5 (0.35)	908.2 (1.06)	906.4 (0.00)	907.2 (0.09)	908.0 (0.86)
Kings Valley Rd E Structure #5	Golden Valley	Residential	906.8	907.0 (0.23)	907.8 (0.99)	908.5 (1.67)	906.7 (0.00)	907.5 (0.69)	908.2 (1.41)	906.7 (0.00)	907.5 (0.69)	908.2 (1.40)	906.4 (0.00)	907.2 (0.43)	908.0 (1.20)
Kings Valley Rd E Structure #6	Golden Valley	Residential	906.9	907.0 (0.15)	907.8 (0.90)	908.5 (1.58)	906.7 (0.00)	907.5 (0.61)	908.2 (1.32)	906.7 (0.00)	907.5 (0.60)	908.2 (1.32)	906.4 (0.00)	907.2 (0.35)	908.0 (1.12)
Kings Valley Rd E Structure #7	Golden Valley	Residential	907.0	907.0 (0.09)	907.8 (0.84)	908.5 (1.52)	906.7 (0.00)	907.5 (0.55)	908.2 (1.26)	906.7 (0.00)	907.5 (0.54)	908.2 (1.26)	906.4 (0.00)	907.2 (0.29)	908.0 (1.06)
Kings Valley Rd E Structure #8	Golden Valley	Residential	906.6	907.0 (0.43)	907.8 (1.18)	908.5 (1.86)	906.7 (0.10)	907.5 (0.89)	908.2 (1.60)	906.7 (0.09)	907.5 (0.89)	908.2 (1.60)	906.4 (0.00)	907.2 (0.63)	908.0 (1.40)
Kings Valley Rd E Structure #9	Golden Valley	Residential	907.4	907.0 (0.00)	907.8 (0.37)	908.5 (1.05)	906.7 (0.00)	907.5 (0.07)	908.2 (0.79)	906.7 (0.00)	907.5 (0.07)	908.2 (0.78)	906.4 (0.00)	907.2 (0.00)	908.0 (0.58)
Marquis Rd Structure #1	Golden Valley	Residential	907.0	907.0 (0.00)	907.8 (0.75)	908.5 (1.43)	906.7 (0.00)	907.5 (0.45)	908.2 (1.17)	906.7 (0.00)	907.5 (0.45)	908.2 (1.16)	906.4 (0.00)	907.2 (0.20)	908.0 (0.96)
Marquis Rd Structure #2	Golden Valley	Residential	907.8	907.0 (0.00)	907.8 (0.04)	908.5 (0.72)	906.7 (0.00)	907.5 (0.00)	908.2 (0.46)	906.7 (0.00)	907.5 (0.00)	908.2 (0.46)	906.4 (0.00)	907.2 (0.00)	908.0 (0.26)
Marquis Rd Structure #3	Golden Valley	Residential	907.8	907.0 (0.00)	907.8 (0.00)	908.5 (0.64)	906.7 (0.00)	907.5 (0.00)	908.2 (0.38)	906.7 (0.00)	907.5 (0.00)	908.2 (0.37)	906.4 (0.00)	907.2 (0.00)	908.0 (0.17)
Mayfair Rd Structure #1	Golden Valley	Residential	907.8	907.0 (0.00)	907.8 (0.01)	908.5 (0.69)	906.7 (0.00)	907.5 (0.00)	908.2 (0.43)	906.7 (0.00)	907.5 (0.00)	908.2 (0.43)	906.4 (0.00)	907.2 (0.00)	908.0 (0.23)
Mayfair Rd Structure #2	Golden Valley	Residential	908.5	907.0 (0.00)	907.8 (0.00)	908.5 (0.02)	906.7 (0.00)	907.5 (0.00)	908.2 (0.00)	906.7 (0.00)	907.5 (0.00)	908.2 (0.00)	906.4 (0.00)	907.2 (0.00)	908.0 (0.00)
Mayfair Rd Structure #3	Golden Valley	Residential	907.9	907.0 (0.00)	907.8 (0.00)	908.5 (0.55)	906.7 (0.00)	907.5 (0.00)	908.2 (0.29)	906.7 (0.00)	907.5 (0.00)	908.2 (0.29)	906.4 (0.00)	907.2 (0.00)	908.0 (0.09)
Mayfair Rd Structure #4	Golden Valley	Residential	907.6	907.0 (0.00)	907.8 (0.20)	908.5 (0.88)	906.7 (0.00)	907.5 (0.00)	908.2 (0.62)	906.7 (0.00)	907.5 (0.00)	908.2 (0.61)	906.4 (0.00)	907.2 (0.00)	908.0 (0.41)
Mendelssohn Ln N Structure #1	Golden Valley	Residential	908.3	907.0 (0.00)	907.8 (0.00)	908.5 (0.19)	906.7 (0.00)	907.5 (0.00)	908.2 (0.00)	906.7 (0.00)	907.5 (0.00)	908.2 (0.00)	906.4 (0.00)	907.2 (0.00)	908.0 (0.00)

