Item 5C.
BCWMC 7-15-21

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Memorandum

To: Bassett Creek Watershed Management Commission (BCWMC)
From: Barr Engineering Co. (Barr)
Subject: Item 5C: Hollydale Development – Plymouth, MN
BCWMC July 15, 2021 Meeting Agenda
Date: July 9, 2021
Project: 23270051.52 2021 2249

5C Hollydale Development – Plymouth BCWMC 2021-10

Summary:

Proposed Work: Site demolition, new 229 single-family home development with streets, house pads, utilities, and stormwater management
Project Proposer: Hollydale Residential GC Development, Inc.
Basis for Review at Commission Meeting: Work in the floodplain
Impervious Surface Area: Increase 29.5 acres
Recommendation for Commission Action: Approval
Recommendations for Developer and City: Multiple, see page 8

General Project Information

The proposed project is in the Plymouth Creek subwatershed at the former Hollydale Golf Course, generally bounded by Holly Lane North to the west, 45th Avenue North to the south, Yuma Lane North to the east, and 49th Place North to the north. The proposed project includes site demolition and construction of a 229 single-family home development including streets, house pads, utilities, and stormwater management (including stormwater reuse) resulting in 112 acres of land disturbance. The proposed project creates 34.7 acres of new and fully reconstructed impervious surfaces, including 5.2 acres of fully reconstructed impervious surfaces and an increase of 29.5 acres of impervious surfaces from 5.2 acres (existing) to 34.7 acres (proposed). Although the entire development is within the Bassett Creek jurisdictional boundary, runoff from approximately eight percent of the site discharges north to the Elm Creek watershed.

At the June 17, 2021 meeting the Commission extended the review period for this project by 60 days to September 6, 2021. Additional information was requested at the June meeting. Text highlighted in grey has been added or revised since the June 17, 2021 meeting.

Floodplain

The proposed project includes work in the BCWMC (Bassett Creek) 1% annual-chance (base flood elevation, 100-year) floodplain. The February 2021 BCWMC Requirements for Improvements and Development Proposals (Requirements) document states that projects within the floodplain must maintain no net loss in floodplain storage and no increase in flood level at any point along the trunk system (managed to at least a precision of 0.00 feet). The proposed project is adjacent to the Rockford Road storage area, which is part of the BCWMC trunk system and drains to Plymouth Creek. The 1% annual-chance (base flood elevation, 100-year) floodplain elevation of the Rockford Road storage area is 968.5 feet NAVD88. The proposed project will result in a net increase in floodplain storage of approximately 3.43 acre-feet from 81.13 acre-feet (existing) to 84.56 acre-feet (proposed). The applicant submitted a revised BCWMC XPSWMM model to show that the proposed project does not result in any increases to the BCWMC 100-year flood levels at any point along the BCWMC trunk system. Based on our review of the model, the BCWMC Engineer confirmed the model results.

The Requirements document also states that minimum building elevations (lowest) floor of new and redeveloped structures, must be at least 2.0 feet above the 100-year flood level. The lowest floor of all proposed homes are at least 2.0 feet above the 100-year floodplain elevation of the Rockford Road storage area. As requested at the June BCWMC meeting, the applicant submitted, and the BCWMC Engineer reviewed, a list of homes adjacent to the Bassett Creek trunk system floodplain including lot numbers, lowest floor elevations, 100-year floodplain elevation, and freeboard. As shown in Table 1 below, the lowest floor elevation of each home is at least 2 feet above the 100-year flood level.

