



Technical Memorandum

To: Ben Scharenbroich and Chris LaBounty, City of Plymouth
From: Karen Chandler and Ross Mullen, Barr Engineering Co., on behalf of the Bassett Creek Watershed Management Commission (BCWMC)
Subject: Preliminary Investigation of South Shore Drive Flooding
Date: August 30, 2019
Project: 23270051.45
c: Laura Jester, BCWMC Administrator

This memo summarizes Barr Engineering Co.'s (Barr) preliminary investigation (on behalf of the BCWMC) of stormwater infrastructure, grading, and drainage contributing to localized flooding along South Shore Drive in the city of Plymouth, Minnesota.

1.0 Background and Purpose

On behalf of the BCWMC, Barr Engineering performed a preliminary investigation to help the city of Plymouth evaluate stormwater infrastructure, grading, drainage, and other factors contributing to flooding observed near 9930 South Shore Drive. South Shore Drive is located in the far southeastern portion of the city of Plymouth, adjacent to Medicine Lake. Repeated flooding during intense rainfall events, including the event on September 20, 2018, near 9930 South Shore Drive has caused hazardous driving conditions and threatened to flood homes. According to homeowners, these drainage issues have increased in recent years despite the construction of a rainwater garden in 2010/2011, which was constructed to help manage stormwater runoff. In response to the concerns raised by homeowners, the city of Plymouth requested that the BCWMC Engineer (Barr) identify the causes of flooding on South Shore Drive. The BCWMC Administrator authorized the Engineer to perform the preliminary study. Figure 1 shows the South Shore Drive study area.

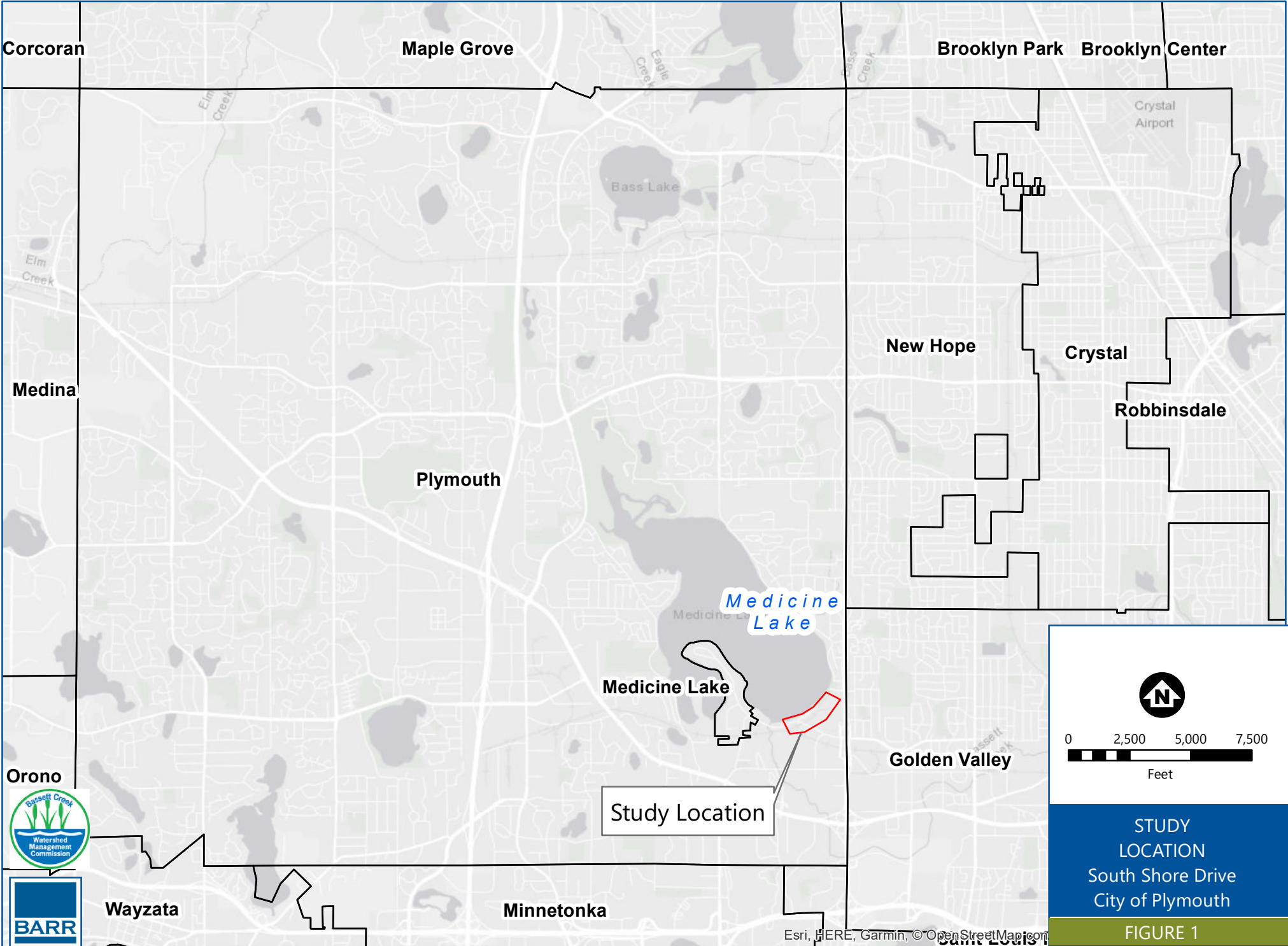
2.0 Preliminary Investigation

The following sections discuss the preliminary investigation into the stormwater infrastructure, grading, drainage, and other factors within the study area that may be contributing to flooding on South Shore Drive.

2.1 Resident Data

The resident at 9930 South Shore Drive provided data to the city via videos and pictures taken during the September 20, 2018 rainfall events. These videos and pictures have helped us understand the problem, severity, impacts, and refine our review of flooding problems in this area.

Specifically, the resident captured a video showing overland flow from the south side of South Shore Drive flow onto the roadway and toward the rainwater garden. Figure 2 shows a screen capture from the video, including the video location. Figure 3 shows photos of flooding on South Shore Drive.