[1] Properties determined to be at-risk of flooding based on comparison of modeled flood elevations and low opening elevations.

[2] Lowest opening elevations determined from the minimum LiDAR elevation along the building footprint

[3] BCWMC Phase 2 XP-SWMM model was updated to include Medley Park survey information collected in 2020.

6.1.3 P8 water quality modeling results

Another primary goal of the Medley Park Stormwater Treatment Facility project is to identify opportunities to improve the water quality treatment provided by the system.

The BCWMC Engineer estimated the pollutant (total phosphorus) removals for each conceptual design alternative using the BCWMC P8 model. The model was updated to reflect existing conditions, using the bathymetric survey data collected during this study, and to revise subwatershed divides to the major project features. The model was then updated to reflect the additional filtration, permanent pool, and flood pool volumes provided by each of the alternatives.

Under current conditions, the P8 model estimates that approximately 12.4 pounds of total phosphorus are removed annually in Medley Pond. With implementation of Concept 1, the total phosphorus removal rate would increase to approximately 26.4 pounds per year (additional removals of 14.0 pounds of total phosphorus per year, of which 1.2 pounds per year would be dissolved phosphorus). The implementation of Concept 2 would increase the total phosphorus removal rate to approximately 31.0 pounds per year (additional removal of 18.6 pounds of total phosphorus removal per year, of which 6.3 pounds per year would be dissolved phosphorus). With the implementation of Concept 3, the total phosphorus removal rate would increase to approximately 29.4 pounds of total phosphorus per year (additional 17.0 pounds of total phosphorus removal per year, with no dissolved phosphorus removal).

Medicine Lake is currently listed as impaired. Reductions in sediment and pollutant loads to the lake can likely help address this impairment.

6.2 Wetland and upland creation and restoration

For all three concepts, various habitats would be restored within the disturbed areas of Medley Park. Depending on the concept, these habitat types include wetland fringe, prairie, open water, and a planted biofiltration basin. The restoration type would generally be determined based on the frequency and duration of inundation.

In all concepts, areas that are expected to be inundated by the 2-year 24-hour and smaller events would be restored as wetland fringe. Enhanced wetland areas should allow for increased water quality treatment and enriched habitat communities for animal and plant species. The total created wetland areas for each concept are summarized in Table 6-1.

Areas outside of the 2-year 24-hour inundation would be restored with native prairie species. The total created prairie area for each concept is summarized in Table 6-1.

For all conceptual designs, tree removal would be required in the disturbance limits to develop the additional flood storage and water quality treatment BMPs. However, the upland areas would be restored with native plants, shrubs, and trees. The density of trees in these restored areas would be determined during final design, although it is anticipated that the replanted tree density would range from the existing density (approximately 2 trees per acre) to a savannah type ecosystem (approximately 35 trees per acre). At a minimum, the 7 trees removed would be replaced in-kind. These trees should provide

shade and aesthetically pleasing views for park users and provide habitat for upland dwelling wildlife. Existing trees would be preserved in areas outside the disturbance limits and on the western shoreline of Medley Pond.

6.3 Open water area creation

In all concepts, the total open water area within Medley Park would increase through the expansion of the existing Medley Pond footprint and through the installation of new stormwater ponds. Open water area provides permanent pool volume for water quality treatment and also allows for the expansion of aquatic habitat. Under existing conditions, Medley Park has approximately 0.5 acres of open water area (footprint of existing Medley Pond). Under Concepts 1, 2, and 3, the total area of open water in the park would be approximately 0.9, 1.0, and 1.5 acres, respectively. Options for submerged macrophyte restoration can also be considered to provide aquatic habitat and promote clearer water conditions.

6.4 Easement acquisition

The proposed work is located on City of Golden Valley property or right of way. No temporary or permanent easements should be needed for the proposed work.

