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Memorandum

To: Bassett Creek Watershed Management Commission (BCWMC)
From: Barr Engineering Co. (Josh Phillips, Gabby Campagnola, Jim Herbert)
Subject: Bassett Creek 2023 Flood Control Project Inspection
Date: December 13, 2023
Project: 23270051.58 2023 4065

In accordance with the Operation and Maintenance Manual for the Bassett Creek Flood Control Project (FCP), an annual inspection is required to review the condition of the FCP features. The FCP was turned over to the local sponsor during 2002. Therefore, inspection of the FCP features was initialized during the fall of 2002, which was the first formal inspection by the Bassett Creek Watershed Management Commission (BCWMC). Except as noted, the annual inspections have been performed from 2002-2023. Inspections were not performed during 2003, 2011, and 2013 due to BCWMC budget considerations. Some of the municipalities have performed independent inspections of several of the FCP structures. The municipalities are responsible for routine maintenance and repair of the BCWMC FCP features located within their city. The municipalities are also responsible for submitting the completed FCP Maintenance Record from the previous year's inspection. It is important that the BCWMC receive these records, as the inspection and reporting are essential to ensure the BCWMC/municipalities maintain their eligibility to receive federal funds to repair or replace FCP features in the event of a catastrophe.

Pursuant to BCWMC policy, the municipalities may request reimbursement from the BCWMC for major maintenance and repairs that exceed $25,000. However, the municipalities must perform regular, routine maintenance and submit the required reporting before requesting and receiving BCWMC reimbursement. This will help prevent the situation wherein the BCWMC pays for maintenance work over $25,000 because the municipalities neglected routine maintenance for several years. The BCWMC expects the municipalities to inform the Commission in advance (e.g., two years) of their request for reimbursement. The BCWMC will consider adding maintenance and repair projects that are more than $100,000 to the BCWMC CIP.

Table 1 provides examples of maintenance and repairs that are major or could be major. In addition, the cities (or other road authority) where the FCP features are located are responsible for maintenance, repair and replacement of road crossings, and their corresponding conveyance structures, which were installed as part of the FCP.

The 2023 inspection comments and recommendations follow Table 1.

Table 1: Routine vs. Major Maintenance and Repairs Items

Item #	Routine vs. Major Maintenance and Repairs – as Recommended by the TAC[1] and approved by the BCWMC[2]
Routine	
1	Vegetation: removal of trees, removal of brush, chemical treatment of stumps, control of noxious weeds, establish vegetation on bare areas
2	Removal of debris: woody debris, riprap, trash from channel, inlets, culverts
3	Repair erosion; channels, inlet and outlet structures, culvert ends
4	Repair/replace riprap: on inlet and outlet ends of culverts, channels, banks
6	Remove sediment from channels, structures, culverts, etc.
10	Repair/maintain guard rails, handrails and fencing: remove rust, prime and paint, repair damaged rails and posts, replace rusted-out sections, repair cables, replace posts, repair chain link fence
12	Repair concrete pipe: repair joints, tie-bolts, spalling, connection to culverts, breakage
13	Repair/replace catch basins, manholes, casting assemblies, grates
14	Repair/maintain debris barrier: removal of debris, repair cables, replace poles
15	Repair/maintain tunnel inlet trash rack: repair/replace trash rack rods (loose or broken, vandalized, bent)
16	Street repairs: pavement, curb and gutter, cracks, depressions, settlement
Major	
5	Repair/replace gabion baskets
7	Remove sediment/dredge ponds, basins, etc.
17	Tunnel repairs: concrete and other repairs to the new Bassett Creek tunnel
Could be major depending on extent	
8	Repair scouring/undercutting at structures and culvert outlets
9	Repair concrete structures: cracking, spalling, breakage
11	Culverts/Bebo sections: joints, settlement, separation, concrete spalling, wing walls – movement and breakage

[1] Based on needed repairs identified during 2016 FCP inspection.

[2] Per BCWMC actions at their May 19, 2016 and July 21, 2016 meetings.

Note: references to "right" and "left" are with respect to facing downstream.

Plymouth Features

Inspection Date: October 10, 2023
Inspection Personnel: Gabrielle Campagnola and Josh Phillips (Barr), Ben Scharenbroich (City of Plymouth)

1. **Plymouth Creek Fish Barrier (Constructed 1987)**
    a. The structure appeared to be in satisfactory condition.
    b. The water level at the staff gage was at 0.35 feet and the depth of water flowing over the weir was 0.1 feet at the time of the inspection.
    c. Woody debris accumulated on the weir was removed during the inspection.
    d. Sediment has accumulated in the pool upstream of the structure and formed a delta, which was overgrown with vegetation. The deposited sediment was generally creating a meander in the creek toward the east (left) bank. Deposited sediment in the upstream pool has been noted since 2005.
    e. The railings at the upstream end of the structure, on the east (left) and west (right) sides, have rusted off below the weir level. This is consistent with previous inspections and has been noted since 2015.
    f. The abutment walls have expansion joints in the middle, just upstream of the weir. The west (right) expansion joint gap was first measured in 2002 at 7/8 inches for comparison with future inspections. The west (right) expansion joint gap has been consistently measured at 7/8 inches.
    g. The top downstream edge of the concrete pile cap forming the weir has deteriorated along its entire length. Deterioration includes loss of cement paste and fines resulting in exposed aggregate. The weir appears to be functioning properly and controlling water to the design elevation.
    h. Three cracks were observed on the downstream west (right) wing wall. This is consistent with previous inspections and has been noted since 2004.
    i. Seven diagonal cracks were observed on the downstream east (left) wing wall. Three of the cracks are more prominently defined, closed cracks. Observation of the three prominent cracks is consistent with previous inspections and has been noted since 2002. The other four cracks are generally closed hairline cracks and less noticeable.
    j. A 15-inch diameter tree was observed growing adjacent to the downstream east (left) wing wall and through the railing.
    k. Small trees and shrubs were observed growing on the embankment and downstream channel banks, including some near the wing walls and railings.
    l. Geotextile fabric is exposed on the downstream banks of both wingwalls.

