HoustonEngineering Inc.

New Brighton/St. Anthony Basic Water Management Project – Phase 1 Rice Creek Watershed District

June 10, 2014

In Association With:

City of New Brighton

City of Roseville

City of St. Anthony

Rinke – Noonan Law Firm

WSB & Associates

ENGINEER'S REPORT

RCD 2, 3, & 5 BASIC WATER MANAGEMENT PROJECT IN NEW BRIGHTON AND ST. ANTHONY – PHASE 1

June 10, 2014

Rice Creek Watershed District

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 Engineer under the laws of the State of Minnesota.

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EXECUTIVE SUMMARY

Ramsey County Ditches 2, 3 and 5 (RCD 2, 3, and 5) are public drainage systems managed by the Rice Creek Watershed District (RCWD) that drain stormwater runoff from land primarily within the Cities of New Brighton, St. Anthony, and Roseville. The public drainage systems convey stormwater runoff from urban catchments, downstream to Pike Lake and Long Lake which are both regional flooding and water quality concerns of the RCWD.

An extreme rainfall event on July 16, 2011 greatly heightened the awareness of flooding and flood risk along the RCD 2, 3 and 5 public drainage systems. The consequences of this rainfall event have prompted the Cities to evaluate the adequacy of their existing stormwater conveyance and management facilities resulting in the submission of a petition to the RCWD to develop a comprehensive plan to address flood risks in the watershed.

The defined project goals are primarily to reduce flood risks at localized areas in the RCD 2, 3 and 5 watershed while considering project impacts at a regional scale, and seeking water quality improvements and opportunities to incorporate ecological and public amenity elements into a comprehensive plan. The comprehensive plan approach provides the benefit of efficient analysis for localized issues (versus individual analysis) and more flexibility to implement projects yielding a greater net benefit towards regional issues.

The purpose of Phase 1 is to identify potential projects for further technical evaluation that are feasible, practicable, affordable, constructible, can reasonably be expected to obtain local approval and be permitted by state and federal agencies.

This Phase 1 report presents detailed information on:

- Project goals and objectives;
- Identification of flood prone areas;
- Design criteria and standards to be used in future detailed analysis;
- Descriptions of project types under consideration;
- A review of the watershed in regards to runoff volumes, timing and storage;
- Identification of projects for further evaluation;
- A review of permitting needs; and
- A review of public drainage system law in MS103E and their implications regarding construction of potential projects.

Several conclusions were drawn during the Watershed Analysis in Phase 1 that are worth mentioning and may provide direction moving forward:

- The projects proposed will not resolve the regional flooding issue at Long Lake and precautions should be taken to avoid worsening regional flooding issues as a result of flood risk reduction projects.
- Conveyance improvements are a reasonable alternative to improve localized flooding issues. Their adverse downstream impacts resulting from increased peak flow rates and loss of detention

storage caused by the conveyance improvements can be offset by downstream projects such as creating additional detention storage in Hansen Park.

Several projects are expected to be ultimately recommended, forming a comprehensive strategy to achieve cost effective stormwater management, reduce flood risk and water quality improvements, while enhancing ecological resources and public amenities. The recommendations will likely include some combination of conveyance system repairs or modifications, creation of new detention storage, volume control and floodproofing.

Should the Cities and RCWD, after review and consideration of the Phase 1 report, choose to move forward in developing a comprehensive stormwater management and flood damage reduction plan (i.e., Phase 2), a petition amendment to proceed is needed. Creation of the comprehensive stormwater management and flood damage reduction plan will consist of detailed analysis of project impacts, benefits and costs, and identify specific capital improvements to address flood risks and the other secondary goals.

1 INTRODUCTION

1.1 BACKGROUND

Ramsey County Ditches 2, 3, and 5 (RCD 2, 3, and 5) are public drainage systems managed by the Rice Creek Watershed District (RCWD) that drain stormwater runoff from approximately 5,300 acres of land within Ramsey County. The lands drained by RCD 2, 3, and 5 lie almost entirely within the Cities of New Brighton, St. Anthony, and Roseville. The public drainage system conveys stormwater runoff from urban catchments, downstream to Pike Lake and Long Lake (which is on Rice Creek) and ultimately to the Mississippi River. The watershed and public drainage system locations are shown on **Figure 1**.

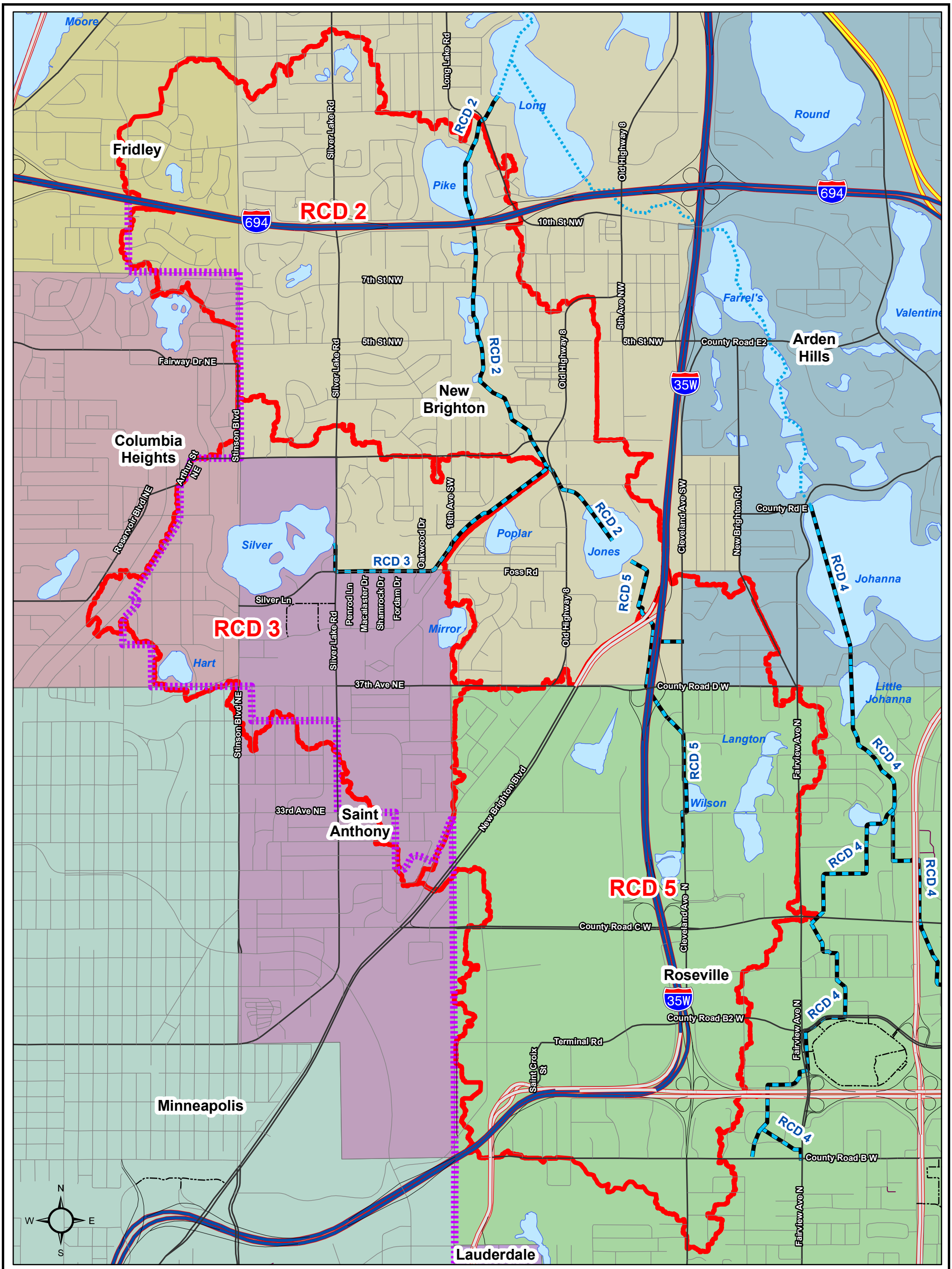
An extreme rainfall event on July 16, 2011 greatly heightened the awareness of flooding and flood risk along the RCD 2, 3 and 5 public drainage systems. Many areas within the RCD 2, 3 and 5 flooded as a result of this rainfall event which dropped an estimated 5 inches of rainfall within a 2.5 hour period. The consequences of this rainfall event have prompted the Cities to evaluate the adequacy of their existing stormwater conveyance and management facilities. The Cities recognize that certain components of stormwater management facilities are the responsibility of the Cities, some including the public drainage system belong to the RCWD and some are shared between the Cities and the RCWD.

1.2 PROJECT PETITION

In August of 2013, the City Councils of New Brighton and St. Anthony each passed a resolution petitioning the RCWD to undertake a Basic Water Management Project to develop a comprehensive stormwater management plan addressing recurring flooding issues (see **Appendix A**). It should be noted that the City of Roseville is in the process of petitioning for the project. Flood prone areas and potential stormwater management projects within the Roseville have been included in this report in anticipation of Roseville formally joining the petition. The comprehensive stormwater management plan is expected to result in recommendations to the Rice Creek Board of Managers and the respective City Councils, for a water management project or a series of projects to address the recurring flooding issues.

WSB & Associates, Inc. prepared reports for New Brighton and St. Anthony titled “2011 Flood: Investigation and Stormwater Modeling Report.” The reports identified specific drainage improvements to reduce future flooding for each City along with associated approximate opinions of cost. The analysis within the reports terminated at the City boundaries and excluded analysis of the potential downstream consequences of the drainage improvements.

These reports formed the basis for petitioning the RCWD. The petitions state that the Cities are subject to National Pollutant Discharge Elimination System (NPDES) and Municipal Separate Storm Sewer Systems (MS4) permits and need to show improvement of stormwater runoff water quality. The petition includes a request to improve the “Pike Lake channel” between Pike Lake and Long Lake. The Cities are seeking to develop a comprehensive and integrated approach to stormwater management, flood damage reduction, and water quality enhancement rather than a series of individual, stand-alone projects.



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- Public Ditch
- Public Watercourse
- RCWD Legal Boundary
- RCWD 2,3, and 5 Drainage Areas
- MN DNR Public Waters Inventory

Figure 1: Watershed Location

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In the petition, the Cities requested the RCWD establish a phased Basic Water Management Project for the purposes of:

1. Identifying and analyzing current conditions, challenges and opportunities related to stormwater management and flood damage within the Cities. Make recommendations of actions likely to address comprehensive stormwater management and flood damage issues within the Cities and those downstream areas affected by stormwater runoff including Pike and Long Lake.
2. Developing a regional, comprehensive stormwater management and flood damage reduction plan, to include water quality features, which identifies capital improvements and other actions to be undertaken by the Cities and the RCWD.
3. Developing implementation timelines and priorities, costs allocations and revenue generation methods for both implementation and long term maintenance of capital improvements and water quality features.
4. Implementation of one or more of the project components identified in item 2 as a coordinated series of capital improvements by the Cities and the RCWD.

