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Technical Memorandum

To: Randy Anhorn, NMCWD Administrator
From: Janna Kieffer
Subject: 2019 Snowmelt Considerations
Date: March 12, 2019
c: Bob Obermeyer

The higher-than-average snowpack and deep frost this year are prompting concerns about the potential for spring flooding from snowmelt and/or rainfall on frozen or partially-frozen ground. The National Oceanic and Atmospheric Administration (NOAA) forecasts the amount of water contained within the snowpack, called snow water equivalent that can be thought of as the depth of water that would theoretically result if you melted the entire snowpack instantaneously. As of March 5, 2019 the NOAA modeled snow water equivalent throughout the Nine Mile Creek (NMC) watershed was 2 to 4 inches (see Figure 1). Following the rain and snow that occurred over the weekend, the NOAA modeled snow water equivalent forecast throughout the NMC watershed as of March 11, 2019 generally remained within the 2 to 4 inch range, with some areas forecast at 4 to 6 inches of SWE (see Figure 2).

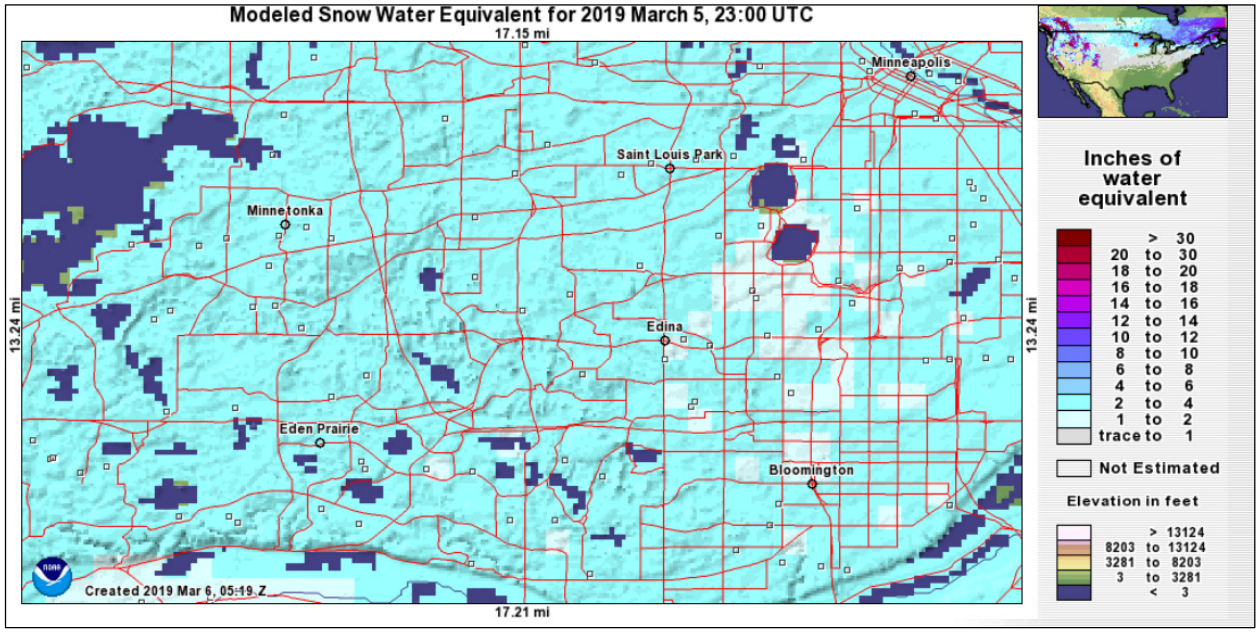


Figure 1. NOAA modeled snow water equivalent for March 5, 2019 for Nine Mile Creek watershed area.

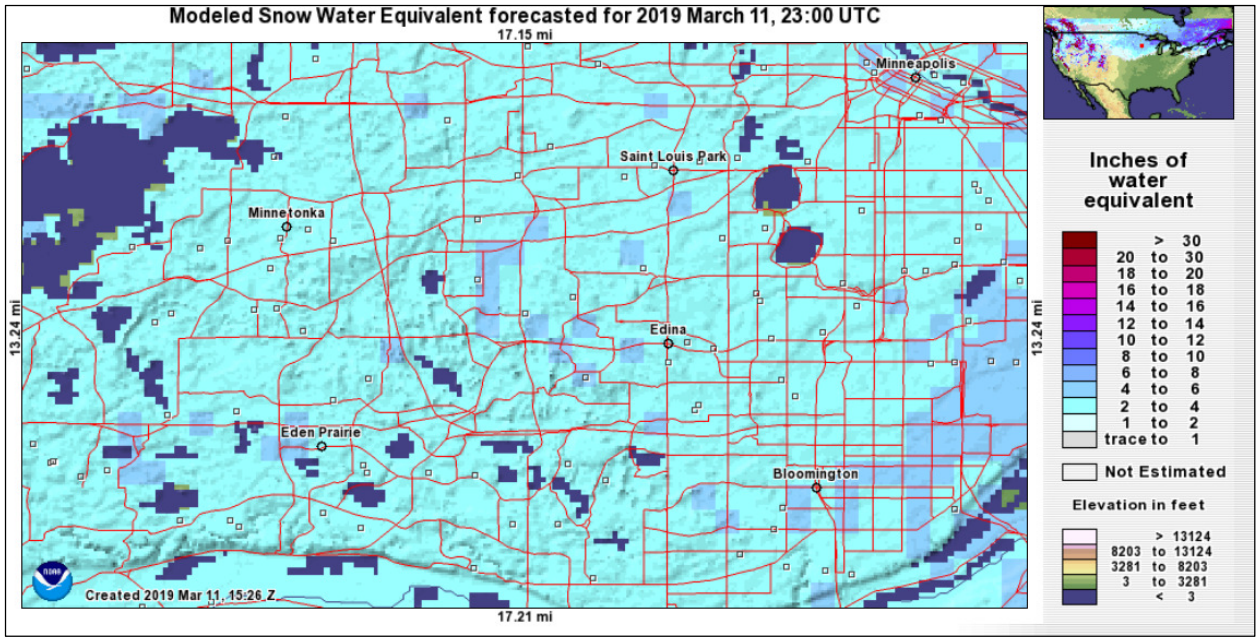


Figure 2. NOAA modeled snow water equivalent forecasted for March 11, 2019 for Nine Mile Creek watershed area.

NMCWD 2011 Snowmelt Modeling

In February of 2011, prompted by large amounts of snowfall through late-January, the NMCWD used its XP-SWMM models to evaluate potential flood conditions under the following two potential snowmelt/runoff scenarios:

1. **6.1 inches of snowmelt runoff.** This scenario was based on snow water content through late-January 2011 (approximately 3.5 inches) plus normal precipitation for February (~0.8 inches) and March (~1.8 inches)
2. **8.3 inches of rainfall and snowmelt runoff**. This scenario was based on 6.1 inches of snowmelt runoff plus 2.2 inches of runoff from rainfall (highest rainfall on record for a 24-hour period during April)

In recent weeks, the NMCWD considered conducting modeling of the potential snowmelt based on 2019-specific snowpack scenarios to better understand flood potential throughout the watershed. However, since snow water equivalent forecasts to date have been below the 2011 modeled scenarios, the NMCWD has decided to forego modeling of 2019 conditions. This memo instead summarizes results from the 2011 snowmelt modeling analysis and project, to a reasonable extent, how these results might translate to 2019 conditions.

2011 Snowmelt Modeling Methodology and Results

The NMCWD 2011 snowmelt modeling analysis included a 10-day snowmelt event and a 10-day snowmelt plus rainfall event. The ground was assumed to be frozen- modeled as 100% imperviousness throughout the entire watershed. Initial lake levels were set based on NMCWD's late-January 2011 lake

level readings (typically collected at the end of each month). A copy of a February 25, 2011 presentation that provided additional information on modeling assumptions is included as Attachment 1.

The following sections briefly summarize the results from the NMCWD 2011 modeling analysis for the creek system and select lakes/water basins. Please note that the 2011 modeling results and other information presented in this memo are summarized for general informational purposes only and should not be relied on for any official purpose. Prediction of the extent or duration of flooding is very imprecise and based on many assumptions about snow and ice conditions, storm sewer conditions and how water will move across land and within surface water channels and basins. Any indication of how far flood waters may reach or how long they may persist, generally or with respect to a specific property, is for illustration only. It does not represent the most likely scenario and the Nine Mile Creek Watershed District does not represent any particular level of probability associated with it. Property owners and other interested persons should rely on a licensed surveyor or other professional retained for specific advice concerning their property and should contact their city for information and assistance concerning federal flood insurance, flood risks and response. The NMCWD strictly disclaims any and all warranties on use of the information presented in this memo.

Results- Nine Mile Creek

The NMCWD 2011 snowmelt modeling analysis was focused on evaluating potential flood levels along the Nine Mile Creek system. Predicted flood elevations for the two modeled scenarios were presented in the form of creek flood level profiles and compared with the NMCWD 100-year flood profiles that were in effect at the time (see Attachment 2). Please note that the NMCWD flood elevations reported on the flood profiles in Attachment 2 are based on the National Weather Service Technical Paper 40 (TP-40) rainfall estimates. While the NMCWD flood elevations have since been updated to reflect Atlas 14 rainfall frequency estimates, the updated Atlas 14 flood elevations are <u>not</u> included on the profiles in Attachment 2. A brief summary of 2011 results for the creek system from the two modeled scenarios is provided below:

- **6.1 inches of snowmelt runoff-** Modeled flood levels at creek crossings from the 6.1-inch, 10-day snowmelt event area are all lower than the 2011 NMCWD 100-year flood management elevations, with exception of one location in the lower valley of the creek system (the 102nd Street crossing/MN & Soo railroad crossing). A figure showing the

- **8.3 inches of rainfall and snowmelt runoff**- Modeled flood levels at creek crossings from the 8.3-inch,10-day snowmelt and rainfall event are higher than the 2011 NMCWD 100-year flood management elevations in several locations, including:
    - Bryant Lake/Willow Creek Road (Eden Prairie)
    - Portions of the Braemar Golf Course (Edina)
    - County Ditch 34, upstream of I-494 (Eden Prairie)
    - 102nd Street and MN & Soo railroad crossings (Bloomington)

A tabular summary of 2011 snowmelt modeling results along the Nine Mile Creek system is included as Attachment 3.

Results- select lakes and water basins

As mentioned above, the 2011 snowmelt modeling analysis was focused on evaluating potential flood levels along the creek system. A summary of estimated high water levels for several lakes and other waterbodies was also compiled as part of the 2011 modeling analysis. These model results, summarized in Table 1, received minimal QA/QC and should be considered as rough approximations.

Comparison of 2011 and 2019 Conditions

The current snow water equivalent forecast throughout the Nine Mile Creek watershed ranges from 2-6 inches (see Figure 2). With an additional 1 to 1.5 inches of rainfall anticipated over March 13-14 and warming temperatures that will induce snowmelt, the amount of potential runoff anticipated appears to be near or within the range covered by the scenarios modeled by NMCWD in 2011. However, a significant difference between 2019 and 2011 conditions is that the starting water levels in many of the lakes and other waterbodies are higher in 2019 than in 2011. Table 1 compares the measured lake levels in January 2011 and January 2019. 2019 lake levels are higher for the majority of the evaluated lakes/water basins, with measured water levels several feet higher in 2019 than in 2011 in several of lakes (primarily many of the land-locked lakes and lakes with high-level outlets).

Approximation of Potential Snowmelt/Spring Runoff Flood Elevations based on 2019 Lake Levels

The preferred approach to estimate potential 2019 flood elevations would be to re-run the NMCWD snowmelt models using the 2019 measured lake levels as an initial condition. However, due to time constraints, we have instead adjusted (increased) the 2011 predicted flood elevations by the difference in measured lake levels for waterbodies with January 2019 water levels higher than the January 2011 measurements. While this is a gross approximation, it should provide a conservative estimate of potential 2019 flood elevations corresponding to the two modeled snowmelt/runoff scenarios (6.1 inches of snowmelt runoff and 8.1 inches of rainfall and snowmelt runoff) for evaluated lakes and other waterbasins. For the creek system, it should be noted that flood elevations corresponding to the two modeled snowmelt/runoff scenarios could be higher in 2019 than the 2011 estimates due to higher starting water levels for lakes along the creek system and throughout the watershed.

The 2019 approximated potential flood elevations for the two modeled scenarios (6.1 inches of snowmelt runoff and 8.1 inches of rainfall and snowmelt runoff) are summarized in Table 1, along with the Atlas 14 flood elevations, where available. Inundation extents corresponding to the 2019 approximated potential flood elevations for the evaluated lakes/water basins were mapped to help identify potential impacts to structures. The potential inundation extents for the two modeled scenarios are presented in Figures 3-8. The list the lakes/water basins shown on each of the figures is provided below:

Figure 3- Glen Lake, Wing Lake, Lake Rose (Minnetonka)

Figure 4- Birch Island Lake (Eden Prairie); Lone Lake, Minnetoga Lake, Shady Oak Lake (Minnetonka)

Figure 5- Arrowhead Lake (Edina); Bryant Lake, Smetana Lake (Eden Prairie)

Figure 6- Lake Cornelia and upstream waterbodies (Garrison Ponds, Valley View Pond), Lake Edina, Hawkes Lake, Mirror Lake (Edina)

Figure 7- North Anderson Lake, Southwest Anderson Lake (Eden Prairie); Southeast Anderson Lake, Bush Lake (Bloomington)

Figure 8- Oxboro Lake, Penn Lake, Skriebakken Pond, Wanda Miller Pond (Bloomington)

Review of the inundation extents for the evaluated lakes/water basins indicates potential impacts to structures at several of the waterbodies for the 6.1-inch snowmelt event and/or the 8.3-inch snowmelt and rainfall event scenarios. While not included with this memo, identification of specific structures within the mapped inundation extents can be provided upon request.

It is important to note that this memo summarizes 2011 modeling results and 2019 approximated potential flood elevations for a select group of lakes and water basins throughout the NMC watershed. There are many other ponds, wetlands, and low areas throughout the watershed that may be at risk for snowmelt/spring runoff flooding but were not evaluated and/or summarized as part of this effort. A more detailed review of flood potential in these localized areas may be warranted by the cities.

