Bassett Creek Watershed Management Commission

Technical Advisory Committee Meeting

Friday, March 18
11:00 a.m.– 12:30 p.m.
Online via Zoom
Join meeting HERE

1. **CALL TO ORDER & ELECT CHAIRPERSON**

2. **COMMUNICATIONS**

3. **BUSINESS**

   A. **Review Latest Costs for Flood Control Project (FCP) Inspections and Consider Future Budgeting**

   At their meeting in December, the Commission approved the TAC recommendation to update the Flood Control Project (FCP) Inspection Program as shown in Table 1. The TAC deferred discussion on budgeting updated costs.

   Currently, the BCWMC Operating Budget includes $25,000/year set aside to cover inspections, or $500,000 over 20 years. At this meeting, the TAC could consider recommending that the Operating Budget include $33,000 for FCP inspections starting in 2023 ($660,000/20 years).

   The TAC and Commission also agreed that Commission Engineers should investigate the use of new technologies (e.g., cameras and drones) for inspections. Attached (at the end of agenda) for discussion is Table 2: Bassett Creek Tunnel Inspection Options that lists several inspection technologies that could be considered for the Bassett Creek tunnel inspections.

Table 1. Updated Flood Control Project Inspection Program

Item	Current/ Recommended Inspection Cycle	Cost/Inspection[1]	20-Year Cost[1,2] Current/Recommended
Annual inspection of the FCP features, except double box culvert & the deep tunnel	Annually	~~$10,000~~ $15,000	~~$200,000/$200,000~~ $200,000/$300,000
Double box culvert inspection (NASSCO)[3]	Every 5 years	~~$32,000~~ $45,000	~~$128,000/$128,000~~ $128,000/$180,000
Deep tunnel (2nd St. & 3rd Ave.) inspection (NAASCO)[3]	Every 10 years	~~$45,000~~ $65,000	~~$45,000/$90,000~~ $65,000/$130,000
~~Two additional 3rd Ave deep tunnel inspections (NASSCO)[3,4]~~	~~Not Applicable/ Every 5 years/~~	~~$5,000~~	~~$0/$10,000[4]~~
Two additional deep tunnel inspections of 3rd Ave tunnel and unsubmerged portions of 2nd St. tunnel (non-NASSCO)[4]	Every 10 years (two total inspections)	$20,000	$0/$40,000
Total[2]			**~~$373,000/$428,000~~ $428,000/$650,000-$670,000**

[1] 2021 dollars
[2] Simple summation (annualized or present worth not calculated)
[3] Tunnel condition inspection based on pipeline assessment and certification program developed by the National Association of Sewer Service Companies (NASSCO)
[4] Brief tunnel inspections looking for significant changes without coding existing or new defects or preparing detailed report, includes preparation of technical memorandum.

B. Discuss 2022 - 2028 CIP – (Draft CIP attached below; scoring matrix attached in email)

[The draft 2022 – 2028 CIP assumes the Commission approves staff's recommendation to implement the original Bryn Mawr Project at their meeting March 17th.]

Changes from current CIP include:

- Shifts in some funding years to balance total levy over years
- Remove Bassett Creek Park Project (as discussed at recent Commission meetings)
- Move purchase of high efficiency street sweeper for Golden Valley to 2024
- Combine two Plymouth Creek restoration projects (and increase budget) – see fact sheet attached

No other projects for consideration in 2028 came forward from TAC members. TAC should consider increasing the budgets of all projects starting 2024 and beyond to account for rising costs. CIP scoring matrix with current existing projects attached in email.

C. Outreach to Cities for WMP Development

The recently approved scope and budget for development of the 2025 Watershed Management Plan includes gathering input from cities on priority issues including:

- Input from city technical staff gathered by Commission staff
- Input from city councils/commissions gathered via commissioners and/or city staff

This work is slated for April and May. The TAC should discuss a process for gathering this input.

D. Watershed Based Implementation Funding Convene Meetings

For the FY22/23 biennium, BCWMC was awarded $87,887 in Clean Water Funds through BWSR's Watershed Based Implementation Funding program for projects or programs in the Bassett Creek Watershed. Eligible projects are those included in the implementation section of local plans or watershed plans.