Note: references to “right” and “left” are with respect to facing downstream.

m. Creek flows appear to be eroding and undercutting the end of the concrete spillway by a few inches.

n. City of Plymouth has a water quality monitoring box at this location.

Recommended Action:

- Remove accumulated sediment at structure and from the upstream pool. (Note: In 2010, the City of Plymouth submitted an Environmental Assessment Worksheet (EAW) to the Minnesota Pollution Control Agency (MPCA) for a channel improvements project. The MPCA informed the City of Plymouth that the Clean Water Act expressly prohibits the use of creeks, streams, lakes, and wetlands from being used as a pollution treatment system except in extreme situations, therefore dredging of the sediment upstream of the fish barrier, in order to continue to utilize the area upstream of the fish barrier as a sedimentation pond, was prohibited by the MPCA and not permitted. It is recommended that the City of Plymouth coordinate with the MPCA to revisit this issue or discuss viable alternatives to remove the sediment since the project intent was not as a sediment basin but as a fish barrier.)
- Remove trees and vegetation on embankment and channel banks. Chemically treat stumps with Garlon 3A herbicide (or other specialty herbicide for use in wetland sites and waterways) to prevent regrowth.
- Monitor concrete cracks and the width of the expansion joints.
- Monitor undercutting at the end of the concrete spillway.

2. Medicine Lake Outlet Structure (Constructed 1996)

a. The channel between Medicine Lake and the outlet structure was clear of debris and flowing full.

b. The water level was measured at 0.3 feet above the weir at the time of the inspection and the staff gauge was measured at 888.0 feet

c. The outlet structure appeared to be in satisfactory condition.

d. Although not part of the flood control project, the storm sewer outfall for local drainage from South Shore Drive in the west (right) bank has previously been nearly full of sediment, but this could not be observed during the inspection due to water levels.

e. Woody vegetation was observed at each end of the dam where it ties into the banks.

f. In late May 2019, City of Plymouth staff observed water flowing over the east side, but not the west side, of the Medicine Lake Outlet Structure. The city performed a baseline survey of the dam in the summer of 2019 and found that the east side of the dam was 0.15 feet lower than the west side. Future surveys can be performed to compare against the baseline.

Recommended Action:

- Remove woody vegetation on each end of the dam where it ties into the banks.

Note: references to “right” and “left” are with respect to facing downstream.

- Although not part of the flood control project, the city may want to consider jetting out the sediment that has accumulated in the storm sewer that provides local drainage from South Shore Drive.

Golden Valley Features

Inspection Date: October 10, 2023
Inspection Personnel: Gabrielle Campagnola and Josh Phillips (Barr)

1. **Wisconsin Avenue Control Structure (Constructed 1987)**
    a. The water level was below the lowest staff gauge reading upstream and downstream of the culvert.
    b. The flood gate was closed (down) at the time of the inspection and appeared to be in satisfactory condition.
    c. Deposited sediment was observed in the bottom of the culvert, ranging from 2-6 inches deep. The deposited sediment is consistent with previous inspections and has been noted since 2006.
    d. Some of the gabion baskets upstream and downstream of the culvert have deteriorated or broken and riprap had fallen out of the baskets at some locations. Although the gabion baskets are no longer functioning as installed, no significant erosion was observed. There is evidence of some minor erosion near the staff gauge and left bank upstream of large culvert.
    e. Cracks were observed along the crown of the culvert.
    f. Upstream of the gate, the left bank has begun to scour, and deposition is occurring on the right bank.
    g. Scour of the creek bed was observed downstream of culvert. The scour appeared to start at the end of the culvert and continued for roughly 40 feet.
    h. The railings at the upstream and downstream ends of the culvert were in satisfactory condition.
    i. City of Golden Valley staff had recently cleared brush at both the upstream and downstream ends of the culvert.

Recommended Action:

- Monitor deposited sediment in the culvert.
- Monitor upstream and downstream banks for erosion.
- Annually clear woody brush directly around the upstream and downstream sides of the culvert.

2. **Golden Valley Country Club – Box Culvert, Overflow Weir, and Downstream Channel (Constructed 1994)**

Note: references to “right” and “left” are with respect to facing downstream.

a. The channel and riprap armoring from Pennsylvania Avenue to the box culvert appeared to be in satisfactory condition.
b. The box culvert, joints, and railings appeared to be in satisfactory condition.
c. The overflow weir (earth berm) appeared to be in satisfactory condition and has been maintained by the Golden Valley Country Club staff as manicured fairway turf.
d. Some sediment deposition was observed on the north (left) bank just upstream of the box culvert on top of the riprap, consistent with previous years.
e. Some sediment deposition in other upstream areas was observed. This may have been due to low water levels.
f. A new outfall into the creek has been installed from the development north of the creek along Pennsylvania Avenue.
g. A tree is growing into the downstream side of the box culvert. The tree is growing through the last joint on the top right of the culvert.
h. Near Pennsylvania avenue, a large chunk of concrete was observed in the channel near the right bank. At roughly the same cross section of the creek, a fence was observed on the left bank. The fence starts on the hill of the right bank and extends to be partially in the creek.