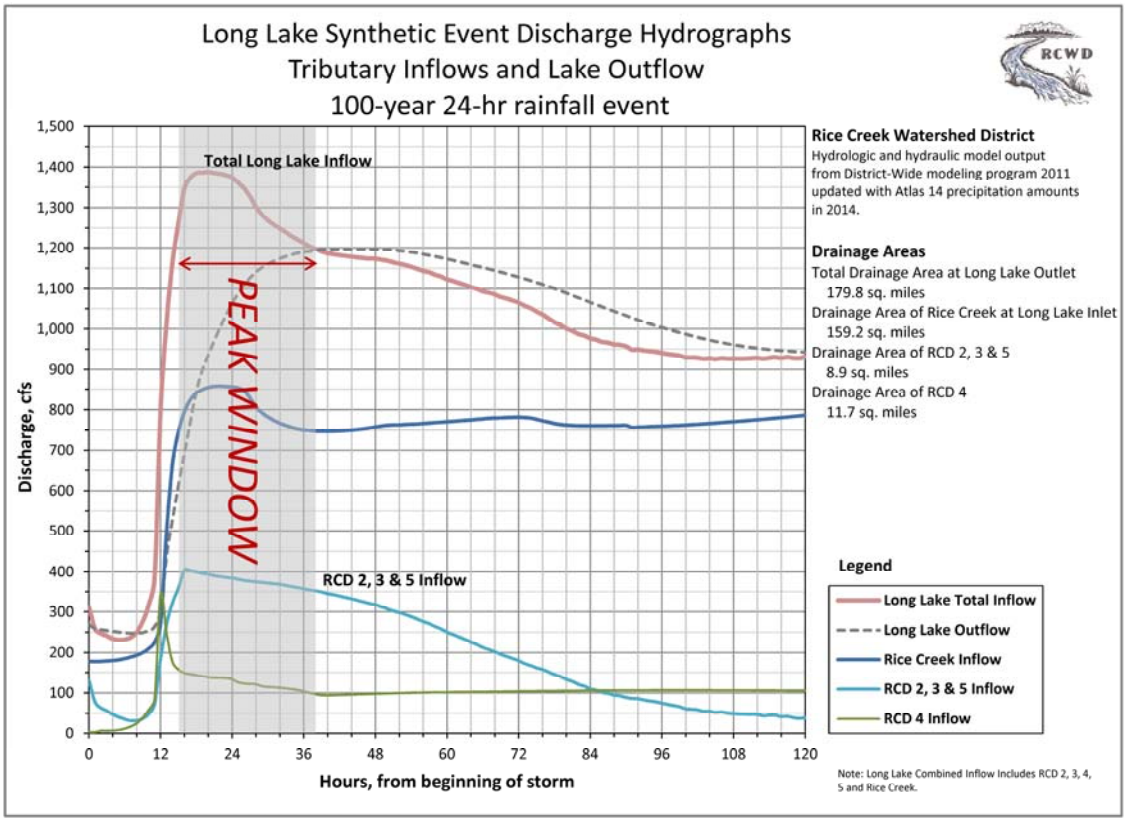
The Cities believe these items lie within the regional management focus of the RCWD – including the ultimate, downstream outlet for stormwater and primary conveyance infrastructure and the shared interest in enhancing water quality by the Cities and the RCWD. Item number 1 in the above list is the focus of this report and is referred to as Phase 1. Should the Cities and RCWD after review and consideration of this report choose to move forward in developing a stormwater management and flood damage reduction plan, a petition amendment is needed to proceed with the next phase. Creation of the stormwater management and flood damage reduction plan will consist of detailed analysis of project impacts, benefits and costs, and identify capital improvements addressing flooding and water quality issues.

1.3 RCWD REGIONAL FLOODING PERSPECTIVE

The RCWD has an interest in managing stormwater runoff within and from the RCD 2, 3 and 5 public drainage systems to reduce localized and regional flooding. Long Lake, which is the outlet for these public drainage systems, also is subject to periodic flooding and is considered a regional issue. During RCWD's recent rule revision, the need for reducing the volume of stormwater reaching Long Lake to reduce flood risk on Long Lake and other parts of the District was recognized and addressed.

The peak window (i.e., the time period of highest inflows) into Long Lake is defined on **Figure 2**. During this period, the total inflow volume into Long Lake is approximately 2,683 acre-feet, 29% of which is from the RCD 2, 3 and 5 watershed. The drainage area of RCD 2, 3 and 5 public drainage systems is a relatively small portion of the total area contributing runoff to Long Lake (8.9 square miles or 5%), but still has considerable effect on flood elevations within Long Lake due to its proximity to Long Lake and its timing with other peak inflows (see **Figure 2**). Ultimately, the Board of Managers implemented rules which included volume and rate control standards intended to remove water from the flood peak on Long Lake to achieve a regional flooding benefit. Because of these issues the RCWD wishes to work in partnership with the Cities to address flooding and the flood risks within the RCD 2, 3 and 5 public drainage systems while considering impacts on downstream water resources.

Figure 2. Long Lake Hydrographs



*Previous RCWD analysis has shown the critical duration 100-year event for Long Lake peak flood elevation to be the 10-day duration runoff event. The 24-hour duration rainfall event is shown here as it is the critical event on the RCD 2, 3 and 5 system.

2 GOALS AND OBJECTIVES

2.1 PROBLEM DESCRIPTION

Previous studies by the Cities of New Brighton and St. Anthony and the RCWD have identified flood prone areas that are the focus of this project. The City of Roseville provided details on locations with known flooding issues for this report. Characteristics of the flood prone areas are summarized in **Table 1** and locations are shown in **Figure 3**. Many flooding locations are identified as a result of the recent July 2011 precipitation event. Each flood prone area is classified either as a Nuisance or as Property Damage. The purpose of this categorization is to evaluate the severity of the flood risk. Lowering the flood risk at locations categorized as Property Damage issues should be considered the highest priority, and Nuisance locations the lowest. Note that some areas shown on **Figure 3** are actually outside of the project area or RCD 2, 3 and 5 watershed boundary.

Table 1. Flood Prone Areas

Location	Description	Risk Classification
Lakeside Mobile Home Park	Water depths up to 2.5 feet were reported during July 2011. No homes were damaged but substructures and outbuildings were flooded. The July 2011 observed peak elevation was approximately 0.7 feet above the RCWD 100-year regulatory elevation.	Property Damage
Old Highway 8 Railroad Bridge	The roadway was temporarily inundated with floodwater during the July 2011 flood event, but no property damage was reported.	Nuisance
4th Street NW Low Area	During the July 2011 event at least 2 buildings reported damages from flood waters.	Property Damage
County Road E2 Low Area	Multiple properties reported damage from the July 2011 event.	Property Damage
Freedom Park/Pike Lake Drive	Overland flow was directed across private property causing property damage during the July 2011 event once a pond on the drainage system reached its emergency overflow elevation.	Property Damage

Location	Description	Risk Classification
Garden View Apartments	In July 2011 parking garages and parking lot areas were covered with floodwater by as much as 4 or 5 feet. The 100-year RCWD flood elevation is approximately equal to the July 2011 observed peak elevation.	Property Damage
Hansen Park	The July 2011 event threatened property damage to nearby homes but only rose to inundate yards on private property. The RCWD 100-year flood elevation is 0.6 feet higher than the observed July 2011 peak elevation.	Nuisance
RCD 3	At several locations along the main trunk of RCD 3 buildings reported property damage during the July 2011 event.	Property Damage
Mirror Lake Townhomes	During the July 2011 event an embankment surrounding Mirror Lake was overtopped and combined with surcharge conditions in RCD 3 several buildings were inundated with damage to more than a dozen condo units. The damage was severe displacing several residents temporarily and a few permanently.	Property Damage
39th Ave and Fordham Drive	During the July 2011 event the storm sewer capacity was exceeded and several buildings reported damages.	Property Damage
Long and Pike Lake	100-year elevations would result in property damage. The July 2011 event did not reach those levels.	Property Damage
Sandcastle Park/Manson Street	Drainage swales are frequently inundated during intense rain events, up to 4 feet deep. Flooding on private property (flooded garage) also occurs.	Property Damage
MTR Pond	Ditch draining to pond becomes inundated, water levels in pond also rise during intense rain events. Sanitary Sewer lift station has been flooded during intense rain events, and there is potential for buildings to flood.	Property Damage
Railroad Open Channel	Ditch becomes inundated with water. Property damage has occurred.	Property Damage

Location	Description	Risk Classification
Wilson Pond	Roadway temporarily floods during intense rain events, but no property damage has been reported.	Nuisance
Cleveland Avenue	Roadway temporarily floods during intense rain events, but no property damage has been reported.	Nuisance
I35W/Twin Lake Parkway Pond	Roadway temporarily floods during intense rain events, but no property damage has been reported.	Nuisance
I35W – St. Croix Street	Storm sewer lift station at St. Croix pond not efficient at keeping up with intense rain events. Potential for property damage (flooded buildings) is high.	Property Damage

Moore
Fridley
Freedom Park
Silver Lake Rd
Long Lake Rd
RCD 2
Long
Pike
Round
Old Highway 8
694
RCD 2
10th St NW
Garden View Apartments
New Brighton Community Center and Golden Pond
7th St NW
Hanson Park
County Road E3 Low Area
Farrel's
Valentine
5th St NW
Fairway Dr NE
Silver Lake Rd
5th Ave NW
County Road E2
Arden Hills
4th Street NW Low Area
Columbia Heights
New Brighton
RCD 2
Old Highway 8
35W
Old Highway 8 Railroad Bridge
Stinson Blvd
Arthur St NE
Reservoir Blvd NE
16th Ave SW
RCD 3
RCD 2
Cleveland Ave SW
New Brighton Rd
County Rd E
Silver Lane and Macalaster Dr
Ditch 3
Oak Dr
Poplar
Silver
Jones
Foss Rd
RCD 4
Johanna
Silver Ln
Penrod Ln
Macalaster Dr
Shamrock Dr
Fordam Dr
Mirror Lake Townhomes
RCD 5
Old Highway 8
RCD 3
Mirror
39th Ave and Fordham Drive
Hart
Silver Lake Rd
37th Ave NE
Stinson Blvd NE
Sandcastle Park/Manson Street
County Road D W
Little Johanna
RCD 5
Langton
MTR Pond
Wilson Pond
RCD 4
Fairview Ave N
New Brighton Blvd
33rd Ave NE
Saint Anthony
Wilson
I35W/Twin Lake Parkway Pond
Cleveland Avenue
RCD 4
Railroad Open Channel
Saint Anthony Industrial Park
County Road C W
Cleveland Ave N
RCD
35W
Roseville
County Road B2 W
Terminal Rd
Saint Croix St
Fairview Ave N
RCD 4
I35W - St. Croix Street
RCD 4
County Road B W
Minneapolis
Lauderdale
Fairview Ave N
N
W
E
S

Approximate Flooding Locations
- New Brighton
- Roseville
- Saint Anthony
- Public Ditch
- Public Watercourse
- RCWD Legal Boundary
- RCWD 2,3, and 5 Drainage Areas
- Floodplains (RCWD)

FEMA Flood Zones
- 0.2 % Annual Chance Flood Hazard
- ZONE A - 1% Annual Chance
- ZONE AE - 1% Annual Chance
- ZONE AE - Floodway
- MN DNR Public Waters Inventory

0 2,500 5,000 Feet

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Figure 3: Documented Flood Prone Areas

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2.2 PROJECT GOALS

The primary goal of this project is to reduce flooding and resulting flood damages to infrastructure, homes, residences, property and land within the RCD 2, 3 and 5 watershed at locations identified above and downstream through Pike and within Long Lake. A secondary goal is to realize an improvement in water quality within Pike Lake, Long Lake, and regional water resources by reducing the concentrations of sediment and nutrients conveyed within the system. A tertiary goal is to incorporate where feasible, ecological benefits and enhancements to public amenities with the recommended solutions (i.e., projects).