September 20, 2018

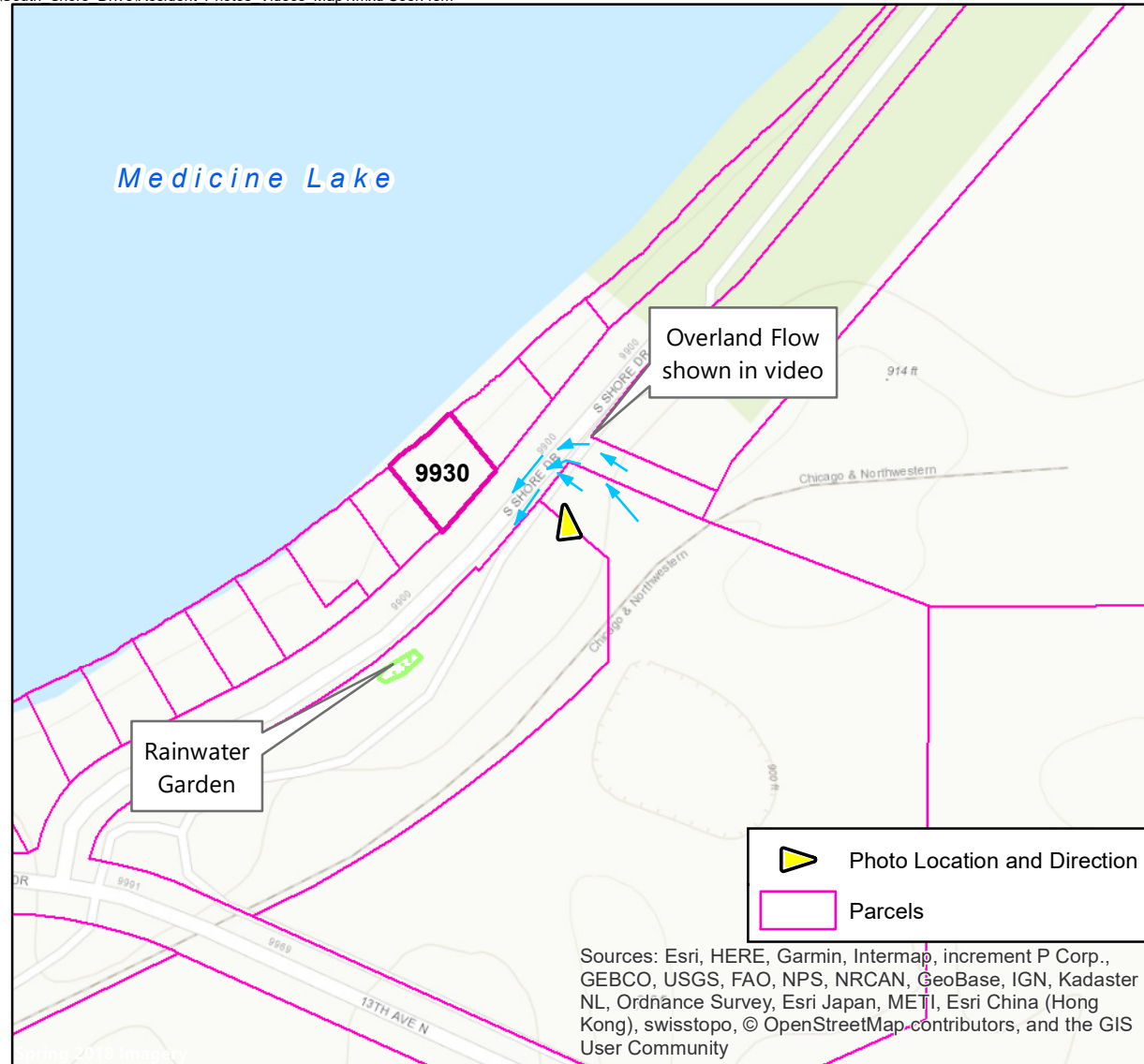
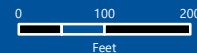


FIGURE 2

RESIDENT VIDEOS AND PHOTOS

City of Plymouth
Plymouth, Minnesota



Imagery: Spring, 2016

Date: September 20, 2018

Comment: Photo shows runoff moving from south of South Shore Drive onto the roadway.