Table 1: Lowest Floor Elevations Compared to BCWMC 100-Year Flood Level

Lot	Lowest Floor Elevation	BCWMC 100-Year Flood Level	Freeboard
Lot 9	981.6	968.5	13.1
Lot 10	980.6	968.5	12.1
Lot 11	980.6	968.5	12.1
Lot 12	980.6	968.5	12.1
Lot 13	983.3	968.5	14.8
Lot 14	982.2	968.5	13.7
Lot 15	982.2	968.5	13.7
Lot 16	981.1	968.5	12.6
Lot 17	978.3	968.5	9.8
Lot 18	975.6	968.5	7.1
Lot 19	972.9	968.5	4.4
Lot 20	972.9	968.5	4.4
Lot 21	973.6	968.5	5.1
Lot 22	975.1	968.5	6.6
Lot 23	976.6	968.5	8.1
Lot 24	976.6	968.5	8.1

Lot 25	976.1	968.5	7.6
Lot 26	974.6	968.5	6.1
Lot 27	974.3	968.5	5.8
Lot 28	974.6	968.5	6.1
Lot 29	977.8	968.5	9.3
Lot 30	981.3	968.5	12.8
Lot 31	984.8	968.5	16.3
Lot 32	987.4	968.5	18.9
Lot 33	989.6	968.5	21.1
Lot 34	989.6	968.5	21.1
Lot 35	984.1	968.5	15.6
Lot 36	980.1	968.5	11.6
Lot 37	980.1	968.5	11.6
Lot 38	981.1	968.5	12.6
Lot 129	975.1	968.5	6.6
Lot 130	973.6	968.5	5.1
Lot 131	973.6	968.5	5.1
Lot 132	973.6	968.5	5.1
Lot 133	974.1	968.5	5.6
Lot 134	975.1	968.5	6.6
Lot 135	977.8	968.5	9.3
Lot 175	990.1	968.5	21.6
Lot 176	988.6	968.5	20.1
Lot 177	989.9	968.5	21.4
Lot 178	994.1	968.5	25.6
Lot 179	994.1	968.5	25.6
Lot 180	988.1	968.5	19.6
Lot 181	982.6	968.5	14.1
Lot 182	978.6	968.5	10.1
Lot 183	976.1	968.5	7.6
Lot 184	974.6	968.5	6.1
Lot 185	974.6	968.5	6.1
Lot 186	974.6	968.5	6.1
Lot 187	976.1	968.5	7.6

Wetlands

The existing site includes several wetlands throughout the existing golf course. The plans show some temporary or permanent impacts to multiple wetlands. The City of Plymouth is the local government unit (LGU) responsible for administering the Wetland Conservation Act; therefore, BCWMC wetland review is not required.

Rate Control

The BCWMC Requirements document states that projects that create more than one (1) acre of new or fully reconstructed impervious area *must manage stormwater such that peak flow rates leaving the site are equal to or less than the existing rate leaving the site for the 2-, 10-, and 100-year events, based on Atlas 14 precipitation amounts and using a nested 24-hour rainfall distribution*.

In existing conditions, stormwater runoff generally leaves the site in two directions: to the north to Elm Creek and to the south to Plymouth Creek (or the Medicine Lake Branch of Bassett Creek). In proposed conditions, stormwater will continue to generally leave the site in the same directions. Six stormwater ponds are proposed to provide detention and rate control for the site. Table 2 summarizes the existing and proposed peak discharge rates for the proposed project and shows that the proposed development meets the BCWMC requirements for rate control.

Table 2: Existing and Proposed Peak Discharge Rates

Runoff Direction	Area (acres)		2-Year Peak (cfs)		10-Year Peak (cfs)		100-Year Peak (cfs)	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
To South (Plymouth Creek) (Wetland 6) [1]	125.4	126.5	77.0	18.5	174.5	41.7	427.7	101.4
To North (Elm Creek) (Wetland 9) [1]	11.3	10.2	5.4	0.9	19.6	5.7	49.7	18.8
Total (Sum)	136.7	136.7	82.4	19.4	194.1	47.4	477.4	120.2

[1] See enclosed Stormwater Reuse Map Figure provided by applicant

Volume Reduction and Water Quality

The BCWMC Requirements document states that projects on sites without restrictions that create one or more acres of new and/or fully reconstructed impervious surfaces shall capture and retain on-site 1.1 inches of runoff from the new and/or fully reconstructed impervious surfaces. If the applicant is unable to achieve the performance goals due to site restrictions, the BCWMC flexible treatment options approach shall be used following the BCWMC design sequence flow chart.