Recommended Action:

- Remove tree that is growing into the box culvert.
- Monitor sediment deposition on the north (left) bank just upstream of the box culvert.

3. Westbrook Road Crossing (Constructed 1993)

a. The concrete Bebo arch culvert appeared to be in satisfactory condition.
b. The water level at the staff gauge was measured at 854.91 feet.
c. In 2022, City of Golden Valley staff repaired the spalled concrete and exposed rebar that were previously observed around the storm sewer pipe entering the culvert on the west (left) side.
d. In 2022, City of Golden Valley staff repaired deteriorating grout and adjusting rings in the downstream east (right) catch basin.
e. A scour hole was observed by the inlet pipe.
f. Longitudinal hairline cracks were observed on the top of sections of the Bebo culvert, extending across the entire section (pre-cast section) width. The cracks are approximately 2 feet off-center of the structure. These cracks are consistent with previous inspections and have been noted since 2002.
g. Spalled concrete was observed at multiple locations upstream and downstream of the culvert at the top of the wing walls and head wall. This is consistent with previous inspections and has been noted since 2007.
h. Spalled concrete was observed in the downstream left catch basin.
i. Westbrook Road over the culvert was repaved in 2022.

Note: references to “right” and “left” are with respect to facing downstream.

j. The railings appeared to be in satisfactory condition.

Recommended Action:

- Monitor cracks in the culvert.
- Monitor joint gap at pressure points.
- Monitor spalled concrete at wing walls, head walls, and catch basin.

4. Regent Avenue Crossing (Constructed 1981-1984)

a. The concrete Bebo arch culvert appeared to be in satisfactory condition.
b. The channel bottom was soft and mucky, and the water level was below the bottom of the staff gauge and not measured.
c. Spalled concrete was observed at the middle joint of the upstream north (left) wing wall. This in consistent with previous inspections and has been noted since 2002.
d. A crack was observed at the upstream north (left) wing wall. The crack was near the top of the wing wall and travels at a 45-degree angle down to the headwall. This in consistent with previous inspections and has been noted since 2002.
e. A crack was observed at the downstream south (right) wing wall. The crack was near the top of the wing wall and travels at a 45-degree angle down to the headwall. This is consistent with previous inspections and has been noted since 2002.
f. Minor erosion was observed on the downstream side of the north (left) wing wall.
g. Flows appeared to have scoured the north (left) side of the creek bottom and deposited sediment on the south (right) side of the creek bottom.
h. The railings appeared to be in satisfactory condition.

Recommended Action:

- Monitor spalled concrete at the upstream north (left) wing wall.
- Monitor cracks at the upstream north (left) wing wall, upstream south (right) wing wall, and downstream south (right) wing wall.
- Monitor creek bottom for scour and deposition.

5. Noble Avenue Crossing (Constructed 1981-1984)

a. The concrete Bebo arch culvert appeared to be in satisfactory condition.
b. Longitudinal hairline cracks were observed throughout the length of the top of the culvert, extending across the entire (pre-cast) section width. The cracks were either in the center of the structure or approximately 2 feet off-center of the structure. This is consistent with previous inspections and has been noted since 2002.
c. Spalled concrete and exposed plastic joint material were observed approximately two feet either side of center throughout the length of the top of the culvert. The cement paste covering the plastic joint material has separated and exposed the plastic. This is consistent with previous inspections and has been noted since 2002.

Note: references to “right” and “left” are with respect to facing downstream.

d. Spalled concrete was observed at the downstream north (left) wing wall. This is consistent with previous inspections and has been noted since 2002.
e. Multiple cracks and spalling were observed at the top of downstream north (left) wing wall. The cracking is consistent with previous inspections and has been noted since 2007.
f. The downstream south (right) wing wall was slightly leaning toward creek. Inspection staff have monitored the offset between the upper portion of the wing wall and the lower portion of the wing wall, which is leaning toward the creek, since 2002 to document movement. The inspection staff's measurements are listed below:

Year*	2002	2004	2005	2006	2007	2008	2009	2010	2012	2014
Offset	5/8"	5/8"	11/16"	1"	1"	1"	1-1/8"	1-1/8"	1-1/8"	1-1/8"

Year*	2015	2016	2017	2018	2019	2020	2021	2022	2023
Offset	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-3/16"	1-3/16"	1-1/2"	1-5/16"	1-3/8"

* FCP inspection was not performed in 2003, 2011, or 2013 due to budget considerations.

g. Minor bank erosion and scour was observed on both sides of the downstream wing walls. This is consistent with previous inspections and has been noted since 2002.
h. Flows appeared to be scouring the north (left) side of the creek bottom.
i. The paint on the railings has begun peeling.
j. The City of Golden Valley installed riprap in 2018 to reinforce the bank and minimize continued erosion at the outside edge of the upstream south (right) wing wall, however some erosion has perpetuated upstream.

Recommended Action:

- Monitor cracks and spalled concrete in the culvert and wing walls.
- Monitor bank erosion at downstream wing walls and upstream of installed riprap at upstream south (right) wing wall.
- Monitor creek bottom for scour and deposition.