Eligible entities form a "partnership" and must hold at least one "convene meeting" to determine where grant funding will be spent. Municipalities in each partnership must coordinate prior to the start of the convene process to self-select up to two decision-making representatives. Municipal representatives are expected to communicate with other municipalities on the solicitation and selection of projects and activities during the process.

The TAC could select two representatives to attend a future convene meeting(s) and should discuss which entity (a city or BCWMC) should coordinate and facilitate the convene meeting(s).

E. Find Time for Monthly Standing TAC Meeting – Determine Format

It would be helpful to establish a day and time for monthly TAC meetings this year. We will certainly cancel meetings if there is a lack of agenda items. However, with watershed plan development tasks, we anticipate needed to hold several TAC meetings this year. Meeting format (in person vs. virtual) should also be discussed.

4. **ADJOURN**

DRAFT BCWMC 5-year Capital Improvement Program: 2024 – 2028 CIP List

Project Name	City	Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	Totals
Medicine Lake Rd & Winnetka Ave Long Term Flood Mitigation Plan Project (DeCola Ponds B&C Improvement Proj. + DeCola Pond F Flood Storage & Diversion Project + SEA School Flood Storage)	GV, Crystal, New Hope	BC-2,3,8, 10	$500,000		$300,000	$1,000,000		~~$600,000~~ $1,000,000	~~$700,000~~ $300,000			$4,131,500
Water quality improvements in Bryn Mawr Meadows, Main Stem Watershed[1]	MPLS	BC-5	$100,000	$412,000		$923,000						~~$512,000~~ $1,435,000
Medley Park Stormwater Treatment Facility[3]	GV	ML-12			$400,000	~~$300,000~~ $150,000	$800,000					$1,350,000
Mt. Olivet Stream Restoration Project	PLYM	ML-20		$178,100								$178,000
Dredging accumulated sediment in Main Stem Bassett Creek Lagoons, Wirth Park[4]	GV/MPLS	BC-7		$600,000	$1,100,000	$534,000	$200,000					$2,434,000
Stormwater Pond in Jevne Park to alleviate flooding/improve water quality	Medicine	ML-21	$500,000									$500,000
Crane Lake Improvement Project @ Ridgedale Dr.	Minnetonka	CL-3	$380,000									$380,000
Parkers Lake Drainage Improvement Project	Plymouth	PL-7		$485,000								$485,000
Bassett Creek Main Stem Restoration - Regent Ave to Golden Valley Rd	Golden Valley	2024-CR-M					$100,000	$600,000				$700,000
~~Bassett Creek Park WQ Improvement Project~~	~~Minneapolis~~	~~BC-11~~					~~$200,000~~	~~$300,000~~				~~$500,000~~
Ponderosa Woods Stream Restoration	Plymouth	ML-22					$475,000					$475,000
Sweeney Lake Water Quality Improvement Project (alum + carp management)	Golden Valley	SL-8	$20,000 [2]	$218,080 [2]								$238,080
Cost share purchase of high efficiency street sweeper	Plymouth	ML-23		$81,600								$81,600
Crane Lake Chloride Reduction Demonstration Project at Ridgedale Mall	Minnetonka	CL-4							$300,000			$300,000
Plymouth Creek Restoration Project ~~Old Rockford Rd. to Vicksburg Ln.~~ Dunkirk Lane to Plym Ice Center	Plymouth	2026CR-P							~~$500,000~~ $1,000,000	$1,000,000		~~$500,000~~ $2,000,000
Cost share purchase of high efficiency street sweeper	Golden Valley	BC-12					$100,000	~~$150,000~~ $50,000				$150,000
Toledo Ave/Minnaqua Pond Stormwater Improvements & Flood Reduction	Golden Valley	BC-13								$300,000	$400,000	$700,000
~~Plymouth Creek Restoration Dunkirk to Yuma and Vicksburg to Cty Rd 9~~	~~Plymouth~~	~~2027CR-P~~								~~$600,000~~		~~$600,000~~
Flood Control Project Double Box Culvert Repairs	Minneapolis	FCP-1								~~$700,000~~ $400,000	~~$500,000~~ $800,000	$1,200,000
Estimated Total Project Cost			**$1,500,000**	**$1,974,780**	**$1,800,000**	**$2,607,000**	**$1,675,000**	**$1,650,000**	**$1,600,000**	**$1,700,000**	**$1,200,000**	
Estimated Use of BCWMC Closed Project Account Funds			$0	$500,000	$100,000	$400,000	$0	$0	$0	$0	$0	~~$800,000~~ $1,000,000
Estimated Total Levy			**$1,500,000**	**$1,474,780**	**$1,700,000**	**$1,207,000**	**$1,675,000**	**$1,650,000**	**$1,600,000**	**$1,700,000**	**$1,200,000**	**$12,833,780**