Expectations are that one or more projects will ultimately be recommended to achieve the primary goal and subsequently be evaluated relative to their water quality, ecological and public amenity benefits. The projects identified shall form a comprehensive strategy to achieve a cost effective stormwater management and flood damage reduction and provide some progress toward improving water quality and enhancing ecological resources. Based on current information, it is believed a comprehensive strategy may consist of some combination of the following:

1. Public drainage system maintenance, repair or improvement;
2. Creation of stormwater retention, detention and storage, BMPs for rate and volume controls;
3. Conveyance system improvements (non-public drainage system);
4. Active or passive flood proofing.

Phase I of this project is intended to identify potential projects for further technical evaluation that are effective, feasible, practicable, affordable and construct-able and can reasonably be expected to obtain local approval and be permitted by state and federal agencies.

2.3 TECHNICAL OBJECTIVES

One or more technical objectives are needed to further describe the primary, secondary and tertiary project goals. The technical objectives represent various attributes or project characteristics which collectively describe specific technical requirements. A concept project failing to meet the primary technical objective is considered incapable of achieving the project goal. The following technical objectives have been developed to support the project goals:

- Reduce flood damages within the RCD 2, 3 and 5 public drainage system downstream to Long Lake. Areas targeted for flood damage reduction are flood prone areas known to be subject to flooding (see **Figure 3**). Specifically:
    - Minimize flooding of homes and other high value properties as a result of the 100-year event. The base event is defined as the 24-hour duration event using a precipitation amount of 7.4 inches as defined by Atlas 14;
    - Minimize flooding of streets as a result of the 10% chance precipitation event (10-year flood, 24-hour event of 4.2 inches);
    - Minimize non-structural property damage as a result of the 10% chance precipitation event (10-year flood, 24-hour event of 4.2 inches);
    - Lower peak flood elevations on Long Lake for the 1% chance event by achieving a reduction in runoff volume entering Long Lake from RCD 2, 3 and 5 during the flood peak

while considering the timing of these flows and their impact on downstream peak elevations; and
    - Resolve currently conflicting regulatory floodplain elevations used within the RCD 2, 3 and 5 public drainage systems.
- Water Quality
    - Improve water quality by reducing sediment and nutrient loads delivered to Long Lake, Pike Lake, Rice Creek and regional water resources on an average annual basis;
    - Make some progress toward achieving established Total Maximum Daily Loads for water bodies failing to meet their current water quality standards.
- Ecological Enhancement
    - Implement designs which incorporate ecological values, to the extent practicable when the primary goal is not compromised.
- Public Amenities
    - Implement designs which incorporate features which are public amenities (e.g., trails) to the extent practicable when the primary goal is not compromised.

Alternatives need to be revenue neutral and either placed on existing public land or shown to provide no change in the underlying use that diminishes value.

3 DESIGN CRITERIA AND STANDARDS

Stormwater management design criteria are used to establish and describe the desired level of service and function of stormwater management system infrastructure components. The criteria described below will be used for future evaluations of potential flood mitigation projects. Projects that cannot reasonably achieve these criteria and standards will not be viewed as effective solutions. Furthermore, any project design is expected to comply with Rice Creek Watershed District Rules.

3.1 HISTORICAL DESIGN CRITERIA OF THE PUBLIC DRAINAGE SYSTEM

It is important to understand the design principals of the historic drainage system in order to identify the level of service provided by the system in its current condition. The RCD 2, 3, and 5 public drainage systems were originally designed for the purposes of agricultural drainage. Older systems such as RCD 2, 3 and 5 designed and constructed between 1906 and 1908 were likely originally hand-dug or dug by horse powered equipment. In many cases for systems constructed during this era, the design capacity is simply assumed to be defined as the bank full conveyance of the 2-year, 24-hour event or the discharge computed from the as-constructed and subsequently improved (ACSIC) profile and cross section. Design for greater conveyance capacities is not consistent with the historic public drainage systems' original purpose.

In the 1950s and 1960s, a substantial portion of the public drainage systems were converted to storm sewer. Although modern storm sewers are normally designed for a 10-year return period, historic storm sewers of this time period were not typically sized to convey flows of this magnitude. Instead, these systems may normally convey flows from a 2-year or 5-year, 24-hour rainfall event at a maximum.

3.2 DESIGN CRITERIA FOR STORM SEWER SYSTEMS AND CULVERTS

The engineer relies on a number of design criteria when assessing the adequacy of the existing conveyance system to carry stormwater or designing a new stormwater system. These design criteria are generally developed and used to define the maximum amount (i.e., peak rate) of water that must be conveyed by the storm sewer system to adequately protect from property damage and for public safety. The two key components of a stormwater system are generally the open channel / pipe system and the road system (overland surface flow). Storm sewer within the RCD 2, 3 and 5 public drainage system (which are under the authority of the RCWD) and segments outside of the public drainage system (which are under the authority of the road authority) may be designed using the same criteria. The criteria used for design of the storm sewer system can be specific to a given city and therefore can vary from one city to another. Typical relevant design criteria are:

- Storm Sewer System – convey the 10-year, critical duration peak discharge (often assumed to be 24-hour duration) without surcharge from the pipe system or out-of-bank flows from an open channel system;
- Overland Surface Flow – allowable depth of flow and area of the road inundated dependent upon the classification of the road (**Table 2**) for a minor and major design event; and
- Culvert / Bridge Road Crossings – maximum water elevation at open channel road crossing does not exceed an elevation 1-foot below the road shoulder elevation for road classifications (**Table 2**) and outlet velocities do not exceed 8 feet per second.

Table 2. Typical Stormwater Design Criteria Related to the Transportation System

Road Classification	Design Criteria		
	Design Event for Maximum Water Elevation Not to Exceed Elevation 1-foot Below the Road Shoulder Elevation	**Allowable Pavement Encroachment and Depth of Flow for 10-Year Storm Event**	**Allowable Depth of Flow and Inundated Area for the 100-year Storm Event**
Local	10-year	No curb overtopping. Flow may spread to the crown of the street.	Inundated area should not exceed street right of way and depth of water above street crown should not exceed 6”, whichever is less.
Collector	10-year	No curb overtopping. Flow spread must not encroach to within 8’ of the centerline of a two-lane street. The flow spread for four-lane streets must leave the equivalent of two 12’ driving lanes clear of water, one in each direction.	Inundated area should not exceed street right of way and depth of water above street crown should not exceed 6”, whichever is less.
Arterial	50-year	No curb overtopping. Flow spread must not encroach to within 10’ from the face of the curb on the outside lane.	Inundated area should not exceed street right of way and depth of water above street crown should not exceed 3”, whichever is less.
Freeway	100-year	No encroachment on driving lanes is allowed on any traffic lane.	None

3.3 FLOOD ELEVATIONS AT STRUCTURES

The primary design criterion is to provide sufficient storage and drainage to ideally avoid, but realistically minimize, flood damages to structures and infrastructure associated with the 100-year event. Avoiding or eliminating structural flood damages for the 100-year event is not always possible because past practices have at times allowed construction in flood prone areas. Design criteria are as follows:

- For structures that are already in the floodplain:
  - 100-year critical duration flood (either 24-hour rainfall or 10-day snowmelt) shall peak at an elevation at least one foot below the lowest entry elevation
- For structures that are already out of the floodplain
  - 100-year critical duration flood (either 24-hour rainfall or 10-day snowmelt) shall peak at an elevation at least two feet below the lowest entry elevation (RCWD Rule)

3.4 DESIGN CRITERIA FOR STORAGE OF FLOOD VOLUMES

Storage is often designed and used to temporarily store runoff in order to control peak discharge rates so other features of the infrastructure (i.e., pipe conveyances) can be smaller in size than otherwise would be needed (and thereby reduce infrastructure costs).

The approaches for calculating design storage volumes depends in part upon whether and where the storage already exists or needs to be created; i.e., within the current floodplains and depressional areas or is created as part of the infrastructure system. Relevant criteria for the storage of flood volumes are:

- Creating Flood Runoff Volume Storage – A common design criteria is to use and create storage through the construction of new stormwater ponds or modification to existing ponds (in addition to existing storage locations) to manage the runoff volume for the 100-year (1% chance) flood event.
- Maintain Current Effective Storage – Maintaining the current storage volume within the RCD 2, 3 and 5 watershed is essential to ensuring flood peaks and flood damages are not increased locally or downstream. There are numerous natural water bodies that currently provide effective detention storage in the watershed with several being located on the public drainage system such as Hansen Park, Jones Lake and Poplar Lake. These water bodies are shown on **Figure 1**.

  Storage that is located such that it removes runoff volume from the flood peak is considered “effective” storage. No net loss of effective storage shall occur at or upstream of any known flooding area. Storage that removes volume on the rising and falling limbs of the flood peak hydrograph is less effective. Decreases in less effective storage may be allowed if no change in downstream peak elevations can be demonstrated for the 2-, 10- and 100-year events.

3.5 WATER QUALITY DESIGN STANDARDS

The projects being considered to address flooding will also be evaluated for their potential water quality benefit. Typically the method for assessing for water quality stormwater components is focused on smaller, more frequent events such as the 2-year, 24-hour rainfall event or a 1-inch runoff event over impervious surfaces. Alternatively, long-term continuous simulations are commonly used to estimate pollutant loading and removal effectiveness on an average annual basis. The RCWD traditionally uses the 1979 growing season precipitation record (which is considered a "typical precipitation year) to estimate an average annual estimates.

3.6 RAINFALL DEPTHS AND DURATION

The precipitation depths for various return periods and durations used in engineering analyses and design were recently updated by the National Oceanic and Atmospheric Administration in a study known as Atlas 14. Atlas 14 increased the 100-year, 24-hour duration rainfall depth from 6 inches to approximately 7.4 inches in the RCD 2, 3 and 5 watershed. Rainfall amounts for smaller events (i.e. the 10-year, 24-hour event) change very little under Atlas 14 in the watershed. Future project phases will utilize the updated rainfall amounts in Atlas 14 to evaluate project performance against the stated design criteria and standards.