6. Highway 55 Control Structure (Constructed 1987)

a. The concrete control structure appeared to be in satisfactory condition.
b. Woody debris, including multiple logs and branches were lodged across the bottom of the low-flow notch on upstream side of structure and partially obstructing flow. These logs and branches were removed during the inspection.
c. A hairline crack was observed in the east (left) wall of the inlet structure, although it appears that the crack may have been previously sealed with caulk. The crack is positioned in the middle of the wall extending full height. This is consistent with previous inspections and has been noted since 2002.
d. Erosion was observed around the east (left) side of the structure, likely from road runoff. In the summer of 2021, Minnesota Department of Transportation (MnDOT) crews placed

Note: references to "right" and "left" are with respect to facing downstream.

class 5 aggregate on the east (left) side of the structure to access the upstream end of the structure to perform repairs of the double box culvert below Highway 55. The new class 5 aggregate is actively eroding. The erosion appears to have worsened since last year.

e. MnDOT crews also drilled holes into the structure to install brackets and a temporary plate to block flows through the structure so they could perform repairs. MnDOT removed the plate, brackets, and bolts, but did not fill or repair the bolt holes.
f. Downed trees are located near the left corner on the upstream side of the structure.
g. In 2021 and 2022 a piece of rebar and relatively small mass of concrete were observed extending into the lower west (right) side of the opening of the low flow weir. A steel threaded rod extended approximately 2 inches from the south face of concrete on the east (left) side of low flow weir. These observations could not be confirmed in this year's inspections due to higher water levels.
h. The left (east) side of the chain link fence around the control structure was not fully reattached at the downstream left corner.

Recommended Action:

- Protect the sides of the structure with armoring (rock or riprap) or reinforced vegetation to limit additional erosion. Alternatively, divert road runoff away from the structure.
- Request that MnDOT repair bolt holes with concrete grout.
- Remove downed trees near the upstream side of the structure.
- Sawcut and remove rebar and concrete chunk on east (left) side of low flow weir.
- Sawcut steel rod to be flush to concrete along south face of concrete on the east (left) side of the low flow weir.
- Repair chain link fence
- Monitor hairline crack in the control structure.

Crystal Features

Inspection Date: October 10, 2023
Inspection Personnel: Gabrielle Campagnola and Josh Phillips (Barr)

1. Markwood Open Channel – Gabion Section (Constructed 1981-1984)

a. The channel appeared to be in satisfactory condition.
b. While recent vegetation clearing appeared to have occurred along the gabion baskets section, the clearing could only be done above the top of the baskets and vegetation is still is growing through the baskets. It was unclear if herbicide was used to prevent regrowth, but this vegetation may continue to pose a risk of damage to the gabion baskets.

Note: references to "right" and "left" are with respect to facing downstream.

Recommended Action:

- Clear woody vegetation growing through the gabion baskets to protect gabion wire and maintain flow capacity. Chemically treat stumps with Garlon 3A herbicide (or other specialty herbicide for use in wetland sites and waterways) to prevent regrowth.

2. Markwood Open Channel (Constructed 1981-1984)

a. The channel appeared to be in satisfactory condition.
b. Vegetation growth was observed along the side slopes of the channel. Some areas appeared to have been cleared since the previous year's inspection.
c. Erosion was observed along the toe of the north (left) and south (right) banks. This is consistent with previous inspections and has been noted since 2006.
d. The retaining wall along the channel at 7010 36th Avenue is failing and falling into the channel, potentially impacting high flows and causing erosion. There was a 1-inch diameter black hose that appeared to be discharging to the channel.
e. Other downstream retaining walls and fences along the channel were leaning toward the channel and, in some cases, appeared to be failing. This is consistent with previous inspections and has been noted since 2009.
f. The City of Crystal's corrugated metal pipe (CMP) storm sewer, discharging into the channel between 6833 and 6825 Markwood Drive, was in poor condition. The pipe bottom was corroded and there was erosion and undercutting around the pipe end. The pipe was exposed approximately 10 feet, measured on the downstream side.
g. Cinder blocks were observed in the creek.

Recommended Action:

- Clear woody vegetation in the channel. Consider clearing vegetation every 3-5 years to maintain flow capacity and allow access through the open channel.
- Remove cinder blocks in the creek.
- Although not part of the flood control project, repair the failing retaining wall and/or stabilize the area at 7010 36th Avenue to prevent erosion and potential obstruction of channel flows.
- Inspect the referenced hose at 7010 36th Avenue for potential illicit discharge directly to the channel.
- Monitor remaining retaining walls and fences for potential failure and obstruction of flow through the channel.
- Monitor erosion along the toe of the channel banks.
- Although not part of the flood control project, the city may want to consider repairing or replacing the CMP storm sewer.

3. 36th Avenue and Hampshire Avenue Crossing – 8 feet x 6 feet Double Box Culverts (Constructed 1981-1984)

a. The concrete box culverts, joints and tie bars appeared to be in satisfactory condition.

Note: references to "right" and "left" are with respect to facing downstream.

b. Some riprap has deposited in the box culverts.
c. Sediment has deposited in the box culverts, mostly in the downstream half of the box culverts. This is consistent with previous inspections and has been noted since 2016.
d. On both culverts, the fifth joint from the downstream end had a 2 ½ inch gap, which is a larger gap than the rest of the joints. This is consistent with previous inspections and has been noted since 2010.
e. Various locations of spalled concrete and exposed reinforcing was observed through both culverts.
f. Infiltration was observed into the north (left) culvert in 2019 and 2020 at the storm pipe connection upstream of the first culvert bend. Infiltration was not observed into the culvert at this location in 2021, 2022, or 2023, potentially due to low water levels and dry conditions.
g. Approximately 6 inches of sediment was observed on the downstream side of both culverts.