Table 1. Summary of 2011 Snowmelt/Runoff Scenario Flood Elevations, January 2011 and 2019 Measured Lake Levels, and 2019 Approximated Potential Flood Elevations

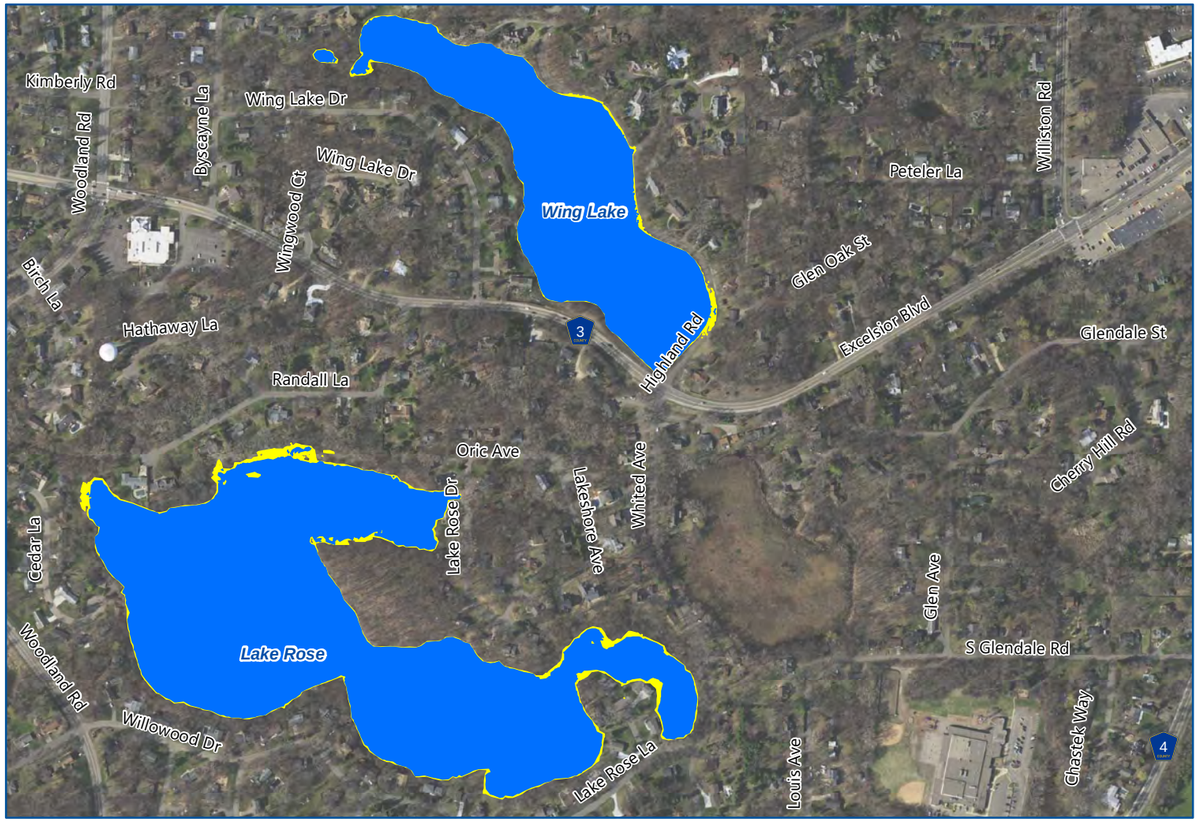
Lake/Pond	Potential Flood Elevation 2011 Snow Scenario (6.1 in Water Equivalent)	Potential Flood Elevation 2011 Snow + Rain Scenario (8.3 in Water Equivalent)	Measured January 2011 Level	Measured January 2019 Level	Difference between 2019 and 2011 measured lake levels (feet)	2019 Approximated Potential Flood Elevation: 6.1 in Water Equivalent Scenario	2019 Approximated Potential Flood Elevation: 8.3 in Water Equivalent Scenario	OHW/ Normal Water Elevation	Atlas 14 100-year Flood Elevation
Bush**	834.1	834.7	831.0	833.1	2.1	836.2	836.8	833.2	835.0
SE Anderson	837.7	838.2	835.3	837.8	2.5	840.2	840.7	839.0	841.0
SW Anderson	839.5	839.7	838.2	839.7	1.5	841.0	841.2	839.0	841.0
N Anderson	838.9	839.3	836.2	839.7	3.4	842.4	842.8	839.0	841.0
Birch Island***	887.8	889.8	877.9	879.3	1.4	889.2	891.2	889.0	[1] 890
Glen***	903.2	904.1	898.8	902.1	3.3	906.5	907.4	904.1	906.0
Shady Oak*	901.1	901.7	899.8	903.2	3.4	904.5	905.1	903.4	906.0
Mirror**	909.3	910.3	906.3	907.7	1.4	910.7	911.7	904.0	911.5
Hawkes**	895.3	897.9	885.4	886.1	0.7	896.0	898.6	885.5	894.6
Edina	823.2	823.8	820.4	821.6	1.2	824.4	825.0	822.0	826.4
North Cornelia	864.1	865.7	859.1	859.1	0.0	864.1	865.7	859.0	864.8
South Cornelia	864.1	865.7	859.1	859.1	0.0	864.1	865.7	859.0	864.6
North Garrison	864.3	865.7	863.5	863.0	-0.5	864.3	865.7	863.0	867.7
South Garrison	864.4	865.7	861.9	861.8	-0.1	864.4	865.7	862.9	866.3
Valley View	865.0	865.9	862.3	862.7	0.4	865.4	866.3	864.5	868.3
Oxboro	809.4	812.3	802.8	803.3	0.5	809.9	812.8	812.0	817.0
Penn	813.6	815.4	805.3	806.6	1.3	814.9	816.7	806.6	817.0
Skriebakken	805.7	806.2	804.2	805.0	0.8	806.5	807.0	802.9	807.7
Wanda Miller	822.9	823.5	820.6	820.5	-0.1	822.9	823.5	821.3	825.2
Pauly's Pond	818.3	818.8	816.2	815.9	-0.3	818.3	818.8	816.6	820.8
Bryant	853.9	855.0	851.0	850.1	-0.9	853.9	855.0	852.6	855.0
Arrowhead*	879.8	881.0	873.5	874.6	1.1	880.9	882.1	875.8	879.9
Rose	927.3	928.2	922.8	923.9	1.1	928.4	929.3	925.9	[1] 928.3
Wing	942.2	942.7	939.1	939.2	0.1	942.3	942.8	939.8	[1] 941.3
Lone*	898.7	899.6	896.4	898.9	2.5	901.2	902.1	901.1	901.0
Minnetoga	898.6	899.4	896.0	896.4	0.4	899.0	899.8	896.4	903.0
Smetana	835.9	836.6	835.1	835.5	0.4	836.3	837.0	835.2	841.0

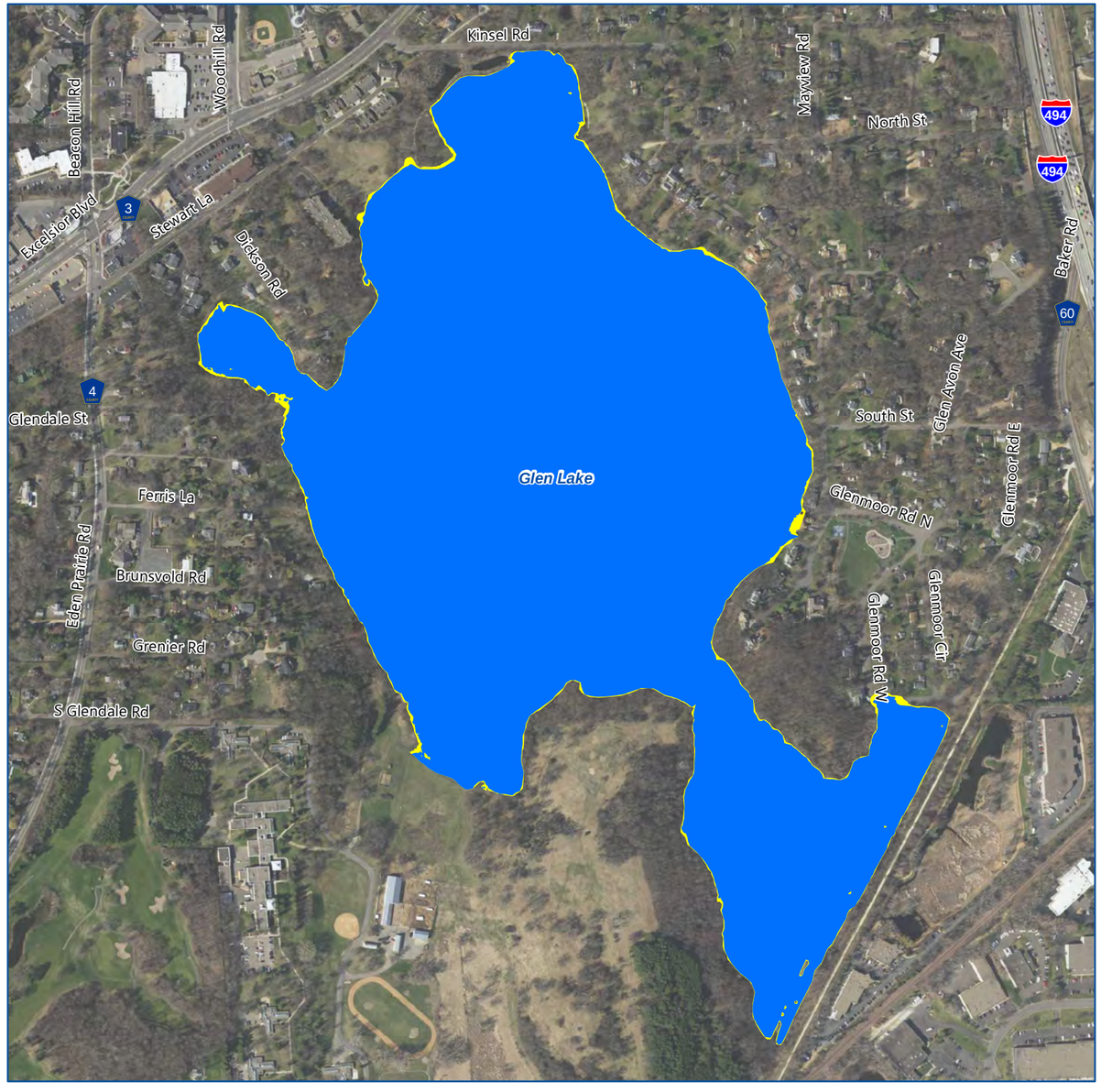
[1] Atlas 14 flood elevation not modeled. Value reported based on 2007 NMCWD Water Management Plan (TP-40 rainfall depths).

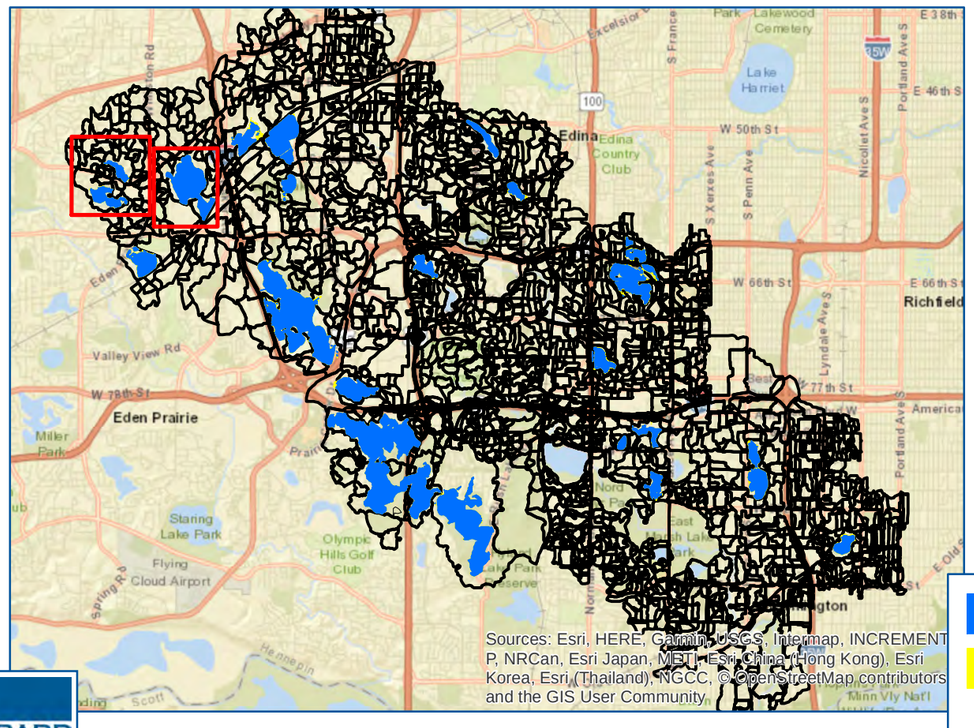
* Land-locked lake

** Pumped outlet

***High surface outlet







Inundation Extent from 6.1-inch Snowmelt

Inundation Extent from 8.3-inch Snowmelt

N

0 375 750 1,500 Feet

APPROXIMATED INUNDATION FROM 2019 SNOWMELT NMCWD

FIGURE 3

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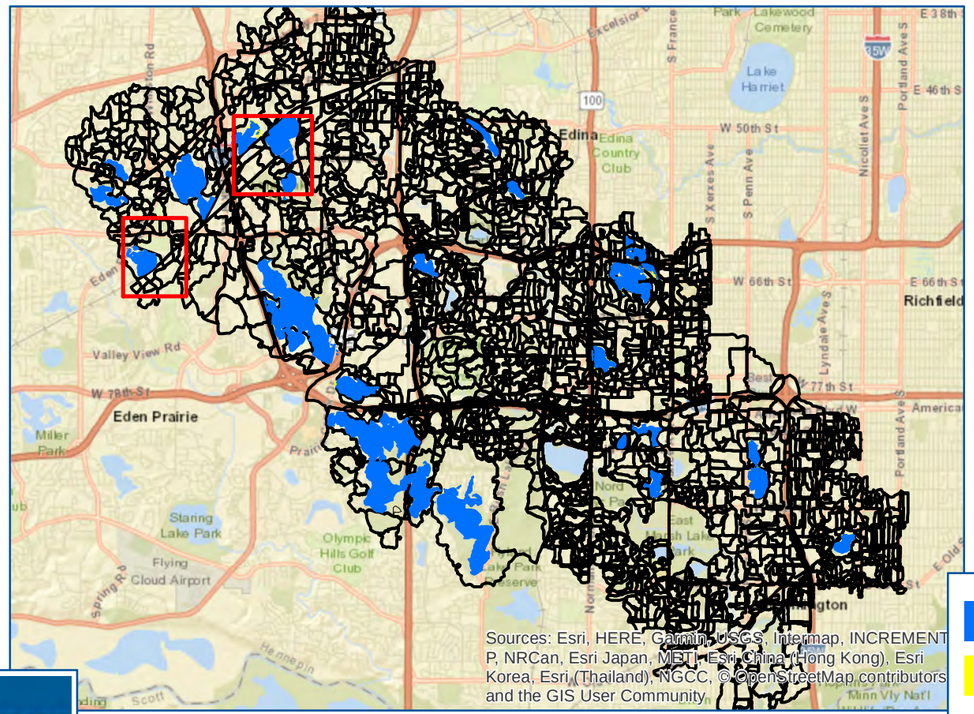