RCWD policy has traditionally dictated that the 24-hour rainfall and 10-day snowmelt events be considered for project design and for permitting approval. A recent analysis completed by the RCWD has determined the 24-hour rainfall to be the critical duration on the RCD 2, 3 and 5 system and thus is recommending the use of the 24-hour rainfall for all further project analysis of the public drainage system. Regional flooding considerations (e.g., Long Lake) will also include the 10-day duration event.

4 DESCRIPTION OF PROJECT TYPES UNDER CONSIDERATION

Stormwater management projects can be categorized based on their method of managing runoff (i.e., temporarily storing runoff or infiltration of runoff). The suitability of each project type depends on watershed characteristics, land availability, locations of flood prone areas, and the project goals and objectives. The purpose of assessing project types is to provide greater focus on certain project types that are better suited to reduce flooding risk in the identified areas in **Figure 3** and meet the defined goals and objectives in Section 2. This exercise is also useful in the permitting process as an evaluation of project alternatives.

Project types can be divided into the following categories and are described in the following sections:

- Conveyance Modification
- Detention Storage
- Volume Control
- Flood Proofing

4.1 CONVEYANCE MODIFICATION

One method to lower flood elevations on a drainage system is to simply increase the downstream conveyance capacity. Although this is frequently the least expensive method of decreasing flood elevations at a given location, a project solely consisting of increased conveyance will result in higher peak flow rates and potentially greater flood risk downstream. In some locations where development has occurred with little or no stormwater rate management (such as the contributing drainage to RCD 3), increasing conveyance capacity may be the only feasible alternative for decreasing flood elevations since locations for other stormwater management practices are limited. An increase in discharge to the public drainage system open channels may require mitigation caused for flow changes, which can increase erosion rates and require more frequent maintenance. There is no water quality benefit from this project type.

4.2 DETENTION

Temporarily storing runoff, known as Detention Storage, is an effective way of controlling discharge rate thereby reducing flood peaks and elevations downstream. There are several natural water bodies that currently provide detention storage in the RCD 2, 3, and 5 watershed, including Jones Lake, Poplar Lake, Silver Lake, Langton Lake, Wilson Lake, Hart Lake, Pike Lake, and Hansen Park along with several other smaller water bodies. Preserving these volumes and examining opportunities to enhance their detention capacity is critical in reducing downstream flooding. The opportunities to create additional detention storage by constructing new stormwater ponds is likely limited because they typically require a sizeable land footprint which may not be readily available in the RCD 2, 3, and 5 watershed due to its fully developed condition. Thus, future project siting will likely focus on modifications to existing regional basins rather than identifying new detention locations to increase the watershed's detention storage. Properly designed stormwater detention ponds can provide a significant water quality benefit in addition to providing rate control.

4.3 VOLUME CONTROL

Volume control (i.e., reduction) is any practice that decreases runoff through infiltration, evapotranspiration (ET), or reusing it for some other purpose. Volume control can be implemented through a variety of practices summarized below. Each of these practice types improves downstream water quality in addition to decreasing runoff rates.

Infiltration is providing an opportunity for runoff to infiltrate into the ground mimicking the natural process that occurred prior to development. Common practices include infiltration basins and trenches and curbside rain gardens.

Evapotranspiration is promoting the natural processes of evaporation and transpiration for stormwater runoff. This can occur through combinations of standing water surfaces and vegetative root exposure that yield volume reductions. Common practices that utilize this process include rain gardens and bioretention basins.

Water Reuse is the process of capturing stormwater runoff and utilizing it for another purpose. A common reuse is for irrigation of managed turf areas such as athletic fields. Water reuse has been incorporated into the District volume control rules for development and redevelopment.

Volume control BMPs should be considered as options to address the goals and objectives, but it is important to understand their limitations for addressing the existing regional flooding issues. Infiltration practices require specific site conditions, such as well-draining soils and sufficient separation from groundwater levels that are not commonly present in the RCD 2, 3, and 5 contributing drainage area. Evapotranspiration and water re-use practices generally treat runoff at site-level scale and thus have little impact regionally until numerous practices are in place. Volume control BMPs typically provide little relief for larger (>50-year recurrence) rainfall events since the storage volume provided by these practices is a fraction of the runoff volume generated by these events.

4.4 FLOODPROOFING

Flood proofing is any measure, structural or non-structural, intended to prevent or reduce damage from flooding to structures. Flood proofing is typically utilized when other project types cannot sufficiently or feasibly mitigate the flood risk. The factors that dictate whether flood proofing can provide adequate protection include:

- The height of maximum flood level on the structure
- Velocity of water near the structure
- Duration and frequency of floods
- Economic considerations

4.5 PROJECT TYPE ASSESSMENT SUMMARY

It is clear that conveyance modifications and the addition of detention storage in a system can be effective at lowering flood elevations and reducing peak flows when site conditions allow doing so. Floodproofing is also seen as a viable alternative when it's economically feasible, and volume control potentially can reduce smaller-scale flood flows when it can be implemented effectively on a large enough scale. Factors such as adverse downstream impacts and their mitigation costs will be considered during the comprehensive analysis.

It is likely a combination of project types will be recommended during the Phase 2 analysis to address the local and regional flooding issues and meet the defined goals and objectives in Section 2. The project types recommended in Phase 2 will depend on a flood prone area's site constraints such as location, land availability, soils, sensitivity of downstream areas and the ability of regional approaches to effectively address issues.

5 WATERSHED ANALYSIS

5.1 RUNOFF VOLUMES

The RCD 2, 3 and 5 watershed is fully developed consisting of a large percentage of impervious surface area. Much of the watershed was developed in the 1950-70s prior to widespread application of stormwater management practices to restrict rate control increases that have been put in place over the last 30 years. The cumulative effect of increased runoff volumes from additional impervious cover and few rate control practices is higher peak flow rates and ultimately a greater flood risk when compared to undeveloped watersheds. The runoff volume has increased approximately 50-75% compared to the undeveloped watershed condition. It's estimated the runoff volume increase is most directly tied to the conversion of pervious land use (e.g., agricultural, forest, parks) to impervious area. Areas within the watershed that have higher percentages of impervious area yield greater runoff volume.

5.2 WATERSHED TIMING

Another significant factor increasing flood risk to the watershed is the conversion of the natural surface drainage systems (i.e., wetlands and meandering channels) to excavated and straightened channels, tile and storm sewer. This system modification began when the public drainage system was initially constructed over a hundred years ago and intensified as the watershed developed. The drainage system modification decreases flow attenuation and thus increases peak flow rates.

Normally, the practice of increasing detention storage lowers peak outflow rates and decreases downstream flooding. Because of the aforementioned regional flooding concerns on Long Lake and associated goal of reducing runoff volume in the peak window, it may be beneficial to shorten travel times to Long Lake for some areas in the RCD 2, 3 and 5 watershed depending on timing of peak flows to and discharges from Long Lake. A cursory review of watershed timing suggests that portions of the RCD 2, 3 and 5 watershed downstream of Hansen Park/I-694 may remove runoff volume from the peak window on Long Lake by shortening their travel time. Projects or policy changes to reduce the travel times in this area should be preceded by a detailed analysis of peak flow timing to ensure that these projects or policy changes will decrease flood elevations in Long Lake and result in no adverse impacts.

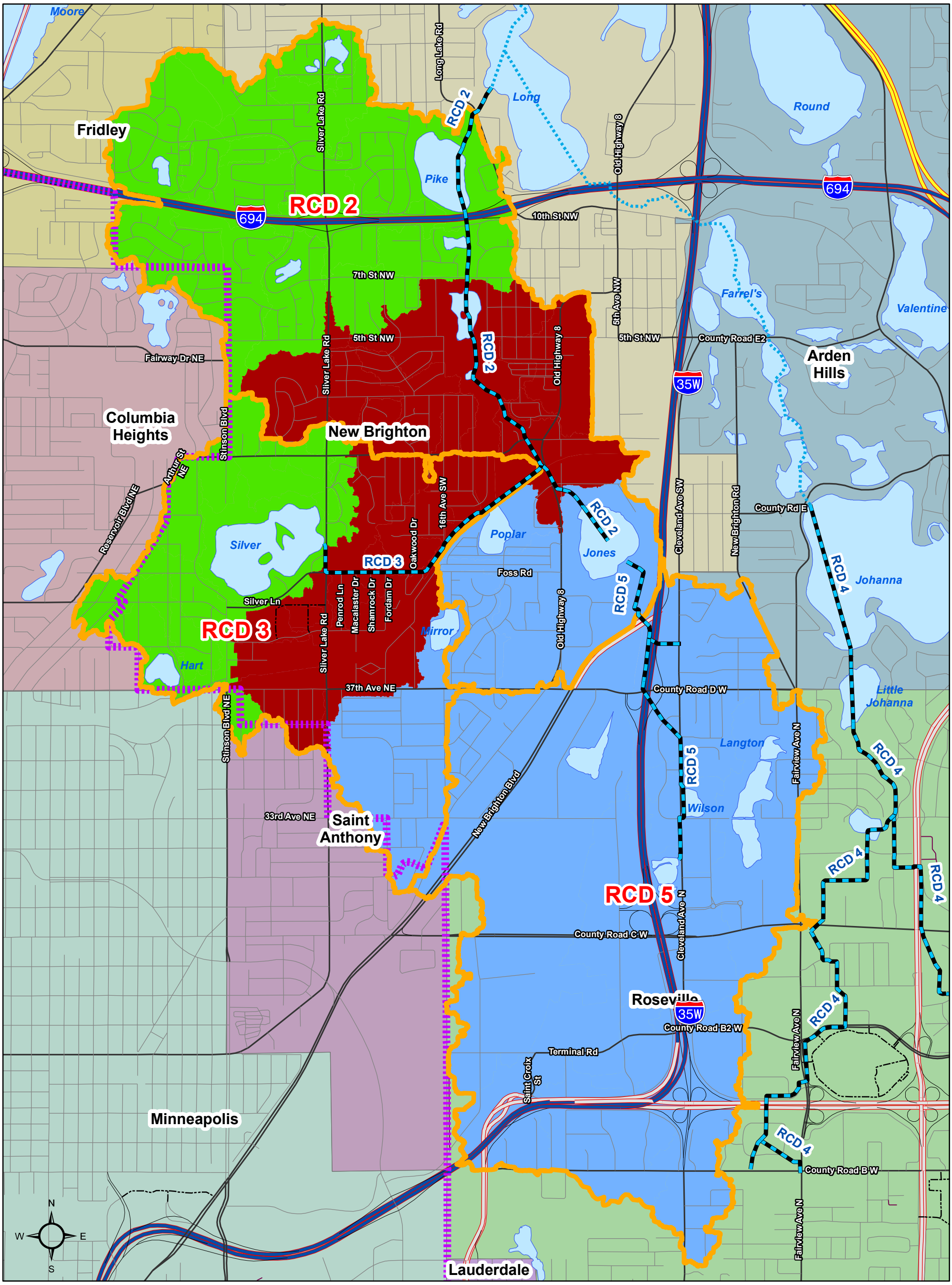
5.3 STORAGE EFFECTIVENESS

Lakes, wetlands and existing regional stormwater management practices have a significant impact on the conveyance of runoff through the drainage system, by temporarily detaining runoff and attenuating peak flows. Without these waterbodies, the peak flow rates and flood risk would certainly be greater downstream. A primary objective of this project is to preserve existing storage and identify opportunities to enhance storage in existing waterbodies or at new locations.