Recommended Action:

- Remove deposited riprap in the box culverts and replace upstream.
- Monitor sediment in the box culverts.
- Monitor the joint gaps in the box culverts.
- Monitor spalled concrete, and exposed reinforcing in the culverts.

4. Markwood Downstream Overflow (Constructed 1981-1984)

a. Approximately 75% of the bolts on the railing of the overflow appeared to be missing.

Recommended Action:

- Add replacement bolts to the railing.

5. Markwood 8 feet x 4 feet Box Culvert (Constructed 1981-1984)

a. The box culvert was not entered due to low clearance and was visually inspected from the outside at the downstream end. The box culvert appeared to be in satisfactory condition.
b. Approximately 2-4 inches of sediment was observed at the downstream side of the culvert.
c. The upstream catch basins appeared to be in satisfactory condition.

Recommended Action:

- None.

6. Georgia Avenue Crossing (Constructed 1981-1984)

a. The concrete culverts appeared to be in satisfactory condition.
b. Cracking and spalling were observed in the south (right) culvert at the second and fourth joints at approximately the five o'clock position.

Note: references to "right" and "left" are with respect to facing downstream.

c. Cracking was observed in multiple joints in the north (left) culvert on the right side.
d. Minor erosion was observed between the concrete culverts at the upstream end.
e. Approximately two inches of sediment has accumulated downstream of the culverts, especially near the north (right) culvert and right bank.
f. Sediment has accumulated on the right bank upstream of the culverts.
g. Both culverts appeared to begin to change slope around mid-channel.
h. There is a downed tree upstream of the culvert that is partially in the creek.

Recommended Action:

- Monitor cracking and spalling in the south (right) culvert.
- Monitor minor erosion between the concrete culverts on the upstream end.
- Remove downed tree upstream of the culvert.

7. Edgewood Embankment (Constructed 1981-1984)

a. The concrete culvert appeared to be in satisfactory condition.
b. The embankment appeared to be in satisfactory condition.
c. No visible settlement or erosion was observed along the embankment.
d. Trees and shrubs are growing on the embankment.
e. Although some branches have been removed since last year's inspection, there are three large trees (two oak trees and one maple tree) that have fallen downstream of the culvert and the tree branches are extending into the creek channel and could obstruct creek flows.
f. The natural boulder riprap between the Edgewood embankment and Douglas Drive crossing is significantly overgrown with vegetation.
g. Spalled concrete was observed at four joints in the culvert.
h. Spalled concrete was observed on the north (right) and south (left) side of the downstream flared end section of the culvert.
i. Moderate erosion is occurring on each side of the upstream end of the culvert.
j. Sediment has accumulated in the pool downstream of the culvert and formed a delta, which had some established vegetation. The deposited sediment was generally creating a meander in the creek toward the south (right) bank.

Recommended Action:

- Remove branches and downed trees that are in the creek channel to prevent obstructing creek flows.
- Remove trees, shrubs and woody vegetation growing on the embankment.
- Clear woody vegetation in the channel between the Edgewood Embankment and Douglas Drive crossing as needed to maintain flow capacity and allow access through the open channel.
- Monitor spalled concrete at the fifth joint from the upstream end in the culvert.

Note: references to "right" and "left" are with respect to facing downstream.

- Monitor spalling on outlet structure.
- Monitor sediment accumulation in the pool downstream of the culvert.

8. Douglas Drive Crossing (Constructed 1981-1984)

a. The concrete box culvert was not entered due to low clearance but appeared to be in satisfactory condition, based on visual inspection.
b. The grouted riprap installed on each side of the box culvert outlet has started to deteriorate, and a gap has opened between the grout and the wall of the box culvert. This is consistent with previous inspections and has been noted since 2016.
c. Spalled concrete was observed at the downstream north (left) wing wall.
d. Sediment has deposited in the bottom of the culvert, ranging from 0-4 inches deep.
e. Some riprap was observed in the culvert.
f. On the downstream end of the culvert, settling was observed in the sidewalk on either side of the culvert.
g. Spalled concrete was observed on the top of the culvert on the downstream end.
h. There are two reinforced concrete storm pipes in Douglas Drive that connect on the left (north) side and right (south side) of the culvert. The reinforced concrete storm pipe on the right (south) side of the culvert appeared to be significantly cracked.
i. Small trees were observed adjacent to the structure at the downstream end.
j. Although not part of the flood control project, the privately-owned CMP culvert downstream of the Douglas Drive crossing is in poor condition. Sagging of this culvert has been observed during inspections since 2009. The culvert is significantly bowing and settling has occurred on either side of the culvert, which is evident in the road pavement above the structure.

Recommended Action:

- Remove riprap from the culvert and replace upstream.
- Consider adding a railing along the sidewalk at the upstream and downstream end of the culvert.
- Consider inspecting the reinforced concrete storm pipe in Douglas Drive that connects to the culvert on the right (south) side and repair as necessary.
- Monitor deposited sediment in the culvert.
- Monitor grouted riprap at the downstream end of the box culvert.
- Monitor spalled concrete at the downstream north (left) wing wall.
- Monitor settling in the sidewalk at the downstream end of the culvert.
- Although not part of the flood control project, it is recommended that the city coordinate with the property owner to repair or replace the culvert downstream of Douglas Drive.