September 20, 2018

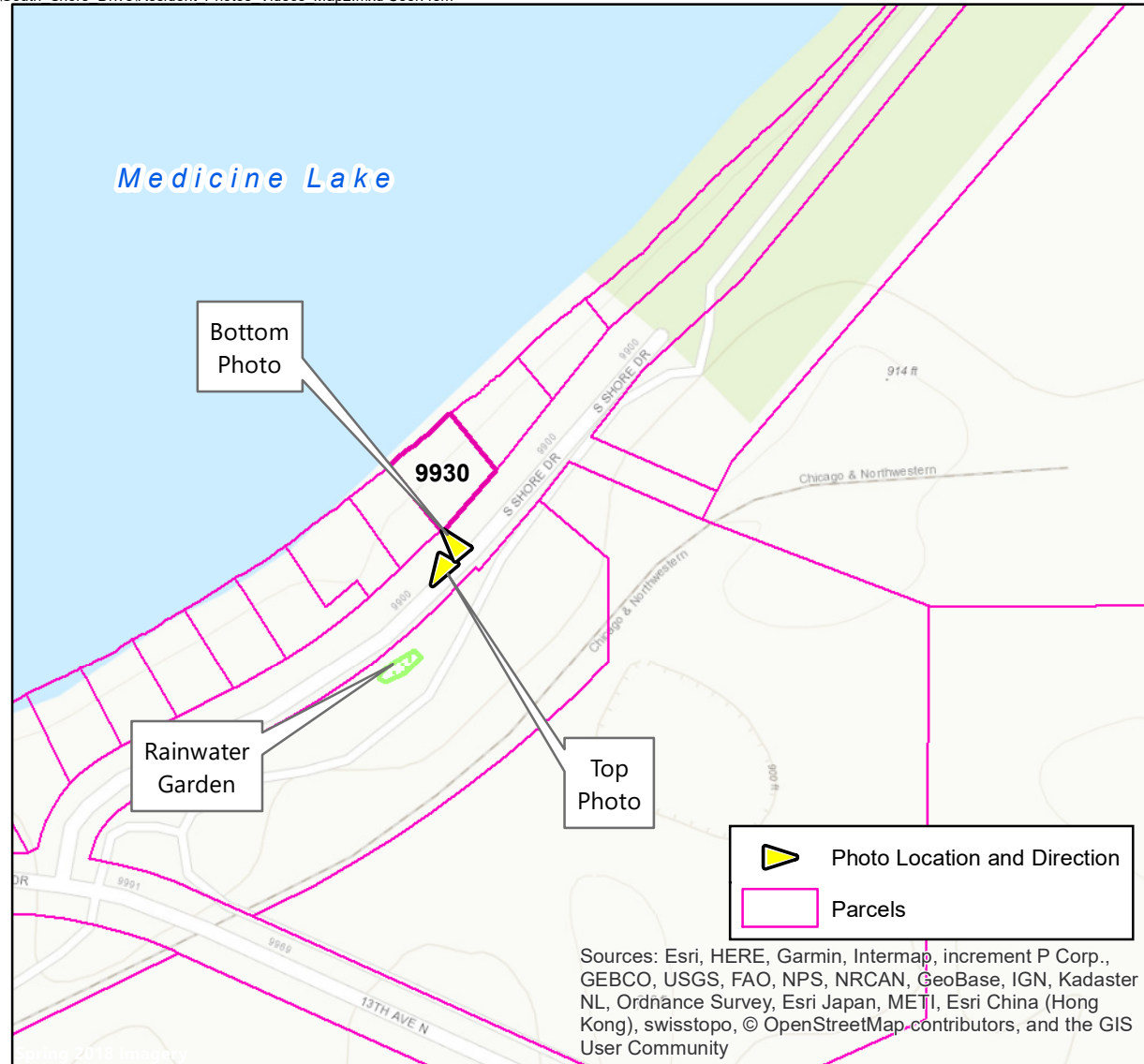
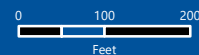


FIGURE 3

RESIDENT VIDEOS AND PHOTOS

City of Plymouth
Plymouth, Minnesota



Imagery: Spring, 2016

Date: September 20, 2018

Comment: Photo shows flooding of South Shore Drive and rainwater garden.



2.2 BCWMC Phase 2 XP-SWMM Model

2.2.1 Background, History, and Purpose of the BCWMC Phase 2 XP-SWMM Model

The BCWMC has a long history of water management planning; the BCWMC was originally created in 1968 as the Bassett Creek Flood Control Commission to address flooding concerns. Between 1984 and 1998, the BCWMC developed the first set of comprehensive hydrologic and hydraulic models for the watershed. In 2012, the BCWMC updated these models to the XP-SWMM modeling software and updated the models to account for changes in the watershed (the Phase 1 XP-SWMM model), but preserved the level of detail of the original hydrologic and hydraulic models (55 subwatersheds). However, because of the coarse level of detail in the number of subwatersheds, calibration was not feasible. In 2015, the BCWMC authorized updating the Phase 1 XP-SWMM model to incorporate much more detailed subwatershed and storage information for the watershed. The detailed report documenting the development of the Phase 2 model is titled *Bassett Creek Hydrologic and Hydraulic Analyses Phase 2 XP-SWMM Model Report* and may be found on the BCWMC's website. There are many useful applications of the BCWMC's updated Phase 2 XP-SWMM model, which can be used by the BCWMC, member cities, and other entities to evaluate projects and make informed watershed management decisions, including identifying localized flooding issues (see the *Hydrologic and Hydraulic Analyses Phase 2 XP-SWMM Model Report* for the full list of potential uses).

City staff requested that Barr use the Phase 2 XP-SWMM model as well as the extensive data library cataloged during the development of the Phase 2 XP-SWMM model to identify causes of localized flooding near South Shore Drive.

2.2.2 Review of the BCWMC Phase 2 XP-SWMM Model

The Phase 2 XP-SWMM model includes over 1,160 subwatersheds with an average size of approximately 23 acres. Three subwatersheds were used to model the study area—a 28-acre subwatershed that includes the highly impervious area west of Highway 169 (Ryerson Steel, Allied Building Products, and Brookdale Plastics), an 84-acre subwatershed for the portion of the watershed in Golden Valley, and the area immediately tributary to the site along South Shore Drive. Figure 4 shows the Phase 2 XP-SWMM model watersheds, along with the storm sewer systems previously provided to Barr. We relied on electronic data provided by the cities to develop the Phase 2 XP-SWMM model and requested as-builts for newer projects. The study area subwatersheds are relatively coarse compared to other parts of the watershed because of the relatively scarce data that was available in electronic format at the time of model development. While Barr performs development reviews on behalf of the BCWMC, the BCWMC does not receive as-builts and some developments are not constructed.

The 84-acre subwatershed drains a portion of Golden Valley from east of U.S. Highway 169 (Highway 169) west under Highway 169 to the regional pond (BCWMC CIP project 2006 ML-4, Medicine Lake East Beach Wet Detention Pond (subwatershed BC-107)) near South Shore Drive.

As part of this investigation, we updated the Phase 2 XP-SWMM model with more detailed site information, including the addition of the low-flow diversion pipe constructed to redirect runoff from Golden Valley and Highway 169 into the regional pond.

The Phase 2 XP-SWMM model shows that the Highway 169 drainage system, if operating as constructed, is large enough to convey flows up to the 100-year runoff event with minimal surcharging (i.e. overflowing out of the system to another location). Figure 4 shows the Phase 2 XP-SWMM model subwatersheds.

Furthermore, should the system surcharge due to sedimentation/blockage in the pipes or clogged inlets, the runoff from this portion of the watershed will not be conveyed to the study area:

- Runoff east of Highway 169 would be conveyed as overland flow east toward Bassett Creek in Golden Valley
- Runoff from Highway 169 would be conveyed as overland flow into the regional pond
- The regional pond would overflow into Medicine Lake instead of backing up and overflowing to the study area.