The effectiveness of new detention storage for reducing peak flows and flood risks at either existing waterbodies or at new locations will vary depending on where the detention storage is located in the watershed (i.e., all storage is not created equal). Runoff typically travels overland across, parking lots, lawns, etc. before being collected in roadway gutters, storm sewer pipes and open channel ditches. The time of travel to the watershed outlet varies based on the distance and the conveyance system

components it must travel through. Existing and new detention storage modifies the rate and timing of runoff peak flows. The location of a storage area affects its influence on peak flows at the watershed outlet.

A simple analysis was done with the RCWD RCD 2, 3, and 5 SWMM model to simulate “what-if” scenarios to gauge the effectiveness of reducing peak flows at the watershed outlet at Long Lake by providing detention storage at different locations in the watershed. The watershed was segmented into regions and classified as having a high, medium or low level of effectiveness to reduce peak flow rates at the watershed outlet. The effectiveness classifications are shown on **Figure 4**. Note that these classifications were not based on the simulation of actual projects and storage effectiveness may vary based on more detailed analysis.



Public Ditch
Public Watercourse
RCWD 2,3, and 5 Drainage Areas
RCWD Legal Boundary
MN DNR Public Waters Inventory

Detention Pond Effectiveness

High
Medium
Low

0 2,500 5,000 Feet

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Figure 4: Flood Storage Effectiveness at Long Lake

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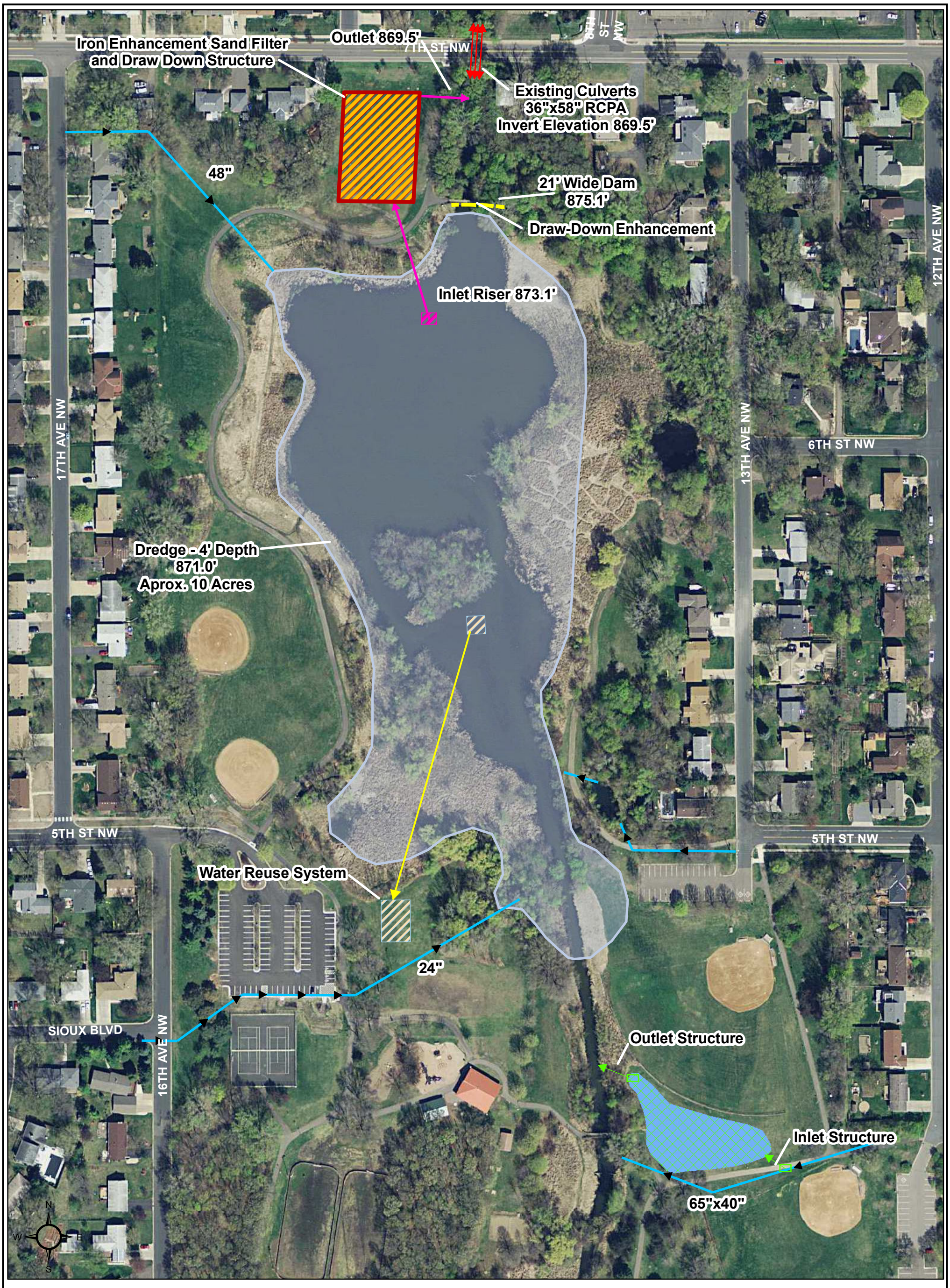
5.4 HANSEN PARK ANALYSIS

A conceptual plan was developed within Hansen Park during Phase 1 to increase detention storage by lowering the Hansen Park Pond's normal water pool elevation and excavating material above the proposed normal elevation. A sketch of the concept which also incorporates water quality features is shown in **Figure 5**. The result is an additional 30 acre-feet of detention storage below the existing 100-year flood elevation. This conceptual plan was simulated in the RCWD SWMM model to gauge its effectiveness at reducing runoff volume in the Long Lake peak window and help gain an understanding of the scale of the regional flooding issue on Long Lake. The approximate result is a net reduction of runoff volume of 8 acre-feet within the peak window (see **Figure 2**), a 0.06 foot reduction in the Long Lake peak flood elevation, and a 13 cfs peak flow reduction into Long Lake during the 24-hour 100-year rainfall event.



0 75 150 300 Feet

- Iron Enhanced Sand Filter
- Water Reuser
- Existing Culverts
- Existing Storm Sewer
- Inlet and Outlet Locations
- Inlet Outlet Pond
- Dam
- Dredge Area
- Pond

Figure 5: Hansen Park Concept Plan

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6 POTENTIAL PROJECTS

Previous studies by the Cities of New Brighton and St. Anthony and the RCWD have identified potential flood risk reduction projects to be further analyzed in Phase 2. The City of Roseville also provided project locations and descriptions for this report. Characteristics of the potential projects are summarized in **Table 3** and their locations are shown in **Figure 6**.

The projects identified in **Table 3** will be further evaluated in Phase 2 of the Basic Water Management Project to gage their effectiveness. Their effectiveness will be measured according to their ability to achieve project goals and objectives using the design criteria stated earlier. Each project listed is believed to be capable of improving the flood risk at one or more flood prone areas. During Phase 2, projects determined to be ineffective or infeasible in some way will be removed from the list.

Some of the identified projects may result in greater flood risks at downstream locations and will require mitigation measures to offset these subsequent impacts. Since detailed analysis of projects has not been completed to determine impacts, the exact level of mitigation is unknown at this time. Potentially the mitigation measures may include flood proofing or the purchase of affected properties.

Table 3. Potential Projects

2011 Report ID	Project Name	Problem Area	Public Drainage System	Watershed	Project Type	Potential Benefits	Water Quality Benefit	Potential Negative Impacts
A1	Hansen Park Bypass Dam and Flood Storage Volume Increase & Outlet Modification	Hansen Park to Long Lake	Yes (PWI)	RCD 2	Detention	Lower flood elevations downstream of Hansen Park and potentially Long Lake	Yes	
-	Hansen Park Outlet Modification, Dredging and Water Quality Treatment BMP (Pending BWSR Grant Application)	Hansen Park to Long Lake	Yes (PWI)	RCD 2	Detention	Lower flood elevations downstream of Hansen Park and potentially Long Lake	Yes	
B3&B5	Surge Basin and Additional Catch Basins (Completed)	Freedom Park	No	RCD 2	Detention, Conveyance Modification	Localized lowering of flood elevations	No	Increase downstream peak flows
C1&C2	Increase Culvert Capacity at 10th St NW and I-694	Garden View Apartments	Yes	RCD 2	Conveyance Modification	Lower flood elevation on RCD2 upstream of 10th St. NW and I-694	No	Increase downstream peak flows and elevations in Pike and Long Lake
E1	Detention Basin North of 5th Street	4th Street NW Low Area	No	RCD 2	Detention	Decrease peak flow rates in storm sewer, Localized lower flood elevation at 4th Street NW Low Area	Yes	
E3	Increase 4th Street Storm Sewer Capacity	4th Street NW Low Area	No	RCD 2	Conveyance Modification	Localized lower flood elevation at 4th Street NW Low Area	No	Increase downstream peak flows and elevations
F2	Modify Jones Lake Outlet	Old Highway 8 Railroad Bridge	Yes (PWI)	RCD 2	Detention	Decrease downstream peak flow rates, Water quality	Yes	
F1	RCD 2 Improvements	Old Highway 8 Railroad Bridge	Yes	RCD 2	Conveyance Modification	Lower flood elevations at Old Highway 8/RCD 2	No	Increase downstream peak flows and elevations
G1&G3	Increase Storm Sewer Capacity on RCD 3 & RCD 2 BR 1 – both outlets of Poplar Lake	Lakeside Mobile Home Park/Poplar Lake	Yes (PWI)	RCD 2 & RCD 3	Conveyance Modification	Lower flood elevations at Lakeside Mobile Home Park	No	Increase downstream peak flows and elevations
I	Increase Storm Sewer Capacity	RCD 3	Yes	RCD 3	Conveyance Modification	Lower flood elevation along RCD 3	No	Increase downstream peak flows and elevations
-	Old RCD 2 Branch 1 Alignment	RCD 3	No	RCD 3	Detention	Reduce peak flows in RCD 3	Yes	
A1	Mirror Lake - Lower Outlet and Dredge Basin	Mirror Lake Townhomes	No	RCD 3	Detention	Lower flood elevations, Decrease downstream peak flow rates	No	
A2	Route Stormwater from CR D and Foss Road through Mirror Lake	Mirror Lake Townhomes	No	RCD 3	Conveyance Modification	Lower flood elevations	Yes	
A3	Mirror Lake - Modify Outlet and Downstream Sewer	Mirror Lake Townhomes	No	RCD 3	Conveyance Modification	Lower flood elevations for Mirror Lake and nearby industrial area	No	
A4	Modify RCD 3 Storm Sewer	Mirror Lake Townhomes	Yes	RCD 3	Conveyance Modification	Lower flood elevations for Mirror Lake and contributing laterals	No	Increase downstream peak flows and elevations
A5	Backflow Prevention	Mirror Lake Townhomes	Yes	RCD3	Conveyance Modification	Reduce backflow for downstream ditch system	No	
A6	Floodproofing and Earthen Berm	Mirror Lake Townhomes	No	RCD3	Floodproofing	Prevent flooding of Foss Road	No	
B1	Increase RCD 3 Storm Sewer Capacity	Silver Lane/Shamrock Drive	Yes	RCD 3	Conveyance Modification	Lower Flood Elevations	No	Increase downstream peak flows and elevations
C	Floodproofing of Individual Homes	39th Street and Shamrock	No	RCD 3	Flood Proofing	Reduce flood damage to property	No	
-	Silver Lake Outlet Modification	RCD 3	Yes (PWI)	RCD 3	Detention	Decrease peak flow rates in RCD 3	Yes	