9. 34th Avenue Crossing (Constructed 1981-1984)

a. The concrete culvert appeared to be in satisfactory condition.

Note: references to “right” and “left” are with respect to facing downstream.

b. Sediment has deposited in the bottom of the culvert, ranging from 0-4 inches deep. This is consistent with previous inspections and 0-12 inches of sediment has been noted in the culvert since 2002.
c. The tie bars directly upstream and downstream of the manhole connection to the culvert were rusty and flaking. This is consistent with previous inspections and has been noted since 2008.

Recommended Action:

- Monitor accumulated sediment in the culvert.
- Monitor tie bars directly upstream and downstream of the manhole connection to the culvert.

10. Brunswick Avenue Crossing (Constructed 1981-1984)

a. Trees are growing around the upstream end of the structure.
b. Water was primarily flowing though the north (left) culvert with less than an inch of water present. This aligns with previous inspections that have noted the north (left) culvert is at a slightly lower elevation at the upstream end.
c. A grade change occurs for both culverts at the 4th joint from the downstream side.
d. Grout and grout repair appeared to be failing at all joints in both culverts. Fractured pieces of concrete and grout were observed at multiple joints in both culverts.
e. Longitudinal and circumferential cracks were observed in both culverts.
f. Strained and detached tie bars were observed in the north (left) culvert. One joint with broken tie bars was previously re-grouted by the City of Crystal, but the joint reopened and a 1.5-inch-gap in the joint was observed during the 2008 inspection. A 3-inch gap in the joint has been noted since 2009.
g. At the 2nd and 5th joint from the downstream side of the north (left) culvert, broken tie bars on both sides of the culvert were observed.
h. A hole was observed at the 2nd joint from the downstream side of the north (left) culvert. Water appeared to be seeping through 2nd downstream joint and coming out of the hole.
i. A broken tie bar was observed in the south (right) culvert on the right side of the joint that is 5th from the downstream end.
j. In the furthest downstream section of the south (right) culvert, there appeared to be significant concrete spalling occurring with rebar exposed.
k. Spalled concrete and exposed reinforcing were observed from the furthest downstream joint to 4th joint from the downstream in the south (right) culvert.
l. A large circumferential crack was observed at the 5th joint from the downstream end of the south (right) culvert, crack was located from 10 to 12 o'clock.
m. Cracks were observed in the road pavement above the structure.
n. Sediment has deposited in the channel between the Brunswick Avenue crossing and the 32nd Avenue crossing and created two deltas in the channel. The channel was armored with boulder riprap in 2014. The sediment delta has been observed since 2017.

Note: references to "right" and "left" are with respect to facing downstream.

Recommended Action:

- Remove trees growing around the upstream end of the structure.
- Replace segments of culvert in poor condition or perform the following repairs:
    - Repair detached tie bars.
    - Repair fractured concrete and grout at joints in the culverts.
    - Repair and seal the hole in the culvert.
    - Repair areas of spalled concrete and exposed reinforcement.
- Monitor minor cracks in the culverts and road.
- Monitor joint separation in north (left) side culvert.
- Monitor deposited sediment and vegetation in the channel between the Brunswick Avenue crossing and the 32nd Avenue crossing.

11. 32nd Avenue Crossing (Constructed 1981-1984)

a. The concrete culverts appeared to be in satisfactory condition. The culverts were only visually inspected from the outside at the upstream and downstream ends due to low clearance and high water levels.
b. The southwest (right) culvert is at a slightly lower elevation at the upstream end.
c. Water was primarily flowing through the right culvert during the inspection. Both culverts had roughly two inches of water.
d. Water was observed seeping into the north (left) culvert through the bottom of the first joint at the upstream end of the culvert. Water appeared to be seeping below the culvert through the second joint and back into the culvert through the third joint. These observations indicate that the joints are not well sealed and there is potential for loss of fines (piping) below the culvert. The culverts had two inches of water during this year's inspections.
e. Concrete erosion along the culvert invert was noted at the upstream side of the north (left) culvert and at the upstream joints.
f. There appeared to be approximately 0-4 inches of sediment in the right and left culvert.
g. Vegetation, including two-inch diameter trees, was growing over the culverts.
h. A grade change occurred at the 5th joint from the upstream inlet.

Recommended Action:

- Seal the upstream joints along the invert of the north (left) culvert to minimize potential loss of material and settling.

12. Bassett Creek Park Pond and Outlet (Constructed 1995)

a. Bassett Creek Park Pond appeared to be in satisfactory condition.
b. Sediment has deposited in the northwest corner of Bassett Creek Park Pond and formed multiple deltas, which are overgrown with trees and vegetation. This has been noted since 2006 and the sediment deposition appears to be increasing.

Note: references to "right" and "left" are with respect to facing downstream.

c. The outlet pipes appeared to be in satisfactory condition.

Recommended Action:

- None.

Additional Comments:

- Dredging of Bassett Creek Park Pond and upstream channel improvements (BCP-2) is included in the BCWMC CIP Table 5-3. The BCWMC completed a feasibility study for the dredging of Bassett Creek Park Pond and Winnetka Pond in May 2017. The City of Crystal dredged Winnetka Pond East in 2019. The Bassett Creek Park Pond dredging is included as a future BCWMC CIP project, pending funding.