The proposed project creates 34.7 acres of new and/or fully reconstructed impervious area. To meet the volume reduction requirements, the applicant incorporated stormwater reuse into the design, in part due to silty and clayey soils, and high groundwater present throughout the site that limit infiltration potential. The proposed reuse plan includes taking stormwater from the largest stormwater pond (Pond 5S), located in the northwest quadrant of the site, and distributing it over multiple irrigation areas throughout the site (see enclosed Stormwater Reuse Map Figure provided by applicant).

1. Stormwater Reuse Calculator

The applicant used a stormwater reuse calculator developed by the Ramsey-Washington Metro Watershed District (RWMWD) to quantify the volume reduction provided by the reuse system. Barr is also a technical advisor to RWMWD and assisted with development of the reuse calculator. The RWMWD stormwater reuse calculator was developed in 2014 and since development, RWMWD has permitted four stormwater reuse systems and contributed grant funding toward one additional system. RWMD has also periodically updated the calculator based on questions from applicants, rule changes, or to incorporate identified improvements; the most recent update was May 21, 2021.

In the RWMWD stormwater reuse calculator, the applicant inputs 1) the watershed area tributary to the reuse system, 2) the directly connected imperviousness of the tributary watershed, 3) the prominent hydrologic soil group of the tributary watershed, 4) the estimated reuse storage volume, 5) the irrigation area, and 6) whether the system goes offline and is drawn down at the end of the irrigation season. The reuse calculator uses the specified inputs to calculate the average annual volume of stormwater reused by the system over a 50-year period. This calculation assumes: an irrigation application rate of one inch per week, that the irrigation system is online from May through September, that irrigation is not used on days when it rains, and that any volume above the storage capacity of the reuse system leaves the system (pond). For each day within the 50-year period, the reuse calculator determines the runoff volume that enters the reuse system, the volume of water that leaves the reuse system based on irrigation demand, the volume that leaves via overflow of the system, and any augmentation of potable water needed to meet the irrigation demand. The total volume of each category is then averaged to calculate an average annual volume. Table 3 below lists these volumes and percentages (as applicable) for each aspect of the reuse calculator.

Table 3: Average Annual Volume Summary

	Total Volume for 50-Year Run Period (ac-ft)	Average Annual Volume (ac-ft/year)	Percent
Watershed Runoff	2,249	45.0	N/A
Runoff Stored and Reused for Irrigation	1,171	23.4	52.5%
Runoff Overflowing / Bypassing	1,078	21.6	47.5%
Winterization Drawdown Volume [1]	0	0	0%
Augmentation Volume with Potable Water [2]	N/A	N/A	N/A

[1] Winterization drawdown is common when a storage tank is used for stormwater reuse and the tank is emptied at the end of the irrigation season. For this project, the irrigation system will pump water from below the normal water level of the stormwater pond (dead storage) and the pond will not be drained or drawn down (below the normal water level) at the end of the irrigation season.

[2] The stormwater reuse calculator provides an estimated volume of augmentation with potable water to meet the estimated irrigation demand. However, a potable water backup is not proposed as part of the current development plan.

Because volume reduction rules are written for instantaneous volume (capture and retain 1.1 inches of runoff from new and reconstructed impervious), the RWMWD reuse calculator also provides a comparison between stormwater reuse volume and volume reduction via infiltration to calculate a stormwater reuse credit factor. The credit factor is used to provide an appropriate comparison of

stormwater volume reduction and stormwater reuse. Table 4 shows the percent average annual volume reduction of the reuse system proposed by the developer versus an infiltration basin sized to meet the volume reduction goals (1.1 inches from new and fully reconstructed impervious surfaces). The last row of Table 4 shows how the credit factor is determined by dividing the two percentages.