2011 Report ID	Project Name	Problem Area	Public Drainage System	Watershed	Project Type	Potential Benefits	Water Quality Benefit	Potential Negative Impacts
-	2014 Pavement Management Program-Drainage Improvements	Sandcastle Park Area	Yes	RCD 5	Detention, Flood Proofing, Conveyance Modification	Lower flood elevations, reduce flood damage to property, re-grade and lower emergency overflow swale	Yes	
-	Twin Lakes I-35W Interchange Ramp Terminal and I-35W/Cleveland Avenue Intersection Improvements	Cleveland Avenue	Yes	RCD 5	Detention, Conveyance Modification	Lower flood elevations along Cleveland Ave.	Yes	
-	Railroad Open Channel Maintenance	Railroad Ditch from TH 36 to County Road D	Yes	RCD 5	Conveyance Modification	Restore ditch to original design/capacity, reduce flood elevations in ditch/potential for property damage	No	Increase downstream peak flows and elevations
-	St. Croix Lift Station Improvements	I35W – St. Croix Street	Yes	RCD 5	Conveyance Modification	Localized lowering of flood elevations	No	Increase downstream peak flows and elevations
-	Pike Lake Channel Modification	TBD	Yes	RCD 2	Conveyance Modification	TBD	TBD	TBD

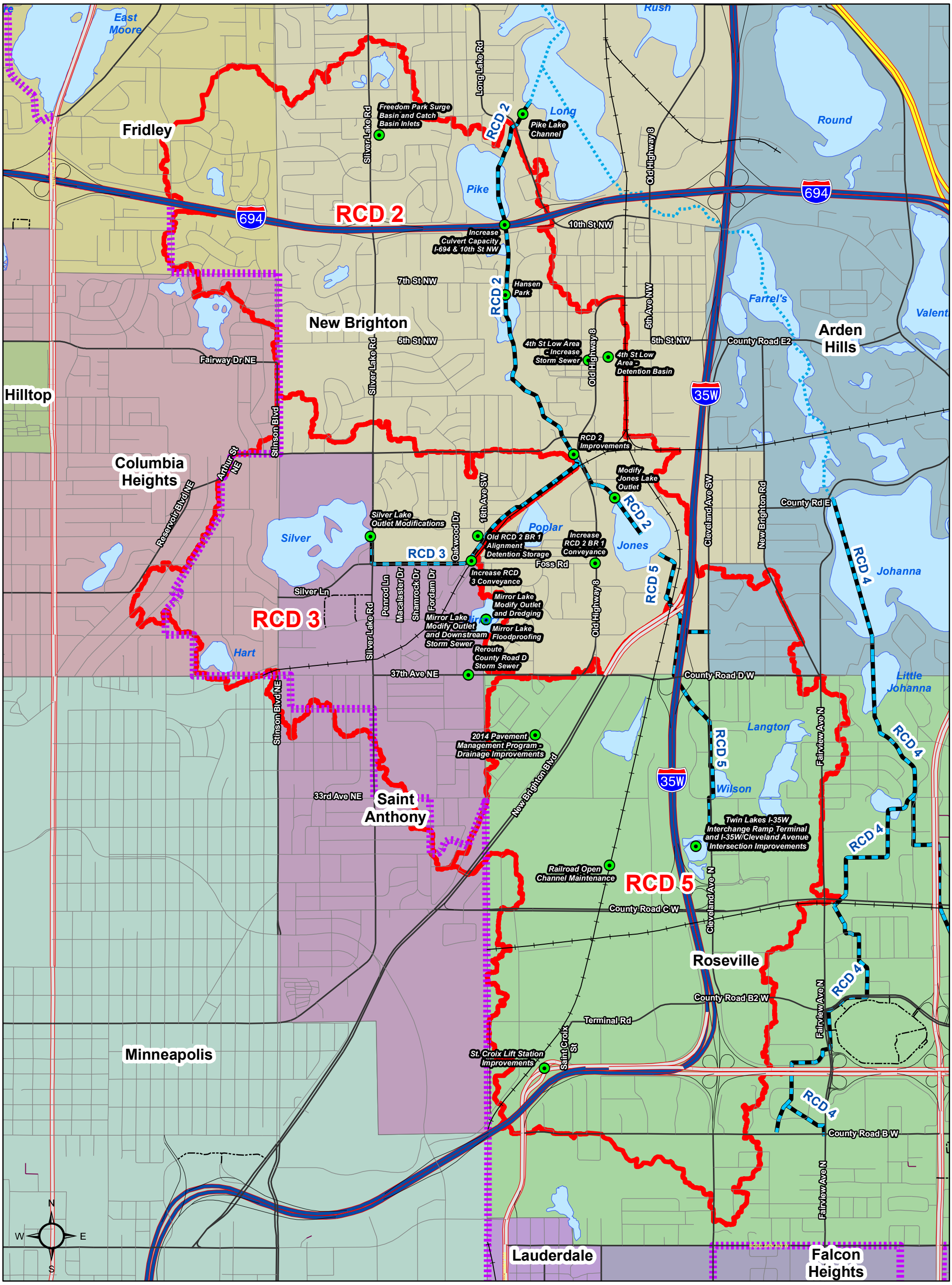

Figure 6: Project Locations

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7 PERMITTING AND PLAN REVIEW

Permitting and/or plan review will be required for any of the projects described within this report, and may involve multiple agencies including the Minnesota Department of Natural Resources (DNR), the RCWD, road authorities, the Army Corp of Engineers (COE), and the Minnesota Pollution Control Agency (MPCA). A description of the permitting and plan review that may be required is described as follows.

7.1 DNR PUBLIC WATERS PERMIT

The DNR has a regulatory permit process for projects that affect the course, current, or cross-section of Public Waters. Public Waters are basins that meet criteria detailed in Minnesota Statute 103G.005 subd. 15. Several Public Waters are located in the project watershed including Hansen Park Pond, Pike Lake, Jones Lake, Poplar Lake and Mirror Lake. The project siting list in the previous section includes several projects involving these Public Waters. ”Work in Public Waters” permits will be required for project types, such as dredging and outlet modification, that alter the course, current, and cross section.

A conceptual plan for the Hansen Park project was presented to DNR staff on December 10, 2013 to verify permit requirements and identify any proposed features that pose permitting challenges. Discussions with DNR staff confirmed that a permit is required for a Hansen Park project and that the project features as presented did not include components deemed to be in conflict with the Public Waters Rules. DNR staff stressed the importance of considering the entire impact on the waterbody beyond the project goals of flood control and water quality, including factors such as ecological habitat. The Hansen Park conceptual plan includes features to assist in long-term basin maintenance, ecological habitat enhancements, water quality treatment, flood control and aesthetic enhancements to the public park.

A similar comprehensive approach should be completed for other proposed public water projects in the watershed. Pre-application correspondence with DNR staff is critical to vet important issues and aspects that are unique to individual waterbodies.

7.2 RICE CREEK WATERSHED DISTRICT RULES

The RCWD has adopted and enforces rules regarding land alteration activities to protect public health and welfare and natural resources within their jurisdiction, which includes the RCD 2, 3 and 5 watershed. These rules include specific sections on stormwater management, floodplain alteration, wetland alteration, crossings over natural and artificial conveyance systems, and the public drainage system that may be applicable towards proposed projects herein. Any project completed as part of the New Brighton/St. Anthony Basic Water Management Project must conform with RCWD rules, regardless of which agency initiates the project.

The RCWD is also the Local Government Unit (LGU) for administering the Wetland Conservation Act (WCA). Non-exempt wetland impacts resulting from a project will need to be mitigated per the schedules listed in WCA.

7.3 ROAD AUTHORITIES

Work that occurs within a public roadway requires a plan review by the Road Authority (City, County, or MnDOT) to verify compliance with street or highway standards of that agency, including traffic control requirements and pavement thicknesses. Any work completed within a state or federal highway right-of-way requires a ROW permit from MnDOT.

7.4 ARMY CORPS OF ENGINEERS

The COE has additional jurisdiction over impacts to wetlands that are either in or tributary to navigable water. These requirements may or may not exceed those required by WCA, depending on the location and nature of the impact. Project design should consider COE requirements where applicable.

8 PUBLIC DRAINAGE SYSTEM CONSIDERATIONS

8.1 BACKGROUND AND DEFINITIONS

The authority of the RCD 2, 3, and 5 public drainage systems were transferred by Ramsey County to the RCWD shortly after the District was established in 1972. These public drainage systems are subject to the articles of Minnesota Statute 103E (i.e. drainage law), which legally establish how the systems may be created, abandoned, or modified. Since several identified potential projects will modify or otherwise impact the public drainage systems, it is important to identify and understand the legal processes required to comply with MS 103E.

The legal public drainage process required by the project may include repair, improvement, impoundment, partial abandonment, and transfer. A definition and description of each of these processes follows:

Repair - Repair of the public drainage system is defined as *the restoration of all or a part of a drainage system as nearly as practicable to the same hydraulic capacity as originally constructed and subsequently improved, including resloping of ditches and leveling of spoil banks if necessary to prevent further deterioration, realignment to original construction if necessary to restore the effectiveness of the drainage system, and routine operations that may be required to remove obstructions and maintain the efficiency of the drainage system. "Repair" also includes:*

(1) incidental straightening of a tile system resulting from the tile-laying technology used to replace tiles; and

(2) replacement of tiles with the next larger size that is readily available, if the original size is not readily available."

Repairs are subject to MS 103E.701 and may be initiated through a petition by a benefitting landowner or by the Drainage Authority (in this case, the RCWD). Repairs do not include lowering or enlarging of the public drainage system beyond the As-constructed and Subsequently Improved Condition (ACSIC). Wetland impacts to Type 1, 2, 6, 7, & 8 wetlands and any wetland in existence for

less than 25 years, resulting from repair to a public drainage system, are exempt from mitigation requirements under the Wetland Conservation Act (WCA).