6.5 Permits required for the project

The proposed project is expected to require the following permits/approvals, regardless of the selected concept:

- Clean Water Act Section 404 and Section 401 Water Quality Certification
- Construction Stormwater General Permit from the MPCA
- Compliance with the MPCA's guidance for managing dredged material
- Compliance with the Minnesota Wetland Conservation Act
- Stormwater Management Permit from the City of Golden Valley
- Right-of-Way (ROW) Management Permit from the City of Golden Valley

6.5.1 Section 404 Permit and Section 401 Certification

According to Section 404 of the Clean Water Act (CWA), the USACE regulates the placement of fill and certain dredging activities in jurisdictional wetlands and other waters of the United States. Jurisdictional wetlands and other waters are those that the USACE determines to have a significant nexus with navigable waters. A jurisdictional determination request was sent to the USACE on March 19, 2021 to determine if Medley Pond is under the jurisdiction of the USACE. The USACE determined that Medley Pond was not under the jurisdiction of the USACE and will not require a section 404 permit.

6.5.2 Construction Stormwater General Permit

A National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Construction Stormwater General Permit from the MPCA authorizes stormwater runoff from construction sites. A Construction Stormwater General Permit is required as the proposed project would disturb more than one

acre of soil. Preparation of a stormwater pollution prevention plan explaining how stormwater would be controlled within the project area during construction would be required as part of this permit.

6.5.3 Guidance for managing dredged material

Dredged material is defined as waste by Minnesota Statute 115.01, and the management and disposal of dredge material is regulated by the MPCA. It is anticipated that sediment dredged as part of the proposed project would be removed from the project site and disposed of at an appropriate landfill, in compliance with the MPCA's guidance for managing dredged materials.

6.5.4 Minnesota Wetland Conservation Act

The Minnesota Wetland Conservation Act (WCA) was enacted to protect wetlands not protected under the MnDNR's public waters work permit program. The WCA regulates filling and draining of all wetlands and regulates excavation within Type 3, 4, and 5 wetlands. The WCA is administered by a local governmental unit (LGU), and it is expected that the City of Golden Valley will be the LGU for WCA-regulated wetland impacts associated with the proposed project.

6.5.5 Stormwater Management Permit

The City of Golden Valley requires Stormwater Management Permits for land-disturbing activities that remove soils or vegetation, including but not limited to clearing, digging, dredging, draining, or filling. This permit would be required for projects that construct, expand, or modify a stormwater quality treatment facility or stormwater BMP. It is anticipated the City of Golden Valley would require a Stormwater Management Permit for the proposed project.

6.5.6 Right-of-Way Management (ROW) Permit

The City of Golden Valley requires a Right-of-Way (ROW) permit for temporary obstructions to travel ways and for the planting of trees, shrubs, or other landscaping features over 12-inches high. It is anticipated that City of Golden Valley would require a ROW permit for the proposed project.

6.6 Other project impacts

6.6.1 Temporary closure of park trail

Medley Park contains paved trails that connect Ensign Avenue, Hillsboro Avenue, and the Kings Valley Townhomes. Since a portion of the walking trails would be impacted by the construction activities within Medley Park, it would be necessary to close a portion of the trails during construction activities. Trail closure signs and barricades would be installed, and a pedestrian detour route would be determined during final design. Every effort would be made to minimize the duration of the trail closure, including considering winter construction to minimize impacts to park users.

6.6.2 Tree removals

For the proposed conceptual designs seven of the surveyed trees are estimated for removal (those located within the project disturbance/grading limits). Two of the trees are conifers less than 7" in

diameter, and the remaining five trees range from 12" to 28" in diameter (four significant hardwoods and one significant softwood).

6.6.3 Impacts to bats

Preservation of bat species in Minnesota has recently become an important issue. White Nose Syndrome (WNS) has been attributed to the deaths of millions of bats in recent years across the United States, and all four species that hibernate in Minnesota are susceptible to the disease (MnDNR, 2015). Bats typically hibernate in sheltered areas such as caves, but some bats nest in trees during summer months. Extensive tree removals are to be avoided when bats are in their active season (April – September) so that nests or foraging areas are not inadvertently destroyed. During final design, there should be additional consultation with the US Fish and Wildlife Service or MnDNR regarding the timing of any tree removals and the potential impacts to bats.