Because the Phase 2 XP-SWMM model showed that runoff from the 84-acre subwatershed is contained in the Highway 169 pipe (54-inch diameter MnDOT pipe), Barr pulled historic BCWMC development reviews to review the localized runoff patterns within the subwatershed directly contributing to the study area.

2.3 Development Review Applications

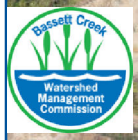
Barr reviewed several development reviews for Brookdale Plastics (then Schaper Manufacturing), Medicine Lake Water Quality Pond BC-107 (Medicine Lake East Beach Wet Detention Pond), Allied Building Products (then the Minneapolis Auto Auction site), South Shore Drive Mill & Overlay, and East Medicine Lake Park.

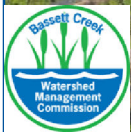
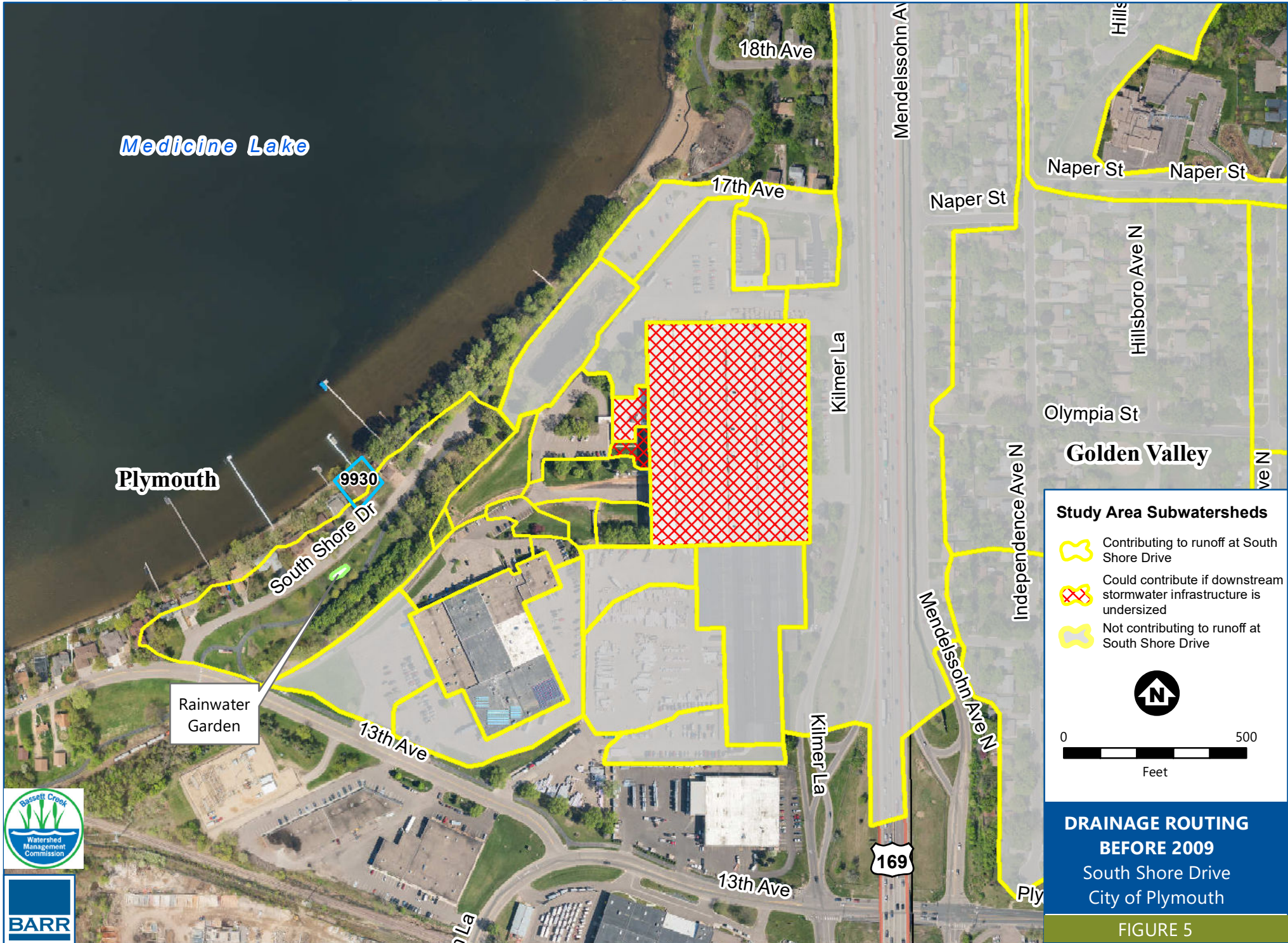
Prior to 2009, the roof from Brookdale Plastics and the northern portion of their parking lot, as well as Ryerson Steel's parking lot, access road, and lawn flowed to a swale, which ultimately discharged into a low spot adjacent to South Shore Drive. This low spot drained to Medicine Lake by a culvert under South Shore Drive (in 2010/2011, a rainwater garden was constructed in the low spot to help manage stormwater runoff).

Based on aerial imagery, it appears most of the downspouts collecting runoff from the Ryerson Steel building roofline are directed south toward the parking lot owned by Allied Building Products. Development reviews filed by Allied Building Products site owners (then the Minneapolis Auto Auction site) indicate storm sewer conveys runoff from this site to the south, away from South Shore Drive. However, this is a large, highly impervious drainage area. During intense rain storms, such drainage areas have significant runoff rates that frequently can overwhelm storm sewer pipes and/or the inlet capacity of catch basins. Many of these types of storm sewer systems are undersized and cannot fully convey these intense storms. If this system is undersized, the Ryerson Steel roof could surcharge through catch basins on the west side of the building and drain via overland flow to the South Shore Drive study area,

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exacerbating flooding issues. The contributing drainage to South Shore Drive prior to 2009 was approximately 14.1 acres (excluding possible surcharging areas) of mixed residential land use (6.2 acres) and highly impervious industrial area (7.9 acres). Figure 5 shows the contributing drainage prior to 2009.