Improvement - Improvement of the public drainage system is defined as *the tiling, enlarging, extending, straightening, or deepening of an established and constructed drainage system including construction of ditches to reline or replace tile and construction of tile to replace a ditch*. Improvements are subject to the requirements of MS 103.215 and must be initiated by a petition by at least 26 percent of the landowners whose property is affected or passed over by the improvement. Wetland impacts resulting from an improvement are not exempt from mitigation requirements under WCA.

Impoundment - Impoundment of the public drainage system includes the construction of a dike, dam, or control structure in the public drainage system that partially obstruct the flow of water at an elevation above the as constructed and subsequently improved profile of the ditch. Impoundments may be initiated per the requirements of MS103E.227. To order an impoundment, the Drainage Authority must determine that the project will be of a public or private benefit and that it will not impair the utility of the drainage system or deprive affected land owners of its benefit.

Partial Abandonment - An owner of benefited property may petition the drainage authority to abandon any part of the drainage system that is not of public benefit and utility and does not serve a substantial useful purpose to property remaining in the system, as specified within MS103E.806. The "abandonment" does not necessarily constitute a change in the existence of the open channel, tile or stormsewer that were components of the public drainage system, but rather reflects the elimination of the Drainage Authority's role in the management and administration of that portion of the system.

Transfer of the Drainage System - Jurisdiction of all or parts of a public drainage system may be transferred from the Drainage Authority to a water management authority (e.g. a watershed district or municipality) under the requirements of MS 103E.811. A municipality may petition for the transfer of the portions of the public drainage system within their City.

Use of the Drainage System as an Outlet - A person or municipality seeking authority to use an established drainage system as an outlet must petition the drainage authority, under MS 103E.401. The drainage authority must consider the capacity of the drainage system before authorizing the outlet, and may establish an outlet fee to be paid.

8.2 SPECIFIC PROJECTS AND PROBABLE NEEDED PROCEEDINGS

The following sections describe several public drainage system considerations for projects included in the project siting process. These specific projects, whose locations are shown on **Figure 7,** will likely impact or require modifications to the public drainage system and consequentially must conform with MS 103E drainage law.

Please note that the RCWD has initiated legal proceedings to correct the drainage system record for RCD 2, 3 and 5. These systems, which were originally constructed between 1906 and 1908, have limited documentation regarding their establishment and subsequent modification. In the "*Ramsey County Ditch 2, 3, and 5 Historical Review"* Memorandum dated May, 14 2013, the RCWD determined the alignment and profile of the as-constructed and subsequently improved condition for each of these public drainage

systems. It is this described condition that shall be used at the basis for assessments of modifications to the systems.

8.2.1 HANSEN PARK

A project is included in the project siting list that involves modifying the water basin located in Hansen Park in New Brighton. This impoundment is located on RCD 2 south of I-694. The project would involve lowering the weir outlet structure to provide more flood control storage within Hansen Park.

There is nothing in the drainage system record to indicate impoundment or other proceedings occurred when this weir was installed 40-50 years ago. The weir is several feet above the ACSIC identified in the recent historical review completed by the RCWD for the drainage system.

There are two processes to deal with the current weir or modified weir to construct such project and satisfy MS 103E drainage law. First, the current weir should be recognized through a legal proceeding by the Drainage Authority as a modification to the drainage system based on the length of time the weir has existed without objection from benefited landowners. Second, for a modification (lowering) of the weir to accomplish project objectives, RCWD legal counsel has recommended a modification proceeding internal to this petitioned basic water management project.

8.2.2 I-694 AREA CULVERT IMPROVEMENT

Another project to be considered in future phases is the increase of flow capacity above current capacity of the RCD 2 culverts under I-694 and 10th St. NW. These crossings were not present in the original establishment and should not be considered original features of the public drainage system. Their replacement or addition of flow capacity should be treated as mitigation of an obstruction and will not constitute as an improvement. These system modifications can be made as part of a drainage system repair and should be specifically referenced in the drainage system records correction process currently underway by the RCWD.

8.2.3 JONES LAKE OUTLET MODIFICATION

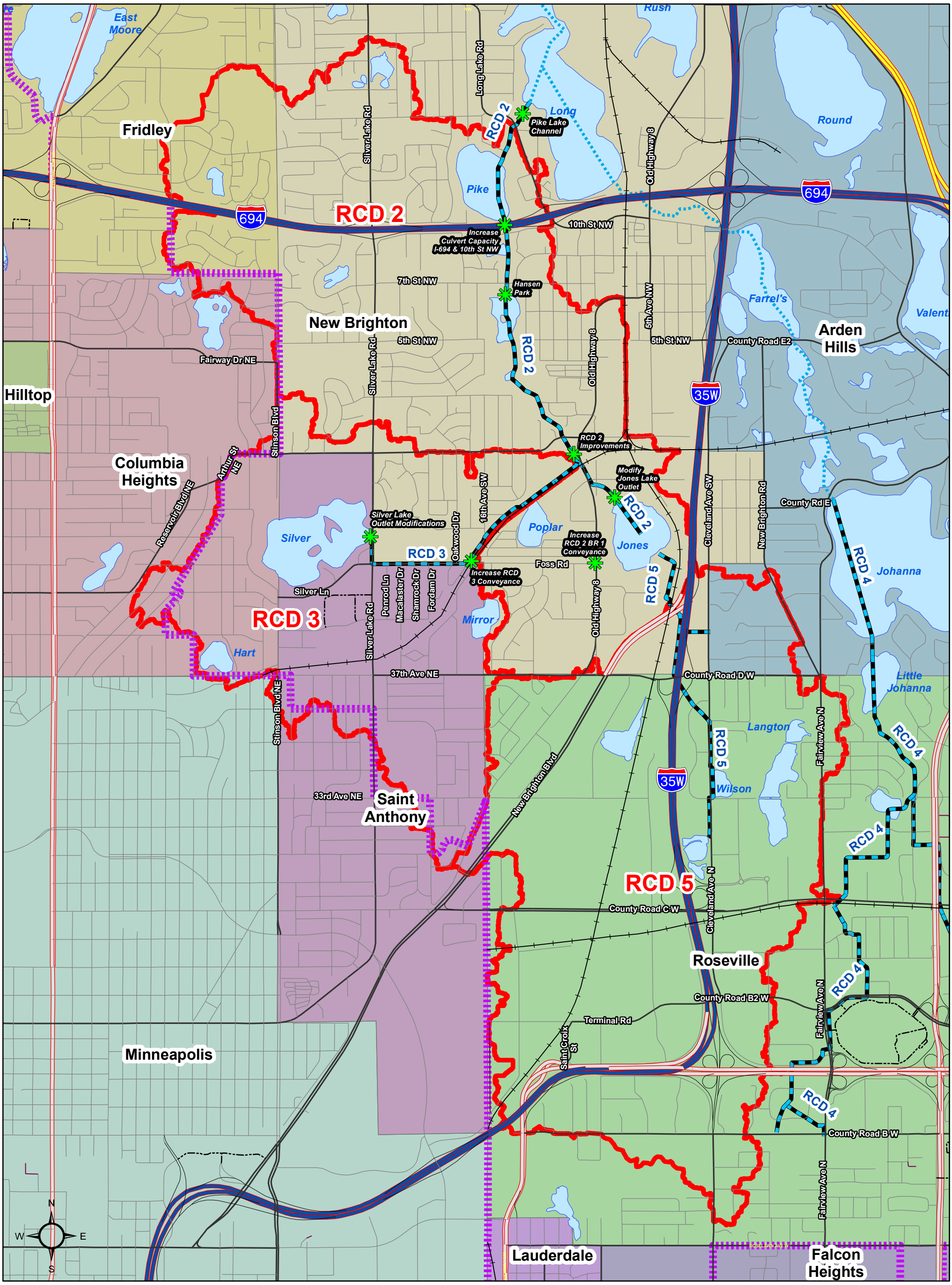
This project would increase runoff storage in Jones Lake by modifying the outlet structure. No record of the establishment of the existing weir is available. This modification would require an impoundment proceedings.

8.2.4 POPLAR LAKE OUTLET MODIFICATION

Two projects are being considered that would modify the outlet of Poplar Lake to alleviate potentially damaging flood elevations by improving the capacity of its outlet. Its current primary outlet is Branch 1 of RCD 2. The first project would increase capacity of RCD 2 Branch 1. This would constitute an improvement and require the necessary legal proceedings. The second project would reroute the outlet to utilize RCD 3 as the primary drainage system serving as an outlet. This action is an improvement of an outlet and requires an improvement petition. The resulting remnant portion of RCD 2 Branch 1 can either be abandoned or transferred to the City for future stormwater management options.

8.2.5 RCD 3 STORMSEWER RESIZING

This project envisions installing additional storm sewers or replacing the current RCD 3 storm sewer with the objective of increasing capacity. Improvement proceedings would be required.



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- Approximate Project Locations on the Public Drainage System
- Public Ditch
- Public Watercourse
- RCWD Legal Boundary
- RCWD 2,3, and 5 Drainage Areas
- MN DNR Public Waters Inventory

Figure 7: Projects Located on Public Drainage System

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APPENDIX A – CITY OF NEW BRIGHTON AND ST. ANTHONY PETITIONS

CITY OF ST. ANTHONY VILLAGE
STATE OF MINNESOTA

RESOLUTION 13-056

RESOLUTION PETITIONING RICE CREEK WATERSHED DISTRICT FOR A BASIC WATERS MANAGEMENT PROJECT TO ADDRESS STORMWATER MANAGEMENT AND FLOODING WITHIN THE CITIES OF NEW BRIGHTON AND SAINT ANTHONY, MINNESOTA

WHEREAS, in July of 2011, New Brighton and Saint Anthony experienced historic rainfall and associated flooding. The events highlighted existing flood risks and caused the Cities to evaluate the adequacy of existing stormwater conveyance and management facilities in the Cities. On May 22, 2012 the City Council accepted the July 2011 Flood Investigation and Stormwater Modeling Report (Flood Report) dated May, 2012 prepared by WSB & Associates; and,

WHEREAS, New Brighton and St. Anthony request that the Rice Creek Watershed District initiate a phased approach by directing its engineer to evaluate the Cities' 2011 Flood Reports and further identify stormwater management, flood damage reduction and water quality opportunities to be further developed in later phases; and,

WHEREAS, rather than a series of individual, un-integrated projects, the Cities seek to develop a comprehensive and integrated approach to stormwater management, flood damage reduction, and water quality enhancement within the Cities and, therefore, seek to partner with various entities, including the Rice Creek Watershed District, for the purpose of developing a comprehensive strategy that implements a series of project components to achieve reasonable stormwater management and flood damage reduction objectives; and,

WHEREAS, the Cities request, as part of our petition, that the Rice Creek Watershed District exercise it full authorities for generating revenues for the implementation of the petitioned project.

NOW, THEREFORE, BE IT RESOLVED, The City Council hereby approves the attached petition to the Rice Creek Watershed District for a Basic Water Management Project to address stormwater management and flooding within the Cities of New Brighton and Saint Anthony.

Adopted this 23rd day of July, 2013.

Jerome O. Faust, Mayor

ATTEST: _____
Barbara J. Suciu, City Clerk

Reviewed for administration:

Mark Casey, City Manager

I certify that this is a true and accurate copy of the City of St. Anthony records.