[1] Total project cost estimated at $1,835,000, received $400,000 Clean Water Fund grant.
[2] Total project cost estimated at $568,080, received $330,000 Federal 319 grant.
[3] Estimated total project costs at $2,150,000; Golden Valley to provide estimated $500,000; $300,000 Clean Water Fund Grant
[4] Total project cost reduced by $500,000 for lower-than-expected engineering; $325,000 in grants received

Project Category: Water Quality/Water Capacity

Project Title: Plymouth Creek Stream Restoration – Dunkirk to PIC

Total Estimated Cost: $2,000,000

BCWMC Project Number: 2026CR-P

Description:
This project in the city of Plymouth will repair erosion and sedimentation that is occurring in Plymouth Creek from Dunkirk Lane to 37th Avenue North behind the Plymouth Ice Center (PIC). The project will likely include various erosion repair and buffer restoration techniques, removal of accumulated sediment, reduction of flood potential, and enhancement of riparian wetlands.

Source of Project Funding	2023	2024	2025	2026	2027
CIP Account – BCWMC ad valorem tax levy through Hennepin County				$1,000,000	$1,000,000

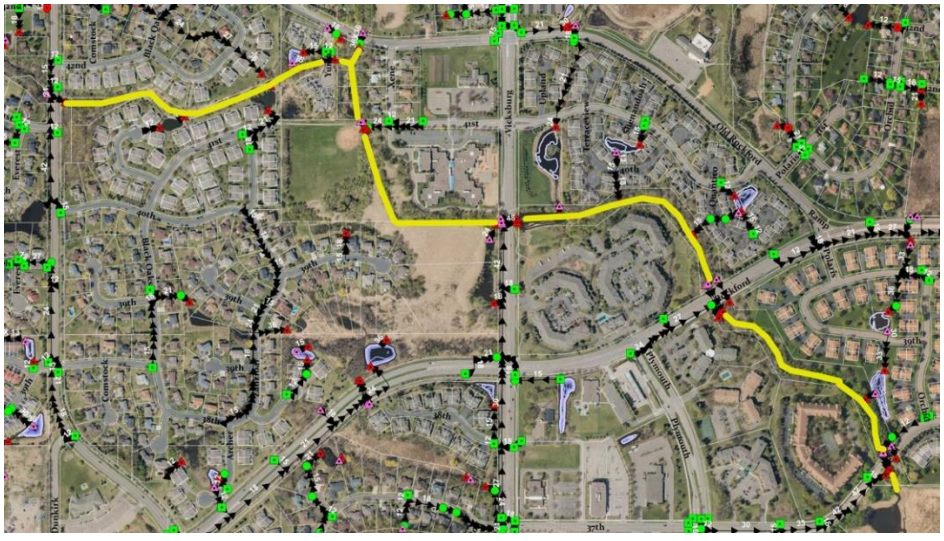
Justification:
This stream restoration project along 6,500 feet of Plymouth Creek will remove accumulated sediment from the stream channel and adjacent wetlands. Removing accumulated sediment in this area will result in lowering the flood potential for homes and stormwater infrastructure. Additionally, private landowners along this stretch will be contacted with the goal of expanding buffers along backyards.