In November 2008, MFRA, Inc. submitted a BCWMC development application for Medicine Lake Properties (the Brookdale Plastics site, formerly Schaper Manufacturing), which included a 10,000 square-foot expansion of the parking lot of Medicine Lake Properties on the property's north side. The application stated there would be a net *reduction* in impervious surface due to the removal of the access road (approximately 5,000 square feet) and removal of impervious surface on the south side of the building (approximately 9,000 square feet).

The application included stormwater best management practices (BMPs), such as the construction of four stormwater retention areas. The application also proposed using a 21-inch pipe to divert all of the new impervious surfaces and all of the existing site (7.9 acres) away from South Shore Drive to the regional pond. If constructed, the drainage area contributing drainage to South Shore Drive would have been reduced to approximately 6.2 acres of mostly residential land use. Figure 6 shows an annotated version of the grading plan for this application, and Figure 7 shows the proposed drainage area. The BCWMC approved the application in February 2009.

Based on the 2018 aerial image, it appears the site was not constructed as approved in 2009. Figure 8 shows the 2018 aerial image, and it can be compared to the 2008 application shown on Figure 6. Differences between the 2018 aerial image and the 2008 application include:

- Only about half of the approved parking lot expansion was constructed
- The proposed stormwater retention basins do not appear to have been constructed
- The proposed removal of approximately 9,000 square feet of impervious did not occur (however this drains away from South Shore Drive)

In addition to the new impervious surfaces generating new stormwater runoff, the construction of the parking lot between Brookdale Plastics and Ryerson Steel may have removed flood storage from the site and increased conveyance of flows to South Shore Drive, as discussed in the list below.

- According to city staff, the Ryerson Steel access road to South Shore Drive was removed in 2013. The 2011 MnDNR LiDAR, flown prior to removal of the access road, shows that the Ryerson Steel parking lot and access road were sloped away from South Shore Drive. Prior to the construction of the new parking lot, runoff discharged from the Brookdale Plastics and Ryerson Steel parcels by flowing through a culvert. This pipe discharged under the access road and ultimately to the rainwater garden along South Shore Drive. However, the access road and culvert may have acted to limit the overall runoff rate leaving the site. The new parking lot, combined with the removal of the culvert and access road may have created a new overland flow path to South Shore Drive. A new overland flow path would increase the rate of stormwater runoff from the Ryerson Steel parking lot.
- The newly-constructed parking lot likely incorporated the drainage features shown in the development review plan—STMH 1 and the flared end section (shown on Figure 6). STMH 1 and the flared end section connect to an existing storm sewer system that drains toward South Shore

Drive. If constructed, this drainage system would provide another conveyance path from the Ryerson Parking lot, access road and newly expanded Brookdale Plastics parking lot to South Shore Drive.

- If the pipe system from the Allied Building Products site surcharges, allowing the Ryerson Steel roof to contribute runoff to South Shore Drive drainage area, these additional stormwater connections (overland and STMH 1 pipe) could contribute significant runoff to South Shore Drive.

Finally, the hydrologic calculations used to size the pipe (and berm) redirecting runoff to the regional pond neglected to consider the Brookdale Plastics roof area as contributing area. Therefore, even if constructed, the pipe and berm may be undersized for the impervious drainage area.

3.0 Recommendations

Based on this preliminary investigation, it appears that the construction of the Medicine Lake Properties (Brookdale Plastics) project differed from what was proposed on the approved development plans and this could be a cause of the flooding along South Shore Drive. The photos and videos taken by the resident at 9930 South Shore Drive appear to show overland flows that are consistent with what we would expect with incomplete construction. To evaluate if the stormwater features were constructed as approved in 2009, to further understand the flooding sources, and to begin to address the flooding issues, we recommend the following actions.

- A detailed site investigation to determine:
 - If the proposed 21-inch diversion pipe (and berm) to redirect stormwater runoff to the regional pond (BC-107) was constructed
 - Which, if any, of the stormwater retention areas were constructed per the 2008 Medicine Lake Properties application
 - The runoff routing direction from the Ryerson Steel roof
 - The outlet pipe size between the rainwater garden along South Shore Drive and Medicine Lake—the 2010 city drawing *STS1378* shows a 12-inch diameter, while the 1984 application for Schaper Manufacturing shows a 24-inch diameter pipe
 - The pipe sizes and routing direction of pipes under the Allied Building Products parking lot. Figure 9 shows site investigation features.
- Update the Phase 2 XP-SWMM model with the information from the detailed site investigation. Use the updated XP-SWMM model to determine the following:
 - If incomplete construction at the Ryerson Steel and Brookdale Plastics sites is consistent with the XP-SWMM model results and with resident observations
 - If surcharging from the storm sewer system at the Allied Building Products site occurs and, if so, if it exacerbates flooding at South Shore Drive

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- If the regional pond is sized such that runoff from the Ryerson Steel and Brookdale Plastics sites could be diverted to the pond, similar to the 2008 Medicine Lake Properties development plans
- If the regional pond is not sized to handle the additional stormwater runoff volume, quantify the storage volume required to mitigate the runoff volume and identify potential locations where this storage could be provided. The city should consider performing a survey along South Shore Drive and the rainwater garden to quantify the existing storage volume
- High-level estimate of cost to construct diversion and/or storage.

Client

JGM AGENCY

1224 West 96th Street
Bloomington, MN 55431

Project

**MEDICINE LAKE
PROPERTIES**

Location

**9909 SOUTH
SHORE DRIVE
PLYMOUTH, MN**

Certification

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.

Registration No. Date:

If applicable, contact us for a wet signed copy of this plan which is available upon request at McCombs Frank Roos Associates, Inc., Plymouth, MN office.