Table 4: Average Annual Volume Reduction Comparison and Credit Factor

Stormwater Feature Type	Average Annual Volume Reduction (Percent)
Watershed Runoff Stored and Reused for Irrigation	52.5%
Infiltration Basin Sized to Meet Volume Reduction Goals (1.1" from new and reconstructed impervious)	81.8%
Credit Factor	52.5 / 81.8 = **0.64**

As shown in Table 5, the required volume reduction for the development is 3.18 acre-feet and the credit factor for this stormwater reuse system is 0.64. At the time of the applicant's original submittal/ application, the previous version (Version 2.1) of the RWMWD stormwater reuse calculator was the current version of the calculator. In that version of the calculator, the equivalent instantaneous runoff that could be applied toward achieving the volume reduction requirement was calculated by multiplying the credit factor by the volume of the proposed stormwater reuse system (7.97 acre-ft), which would indicate a volume reduction of 5.10 acre-feet.

*0.64 * 7.97 acre-ft =* ***5.10 acre-feet***

However, while Version 2.1 of the RWMWD stormwater reuse calculator showed that the proposed project met the volume reduction requirements using the proposed reuse system, RWMWD updated the calculator on May 21, 2021 to correct an error that artificially showed excess treatment in some scenarios. The stormwater reuse system proposed as part of the Hollydale Development is one of the types of scenarios where excess treatment was artificially shown in Version 2.1 of the reuse calculator. In the new version (Version 2.2) of the RWMWD stormwater reuse calculator, the equivalent instantaneous runoff that could be applied toward achieving the volume reduction requirements is calculated by multiplying the credit factor by the volume reduction requirement (3.18 acre-feet), which would indicate a volume reduction of 2.04 acre-feet.

*0.64 * 3.18 acre-feet =* ***2.04 acre-feet***

We recognize that the release of a new version of the stormwater reuse calculator after the original application for review by the developer is not ideal timing. The site was designed using the old version (Version 2.1) of that calculator and it appears that the developer was reasonably attempting to use the calculator for demonstrating compliance to stormwater treatment requirements. However, we also recognize that it is appropriate to use the most recent version of the reuse calculator for the analysis.

Table 5 shows that the volume reduction that can be applied toward achieving the requirement is 2.04 acre-feet, which does not meet the BCWMC volume reduction requirements.

Table 5: Stormwater Volume Reduction Required and Provided

New and Reconstructed Impervious (acres)	Volume Reduction Goal (formula)	Volume Reduction Required [1] (acre-feet)	RWMWD Credit Factor	Volume Reduction Provided [2] (acre-feet)
34.7	Volume = Imp. Area * 1.1 inches runoff	3.18	0.64	2.04

[1] Required instantaneous runoff volume based on MIDS requirements
[2] Equivalent instantaneous runoff that can be applied toward achieving the volume reduction requirements

2. Flexible Treatment Option #1

Within the BCWMC Design Sequence Flow Chart, if stormwater best management practices (BMPs) cannot be sized to meet the volume reduction requirement due to site constraints, the applicant shall follow the flow chart to consider the Flexible Treatment Options (FTO). When it was determined that the stormwater reuse system would not, on its own, meet the BCWMC volume reduction requirements, the applicant followed the design sequence flow chart to the first option, FTO #1, which requires that the project achieve volume reduction of at least 0.55 inches from the new and fully reconstructed impervious surfaces and provide 75% removal of total phosphorus (TP). The applicant provided a geotechnical report, including soil borings, showing shallow groundwater and soils that are generally not conducive to infiltration throughout the site and provided water quality modeling using P8 to determine to total phosphorus (TP) loading and removals from the stormwater ponds. Although P8 does not have the capacity to model TP loading and removals from stormwater reuse, we used the model to estimate the water quality treatment provided by reuse by adding a small rate of "artificial" infiltration to the dead storage of Pond 5S. The assumed pond infiltration rate is equivalent to the irrigation application rate of 1 inch per week over 18.3 acres, converted to a constant flow rate, which appears to be an appropriate assumption to account for irrigation in the P8 modeling. Table 6 summarizes the TP loading and removals from the submitted P8 modeling.