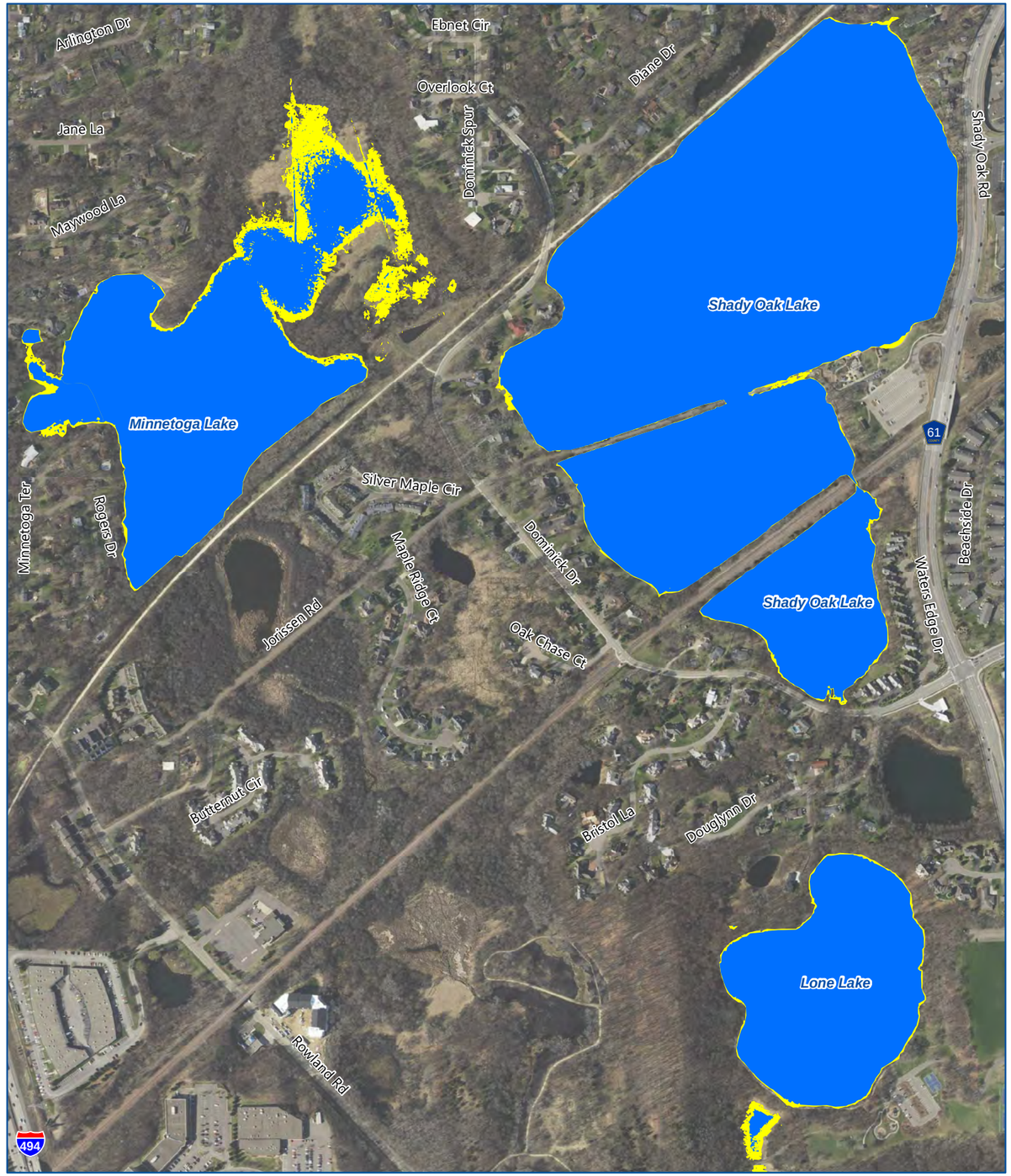

Inundation Extent from 6.1-inch Snowmelt

Inundation Extent from 8.3-inch Snowmelt

N

0 370 740 1,480 Feet

APPROXIMATED INUNDATION FROM 2019 SNOWMELT NMCWD

FIGURE 4

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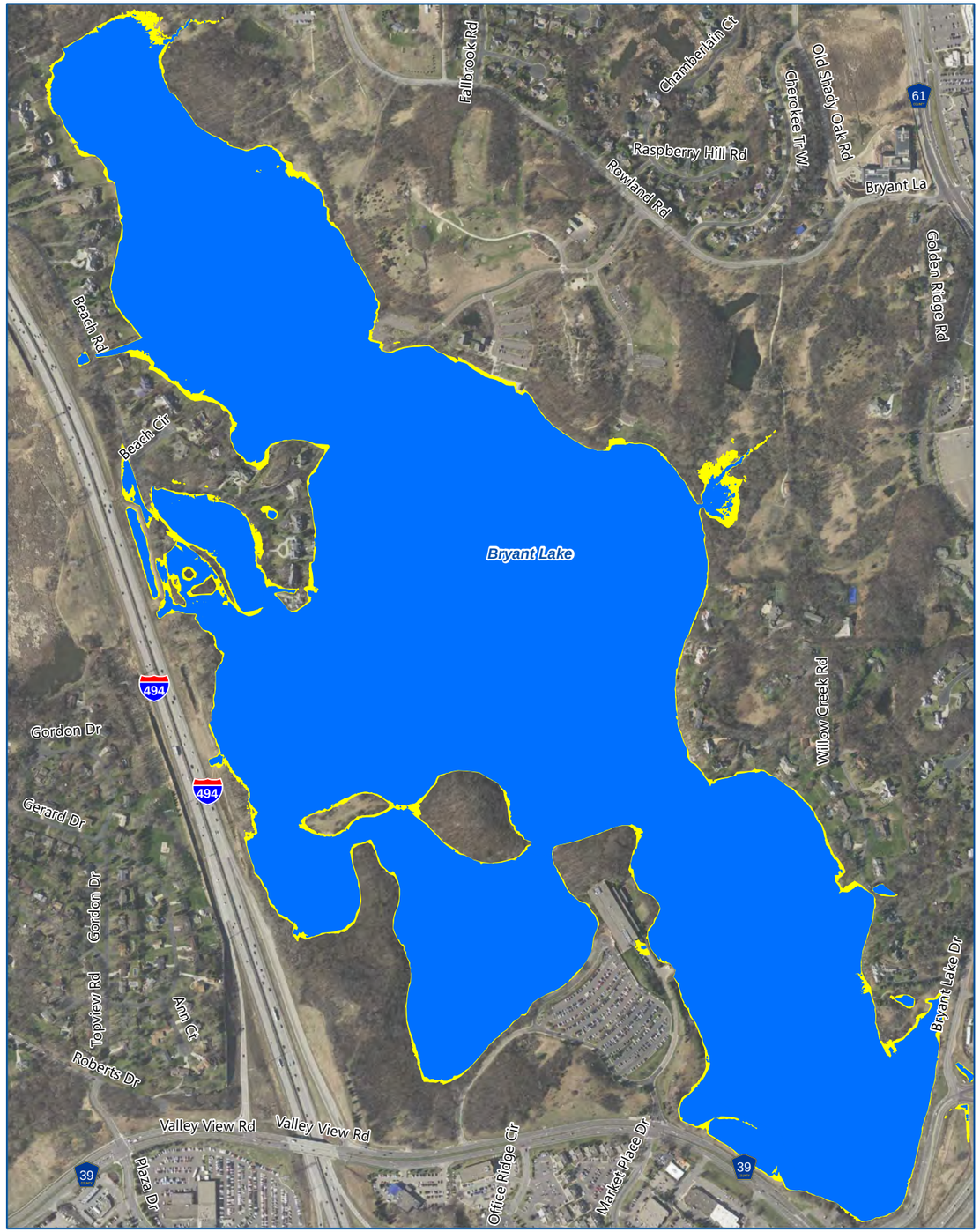
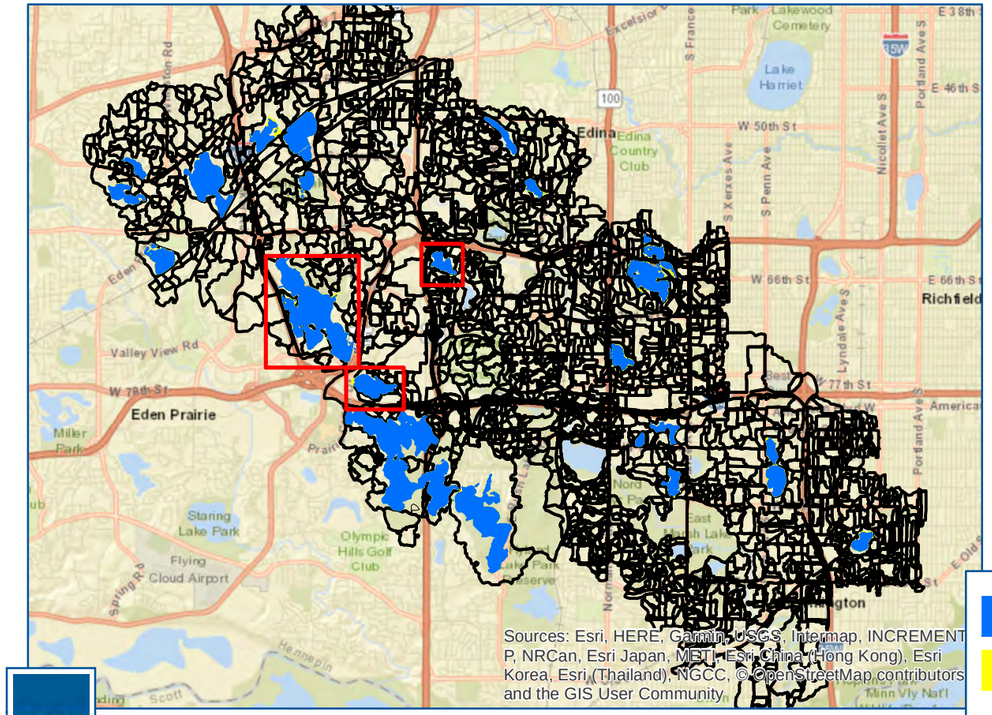
0 200 400 800

Feet

0 250 500 1,000

Feet





0 375 750 1,500

Feet

Inundation Extent from 6.1-inch Snowmelt

Inundation Extent from 8.3-inch Snowmelt

N

APPROXIMATED INUNDATION FROM 2019 SNOWMELT NMCWD

FIGURE 5

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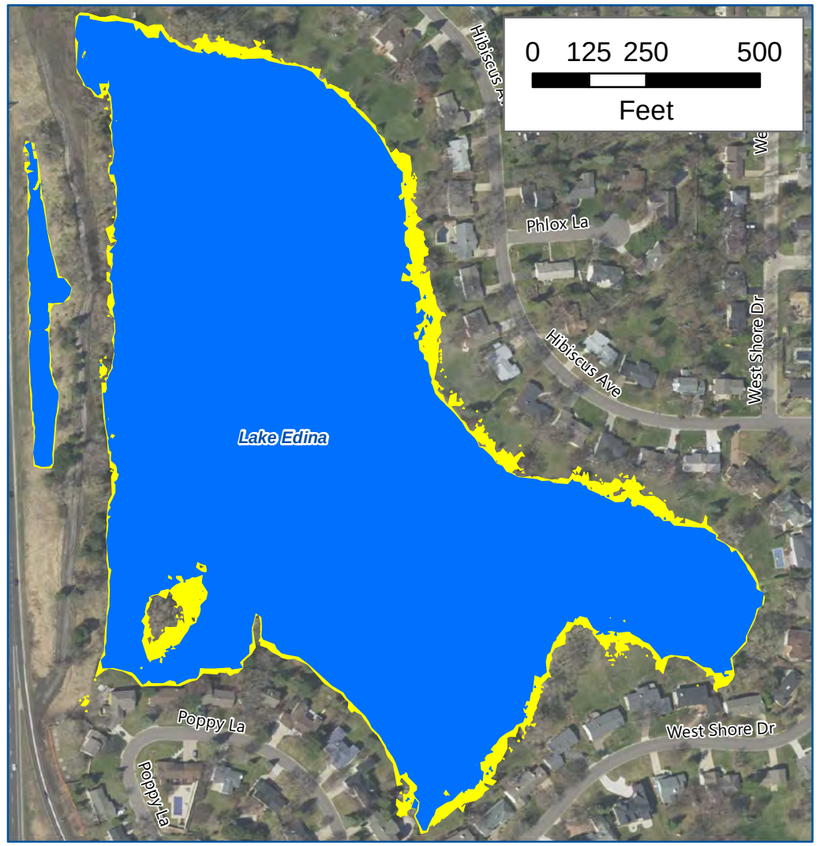