Summary

Designed: JB Drawn: JJ
Approved: DR Book / Page:
Phase: PRELIMINARY Initial Issue: 11/19/2008

Revision History

No. Date By Submittal / Revision
01/09/09 JJ Sisset Creek Comments

Sheet Title

GRADING PLAN

Sheet Number Revision

C2

Project No. **JGM17112**

GRADING NOTES

- A. PROPOSED CONTOURS ARE TO FINISHED SURFACE ELEVATION. SPOT ELEVATIONS ALONG PROPOSED CURB DENOTE GUTTER GRADE.
- B. THE CONTRACTOR IS CAUTIONED THAT THE SUBSURFACE UTILITY INFORMATION SHOWN ON THESE PLANS IS A UTILITY QUALITY LEVEL D. THIS QUALITY LEVEL WAS DETERMINED ACCORDING TO THE GUIDELINES OF CIVASCE 38-02 TITLED "STANDARD GUIDELINES FOR THE COLLECTION AND DEPICTION OF EXISTING SUBSURFACE UTILITY DATA". THE CONTRACTOR AND/OR SUBCONTRACTORS SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, BY CONTACTING THE NOTIFICATION CENTER (Gopher State One) OR MINNESOTA AT 1-800-252-1168. THE CONTRACTOR AND/OR SUBCONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY HIS OR HER FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES (UNDERGROUND AND OVERHEAD).
IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
- C. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO AVOID PROPERTY DAMAGE TO ADJACENT PROPERTIES DURING THE CONSTRUCTION PHASES OF THIS PROJECT. THE CONTRACTOR WILL BE HELD SOLELY RESPONSIBLE FOR ANY DAMAGES TO THE ADJACENT PROPERTIES OCCURRING DURING THE CONSTRUCTION PHASES OF THIS PROJECT.
- D. SAFETY NOTICE TO CONTRACTORS: IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, THE CONTRACTOR WILL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS ON THE JOB SITE, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY DURING PERFORMANCE OF THE WORK. THIS REQUIREMENT WILL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE DUTY OF THE ENGINEER OR THE DEVELOPER TO CONDUCT CONSTRUCTION REVIEW OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES IN, ON OR NEAR THE CONSTRUCTION SITE.
- E. THE CONTRACTOR SHALL COMPLETE THE SITE GRADING CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF THE OWNER'S SOILS ENGINEER. ALL SOIL TESTING SHALL BE COMPLETED BY THE OWNER'S SOILS ENGINEER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL REQUIRED SOIL TESTS AND INSPECTIONS WITH THE SOILS ENGINEER.
- F. PRIOR TO PLACEMENT OF THE AGGREGATE BASE, A TEST ROLL WILL BE REQUIRED ON THE STREET AND PARKING AREA SUBGRADE. THE CONTRACTOR SHALL PROVIDE A LOADED TANDDEM AXLE TRUCK WITH A GROSS WEIGHT OF 25 TONS. THE TEST ROLLING SHALL BE AT THE DIRECTION OF THE SOILS ENGINEER. THE SOILS ENGINEER SHALL DETERMINE WHICH SECTIONS OF THE STREET OR PARKING AREA ARE UNSTABLE. CORRECTIONS OF THE SUBGRADE SOILS SHALL BE COMPLETED IN ACCORDANCE WITH THE REQUIREMENTS OF THE SOILS ENGINEER.
- G. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND MAINTAINING TRAFFIC CONTROL DEVICES SUCH AS BARRICADES, WARNING SIGNS, DIRECTIONAL SIGNS, FLAGMEN AND LIGHTS TO CONTROL THE MOVEMENT OF TRAFFIC WHERE NECESSARY. TRAFFIC CONTROL DEVICES SHALL CONFORM TO APPROPRIATE MINNESOTA DEPARTMENT OF TRANSPORTATION STANDARDS.