Table 6: Average Annual TP Loading and Removal Summary

Stormwater BMP	TP Loading (lbs/year)	TP Removal (lbs/year)	Percent Removal
Pond 1N	2.1	1.4	68.5%
Pond 1S	22.5	8.7	38.7%
Pond 2S	4.6	3.0	64.6%
Pond 3S	8.9	5.7	64.3%
Pond 4S	14.3	6.3	44.5%
Pond 5S	32.0	29.5 [21.9 via sedimentation] [7.6 via reuse system]	92.4% [68.4% via sedimentation] [23.8% via reuse system]
Total [1]	**72.0**	**54.7**	**76.0%**

[1] Totals are not a direct sum of individual ponds due to differing discharge directions and routing of flows from one stormwater pond to another within the modeling.

Stormwater reuse has sparingly been used in the Bassett Creek watershed to meet volume reduction and water quality goals for development or redevelopment, and the BCWMC has not reviewed an application that has used the RWMWD calculator in the past. Although the new version of the reuse calculator indicates that the stormwater reuse system does not meet the BCWMC performance goal for volume reduction on its own, Table 7 summarizes how the stormwater reuse calculator, along with the supplemental P8 modeling, demonstrates that the stormwater ponds and reuse system together meet the BCWMC FTO #1 for water quality treatment.

Table 7: Stormwater Volume Reduction Required and Provided

New and Recon. Impervious (acres)	FTO #1 Volume Reduction Goal (formula)	FTO #1 Volume Reduction Required [1] (acre-feet)	Volume Reduction Provided [2] (acre-feet)	FTO #1 TP Removal Required (%)	TP Removal Provided (%)
34.7	Volume = Imp. Area * 0.55 inches runoff	1.59	2.04	75%	76.0%

[1] Required instantaneous runoff volume based on MIDS requirements
[2] Equivalent instantaneous runoff that can be applied toward achieving the volume reduction requirements

Erosion and Sediment Control

The proposed project results in more than 10,000 square feet of land disturbance; therefore, the proposed project must meet the BCWMC erosion and sediment control requirements. Proposed temporary erosion and sediment control features include rock construction entrances, silt fence, inlet protection, and concrete washouts. Permanent erosion and sediment control features include riprap armoring at pipe outlets, stabilization with seed and mulch, and erosion control blanket.

Recommendations

1. We recommend that the Commission approve the project plans based on the revised July 7, 2021 submittal
2. On June 29, 2021, we met with Plymouth staff, Administrator Jester, and representatives from the developer and their consultants to discuss possible areas or activities for collaboration to further improve water quality and natural resources. We recommend the developer and/or city take the following actions:
   - Restore and expand wetland buffers with native, deep rooted grasses, flowers, and shrubs to improve ecological diversity and water absorption.
   - Follow a robust vegetation maintenance plan to reduce invasive species and ensure continued native plant health and diversity.
   - Develop a chloride management plan for common areas and HOA and require that winter maintenance crews have MPCA Smart Salting certification. Learn more at https://www.bassettcreekwmo.org/developer/winter-maintenance.
   - Provide education to residents on chloride management and Smart Salting practices.
   - Develop and implement a robust operation and maintenance agreement and plan, including periodic inspections, to ensure proper functioning of the water reuse system.

Project Location
Municipality
BCWMC Legal Boundary
Major Subwatershed
BCWMC Hydrologic Boundary
Bassett Creek