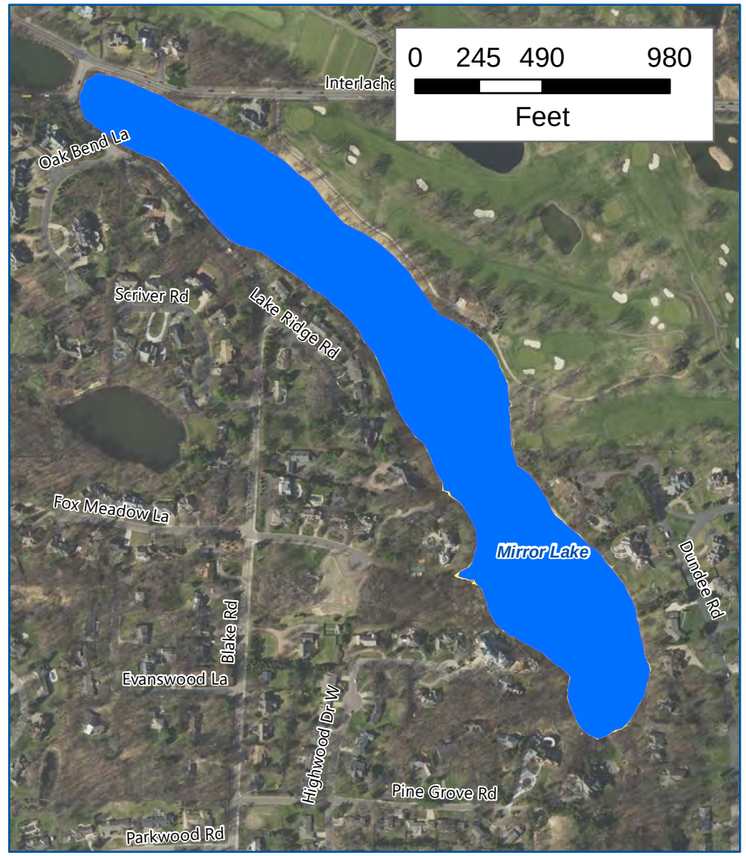

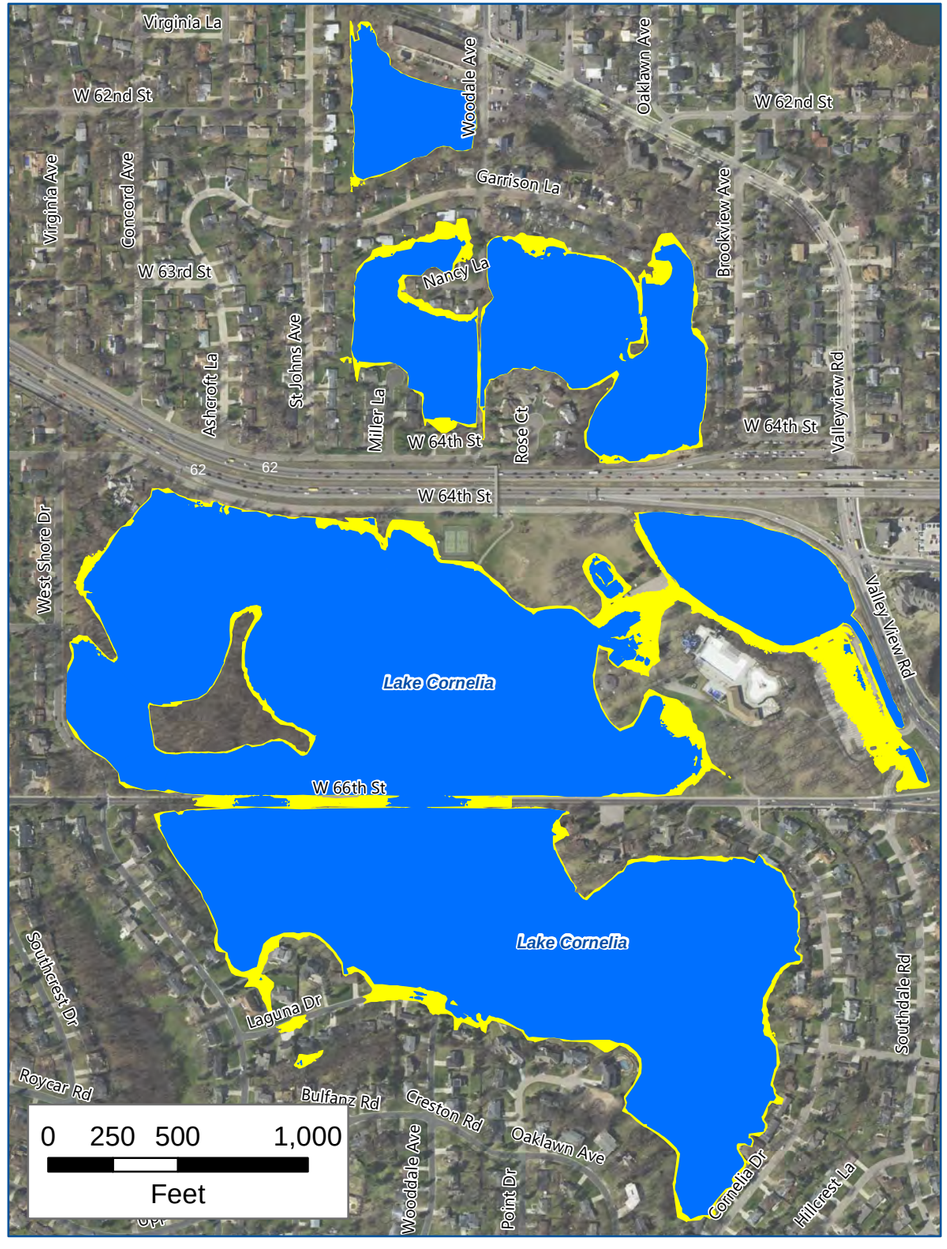

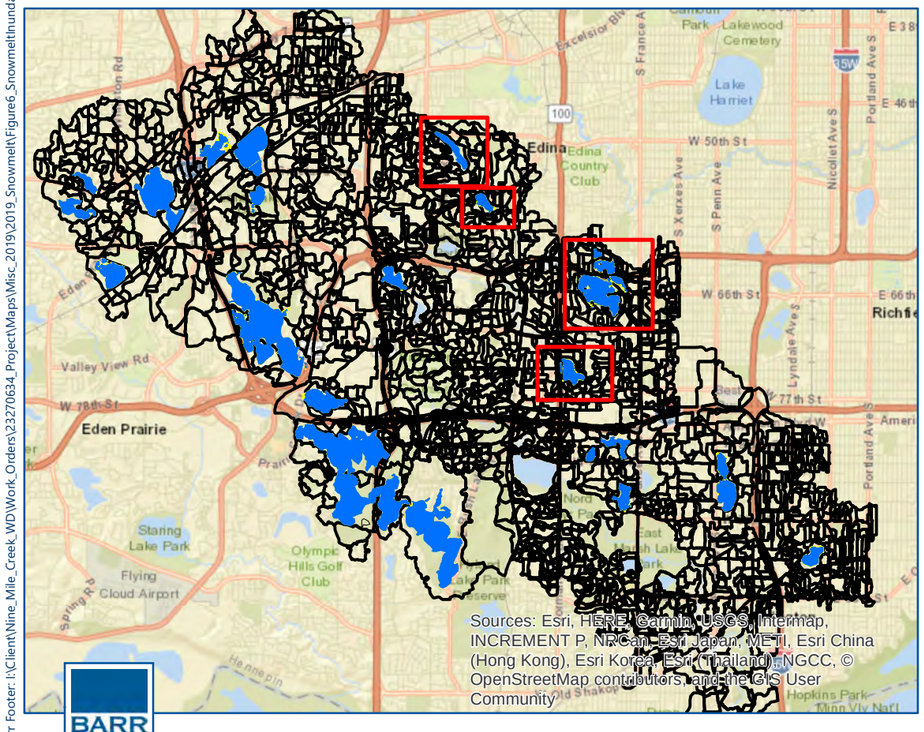

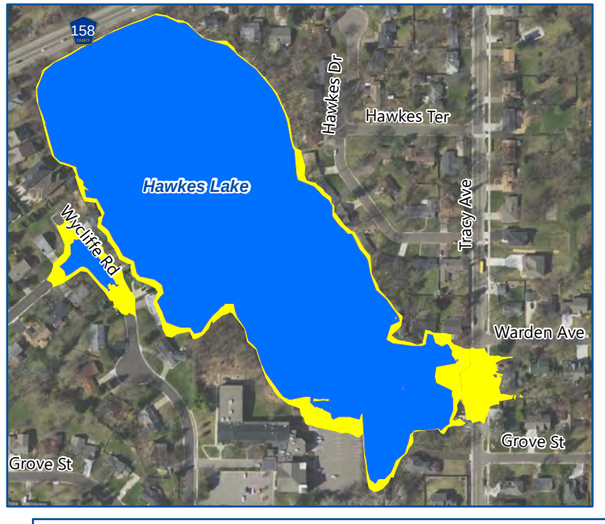

0 250 500
Feet

Inundation Extent from 6.1-inch Snowmelt

Inundation Extent from 8.3-inch Snowmelt

N

APPROXIMATED INUNDATION FROM 2019 SNOWMELT NMCWD

FIGURE 6

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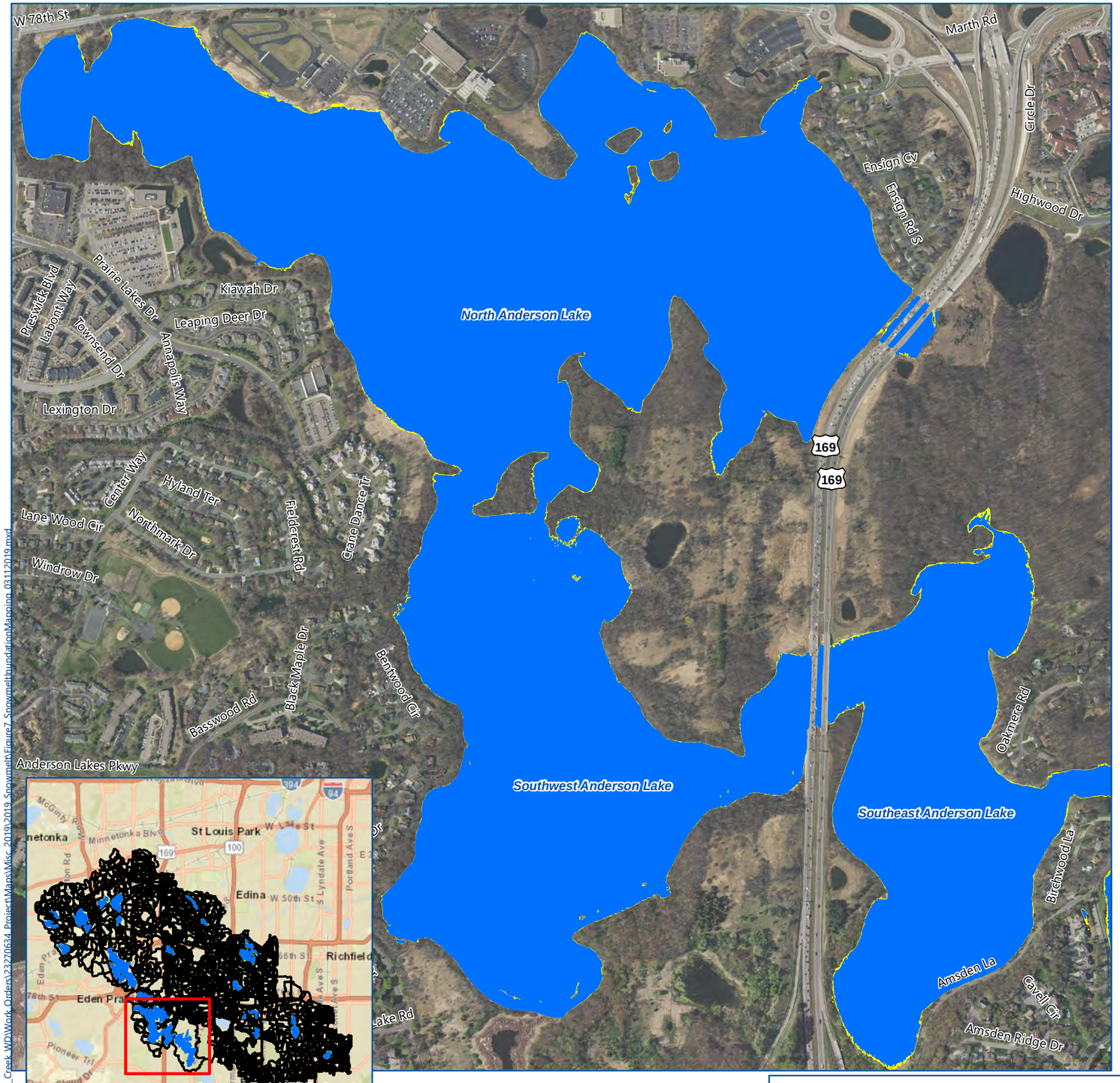

Inundation Extent from 6.1-inch Snowmelt

Inundation Extent from 8.3-inch Snowmelt

N

0 450 900 1,800

Feet

APPROXIMATED INUNDATION FROM 2019 SNOWMELT NMCWD

FIGURE 7

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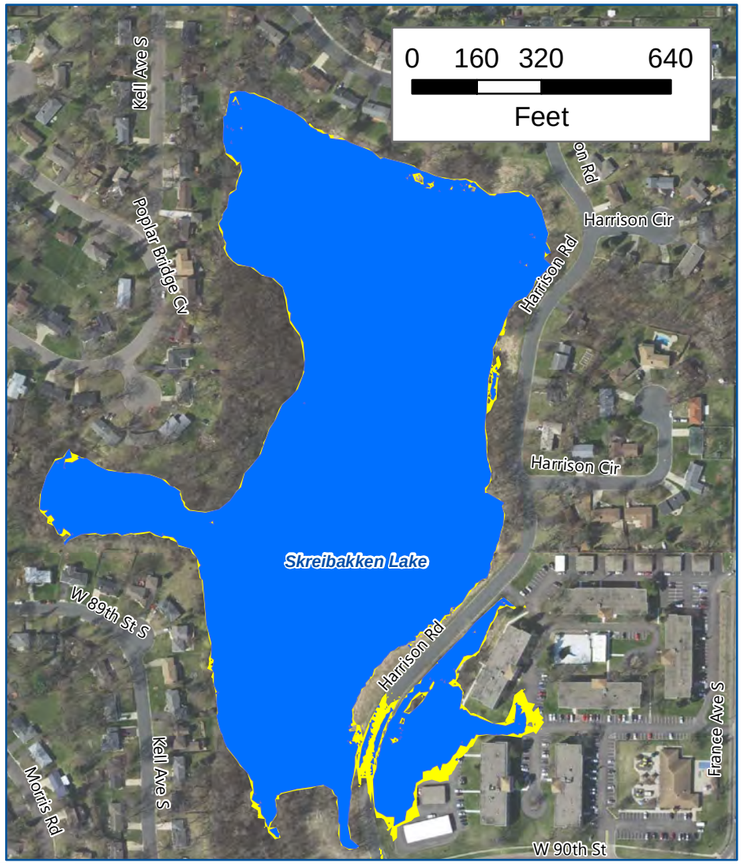

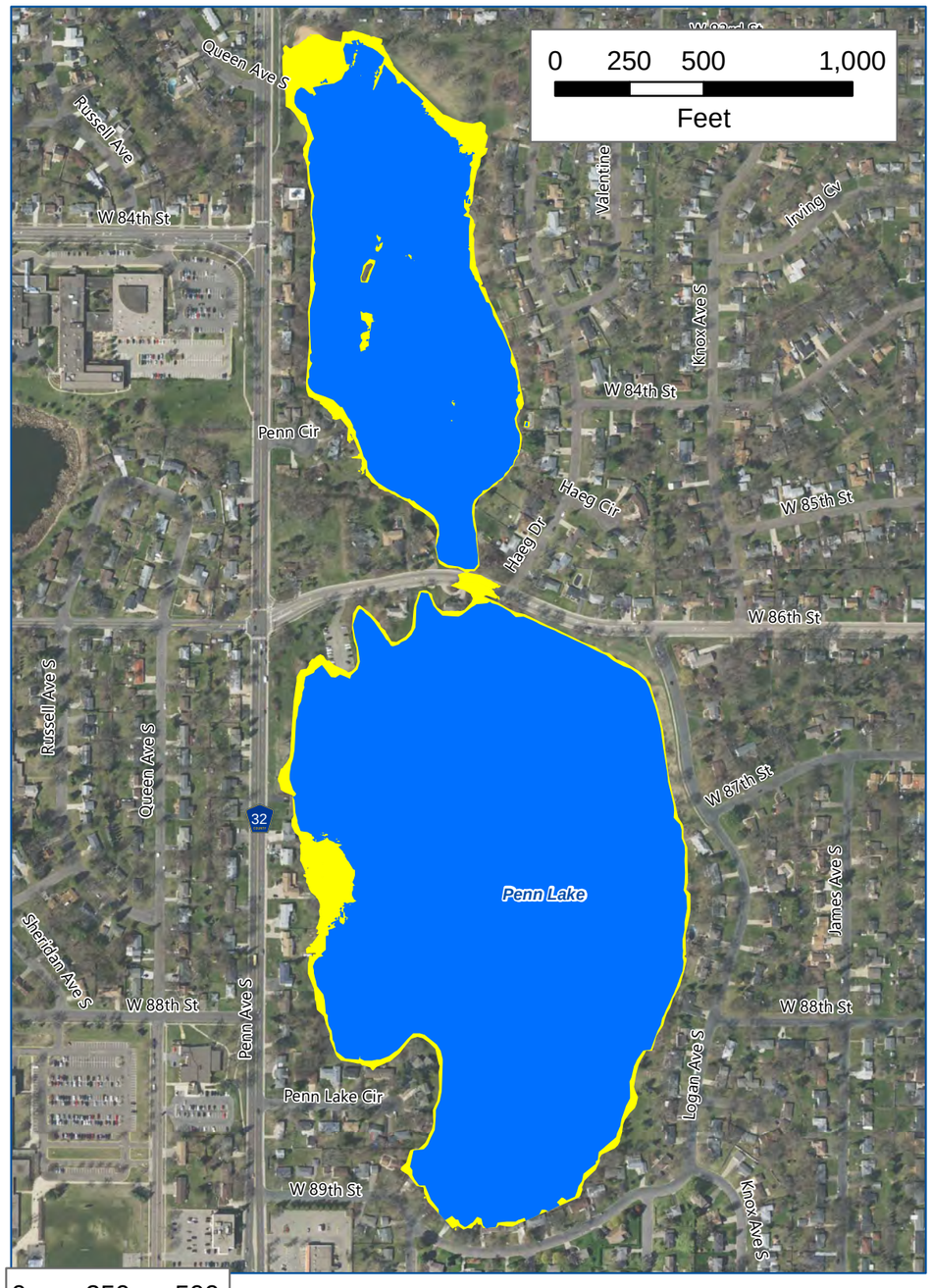

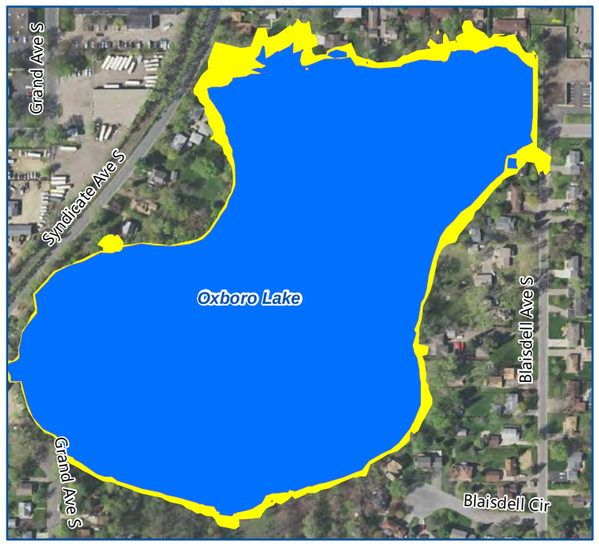

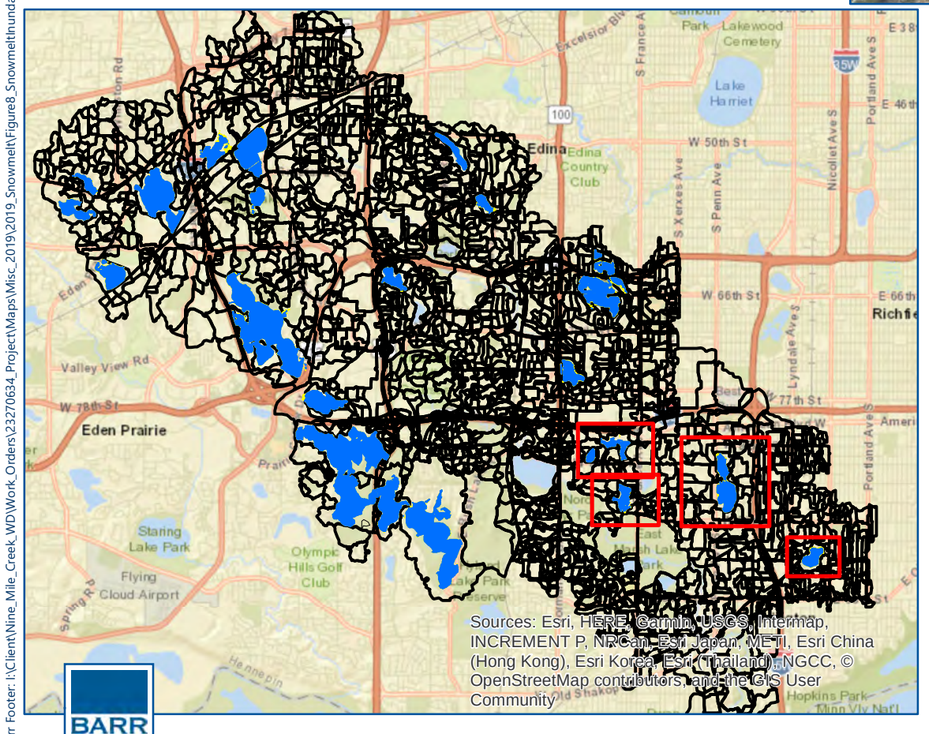

0 250 500
Feet

Inundation Extent from 6.1-inch Snowmelt

Inundation Extent from 8.3-inch Snowmelt

N

APPROXIMATED INUNDATION FROM 2019 SNOWMELT NMCWD

FIGURE 8

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Attachment 1

Modeling of Potential 2011 Snowmelt Scenarios for Nine Mile Creek

February 25, 2011

Modeling Background

- Nine Mile Creek flood levels estimated using District's XP-SWMM models
- Two runoff scenarios modeled
  - 10-day snowmelt event on frozen ground
  - 10-day snowmelt event + rain event on frozen ground

10-day Snowmelt Scenario

- 6.1 inches of snowmelt runoff
  - Based on snow water content through late-January (~3.5 inches) plus normal precipitation for February (~0.8 inches) & March (~1.8 inches)
- Assumption of 100% impervious ground
- Lake levels set from late-January readings