7/25/13 _____
Date City Clerk

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CITY OF NEW BRIGHTON
RAMSEY COUNTY, MINNESOTA
RESOLUTION NO 13-055

RESOLUTION RELATING TO THE CITY OF NEW BRIGHTON PETITION TO THE RICE CREEK WATERSHED DISTRICT FOR A BASIC WATERS MANAGEMENT PROJECT TO ADDRESS STORMWATER MANAGEMENT AND FLOODING WITHIN THE CITIES OF NEW BRIGHTON AND SAINT ANTHONY, MINNESOTA

WHEREAS, in July of 2011, New Brighton and Saint Anthony experienced historic rainfall and associated flooding. The events highlighted existing flood risks and caused the Cities to evaluate the adequacy of existing stormwater conveyance and management facilities in the Cities. On April 24, 2012 the City Council accepted the July 2011 Flood Investigation and Stormwater Modeling Report (Flood Report) dated April 17, 2012 prepared by WSB & Associates; and,

WHEREAS, New Brighton and St. Anthony request that the Rice Creek Watershed District initiate a phased approach by directing its engineer to evaluate the Cities' 2011 Flood Reports and further identify stormwater management, flood damage reduction and water quality opportunities to be further developed in later phases; and,

WHEREAS, rather than a series of individual, un-integrated projects, the Cities seek to develop a comprehensive and integrated approach to stormwater management, flood damage reduction, and water quality enhancement within the Cities and, therefore, seek to partner with various entities, including the Rice Creek Watershed District, for the purpose of developing a comprehensive strategy that implements a series of project components to achieve reasonable stormwater management and flood damage reduction objectives; and,

WHEREAS, the Cities request, as part of our petition, that the Rice Creek Watershed District exercise it full authorities for generating revenues for the implementation of the petitioned project.

NOW, THEREFORE, BE IT RESOLVED, The City Council hereby approves the attached petition to the Rice Creek Watershed District for a Basic Water Management Project to address stormwater management and flooding within the Cities of New Brighton and Saint Anthony.

Adopted this 9th day of July 2013.

Dave Jacobsen, Mayor

Dean R. Lotter, City Manager

ATTEST:

Daniel A. Maiers,
Director of Finance and Support Services

STATE OF MINNESOTA

RICE CREEK WATERSHED DISTRICT

The matter of the petition of the Cities of New Brighton and Saint Anthony for a Basic Water Management Project to address stormwater management and flooding within the Cities of New Brighton and Saint Anthony	**Petition for Watershed Project**

Petitioners Cities of New Brighton and Saint Anthony, for their petition to the Board of Managers of the Rice Creek Watershed District state and request the following:

1. In July of 2011 the Cities experienced historic rainfall and associated flooding. The events highlighted existing flood risks and caused the Cities to evaluate the adequacy of existing stormwater conveyance and management facilities in the Cities.

2. Each City relies upon public drainage systems, managed by the Rice Creek Watershed District as the Drainage Authority, as the ultimate, downstream outlet for stormwater. In most cases the public drainage systems serve as the direct outlets for the Cities' municipal stormwater infrastructure. The specific public drainage systems are Ramsey County Ditches 2, 3 and 5, which are interconnected to a series of lakes, the prominent being Pike Lake and Long Lake.

3. As a result of the flooding, each City requested engineering review of the adequacy of the conveyance infrastructure and the adequacy of existing flood storage provided by the drainage systems and an investigation of improvements that could be pursued to reduce future flooding of the impacted areas.

4. The Cities' engineering consultant, WSB & Associates, Inc., prepared reports for each City entitled "2011 Flood: Investigation and Stormwater Modeling Report." A copy of each report is appended and incorporated into this Petition by reference.

5. The report for the City of New Brighton identified specific drainage improvements to reduce future flooding at an approximate opinion of cost of $8.7 million.

6. The report for the City of Saint Anthony identified specific drainage improvements to reduce future flooding at an approximate opinion of cost of $1.7 to 3 million.

7. The spatial extent of the analysis within these reports terminated at the City boundaries, excluding an analysis of the potential downstream consequences of the drainage improvements.

8. The costs also only consider the specific improvements identified for selected areas within the specific cities that experienced flooding in the summer of 2011 and did not consider

improvements for several other areas that also experienced or a prone to flooding and associated damages or the downstream consequences.

9. Both Cities are also subject to requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer (MS4S) permit and need to show reasonable progress for improving stormwater runoff water quality. The Rice Creek Watershed District shares the interest in improving water quality. The reports prepared by the Cities excluded an analysis of the potential water quality benefits of the improvements.

10. On February 4, 2013, the City of New Brighton received a petition for the maintenance of "Pike Lake channel". Pike Lake channel is a downstream extent of Ramsey County Ditch 2 between Pike and Long Lakes. The City of New Brighton's 2011 Flood: Investigation and Stormwater Modeling Report noted specific alteration of the Pike Lake channel as one action evaluated to provide stormwater management and flood control.

11. Rather than a series of individual, un-integrated projects, the Cities seek to develop a comprehensive and integrated approach to stormwater management, flood damage reduction, and water quality enhancement within the Cities and, therefore, seek to partner with various entities, including the Rice Creek Watershed District, for the purpose of developing a comprehensive strategy that implements a series of project components to achieve reasonable stormwater management and flood damage reduction objectives.

12. The Cities acknowledge that some components of a comprehensive strategy fall solely within the purview of the Cities, while others fall within the regional management focus of the Rice Creek Watershed District – including the management of public drainage systems as the ultimate, downstream outlet for stormwater and primary conveyance infrastructure. The Cities and the RCWD share interest in enhancing water quality.

13. The Cities believe that a comprehensive system of pro-active drainage system maintenance, repair or improvement; the creation of stormwater retention, detention and storage; BMPs for rate and volume controls and water quality improvement for development and redevelopment, as well as active and passive flood proofing/damage reduction methods is required to achieve reasonable stormwater management and flood damage reduction objectives.

14. The Cities, therefore, petition the Rice Creek Watershed District to establish a phased Basic Water Management Project for the following purposes:

a. Phase 1: Identifying and analyzing current conditions, challenges and opportunities related to stormwater management and flood damage within the Cities and making recommendations of actions likely to address comprehensive stormwater management and flood damage issues within the Cities and those downstream areas affected by stormwater runoff including Pike and Long Lake;
b. Phase 2: Developing a regional, comprehensive stormwater management and flood damage reduction plan, to include water quality features, which identifies capital improvements and other actions to be undertaken by the Cities and the Rice Creek Watershed District;

c. Phase 3: Developing implementation timelines and priorities, costs allocations and revenue generation methods for both implementation and long term maintenance of capital improvements and water quality features;
d. Phase 4: Implementing one or more of the project components identified in Phase 2 as a coordinated series of capital improvements by the Cities and the Rice Creek Watershed District;

15. This petition is limited to the actions set forth in paragraph 14.a. above until such time as the Cities, individually or jointly, amend this petition to proceed with subsequent actions contained in paragraph 14.b. – d.

16. Because this petition is being submitted by the governing body of a city, no bond is required under Statutes Section 103D.705, Subdivision 3. However, each of the Cities must pay one-half of all costs and expenses that may be incurred in the proceedings for the proposed Basic Water Management Project if the proceedings are dismissed or a construction or implementation contract is not awarded for all or a portion of the project.

17. Subject to the provisions of Statutes Section 103D.705, Subdivisions 3 & 4, the Cities may dismiss this petition or any amendment hereof. Failure to amend the petition to authorize a subsequent phase of the project shall be deemed a dismissal of the petition.

18. This petition is conditioned upon the following process to be followed by the Rice Creek Watershed District in implementing project phases:

a. Pre-coordination: The Cities and the Rice Creek Watershed District shall meet at the initiation of any project phase to establish a scope of work and anticipated cost.
b. Study/Component Development: The Rice Creek Watershed District, in consultation with City staff shall prepare all studies and develop project features consistent with project phases and purposes described in paragraph 14. Project study and component development shall culminate with a joint presentation to the City Councils of the outcomes and recommendations of the Rice Creek Watershed District.
c. Concurrence/Petition Amendment: The City Councils, considering the information and recommendations presented by the Rice Creek Watershed District, shall concur or not concur with one or more of the recommendations and either authorize petition amendment to proceed with a subsequent phase of the project or dismiss the petition.

19. This petition is authorized by separate resolution of the City Councils authorizing their respective Mayors and City Managers to sign and submit this petition as the action of each City.

20. The proposed Basic Water Management Project will be conducive to the public health, safety, convenience and welfare of the Cities and their residents as well as regional providers and consumers of goods and services within the Cities.

21. The Cities, by action of their individual Councils, concur in the Rice Creek Watershed District's exercise of alternative authority to maintain and improve public drainage systems within the Cities as provided in Minnesota Statutes Section 103D.621, subd. 4.

22. The Cities request, as part of their petition, that the Rice Creek Watershed District exercise it full authorities for generating revenues for the implementation of the petitioned project.

23. The Cities further request that the Rice Creek Watershed District initiate Phase 1, as described in paragraph 14, by directing its engineer to evaluate the Cities' 2011 Flood: Investigation and Stormwater Modeling Reports and further identify stormwater management, flood damage reduction and water quality opportunities to be further developed in Phase 2, if so authorized by amendment to this Petition.

24. Phase 1 actions may include but are not limited to:

a. Confirming of the study area;
b. Establishing project goals and objectives;
c. Establishing design criteria and standards;
d. Reviewing the WSB reports and identify modeling approach and process needed for more detailed investigation;
e. Developing concepts for BMPs / projects and agreement on what will be looked at in more detail in subsequent phases;
f. Identifying detailed processes, including permitting, regulatory issues, and relevant local approval processes.

25. All actions described in this Petition are intended to support and be implemented as part of a petitioned Basic Water Management Project of the Rice Creek Watershed District.

26. This petition may be executed in counterparts.

SIGNATURE PAGES TO FOLLOW

SIGNATURE PAGE OF THE CITY OF NEW BRIGHTON TO THE PETITION TO THE RICE CREEK WATERSHED DISTRICT FOR A BASIC WATERS MANAGEMENT PROJECT TO ADDRESS STORMWATER MANAGEMENT AND FLOOING WITHIN THE CITIES OF NEW BRIGHTON AND SAINT ANTHONY, MINNESOTA

Respectfully Submitted:

City of New Brighton Dated: July 9, 2013

By _____
Its Mayor

Attest:

By: _____
Its City Manager

SIGNATURE PAGE OF THE CITY OF SAINT ANTHONY TO THE PETITION TO THE RICE CREEK WATERSHED DISTRICT FOR A BASIC WATERS MANAGEMENT PROJECT TO ADDRESS STORMWATER MANAGEMENT AND FLOOING WITHIN THE CITIES OF NEW BRIGHTON AND SAINT ANTHONY, MINNESOTA

Respectfully Submitted:

City of Saint Anthony Dated: 7/23/13

By: _____
Its Mayor

Attest:

By: _____
Its City Manager