13. Detention Pond and Outlet Structure (Constructed 1995)

a. The outlet structure appeared to be in satisfactory condition.
b. The detention pond appeared to be in satisfactory condition, but a survey is needed to assess accumulated sediment.

Recommended Action:

- Survey the detention pond to determine if the pond has accumulated sediment.

Crystal / Golden Valley Features

Inspection Date: October 10, 2023
Inspection Personnel: Gabrielle Campagnola and Josh Phillips (Barr)

1. Highway 100 Double Box Culverts (Constructed 1930s, and 2001) and Inlet Structure (Constructed 1995)

a. The concrete inlet structure appeared to be in satisfactory condition.
b. Circumferential cracks and approximately 12 locations of spalled concrete, nine of which had exposed reinforcement, were observed in the north (left) box culvert.
c. Two areas of spalled concrete on the right wall of the south (right) box culvert were observed.
d. Four longitudinal cracks, circumferential cracks, and areas of spalled concrete with exposed reinforcement were observed along the top of the south (right) box culvert. MnDOT performed repairs to the culverts in 2007, but cracks have been noted since 2008 and areas of concrete spalling have been noted since 2014.
e. Deposited sediment was observed in the north (left) box culvert, generally ranging from 6-36 inches deep. This is similar to previous inspections that noted 6-24 inches of deposited sediment has been observed in the north (left) box culvert since 2002.
f. The outlet portion of the structure appeared to be in satisfactory condition.
g. Riprap was observed in the inlet structure near entrance to the south (right) box culvert.

Note: references to “right” and “left” are with respect to facing downstream.

Recommended Action:

- Remove deposited riprap in the inlet structure near the entrance to the south (right) box culvert.
- Monitor accumulated sediment in north (left) box culvert and consider future removal.
- Monitor cracking, spalling concrete, and exposed reinforcement in both box culverts.
- MnDOT should assess the defects and repair, as necessary.

Minneapolis Features

Inspection Date: October 10, 2023
Inspection Personnel: Gabrielle Campagnola and Josh Phillips (Barr)

1. **Open Channel (Constructed 1992)**
    a. The open channel, from Van White Memorial Boulevard to the inlet structure, appeared to be in satisfactory condition.
    b. The banks were generally vegetated. Some areas had exposed soil and steep slopes but seemed stable and no obvious signs of bank erosion were noted.
    c. Sediment has deposited and formed a delta on the south (right) side of the channel between the debris barrier and inlet structure, extending approximately 20% of the channel width. Vegetation was growing on the delta. This is consistent with previous years' observation.

Recommended Action:

- Remove accumulated sediment and debris on the south (right) side of the channel between the inlet structure and debris barrier.
- Monitor downed tree(s) and debris and remove as needed.

2. **Debris Barrier (Constructed 1992)**
    a. The debris barrier piles appeared to be in satisfactory condition.
    b. The steel cable was repaired by the City since the last inspection and extended across the channel, attached at each post.

Recommended Action:

- Monitor for debris and remove as needed.

3. **Inlet Structure (Constructed 1992)**
    a. The concrete inlet structure appeared to be in satisfactory condition.
    b. Vertical cracks were observed in the concrete on either side of the structure.
    c. Cracks were observed near where the handrail posts are embedded.
    d. The railings appeared to be in satisfactory condition.
    e. Some of the vertical bars have been bent and projecting a slight bow but generally appeared to be in satisfactory condition.

Note: references to "right" and "left" are with respect to facing downstream.

f. The inlet structure was clear of debris.
g. Spalled concrete was observed behind the railings on the right side of the structure.

Recommended Action:

- Monitor for debris and clear as needed.
- Monitor cracks in the concrete inlet structure.
- Monitor concrete spalling behind the railings.

4. Double Box Culvert (Constructed 1992)

a. The most recent inspection of the double box culvert was completed in 2019. Inspection of the double box culvert is on a 5-year interval with the next inspection scheduled for 2024.

5. 3rd Avenue Tunnel (Constructed 1990)

a. The most recent detailed inspection of the 3rd Avenue Tunnel was completed in 2020. Inspection of the 3rd Avenue "deep" tunnel is on a 5-year interval, alternating between a detailed NAASCO inspection and a less comprehensive tunnel inspection, looking for significant changes without coding existing or new defects or preparing a detailed report. The next "less comprehensive" inspection is scheduled for 2025.

6. 2nd Street Tunnel (Constructed 1979)

a. The most recent inspection of the 2nd Street Tunnel was completed in 2020. Inspection of the entire 2nd Street "deep" tunnel is on a 10-year inspection interval with the next detailed NAASCO inspection scheduled for 2030. Similar to the 3rd Avenue Tunnel a "less comprehensive" inspection of the unsubmerged portions of the tunnel is scheduled for 2025.

Note: references to "right" and "left" are with respect to facing downstream.