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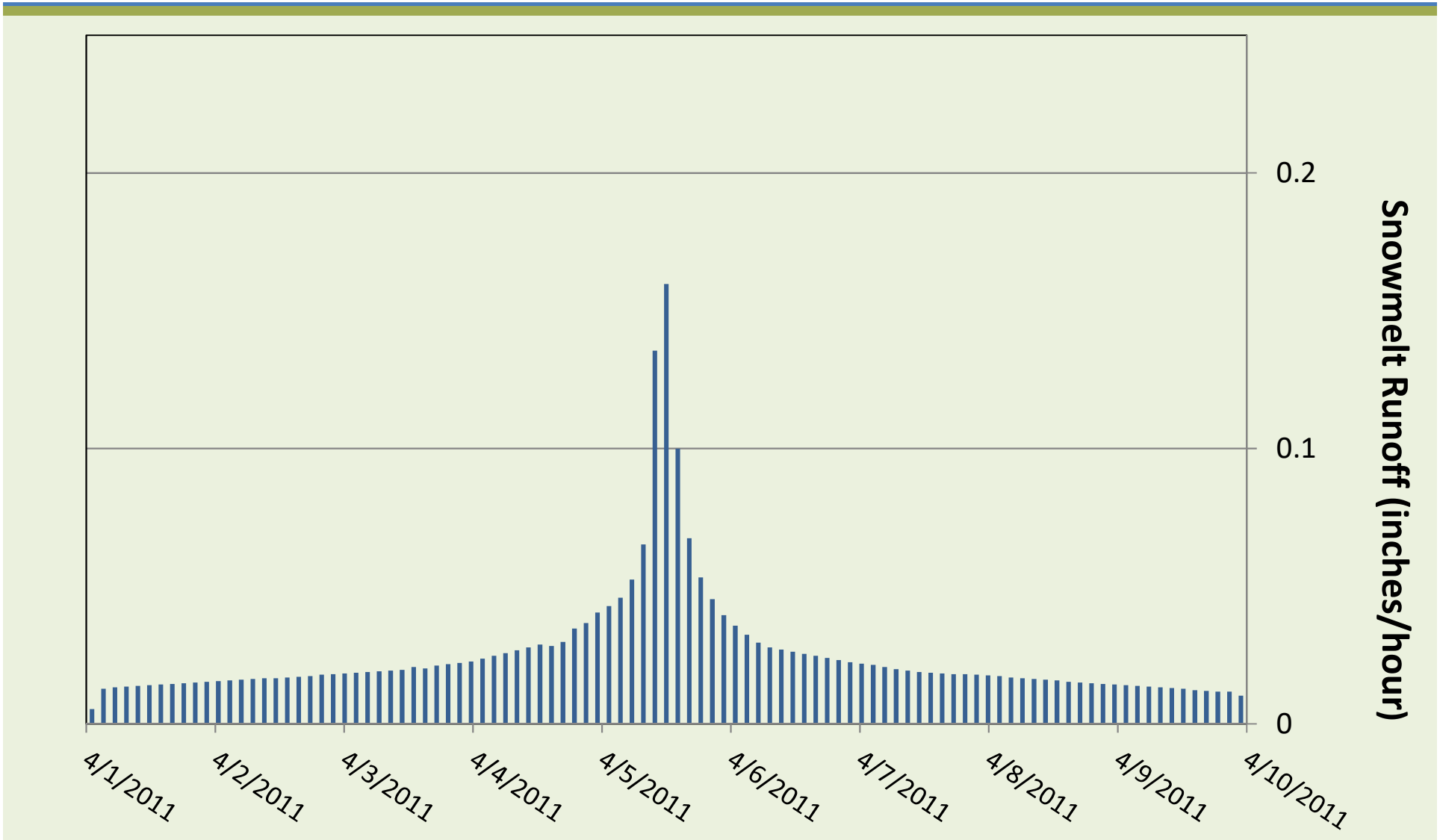
Distribution for 10-day Snowmelt



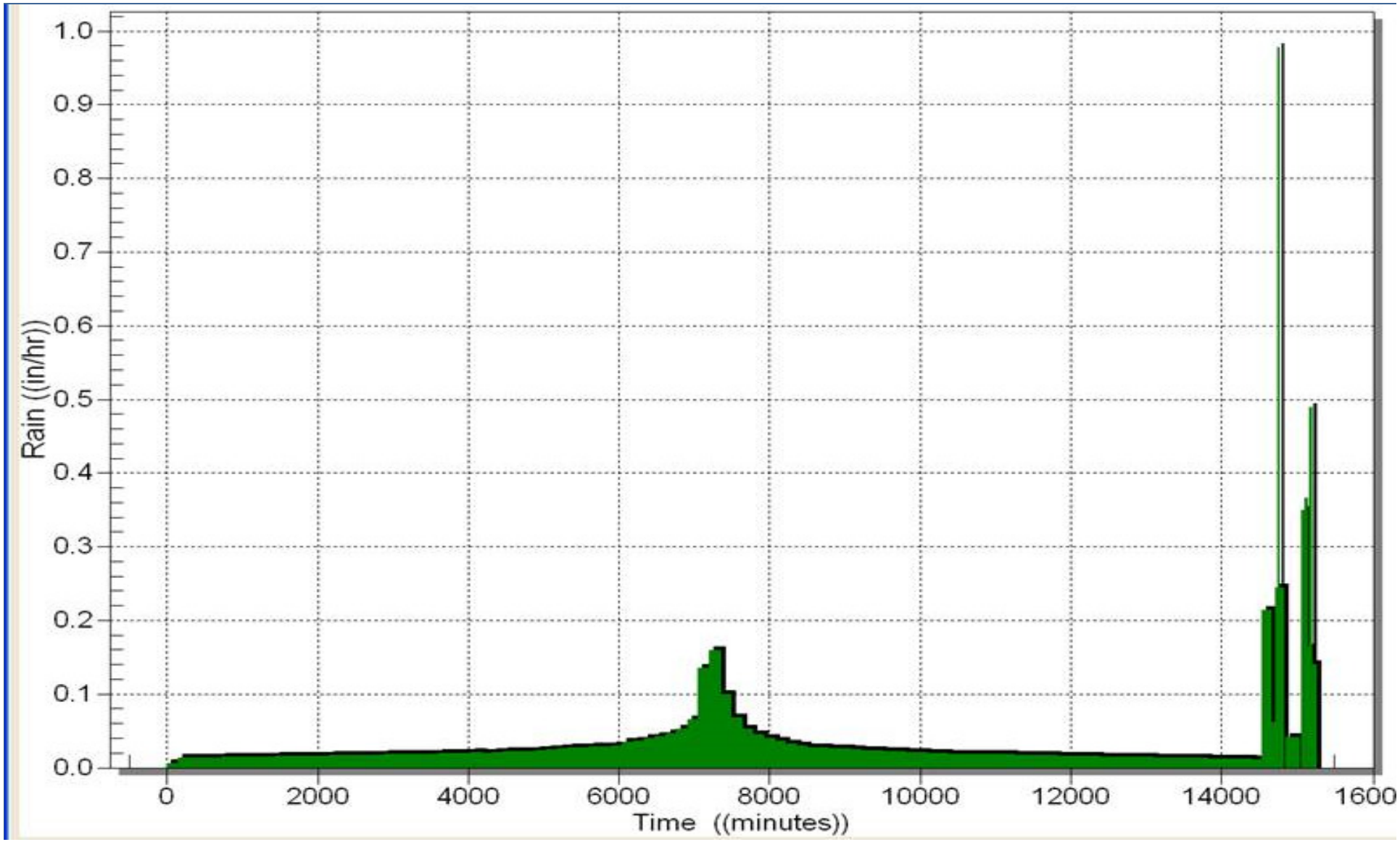
10-day Snowmelt + Rainfall Scenario

- 6.1 inches of snowmelt runoff

  +

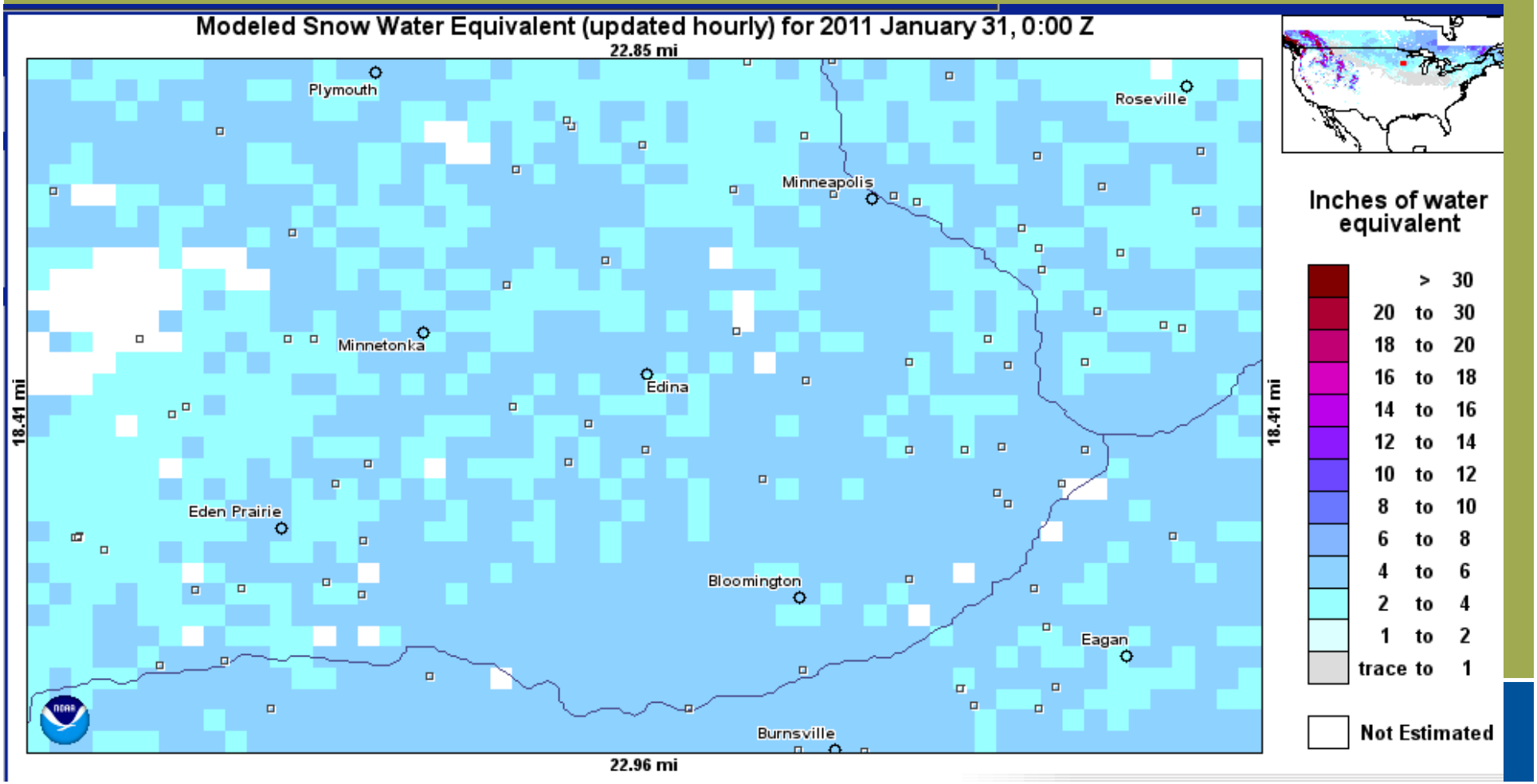
- 2.2 inches of runoff from rainfall
  - Highest on record for a 24-hour period during April (April 1965)
- Assumption of 100% impervious ground
- Lake levels set from late-January readings

Distribution for 10-day Snowmelt + 24-hour Rainfall Event

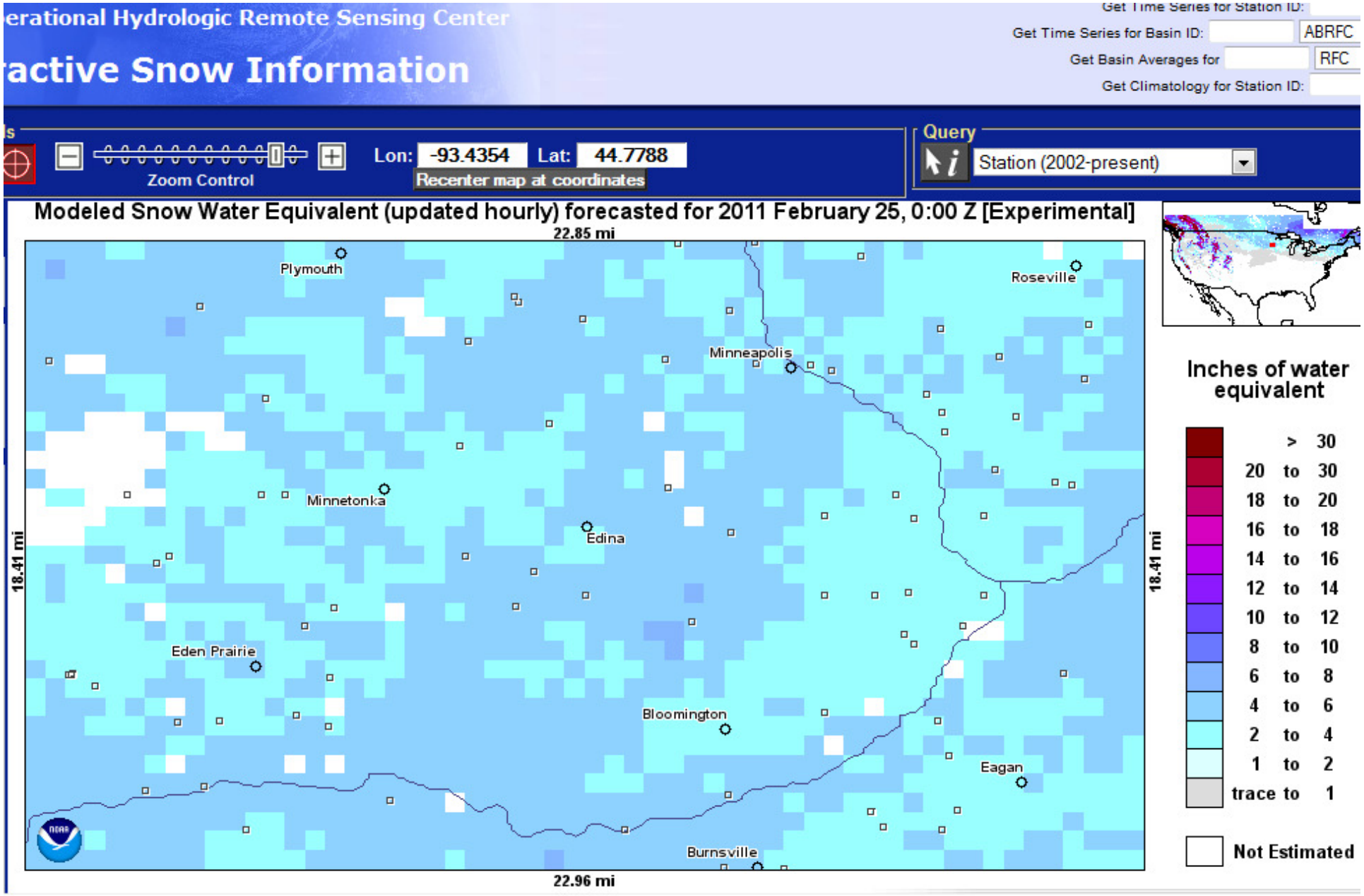


How realistic are these assumptions?

Snow water equivalent as of January 31



Snow Water Equivalent as of Feb. 25th



Shallow frost depths may help reduce spring flooding potential

- Frost penetration inhibited by early and abundant snow cover, despite cold winter temperatures.