7.0 Project cost considerations

This section presents the feasibility-level opinion of cost of the evaluated alternatives, discusses potential funding sources, and provides an approximate project schedule.

7.1 Opinion of cost

The opinion of cost is a Class 4 feasibility-level cost estimate as defined by the American Association of Cost Engineers International (AACI International) and uses the assumptions listed below and detailed in the following sections.

1. The cost estimate assumes a 25% construction contingency.
2. Costs associated with design, permitting, and construction observation (collectively "engineering") is assumed to be 25% of the estimated construction costs.

The Class 4 level cost estimates have an acceptable range of between -15% to -30% on the low range and +20% to +50% on the high range. Based on the development of concepts and initial vetting of the concepts by the City of Golden Valley, it is not necessary to utilize the full range of the acceptable range for the cost estimate; and we assume the final project costs may be between -20% and +30% of the estimated project budget.

The total construction cost estimates for each recommended alternative are summarized in Table 6-1. These costs do not include the cost of feasibility design. Appendix D provides detailed cost-estimate tables for all alternatives considered.

7.1.1 Conceptual designs' opinions of cost

The total capital cost for construction of conceptual design 1 is $1.8 million (-20%/+30%), which includes estimated construction costs of $1.2 million, plus $296,000 for construction contingency and $370,000 for engineering.

The total capital cost for construction of conceptual design 2 is $2.1 million (-20%/+30%), which includes estimated construction costs of $1.4 million, plus $342,000 for construction contingency and $428,000 for engineering.

The total capital cost for construction of conceptual design 3 is $1.8 million (-20%/ +30%), which includes estimated construction costs of $1.2 million, plus $295,000 for construction contingency and $369,000 for engineering.

7.1.2 Project costs per acre-foot of flood mitigation volume

The total construction costs per acre-foot of flood mitigation volume created on-site is as follows:

- The cost per acre-foot of flood mitigation volume created (5.3 acre-feet) for conceptual design 1 is approximately $349,000.

- The cost per acre-foot of flood mitigation volume created (6.0 acre-feet) for conceptual design 2 is approximately $356,000.
- The cost per acre-foot of flood mitigation volume created (8.3 acre-feet) for conceptual design 3 is approximately $222,000.

7.1.3 Off-site sediment disposal

All of the conceptual design alternatives assume that excavated sediment will be removed from the site.

Testing of Medley Pond sediment indicates the sediment does not meet the MPCA's guidelines for Unregulated Fill. BaP equivalents values exceeded the MPCA's Residential (SRV) in all sediment samples; additionally, the DRO concentration exceeded the MPCA's Unregulated Fill TPH threshold of 100 mg/kg in sample SED-01. Medley Pond sediment could potentially be reused as Regulated Fill on a property with industrial or commercial land use designation; however, the additional costs associated with finding a suitable property to accept the material and obtaining MPCA approval to reuse the sediment as Regulated Fill are likely to exceed the costs of landfilling the sediment. Therefore, the BCWMC Engineer recommends that the Medley Pond sediment, if excavated, be disposed in a landfill.

A line item for sediment dredging and disposal of contaminated sediment from Medley Pond is included in the feasibility cost estimates. It assumes all sediment dredged from Medley Pond will require landfill disposal. Additional testing and onsite observation during excavation and hauling should be considered.

7.1.4 Wetland mitigation

The wetland delineation for Medley Pond and the northern portion of ML-2 (Kings Valley Pond) identified wetlands at the pond peripheries and within the ponds. The goal of the proposed alternatives is to minimize the amount of wetland impacts, restore all impacted wetland areas to the existing wetland type, and develop new wetland habitat and wetland fringe areas in the disturbed extents. Therefore, it is not anticipated that the projects will require additional costs for wetland mitigation since the proposed project intends to impose only temporary impacts to existing wetlands.

7.1.5 Maintenance considerations

Operation and maintenance (O&M) activities will be the responsibility of the City of Golden Valley. This section provides an overview of the anticipated maintenance activities for each concept design. The O&M recommendations include specific inspection/maintenance activities and frequency, and estimated annual costs based on existing project data. The City of Golden Valley may have alternative unit costs for each O&M task based on annual staffing and equipment availability. The following table summarizes the recommended maintenance activities for the proposed project features and the anticipated annual costs.