BARR

N

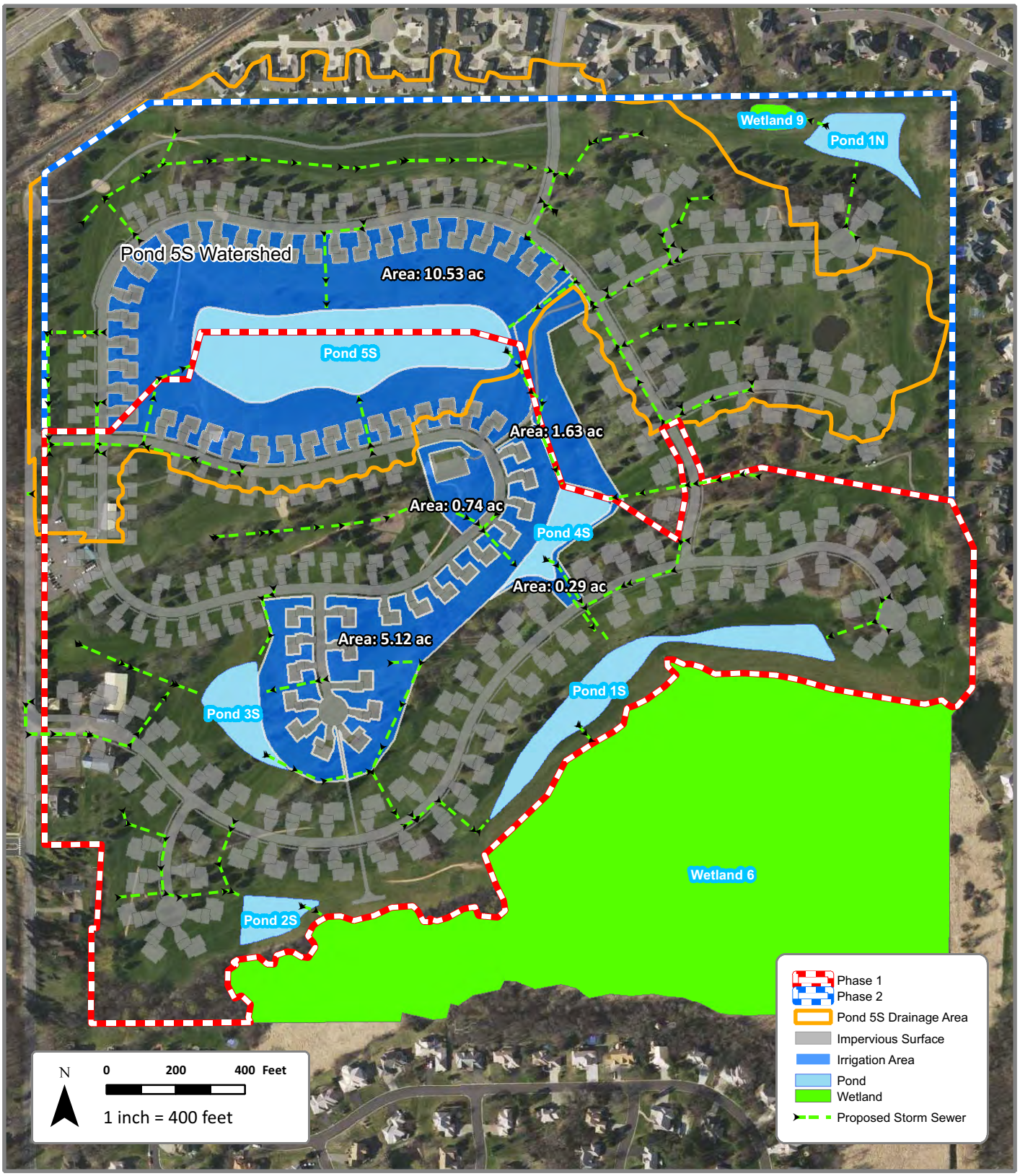
0 300 600 Feet

Bassett Creek Watershed Management Commission

BCWMC #2021-10
HOLLYDALE DEVELOPMENT
Plymouth, MN

LOCATION MAP

Barr Footer: ArcGIS 10.8.1, 2021-06-08 16:47 File: I:\Client\BassettCreek\gis\maps\Permits\Maps-2021\2021-10 Hollydale Development.mxd User: EMA



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Coordinate System: NAD 1983 HARN Adj MN Hennepin Feet | Edited by: jklabo | C:\Users\JKlabo\AE2S\Sathre - Documents\Hollydale Golf Course\GIS\Fig4_Stormwater Reuse Map.mxd

Locator Map Not to Scale

Figure 4

STORMWATER REUSE MAP

HOLLYDALE DEVELOPMENT

SATHRE-BERGQUIST,INC

Plymouth | Hennepin County, MN

Date: 7/7/2021