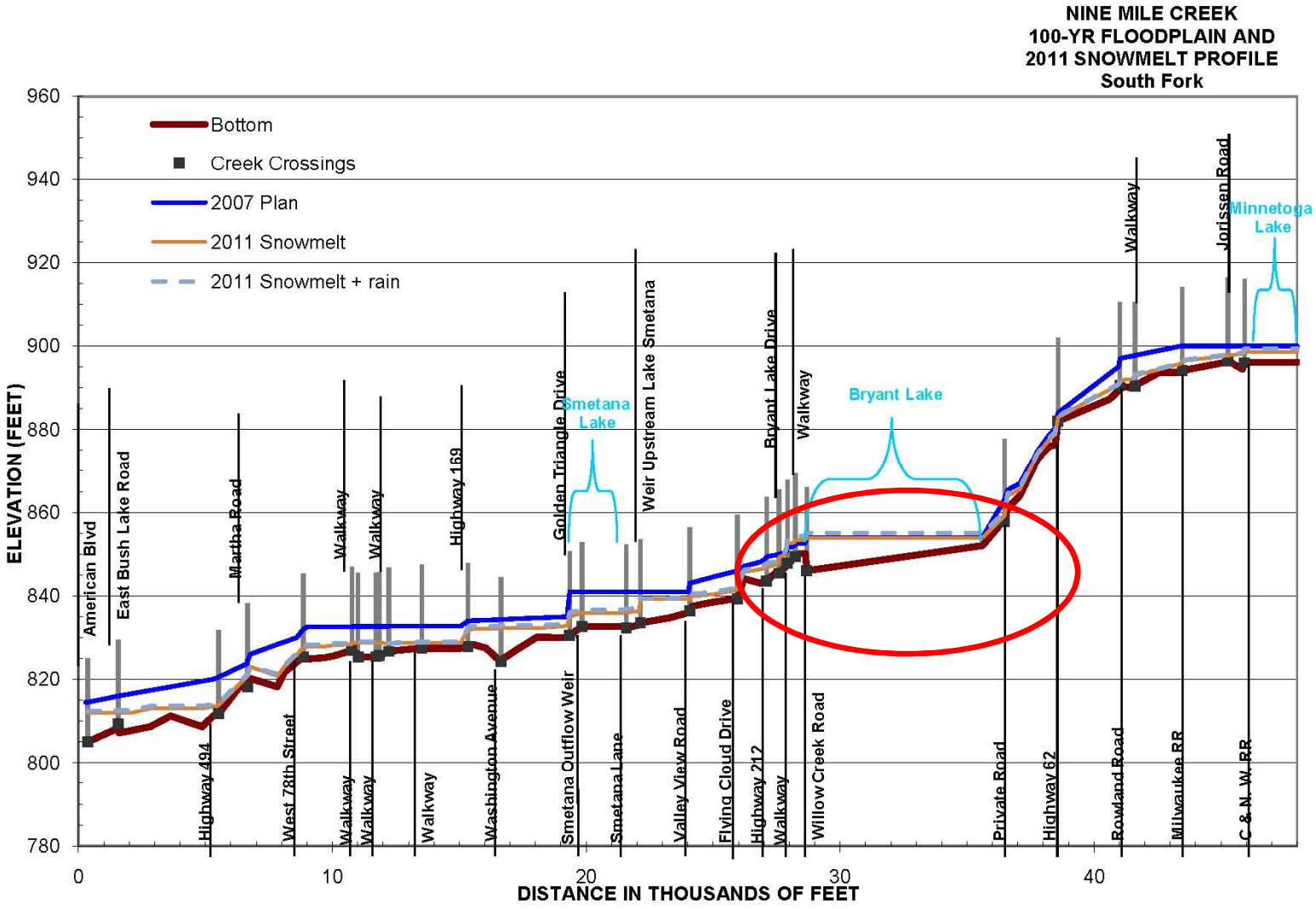
- Frost depths under sod range from near-zero to thirty inches (roughly 12 inches in most locations).

State Climatological Office, February 2, 2011

Modeling Results

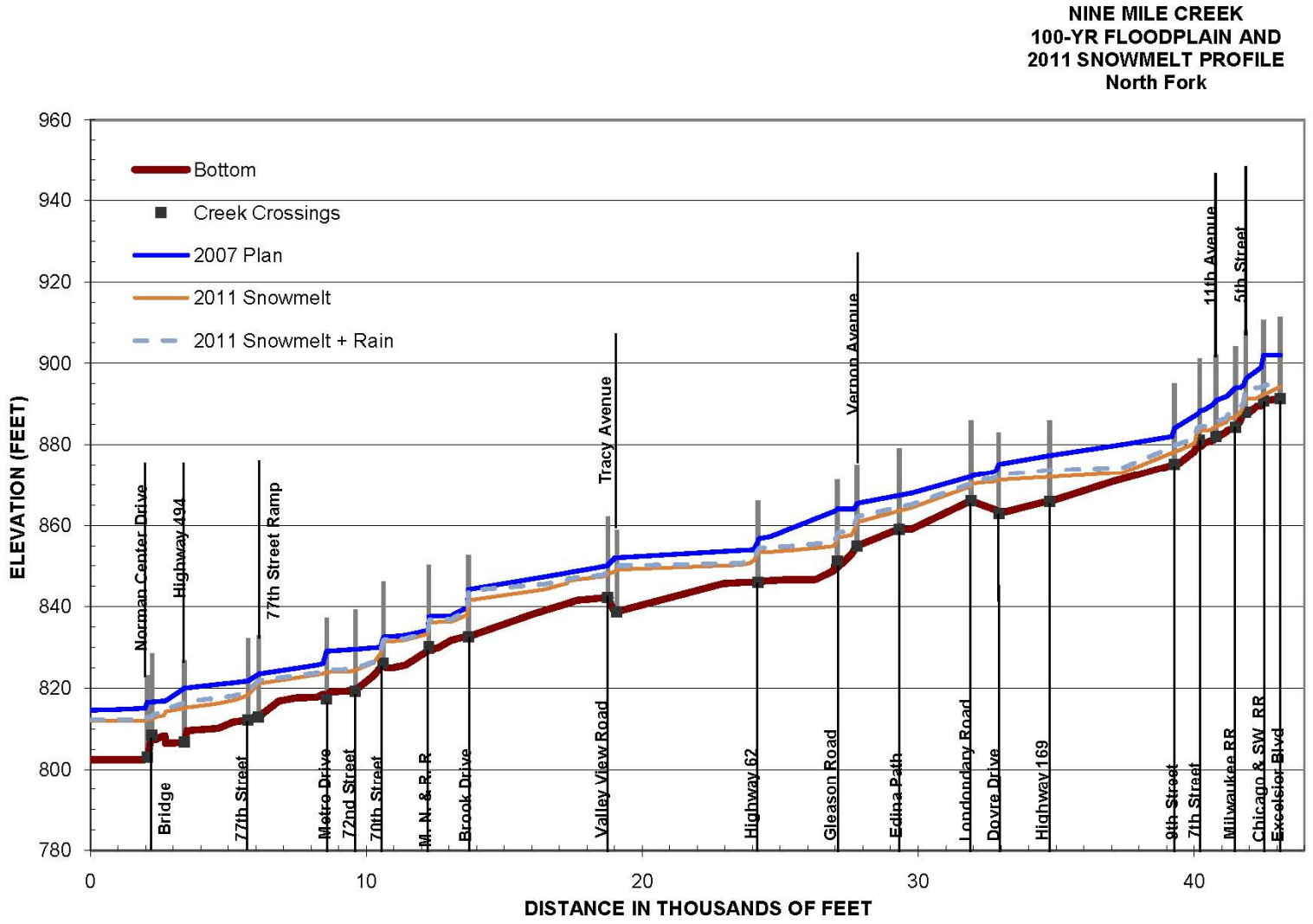
- Flood levels at creek crossings from 10-day snowmelt all lower than NMCWD 100-year management elevations (except 1 location)
- Flood levels on creek from 10-day snow + 24-hour rain event higher than NMCWD management elevations in a few locations