Erosion along the stream channel would be repaired, reducing pollutants like total phosphorus and total suspended solids, and possibly improving riparian and in-steam habitats. Various methods of repairing erosion will be investigated including storm sewer pipe, bio engineering techniques, and rip rap. Natural restoration techniques will be followed as much as possible, however the need for hard armoring and rip rap is expected to be necessary in some locations.

As a part of the stream restoration project, educational efforts including outreach and signage along the trail will be included. Additional outreach will be done with students and staff at Plymouth Creek Elementary School, which is within the project area.

Scheduling and Project Status:
[Staff will provide this information.]

Relationship to BCWMC Plan and Other Projects:
This project is consistent with the goals and policies of the BCWMC Watershed Management Plan. This project would assist in meeting the goals of the Medicine Lake Total Maximum Daily Load study.



Effect on Annual Operations Costs:
This project has no effect on BCWMC Annual Operations Costs.

City of Plymouth

Plymouth Creek Stream Restoration

~6,500 lf

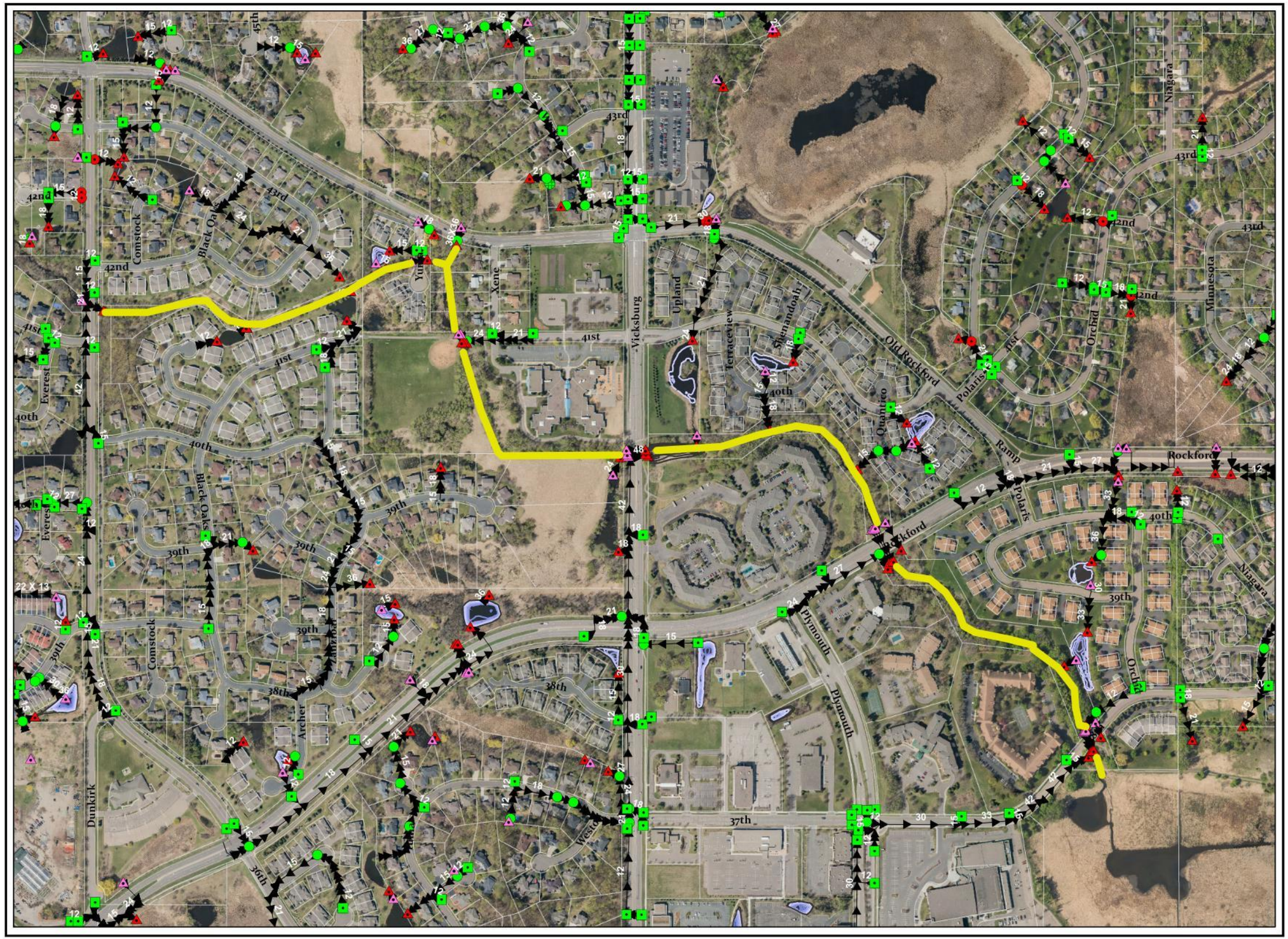


Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

Monitoring Options/ Description	Pros	Cons	Relative Cost	Notes
A: Inspection Techniques				
Option A1: Visual Inspection  - Perform inspection on set schedule - Consistent with previous inspections	- Nondestructive application - Baseline set to perform measurements at same location in the future - Easy to measure where inspectors are in the tunnel relative to previous inspections and existing stationing - Identifies significant surficial defects/changes - Minimal post-data processing - Easy to understand report (minimal interpretation)	- Does not provide measurement of voids or material loss behind tunnel liner (see Option A2 below) - Work performed with flashlights (may not collect all cracks and fractures)	$$	- Current BCWMC inspection program - NASSCO coding is completed during inspection and processed offsite - Option to use go-pro camera to collect continuous video footage - BCWMC Engineer recommends this option