Attachment

Photographs of Bassett Creek Flood Control Project Features

October 10, 2023

Plymouth Creek Fish Barrier (Plymouth)

Medicine Lake Outlet (Plymouth)

Wisconsin Avenue Control Structure (Golden Valley)

Golden Valley Country Club (Golden Valley)

Westbrook Road Crossing (Golden Valley)

Regent Avenue Crossing (Golden Valley)

Noble Avenue Crossing (Golden Valley)

Highway 55 Control Structure (Golden Valley)

Markwood Open Channel – Gabion Section (Crystal)

Markwood Open Channel (Crystal)

36th Avenue and Hampshire Avenue Crossing (Crystal)

Markwood Downstream Overflow (Crystal)

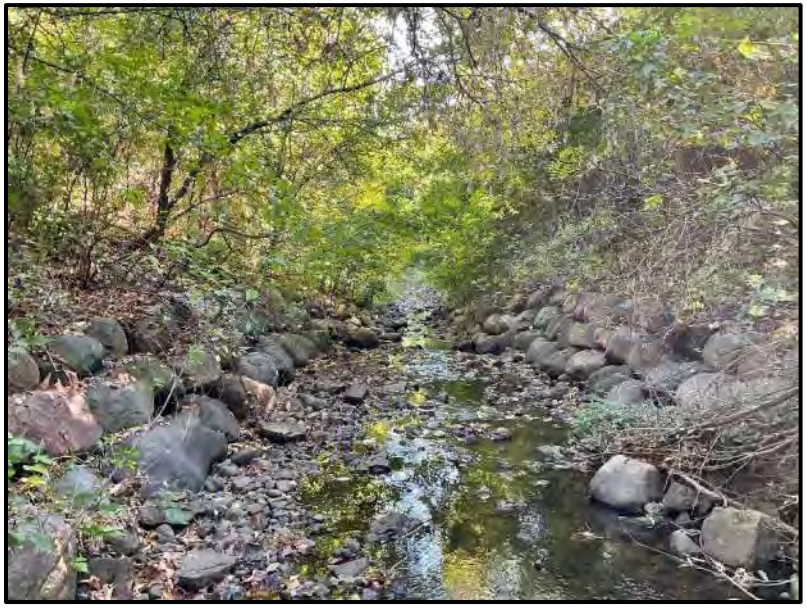
Markwood 8 feet x 4 feet Box Culvert (Crystal)

Georgia Avenue Crossing (Crystal)

Edgewood Embankment (Crystal)

Douglas Drive Crossing (Crystal)

34th Avenue Crossing (Crystal)



Brunswick Avenue Crossing (Crystal)

Brunswick Avenue Crossing (Crystal), continued

32nd Avenue Crossing (Crystal)

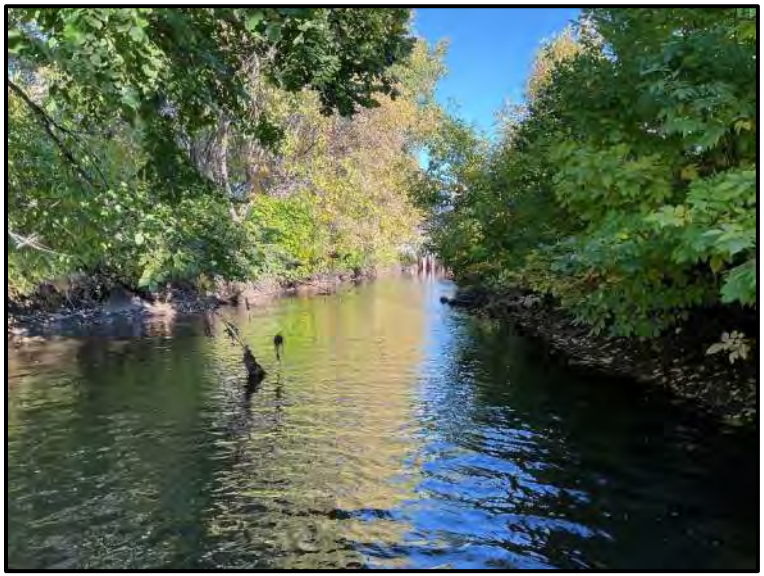
Bassett Creek Park Pond and Outlet (Crystal)

Detention Pond and Outlet Structure (Crystal)

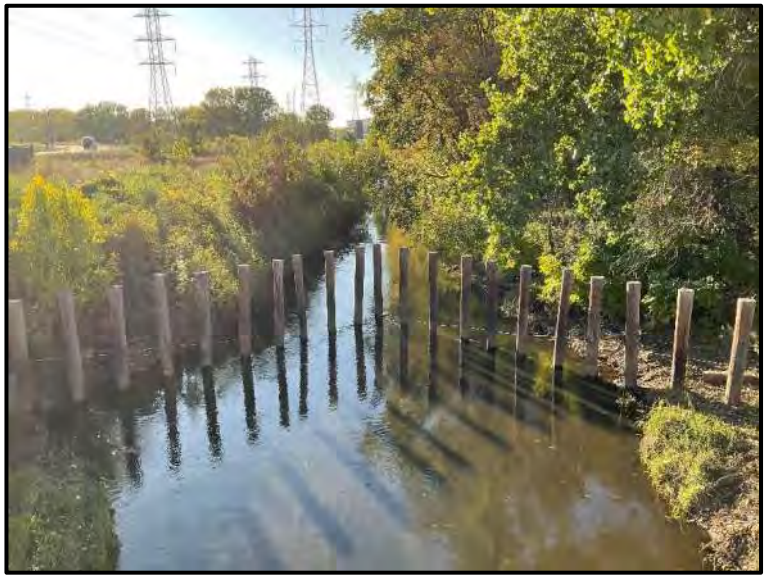
Highway 100 Double Box Culverts (MnDOT Responsibility, Located in Crystal/Golden Valley)

Highway 100 Double Box Culverts, continued

Open Channel (Minneapolis)



Debris Barrier (Minneapolis)



Inlet Structure (Minneapolis)