Creek Profile- South Fork



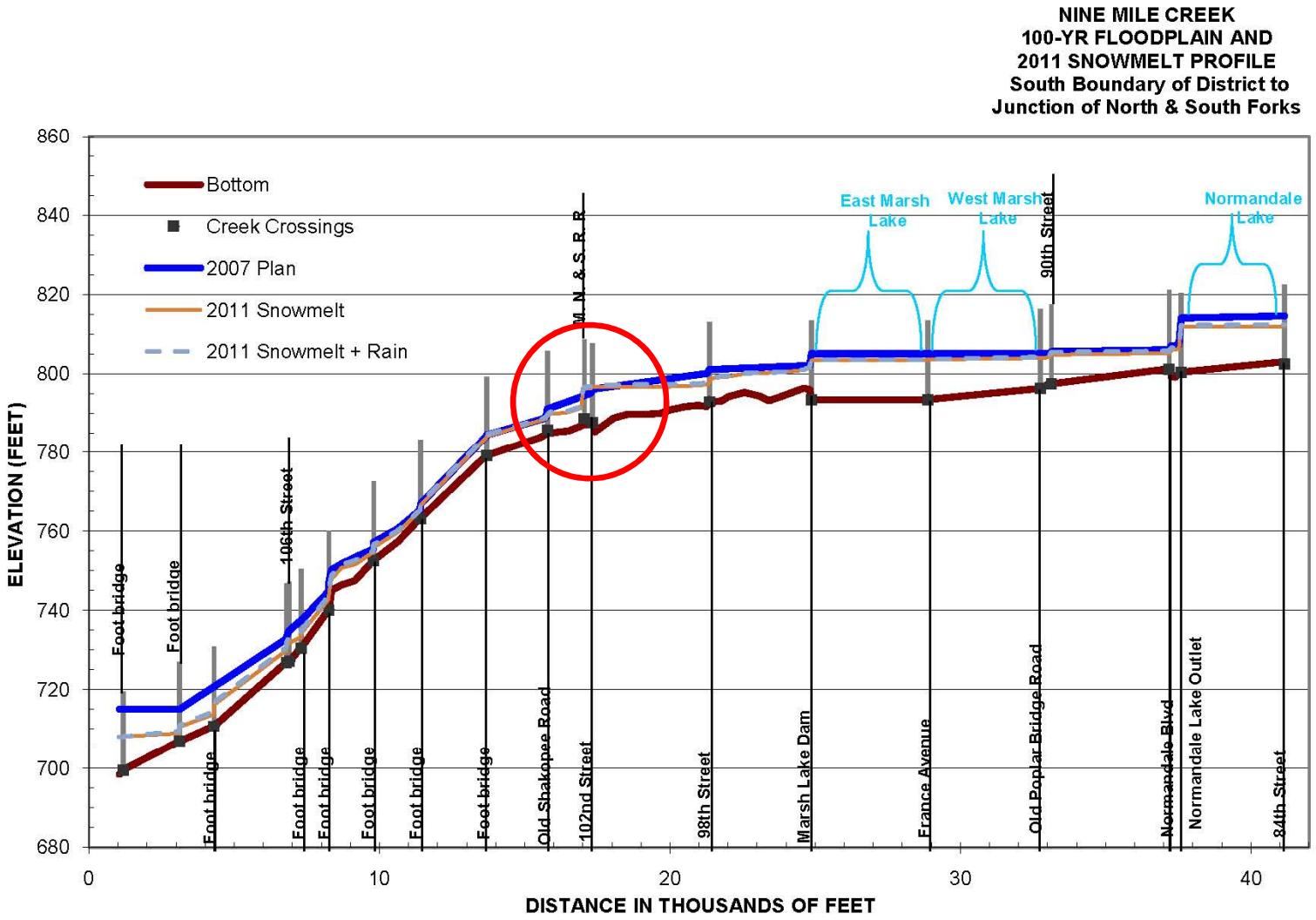
REVISED FEBRUARY 25, 2011

Creek Profile- North Fork



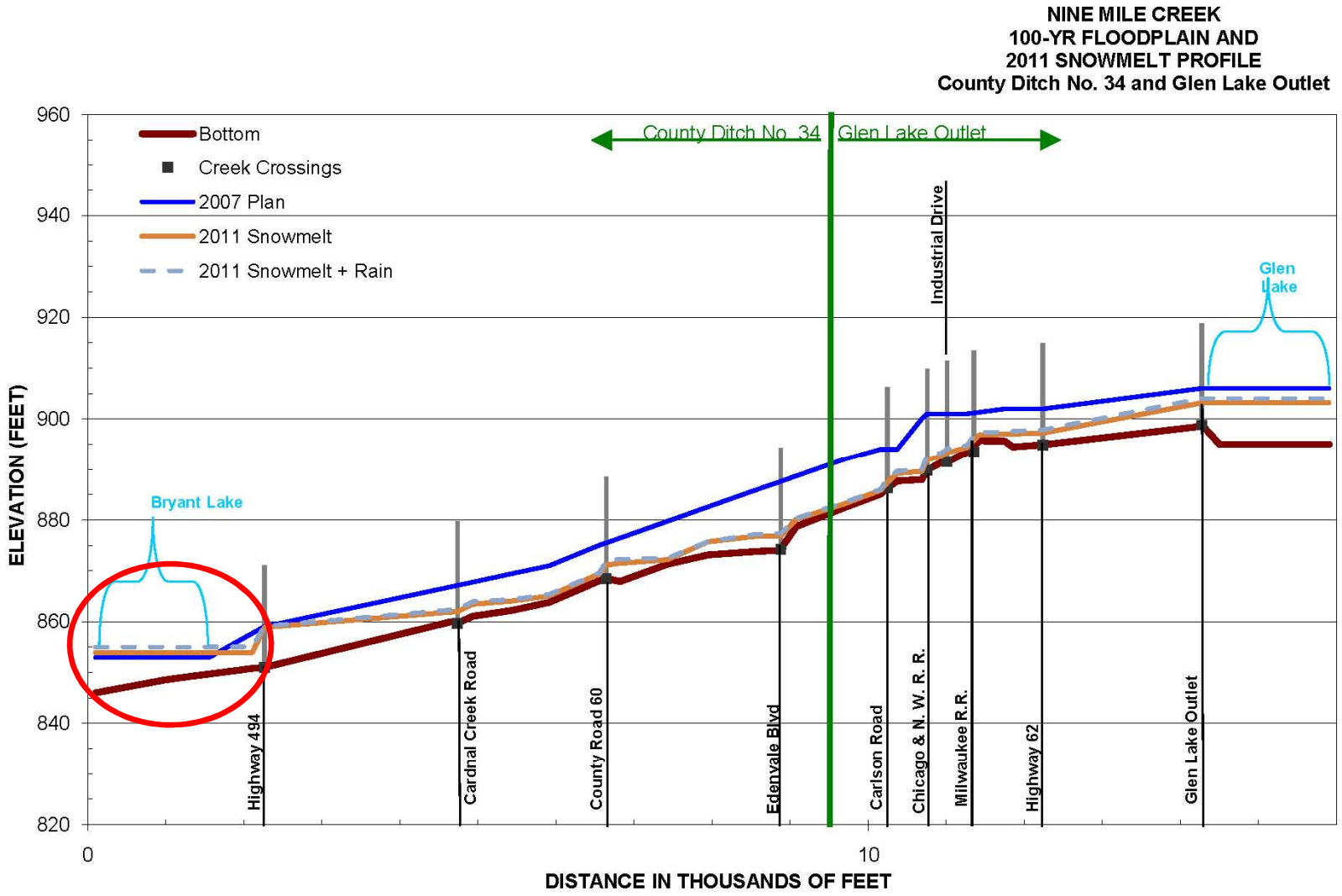
REVISED FEBRUARY 25, 2011

Creek Profile- Lower Valley



REVISED FEBRUARY 25, 2011

Creek Profile- Glen Lake & County Ditch 34



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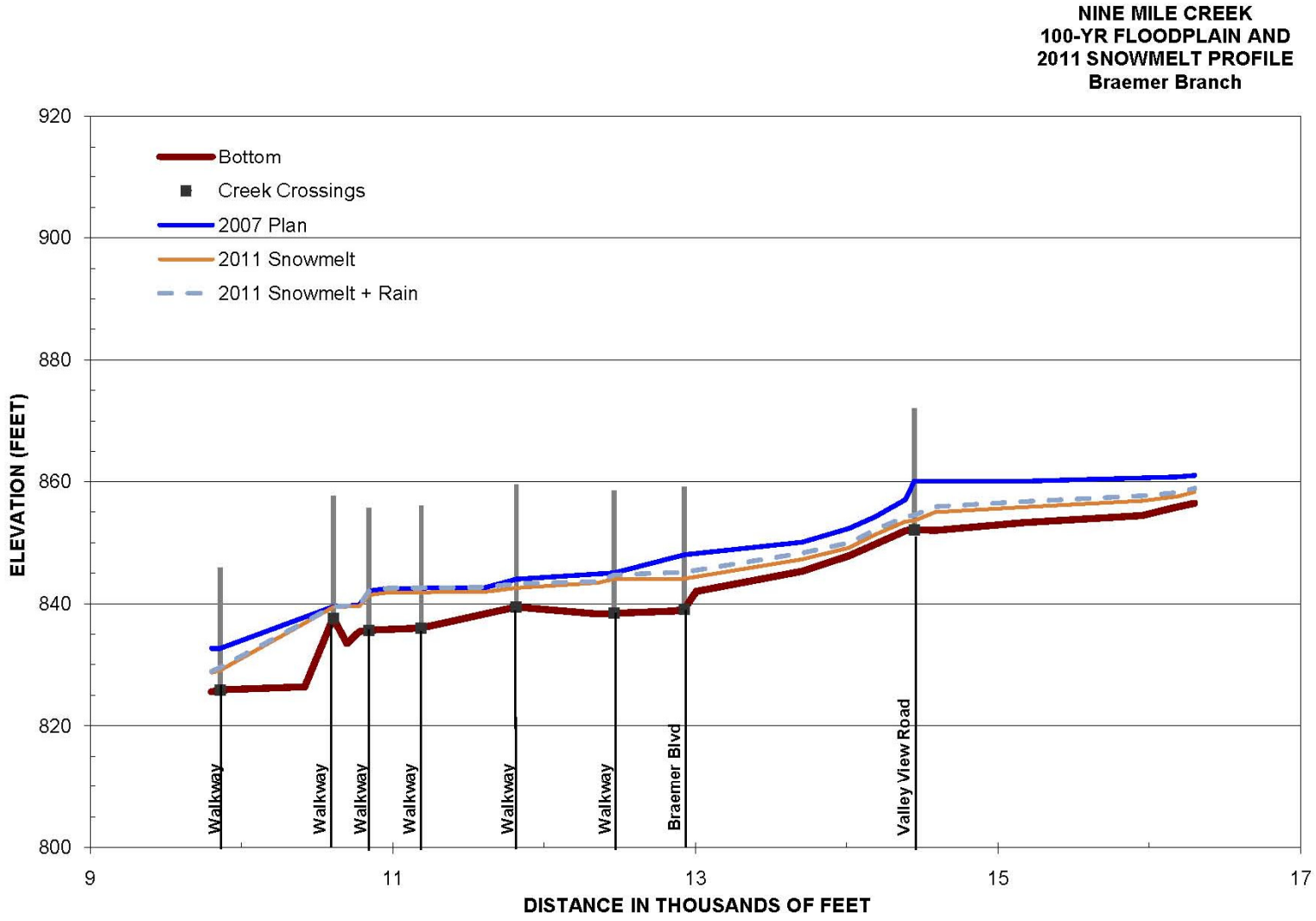
Creek Profile- Braemar Branch



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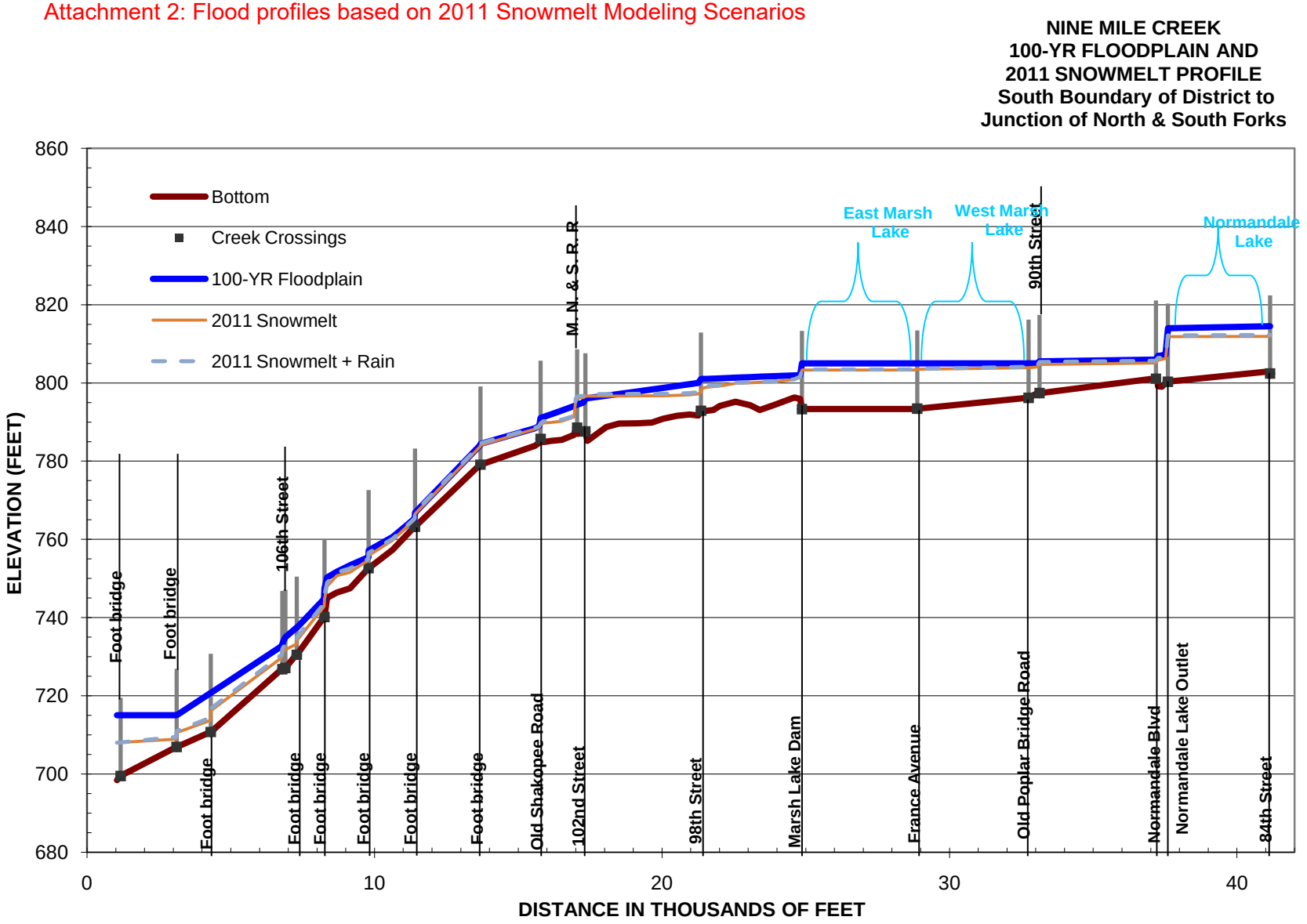
Next Steps?

Attachment 2

Attachment 2: Flood profiles based on 2011 Snowmelt Modeling Scenarios



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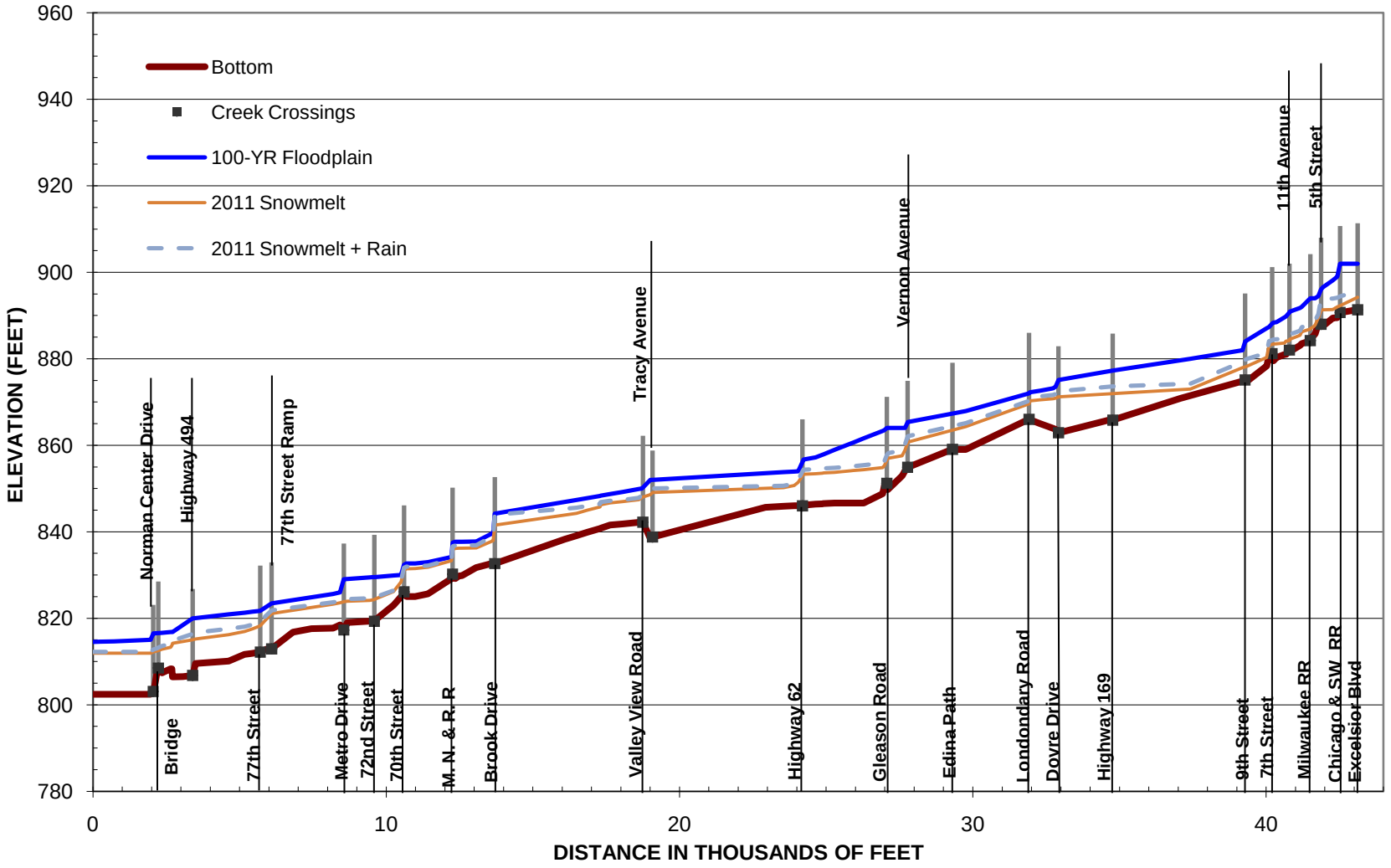
NINE MILE CREEK
100-YR FLOODPLAIN AND
2011 SNOWMELT PROFILE
North Fork



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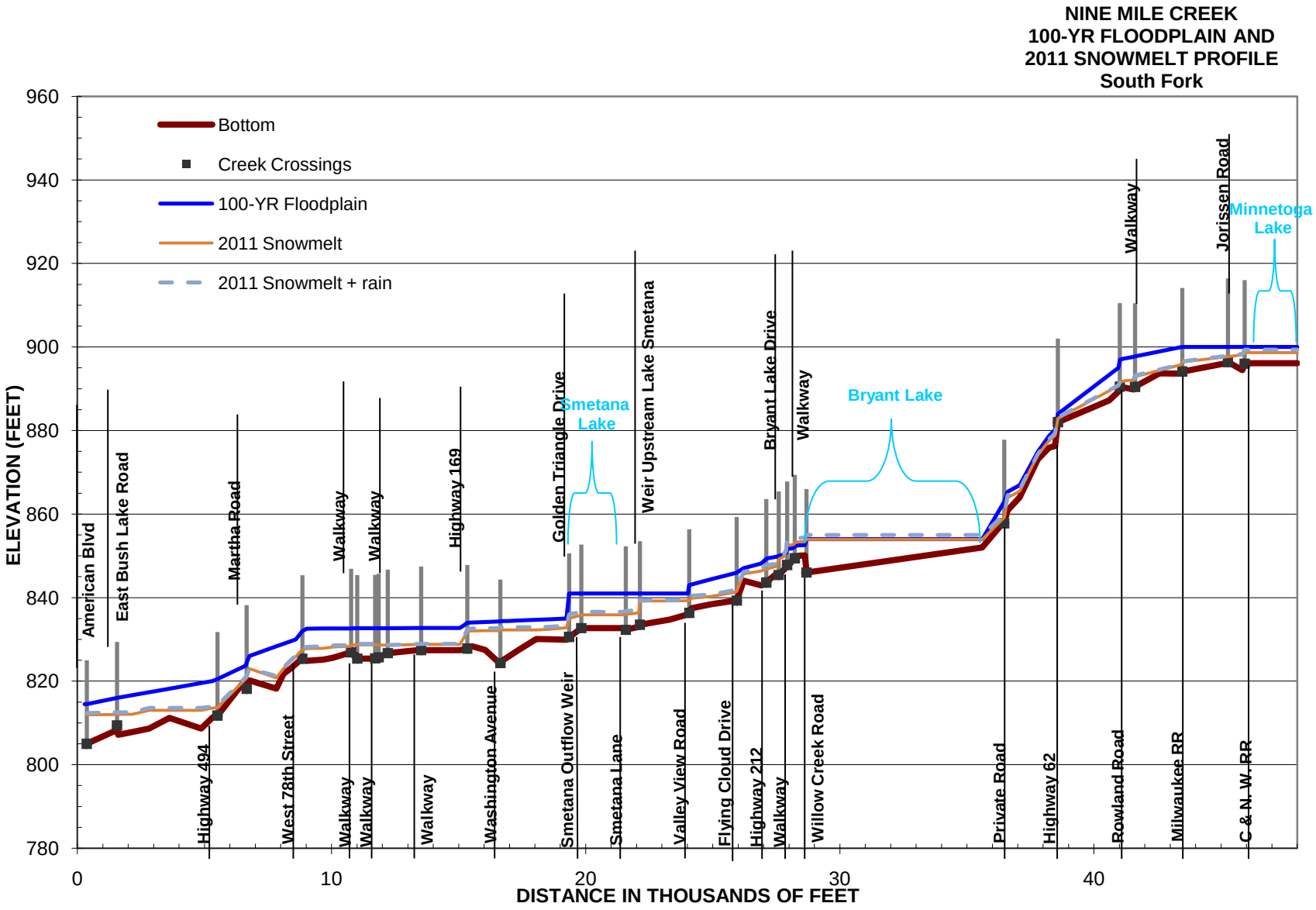