Table 7-1 Estimated Operations and Maintenance Tasks and Annual Costs

Feature	O&M Task	Frequency	Estimated Annual Cost
Stormwater Biofiltration Basin	Inspect basin for trash, debris, soil accumulation, presence of weeds, depth of mulch, condition of plants, blockages in inlet/outlet structures, presence of plowed snow (winter only), standing water (>48 hours)	Once per month (growing season), twice per winter and following rain events >2″	$4,000/basin
	Remove weeds from basin	Once per month (growing season)	
	Remove and replace dead or diseased plants, remove invasive plants	At least once per year	
	Remove trash, debris, and sediment from energy dissipation structures, outlet structures, and basin	Infrequent (as needed)	
	Draintile jetting when prolonged inundation is observed (standing water > 48 hours)	Infrequent (as needed)	
	Replace mulch in bare areas	Infrequent (as needed)	
Stormwater Ponds; Inlet/Outlet Structures	Inspect stormwater ponds for accumulation of trash, debris, and sediment; inspect slopes for presence of weeds, erosion, invasive species, and condition of plants; inspect inlet structures for structural damage or blockage	At least once per year and following rain events >2″	$5,000/pond
	Inspect outlet control structures, storm sewer pipes, sumps, weirs, and orifices for accumulation of trash, debris, and sediment; inspect for water surface elevations not dropping to normal water level (blocked outlet); inspect for structural damage	At least four times per year and following rain events >2″	
	Inspect diversion manholes for trash, debris, and sediment accumulation in the structures; inspect for storm sewer pipe blockages; inspect for structural damage	At least once per year and following rain events >2″	
	Remove trash and debris from stormwater ponds; remove weeds and invasive species and provide seed/sod; remove and replace dead or diseased plants	At once per year and following rain events >2″	
	Remove trash, debris and sediment from diversion manholes and outlet control features with vacuum truck hose	At once per year and following rain events >2″	
	Survey bottom of dead storage stormwater ponds to estimate volume of sediment accumulation	Every 10 years	
	Dredge accumulated sediment in stormwater ponds	Every 10+ years	

7.1.6 30-year cost

The 30-year cost for each alternative is calculated as the future worth of the initial capital cost (including contingency and engineering costs) plus the future worth of annual maintenance (see Table 7-1) and significant maintenance at the end of the alternative's life span. The life span for each proposed concept was assumed to be 30-years. A 4% rate of inflation is assumed. The annualized cost for each alternative is calculated as the value of 30 equal, annual payments of the same future worth as the 30-year cost.

Conceptual Design 1 30-year cost:

- The estimated total 30-year annualized cost is $121,000.

Conceptual Design 2 30-year cost:

- The estimated total 30-year annualized cost is $138,000.

Conceptual Design 3 30-year cost:

- The estimated total 30-year cost annualized cost is $122,000.

7.1.7 Annualized pollutant reduction cost

Section 6.1.3 and Table 6-1 show the estimated annual loading reductions for total phosphorus (TP) for each recommended conceptual design alternative. The BCWMC Engineer estimated the total phosphorus load reductions by modifying the BCWMC P8 model to include the proposed alternatives and comparing to existing conditions.

The annualized pollutant-reduction cost for each alternative is presented in two ways. The first value is the annualized 30-year total project cost (including both flood and water quality portions of the project, factoring in an assumed life span of 30 years for the proposed features) divided by the annual load reduction. The total cost per pound of phosphorus removed for this project is high compared to other BCWMC CIP projects—for example, a previous high cost per pound of phosphorus removed for a BCWMC CIP project was $5,900 for the Northwood Lake Improvement Project. The higher cost per pound of phosphorus removed for the Medley Park Stormwater Treatment Facility project can be attributed to a significant portion of the construction cost coming from flood mitigation features. Approximately 43-66% of the construction costs are for the development of flood storage volume and for the restoration of the graded areas rather than for water quality improvement, depending on the alternative.

Because the Medley Park project has two primary goals: flood mitigation and water quality improvement, the second value listed below is the estimated annualized 30-year cost of only the water quality treatment components cost divided by the annual load reduction. The water quality treatment project cost was estimated by summing the itemized project costs related to water quality improvement, comparing this to the total project cost, and applying that fraction of the total project cost.

Conceptual Design 1 annualized pollutant reduction cost:

- The estimated total project annualized pollutant reduction costs for conceptual design 1 are $8,600 per pound TP removal. The estimated water quality project annualized pollutant reduction costs for conceptual design 1 are $5,900 per pound TP removal.