- H. THE TREES AND OTHER NATURAL VEGETATION WITHIN THE PROJECT AND/OR ADJACENT TO THE PROJECT ARE OF PRIME CONCERN TO THE CONTRACTORS OPERATIONS. HE WILL BE REQUIRED TO PROTECT THE TREES WHICH ARE TO BE SAVED TO BE SURE THAT EQUIPMENT IS NOT NECESSARILY OPERATED UNDER NEARBY TREES AND SHALL EXERCISE EXTREME CAUTION IN WORKING ADJACENT TO TREES. SHOULD ANY PORTION OF THE TREE BRANCHES REQUIRE REMOVAL TO PERMIT OPERATION OF THE CONTRACTOR'S EQUIPMENT, HE SHALL OBTAIN THE SERVICES OF A PROFESSIONAL TREE TRIMMING SERVICE TO TRIM THE TREES PRIOR TO THE BEGINNING OF OPERATION. SHOULD THE CONTRACTOR'S OPERATIONS RESULT IN THE BREAKING OF ANY LIMBS, THE BROKEN LIMBS SHOULD BE REMOVED IMMEDIATELY AND CUTS SHALL BE PROPERLY PROTECTED TO MINIMIZE ANY LASTING DAMAGE TO THE TREE. NO TREES SHALL BE REMOVED WITHOUT AUTHORIZATION BY THE ENGINEER. COSTS FOR TRIMMING SERVICES SHALL BE CONSIDERED INCIDENTAL TO THE GRADING CONSTRUCTION AND NO SPECIAL PAYMENT WILL BE MADE.
- J. EXCAVATE TOPSOIL FROM AREAS TO BE FURTHER EXCAVATED OR REGRADED AND STOCKPILE IN AREAS DESIGNATED ON THE SITE. THE CONTRACTOR SHALL SALVAGE ENOUGH TOPSOIL FOR RESPAEDING ON THE SITE AS SPECIFIED. EXCESS TOPSOIL SHALL BE PLACED IN EMBANKMENT AREAS, OUTSIDE OF BUILDING PADS, ROADWAYS AND PARKING AREAS. THE CONTRACTOR SHALL SUBCUT CUT AREAS WHERE TURF IS TO BE ESTABLISHED, TO A DEPTH OF 4 INCHES. RESPAED TOPSOIL IN AREAS WHERE TURF IS TO BE ESTABLISHED TO A MINIMUM DEPTH OF 4 INCHES.
- K. FINISHED GRADING SHALL BE COMPLETED. THE CONTRACTOR SHALL UNIFORMLY GRADE AREAS WITHIN LIMITS OF GRADING, INCLUDING ADJACENT TRANSITION AREAS. PROVIDE A SMOOTH FINISHED SURFACE WITHIN SPECIFIED TOLERANCES, WITH UNIFORM LEVELS OR SLOPES BETWEEN POINTS WHERE ELEVATIONS ARE SHOWN, OR BETWEEN SUCH POINTS AND EXISTING GRADES. AREAS THAT HAVE BEEN FINISHED GRADED SHALL BE PROTECTED FROM SUBSEQUENT CONSTRUCTION OPERATIONS, TRAFFIC AND EROSION. REPAIR ALL AREAS THAT HAVE BECOME RUPTURED BY TRAFFIC OR ERODED BY WATER OR HAS SETTLED BELOW THE CORRECT GRADE. ALL AREAS DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED TO EQUAL OR BETTER THAN ORIGINAL CONDITION OR TO THE REQUIREMENTS OF THE NEW WORK.
- L. TOLERANCES
 1. THE STREET OR PARKING AREA SUBGRADE FINISHED SURFACE ELEVATION SHALL NOT VARY BY MORE THAN 0.05 FOOT ABOVE, OR 0.10 FOOT BELOW, THE PRESCRIBED ELEVATION OF ANY POINT WHERE MEASUREMENT IS MADE.
 2. AREAS WHICH ARE TO RECEIVE TOPSOIL SHALL BE GRADED TO WITHIN 0.30 FOOT ABOVE OR BELOW THE REQUIRED ELEVATION, UNLESS DIRECTED OTHERWISE BY THE ENGINEER.
 3. TOPSOIL SHALL BE GRADED TO PLUS OR MINUS 1/2 INCH OF THE SPECIFIED THICKNESS.
- M. AFTER THE SITE GRADING IS COMPLETED, IF EXCESS OR SHORTAGE OF SOIL MATERIAL EXISTS, THE CONTRACTOR SHALL TRANSPORT ALL EXCESS SOIL MATERIAL OFF THE SITE TO AN AREA SELECTED BY THE CONTRACTOR, OR IMPORT SUITABLE MATERIAL TO THE SITE.
- N. RETAINING WALL(S) SHALL BE CONSTRUCTED OF MODULAR BLOCK MATERIAL. THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER AND LOCAL AUTHORITY CERTIFIED ENGINEERING DRAWINGS, DESIGN CALCULATIONS AND SOIL BORINGS. THE CER TIFIED ENGINEER FOR THE RETAINING WALL(S) SHALL PROVIDE CONSTRUCTION OBSERVATIONS OF THE RETAINING WALL IMPROVEMENT, AND A LETTER CERTIFYING THE INSTALLATION OF THE WALL(S) WAS CONSTRUCTED IN CONFORMANCE WITH THE PLANS AND SPECIFICATIONS. THE CITY OF PLYMOUTH BUILDING DEPARTMENT WILL ISSUE THE PERMIT FOR THE RETAINING WALL. A MINIMUM 5-TALL SAFETY FENCE SHALL BE INSTALLED ON ALL WALLS 4-TALL OR HIGHER.