Option A2: Drill Hole Void Probing (during visual inspection)  - Drill small hole through tunnel liner - Probe/measure thickness of concrete liner and distance to bedrock to determine void - Plug holes	- Accurately measures depth of voids at selected locations - Baseline set to perform measurements at same location in the future - Easy to measure where inspectors are in the tunnel relative to previous inspections and existing stationing - Provides estimate of voids behind tunnel	- Destructive testing application - Data typically performed at 100, 500 or 1,000-foot intervals (leaves large areas that are not tested) - Potential for difficulties in plugging holes resulting in "gushers" and loss of material through holes	$-$$$	- MNDOT performed void probing at 500 ft. intervals during 2008 Bassett Creek deep tunnel inspection - Void estimate could vary significantly from actual voids based on limited probe holes - Work performed by inspection staff or contractor - May be best set drill hole probe locations based on nondestructive testing results it's best to confirm the void data found using this method by using a nondestructive method - May be best to first perform nondestructive testing to identify potential voids and then follow-up with drill hole probing, at select locations, to confirm depth of voids - BCWMC Engineer recommends this option for consideration

Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

Monitoring Options/ Description	Pros	Cons	Relative Cost	Notes
B: Tunnel Profiling Techniques				
Option B1: 3-D Laser Scan Baseline Survey  - Set up scanner along various stages in the tunnel	- Nondestructive testing method - Establishes baseline survey for future reference - Accurately measures cross section of tunnel, cracks, deficiencies, and erosion of material between inspections - Data collection can be performed in the dark, but imaging requires light - Survey accuracy within fraction of an inch	- Requires multiple equipment setups - Post survey review required - Not effective for collecting data along invert and areas below the water - Large point cloud data set to manage/store - Data processing can be expensive when comparing multiple inspections - Stationing may not line up exactly with previous inspections	$$-$$$	- Provides a more accurate baseline than achieved with visual inspections. - Method best suited for monitoring movement or loss of material above water level - Barr used this method for measuring quantities for invert repair of Minneapolis tunnel (pre- and post-construction scans) - BCWMC Engineer recommends this option for consideration

Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

Monitoring Options/ Description	Pros	Cons	Relative Cost	Notes
Option B2: Multi-Sensor Inspection (MSI) **REDZONE ROBOTICS, INC.**   - Robotic equipment does not require individual tripod set up	- Nondestructive testing method - Establishes baseline for future reference - Accurately measures cross section of tunnel, cracks, deficiencies, and erosion of material - Best method to accurately measure sediment level - Accurately measures invert erosion if sediment has been removed. - Survey accuracy within fraction of an inch	- Work performed by specialty contractor - May be better suited for sanitary sewers that are exposed to H2S and crown corrosion - Post survey review required - Large point cloud data set to manage/store - Data processing can be expensive when comparing multiple inspections - Stationing may not line up exactly with previous inspections	$$$$	- Provides laser scan above water surface and sonar scan below water surface - Provides high-definition CCTV - Provides a more accurate baseline than achieved with visual inspections. - Sonar profiling can be used to calculate sediment levels. - Laser profiling can detect size, alignment, erosion, defects, H2S gas detection and air temperature measurement causing internal deterioration. - NASSCO coding is completed offsite. - Commonly used for sanitary sewer inspections - BCWMC Engineer recommends this option for consideration if Mississippi River pool cannot be lowered for next inspection
Option B3: Handheld 3-D Laser Scan (using simultaneous localization and mapping (SLAM) technology) **Baseline Survey**  - No scanner setup required in the tunnel (just walk)	- Similar to Option B1	- Similar to Option B1 but does not require individual equipment setup	NA	- Provides a more accurate baseline than achieved with visual inspections or the UAV. - This equipment includes Leica BLK2GO - Further discussion with manufacturer indicated this device may not be well suited for data collection in tunnels (but will likely be more advanced by time of next deep tunnel inspection) - BCWMC Engineer does not recommend this option at this time

Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

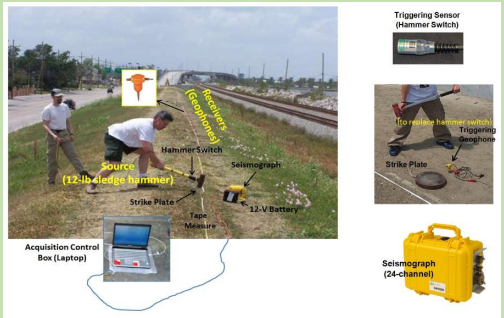
Monitoring Options/ Description	Pros	Cons	Relative Cost	Notes
C: Drone Imagery				
Option C: Unmanned Aerial Vehicle (UAV) Survey (Drone)  - Use UAV for periodic monitoring/survey of site	- Nondestructive testing method - Provides photographic and video records - Easy to view where drone is in the tunnel relative to previous inspections and existing stationing	- Post survey review required -Requires well-lit tunnel	$	- Provides photographs or video of well-lit areas - Barr has used drones to take professional photographs in Trout Brook Interceptor for CRWD - May not provide advantage for periodic inspection - Better suited for taking specific photographs of hard-to-reach areas - BCWMC Engineer does not recommend this option to replace a visual in-tunnel inspection - BCWMC Engineer recommends this technique for obtaining photographs of sediment at tunnel outlet during next Mississippi River drawdown
D: Geophysical Techniques				
Option D1: Multichannel Analysis of Surface Waves (MASW) - Seismic exploration technology  1. Extend and attach geophones (receivers) along tunnel side walls (liner) inside tunnel 2. Hammer sensor hits strike plate 3. Seismograph collects data	- Nondestructive testing method - Identify voids behind tunnel liner	- Geophones may be difficult to adhere to tunnel side walls - May need to confirm void depth by destructive drill hole void probing - Work performed by specialty contractor - Complex data interpretation - Stationing may not line up exactly with previous inspections	$$-$$$	- MASW evaluates ground and material stiffness by measuring shear-wave velocity (Vs) of subsurface in 1-D, 2-D, and 3-D - The data acquisition consists of setting up a linear array of geophones and recording ambient seismic “noise”. - A shear-wave dispersion curve is derived and used to model subsurface shear-wave velocity. The effective depth of investigation is related to the length of the geophone array and the frequency response of the measurement system. - Commonly used for soil-bedrock mapping - Some success for mapping tunnel voids - BCWMC Engineer recommends this option or D2 for consideration to map voids during next Mississippi River drawdown

Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

Monitoring Options/ Description	Pros	Cons	Relative Cost	Notes
Option D2: Ground Penetrating Radar (GPR) - Radar exploration technique   1. Energy is propagated into the ground from a transmitting antenna and is reflected back to a receiving antenna from subsurface boundaries at which there are electromagnetic (EM) property contrasts. 2. As the antennas are moved along the survey line, a series of scans are collected and positioned side by side to form a profile of the subsurface.	- Nondestructive testing method - Identify voids behind tunnel liner - Relatively easy to mobilize and operate	- Difficult to determine depth of void - May need to confirm void depth by destructive drill hole void probing - Reinforcement in concrete can minimize effectiveness of data collection - Work performed by specialty contractor - Complex data interpretation - Stationing may not line up exactly with previous inspections	$-$$	- In a GPR survey, high frequency (10 MHz to 3,000 MHz) electromagnetic (EM) pulses are used to detect changes in EM properties (dielectric permittivity, conductivity and magnetic permeability) - Seeks electrical anomaly - The GPR method is limited to areas which do not contain high conductivity soils, or sediments which are saturated with salt water or other highly conductive fluids. - BCWMC Engineer recommends this option or D1 for consideration to map voids during next Mississippi River drawdown

Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

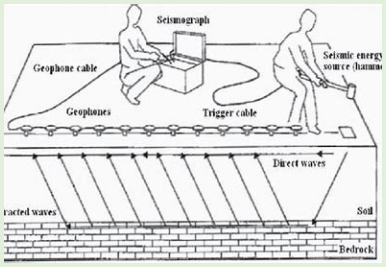
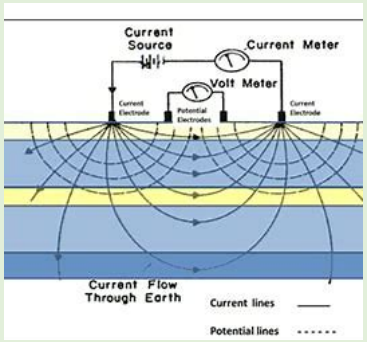
Monitoring Options/ Description	Notes
E: Other Inspection Technologies	
E1: Panorama SI 	- 3D Optical Manhole Scan - Nondestructive application - Typically used for sanitary manhole inspection - Allows for manhole inspection without entry - Best suited for inspecting long runs of sanitary or storm sewer with multiple manholes
E2: Seismic Refraction method 	- Geophysical seismic technique - Nondestructive application - Seismic refraction explorations consist of measuring the time required for a seismic impulse to travel from a seismic source to a receiving transducer - An explosive device, an air gun, a weight dropped from a truck or a hammer striking a steel plate is typically used for the seismic source and twelve or more vertical geophones are used for the receiving transducers. These would need to be installed in the tunnel for this application. - Better suited for bedrock mapping

Table 2: Bassett Creek Tunnel Inspection Options – March 18, 2022 TAC Meeting

E3: Electromagnetic methods 	- Electromagnetic (EM) induction uses a transmitter to generate a pulsed primary magnetic field. - The transmitted magnetic field induces eddy currents in nearby ferrous and non-ferrous metallic objects. - The EM measuring device senses the eddy current fields. The amplitude and phase of the eddy current fields are related to the electrical properties of the subsurface. - This application would require modifications to perform this method in a tunnel for void detection. - May not be best suited for tunnel void inspection - Better suited for identifying reinforcing in concrete structures or other iron anomalies below ground surface
E4: Electrical resistivity methods 	- Electrical resistivity is an intrinsic property of all materials. - The properties that affect the resistivity of soil or rock include: porosity, water content, composition (clay mineral and metal content), salinity of the pore water, and grain size distribution. - In an electrical resistivity exploration, electric current is applied to the ground surface through two electrodes. - Two or three additional electrodes are placed in the ground to measure variations in the potential of the electrical field (voltage) that is set up within the earth by the current electrodes. - The electrical resistivity method is primarily deployed on land and would require modifications to perform this method in a tunnel for void detection. - Better suited for surface application and to provide information for ground water surveys and bedrock topography.