Conceptual Design 2 annualized pollutant reduction cost:

- The estimated total project annualized pollutant reduction costs for conceptual design 2 are $7,400 per pound TP removal. The estimated water quality project annualized pollutant reduction costs for conceptual design 2 are $4,500 per pound TP removal.

Conceptual Design 3 annualized pollutant reduction cost:

- The estimated total project annualized pollutant reduction costs for conceptual design 2 are $7,200 per pound TP removal. The estimated water quality project annualized pollutant reduction costs for conceptual design 3 are $3,500 per pound TP removal.

7.1.8 Miscellaneous costs

Miscellaneous costs that may arise during final design might relate to park recreational or educational improvements. Since the proposed project area is within an existing park, final design may uncover opportunities to improve trash management, tree management, park safety, and/or incorporate other recreational amenities such as overlooks, benches, and wildlife habitat/features. These additional features may not be applicable for BCWMC CIP funding, so funding may need to be coordinated with the City of Golden Valley.

7.2 Funding sources

The BCWMC originally proposed $500,000 in CIP funds for the Medley Park Stormwater Treatment Facility Project. After feasibility-level cost estimates were developed, it was quickly realized that the initial CIP budget would not cover the construction and design costs of the proposed project. At the March 2021 BCMWC meeting, the Commission approved its 5-year CIP, including an increase to the Medley Park Stormwater Treatment Facility CIP funding to $1.5 million.

Even with this increase in the BCWMC's CIP funding, the BCWMC CIP funds alone would not fully cover the implementation of project alternatives presented in this study. Other sources of funding for this project may include:

- City of Golden Valley
- Other sources, including potential grants (e.g. Hennepin County Natural Resource Opportunity grants, Hennepin County Environmental Response Fund (ERF) grants)

The City of Golden Valley may have up to $500,000 in funds available for use on this project. The exact amount will be determined during final design at the City of Golden Valley's December 2021 city council meeting.

7.3 Project schedule

The BCWMC will hold a public hearing in September 2021 on this project. Pending the outcome of the hearing, the BCWMC will consider officially ordering the project, entering into an agreement with the City of Golden Valley to design and construct the project, and certifying to Hennepin County a final 2022 tax levy for this project.

The construction work would likely begin in winter 2022/2023, as tree removal should occur in the period from October through March, outside of the northern long-eared bat's active season (April through September). Additionally, excavation during the winter would be appropriate to complete the major earthwork during periods with less frequent runoff events. Final construction and restoration would be completed in spring/summer 2023.

For project construction to occur in winter 2022/2023, project design should begin in winter 2021/2022 or spring of 2022. If project construction is scheduled for winter 2022/2023, summer 2022 bidding is recommended. This will give contractors adequate scheduling time to complete the project at a reasonable price. In the intervening time, the City would gather public input, prepare the final design, and obtain permits.

8.0 Alternatives assessment and recommendations

Table 8-1 provides an overview of the main project impacts and benefits for each Concept based on the details outlined in the previous sections (also summarized in Table 1-1). For a complete summary of the estimated impacts, permitting requirements, disposal of contaminated sediment, closure of pedestrian trails, and costs of the concepts, including the methodology and assumptions used for the cost estimate, refer to Section 6.0, Section 7.0, and Table 6-1.

Based on review of the project impacts for each of the three concepts, the overall project costs, feedback from the public, the City and BCWMC staff, the BCWMC Engineer recommends implementation of Concept 3, which best balances the development of flood mitigation volume and water quality treatment.

Concept 3 results in the development of the most flood mitigation volume when compared to Concepts 1 and 2; however, the difference in the flood reduction in Medley Park is only a 0.2 feet difference during the 100-year 24-hour event. For all concepts, three structures in the Kings Valley Townhomes development are removed from being at-risk of flooding. Although the three concepts result in the same reduction of at-risk structures for the 100-year 24-hour event, despite the difference in available flood storage volume, more notable impacts are realized with the implementation of Concept 3 for the 25- and 50-year 24-hour events. For the 50-year 24-hour event, 5 structures are removed from being at-risk of flooding with the installation of Concept 3 features. For Concepts 1 and 2, 4 structures are removed from being at-risk during the 50-year. 24-hour event. For the 25-year 24-hour event, 6 structures are expected to be removed from being at risk of flooding with the installation of Concept 3. Concepts 1 and 2 remove 5 structures from being at-risk during the 25-year 24-hour event.