LEGEND

PROPOSED	EXISTING

2" BITUMINOUS WEAR MNDOT SPEC 2360 LV
2" BITUMINOUS BASE MNDOT SPEC 2360 LV
9" CLASS 5 AGGREGATE BASE MNDOT SPEC 2211
(REFER TO GEOTECHNICAL EVALUATION REPORT)

Figure 6 2008 Grading Plan for Medicine Lake Properties (annotated)

Proposed redirection pipe and berm

STMH 1 and Flared End Section (drains new parking lot and is connected to existing sewer leading to South Shore Drive)

Proposed parking lot expansion

ALL AREAS DISTURBED BY PIPE INSTALLATION SHALL BE RESTORED IN KIND TO MATCH EXISTING CONDITION. SEED OR SOD PER DIRECTION OF CITY OF PLYMOUTH AND RYERSON STEEL

CITY OF PLYMOUTH PARK LAND

EXISTING POND
SHOWING FOR REFERENCE ONLY -
CONTRACTOR TO FIELD VERIFY
LOCATION OF POND AND ALL
UTILITIES PRIOR TO CONSTRUCTION

RESTORE ANY RIPRAP
DISTURBED BY PIPE INSTALLATION
TO EXISTING CONDITION

PROTECT EXISTING TREE

RYERSON STEEL

EDGE OF BITUMINOUS

WATER WELL

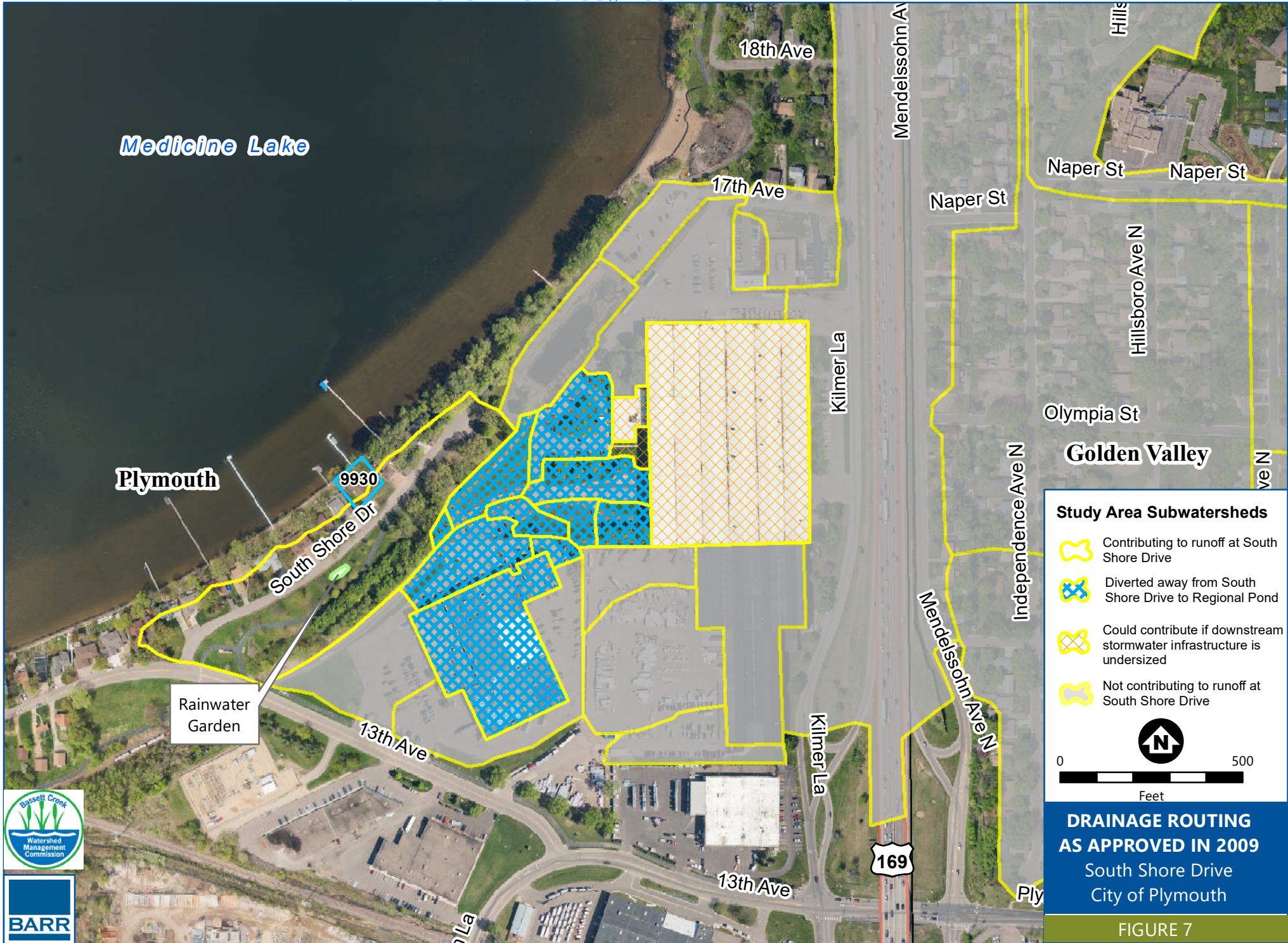
TANK AREA

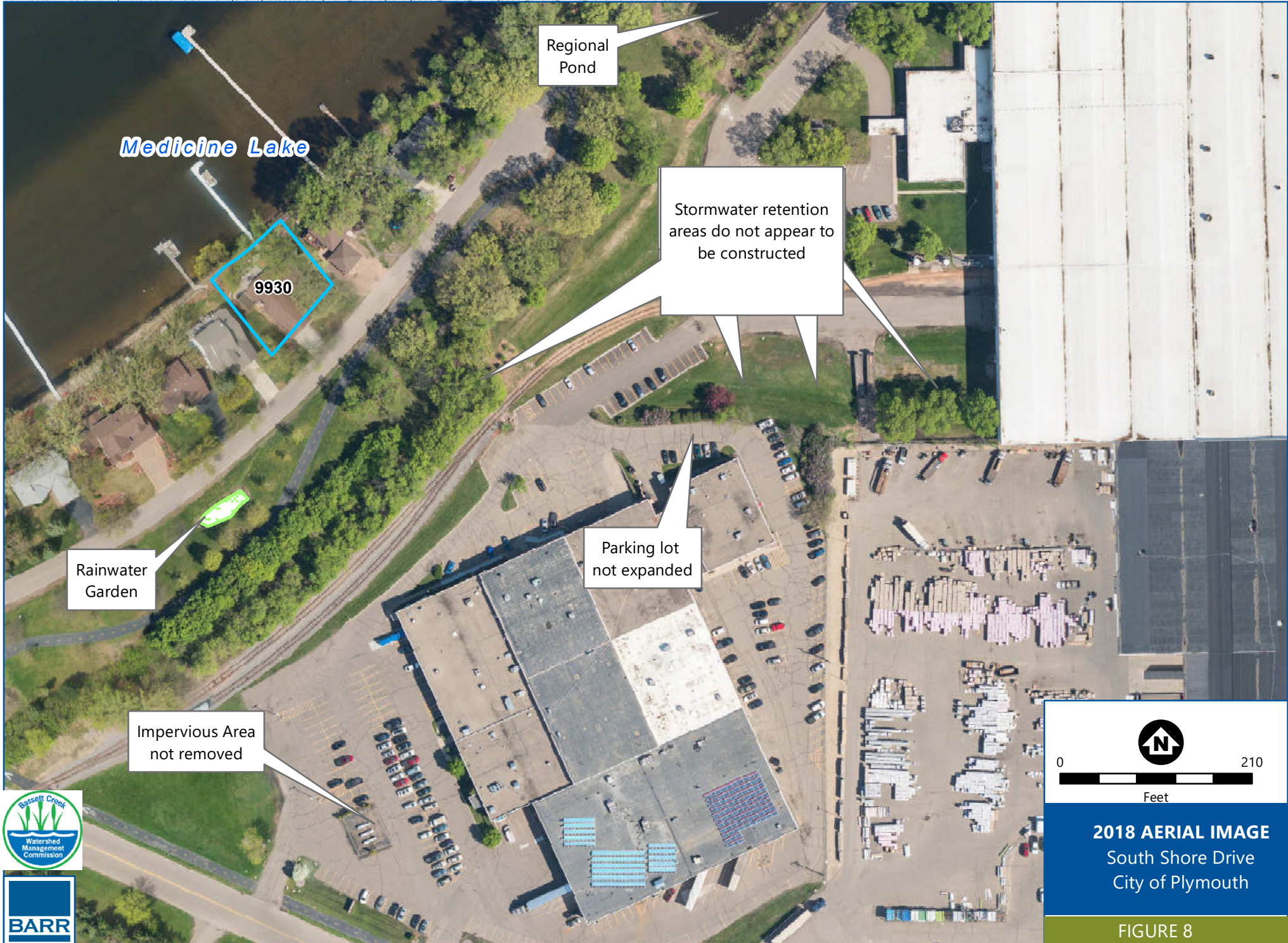
TRENCH DRAIN

TANK AREA

Building on line
CB RIM=895.6±
INV=891.4±

SCALE IN FEET: 1 INCH = 30 FEET





2018 AERIAL IMAGE
South Shore Drive
City of Plymouth

FIGURE 8