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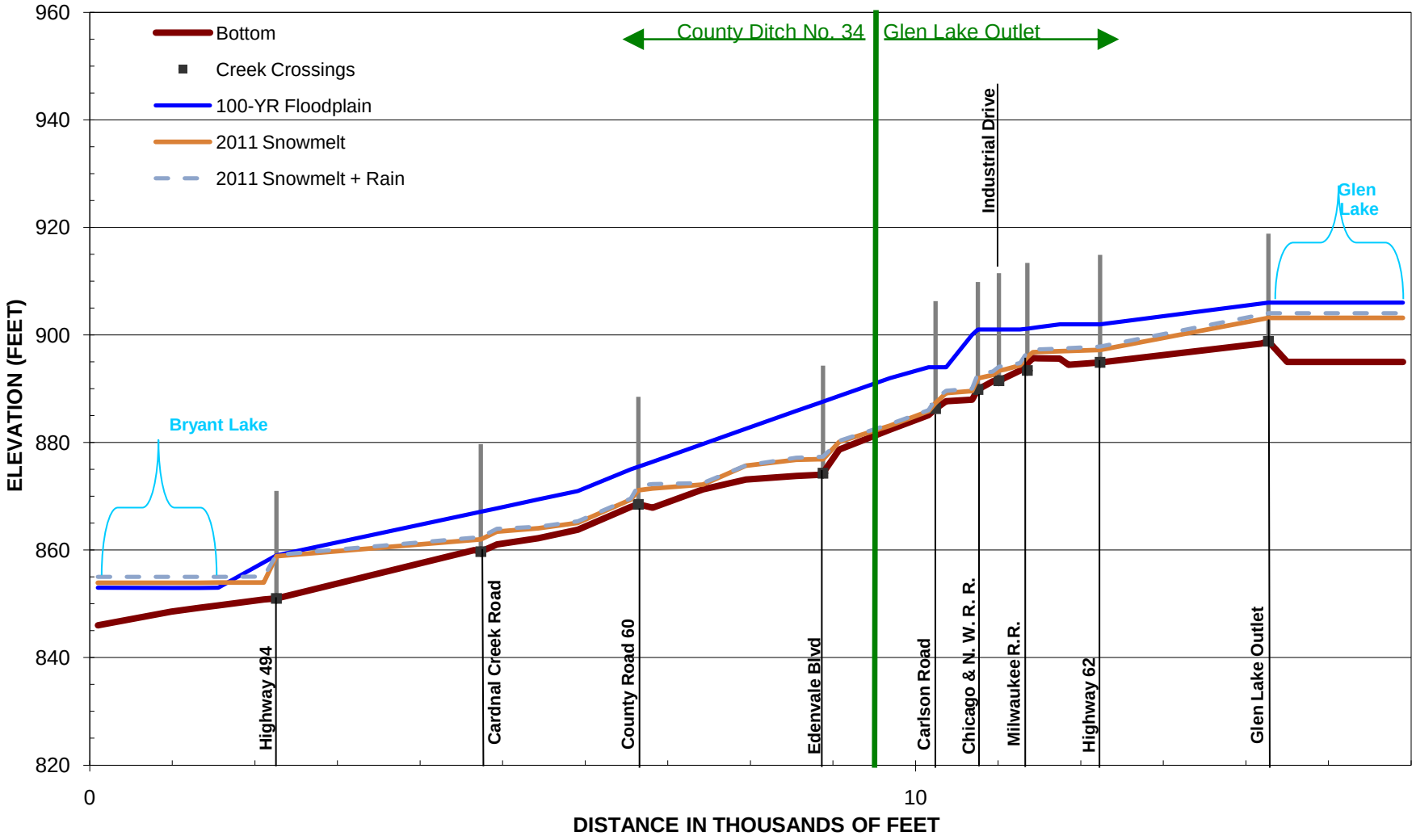
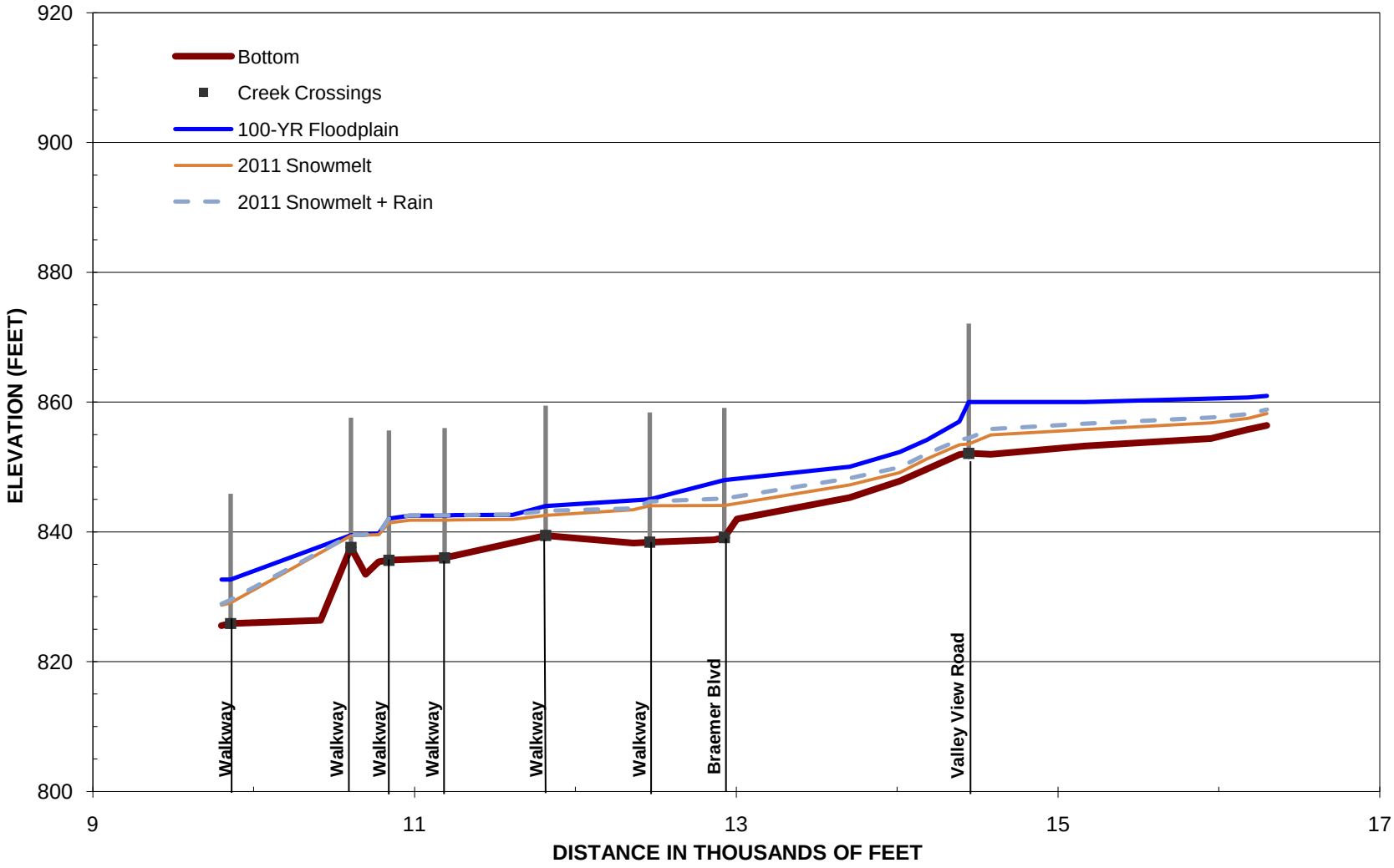
NINE MILE CREEK
100-YR FLOODPLAIN AND
2011 SNOWMELT PROFILE
County Ditch No. 34 and Glen Lake Outlet



REVISED FEBRUARY 25, 2011

NINE MILE CREEK
100-YR FLOODPLAIN AND
2011 SNOWMELT PROFILE
Braemer Branch



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Attachment 3

Attachment 3: Flood elevations based on 2011 Snowmelt Modeling Scenarios

Table 1. Creek Crossing Elevations - South Boundary of District to Junction of North & South Forks

Creek Crossing	Snow Scenario[1] Elevation (ft)	Snow + Rain Scenario Elevation[2] (ft)	NMCWD 100-YR Management Elevation (ft)	Difference between Snow + Rain Scenario and 100-Yr Management Elevation (ft)
Upstream Footbridge 9	708.1	708.1	715	-6.9
Upstream Footbridge 8	710.5	710.9	715	-4.1
Upstream Footbridge 7	716.1	716.7	721	-4.3
Upstream Footbridge 6	730.8	731.9	733	-1.1
Upstream 106th St	731.8	733.0	735	-2.0
Upstream Footbridge 5	734.1	734.9	737	-2.1
Upstream Footbridge 4	744.8	746.0	747	-1.0
Upstream Footbridge 3	755.8	756.5	757	-0.5
Upstream Footbridge 2	766.5	767.0	767	0.0
Upstream Footbridge 1	784.1	784.6	784	0.6
Upstream Old Shakopee Rd	789.3	789.7	791	-1.3
Upstream RR 3	796.1	796.5	794	2.5
Upstream 102nd St	796.6	797.1	796	1.1
Upstream 98th St	797.7	798.1	801	-2.9
Upstream Marsh Lake Dam	803.3	803.4	805	-1.6
Upstream France Ave	803.5	803.6	805	-1.4
Upstream OLD Poplar Bridge Rd	803.9	804.1	805	-0.9
Upstream 90th St	804.7	805.4	806	-0.6
Upstream Normandale Blvd	805.1	805.7	806	-0.3
Upstream Normandale Lake Weir	811.8	812.1	814	-1.9
Upstream 84th Street	811.9	812.3	815	-2.7

[1]Modeled as 6.1 inches of snowmelt runoff in ten days with 100% impervious conditions.

[2]Modeled as 6.1 inches of snowmelt runoff in ten days followed immediately by a 2.2-inch rain storm in the next 24-hour period, with 100% impervious conditions.

Table 2. Creek Crossing Elevations - South Fork

Creek Crossing	Snow Scenario[1] Elevation (ft)	Snow + Rain Scenario Elevation[2] (ft)	NMCWD 100-YR Management Elevation (ft)	Difference between Snow + Rain Scenario and 100-Yr Management Elevation (ft)
Upstream American Blvd	811.9	812.3	815	-2.7
Upstream East Bush Lake Rd	812.0	812.5	816	-3.5
Upstream Hwy 494	813.7	814.2	821	-6.8
Upstream Marth Rd	820.8	821.2	824	-2.8
Upstream West 78th St	827.6	828.0	832	-4.0
Upstream SF 5 Walkway	828.6	828.9	833	-4.1
Upstream 41.3 Walkway	828.7	828.9	833	-4.1
Upstream 41.2 Walkway	828.7	828.9	833	-4.1
Upstream 41.1 Walkway	828.7	828.9	833	-4.1
Upstream 48 Walkway	828.6	828.7	833	-4.3
Upstream SF 4 Walkway	828.8	828.9	833	-4.1
Upstream Hwy 169	831.9	832.4	834	-1.6
Upstream Washington Ave	832.2	832.9	834	-1.1
Upstream Golden Triangle Dr	835.0	836.0	841	-5.0
Upstream Smetana Overflow	835.9	836.6	841	-4.4
Upstream Smetana Ln	836.0	836.8	841	-4.2
Upstream Smetana Inflow	838.8	839.0	841	-2.0
Smetana Inflow Weir	839.2	839.3	841	-1.7
Upstream Valley View Rd	839.3	839.7	843	-3.3
Upstream Flying Cloud Dr	841.5	842.2	846	-3.8
Upstream Hwy 212	846.8	847.8	849	-1.2
Upstream Bryant Lake Drive	849.2	849.9	850	-0.1
Upstream SF 3 Walkway	852.5	853.3	852	1.3
Upstream SF 2 Walkway	853.2	854.1	852	2.1
Upstream Willow Creek Rd	853.9	855.0	854	1.0
Upstream 60 Private Rd	859.2	860.0	863	-3.0
Upstream 61 Hwy 62	882.9	883.2	884	-0.8
Upstream Rowland Rd	891.5	891.6	897	-5.4
Upstream SF 1 Walkway	892.9	893.2	898	-4.8
Upstream Milwaukee RR	896.4	896.6	900	-3.4
Upstream Jorissen Rd	898.1	898.3	900	-1.7
Upstream C & N. W. RR	898.6	899.4	900	-0.6

[1]Modeled as 6.1 inches of snowmelt runoff in ten days with 100% impervious conditions.

[2]Modeled as 6.1 inches of snowmelt runoff in ten days followed immediately by a 2.2-inch rain storm in the next 24-hour period, with 100% impervious conditions.

Table 3. Creek Crossing Elevations - North Fork

Creek Crossing	Snow Scenario[1] Elevation (ft)	Snow + Rain Scenario Elevation[2] (ft)	NMCWD 100-YR Management Elevation (ft)	Difference between Snow + Rain Scenario and 100-Yr Management Elevation (ft)
Upstream Norman Center Drive	812.2	812.8	817	-4.2
Upstream 13 Bridge	812.5	813.2	817	-3.8
Upstream Bloomington Weir	814.2	814.8	817	-2.2
Upstream 14 Hwy 494	815.0	816.4	820	-3.6
Upstream 77th St	818.3	819.3	822	-2.7
Upstream 77th St Ramp	821.1	821.8	823	-1.2
Upstream Metro Dr	823.8	824.3	829	-4.7
Upstream 72nd St	824.3	824.8	830	-5.2
Upstream 70th St	831.1	831.7	832	-0.3
Upstream MN & RR	835.9	836.6	837	-0.4
Upstream Brook Dr	841.5	844.0	844	0.0
Upstream 21 Valley View	848.6	849.2	851	-1.8
Upstream Tracy Ave	849.1	850.0	852	-2.0
Upstream 23 Hwy 62	853.0	854.0	856	-2.0
Upstream Gleason Rd	856.6	857.8	864	-6.2
Upstream Vernon Ave	860.7	862.1	865	-2.9
Upstream Edina Path	864.0	865.1	867	-1.9
Upstream Londonderrry Rd	869.6	870.2	872	-1.8
Upstream Dovre Drive	871.2	872.5	875	-2.5
Upstream 28 Hwy 169	871.9	873.6	877	-3.4
Upstream 9th St	878.1	879.7	884	-4.3
Upstream 7th St	883.3	884.3	888	-3.7
Upstream 11th Ave	884.2	885.5	891	-5.5
Upstream Milwaukee RR	886.9	888.1	894	-5.9
Upstream 5th St	891.2	893.8	896	-2.2
Upstream Chicago & SW RR	892.3	894.4	902	-7.6
Downstream Excelsior Dr	894.2	895.7	902	-6.3
Upstream Excelsior Dr	894.4	896.1	902	-5.9

[1]Modeled as 6.1 inches of snowmelt runoff in ten days with 100% impervious conditions.

[2]Modeled as 6.1 inches of snowmelt runoff in ten days followed immediately by a 2.2-inch rain storm in the next 24-hour period, with 100% impervious conditions.

Table 4. Creek Crossing Elevations - Braemer Branch

Creek Crossing	Snow Scenario[1] Elevation (ft)	Snow + Rain Scenario Elevation[2] (ft)	NMCWD 100-YR Management Elevation (ft)	Difference between Snow + Rain Scenario and 100-Yr Management Elevation (ft)
Upstream 42 Walkway	829.1	829.5	833	-3.5
Upstream 43 Walkway	839.4	839.5	839	0.5
Upstream BR 2 Walkway	841.4	842.1	842	0.1
Upstream BR 1 Walkway	841.8	842.5	843	-0.5
Downstream 44 Walkway	842.5	843.3	844	-0.7
Upstream 45 Walkway	844.0	844.7	845	-0.3
Upstream Breamer Blvd	844.1	845.1	848	-2.9
Upstream 47 Valley View Rd	853.6	854.5	860	-5.5

[1]Modeled as 6.1 inches of snowmelt runoff in ten days with 100% impervious conditions.

[2]Modeled as 6.1 inches of snowmelt runoff in ten days followed immediately by a 2.2-inch rain storm in the next 24-hour period, with 100% impervious conditions.

Table 5. Creek Crossing Elevations - County Ditch No. 34 and Glen Lake Outlet

Creek Crossing	Snow Scenario[1] Elevation (ft)	Snow + Rain Scenario Elevation[2] (ft)	NMCWD 100-YR Management Elevation (ft)	Difference between Snow + Rain Scenario and 100-Yr Management Elevation (ft)
Upstream 65 Hwy 494	858.9	859.1	859	0.1
Upstream Cardnal Creek Rd	862.0	862.4	867	-4.6
Upstream Coutny Rd 60	871.1	872.0	875	-3.0
Upstream Edenvale Blvd	876.9	877.4	888	-10.6
Upstream Carlson Dr	887.4	888.2	894	-5.8
Upstream C & N. W. RR	891.9	892.8	901	-8.2
Downstream Milwaukee RR	895.9	896.8	901	-4.2
Upstream Industrial Dr	893.4	894.1	901	-6.9
Upstream 75 Hwy 62	897.2	897.8	902	-4.2
Glen Lake Outlet	903.2	904.1	906	-1.9

[1]Modeled as 6.1 inches of snowmelt runoff in ten days with 100% impervious conditions.

[2]Modeled as 6.1 inches of snowmelt runoff in ten days followed immediately by a 2.2-inch rain storm in the next 24-hour

PLEASE NOTE: The 2011 Snowmelt Profile for Nine Mile Creek and corresponding Tables of elevations is for general informational purposes only and should not be relied on for any official purpose. Prediction of the extent or duration of flooding is very imprecise and based on many assumptions about snow and ice conditions, storm sewer conditions and how water will move across land and within surface water channels and basins. All future flooding scenarios are also affected significantly by weather conditions including but not limited to temperatures and patterns of snowfall and rainfall. Any indication of how far flood waters may reach or how long they may persist, generally or with respect to a specific property, is for illustration only. It does not represent the most likely scenario and the Nine Mile Creek Watershed District does not represent any particular level of probability associated with it. Property owners and other interested persons should rely on a licensed surveyor or other professional retained for specific advice concerning their property and should contact their city for information and assistance concerning federal flood insurance, flood risks and response. The Nine Mile Creek Watershed District strictly disclaims any and all warranties on use of the information in the 2011 Snowmelt Profile for Nine Mile Creek and corresponding Tables of elevations for any purpose.