Concept 3 resulted in the second highest removal of total phosphorus of the three concepts analyzed. The installation of the Concept 3 stormwater features within Medley Park would increase the phosphorus load reduction by 17.0 pounds per year to downstream water bodies, which includes Medicine Lake. Because Concept 3 currently does not include filtration features, dissolved phosphorus would not be removed with this design.

Adding filtration features to Concept 3 would be accompanied by a number of trade-offs, which would include:

- The loss of flood mitigation volume to develop water quality treatment areas in separate basins or benched features.
- The loss of flood mitigation volume to develop enough elevation difference to adequately filtrate stormwater runoff.
- Increased maintenance of the filtration media and draintiles due to substantial bounce of maximum water surface elevations in the stormwater ponds and prolonged periods of inundation for small storm events.
- Limited options for filtration media due to prolonged periods of inundation for smaller storm events. Iron-enhanced sand is not recommended due to the risk of anoxic conditions and release of previously bound phosphate. Spent lime is not recommended due to the risk of media

instability from prolonged periods of inundation. Biochar is not recommended because phosphorus removal efficiency is limited and the media is more appropriate for the removal of E. coli. Cleaned washed sand could be utilized within a filtration bench; however, the cost of including this filtration bench may outweigh the benefits due to the limited dissolved phosphorus removal efficiency.

Rather than include filtration in Concept 3, the BCWMC may want to consider infiltration or filtration features at other locations in the Medicine Lake watershed, if dissolved phosphorus removal is desired in future projects.

Concept 3 would also include the restoration of 0.6 acres of wetland and 0.6 acres of upland, prairie habitat. Disturbed trails would be replaced with a looped ADA paved trail to provide active recreation and habitat viewing opportunities for park users and to provide maintenance access.

Based on the planning level estimated cost, Concept 3 has the lowest anticipated construction and design cost of the three concepts analyzed at approximately $1.8 million (-20%/+30%). Concept 3 also has the lowest annualized cost per pound of total phosphorus removed (water quality treatment portion) and lowest cost per acre-foot of flood mitigation volume developed, at approximately $3,500 and $222,000, respectively.

Table 8-1 Medley Park Stormwater Treatment Facility Impacts Summary

Category	Item	Existing Conditions	Concept 1	Concept 2	Concept 3
Flood Mitigation	Increase in Flood Mitigation Volume (ac-ft)	--	5.3	6	8.3
	# of Potentially At-Risk Structures (25-year)	6	1	1	0
	# of Potentially At-Risk Structures (50-year)	15	11	11	10
	# of Potentially At-Risk Structures (100-year)	20	17	17	17
Water Quality	Additional Water Quality Treatment Volume (ac-ft)	--	2.8	2.7	4.3
	Increase in Total Phosphorus Removal (lbs/yr)	--	14	18.6	17
	Dissolved Phosphorus Removal (lbs/yr)	0	1.2	6.3	0
Restoration	Number of Trees Removed	-	7	7	7
	Restored Wetland Area (ac)	--	0.56	0.69	0.56
	Restored Prairie Area (ac)	--	0.85	0.49	0.56
Project Costs	Feasibility Level Opinion of Cost	--	$1,848,000	$2,137,000	$1,845,000
	Cost per Acre-Ft of Flood Mitigation Volume	--	$349,000	$356,000	$222,000
	Annualized Cost per Pound of Total Phosphorus Removed (Water Quality Treatment)	--	$5,900	$4,500	$3,500

9.0 References

1. **Bassett Creek Watershed Management Commission.** 2015 Watershed Management Plan. September 2015.

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3. **Minnesota Department of Natural Resources.** White-nose Syndrome and Minnesota's bats. [http://www.dnr.state.mn.us/wns/index.html]. 2015.

4. **Minnesota Pollution Control Agency and Bassett Creek Watershed Management Commission.** *Medicine Lake Excess Nutrients Total Maximum Daily Load.* November 2010.

5. —. *Medicine Lake Excess Nutrients Total Maximum Daily Load Implementation Plan.* September 2010.

6. **Minnesota Pollution Control Agency (MPCA).** *Managing Stormwater Sediment, Best Management Practice Guidance, document wq-strm4-16.* 2017.

7. **Minnesota Pollution Control Agency.** *2020 Proposed Impaired Waters List.* [https://www.pca.state.mn.us/sites/default/files/wq-iw1-65i.pdf]. 2021.