VRWJPO XP-SWMM Model Update

Prepared for
City of Lakeville

December 2014

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VRWJPO XP-SWMM Model Update

December 2014

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Certifications

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Brandon Barnes PE #: 49540

December 23, 2014

Date

Executive Summary

This report describes the methodology and results of hydrologic and hydraulic modeling of the North Creek, Middle Creek, and South Creek, subwatersheds within the City of Lakeville and tributary to the Vermillion River. The Vermillion River begins in the southwestern portion of Scott County and flows east through the central portion of Dakota County towards the Mississippi River near Hastings, Minnesota. The study area, roughly 35 square miles, includes the majority of the City as well as area outside the municipal boundary that is tributary to the City's creeks and streams as shown in Figure EX-1.

Previous modeling analyses of the Vermillion River watershed were completed in 2009 and 2010 for the Vermillion River Watershed Joint Powers Organization (VRWJPO). These analyses used subwatersheds that were generally 160 to 640 acres in area. The resulting calibrated XP-SWMM model was primarily a single-tiered network (i.e., flow was primarily routed through an overland network of drainage ways, natural stream sections, and roadway culverts and generally excluded detailed storm sewer networks). The VRWJPO used the peak flows and runoff volumes from the 2010 analysis to set flow and volume standards at the community standard locations defined in the 2009 study.

This study modified the Lakeville portion of the VRWJPO XP-SWMM model to include smaller subwatersheds, regional stormwater ponds, storm sewer connections between stormwater ponds, and storm sewer outlets to North Creek, Middle Creek, and South Creek as shown in Figure EX-2. The updated portion of the XP-SWMM model now includes sections of two-tiered network (i.e., flows are simultaneously routed through detailed storm sewer and overland networks). The updated XP-SWMM model was used to simulate the 1-, 2-, 10-, 50-, and 100-year 4-day events without further calibration. The resulting flow rates and runoff volumes were compared to the established rates and volumes at the community standard locations.

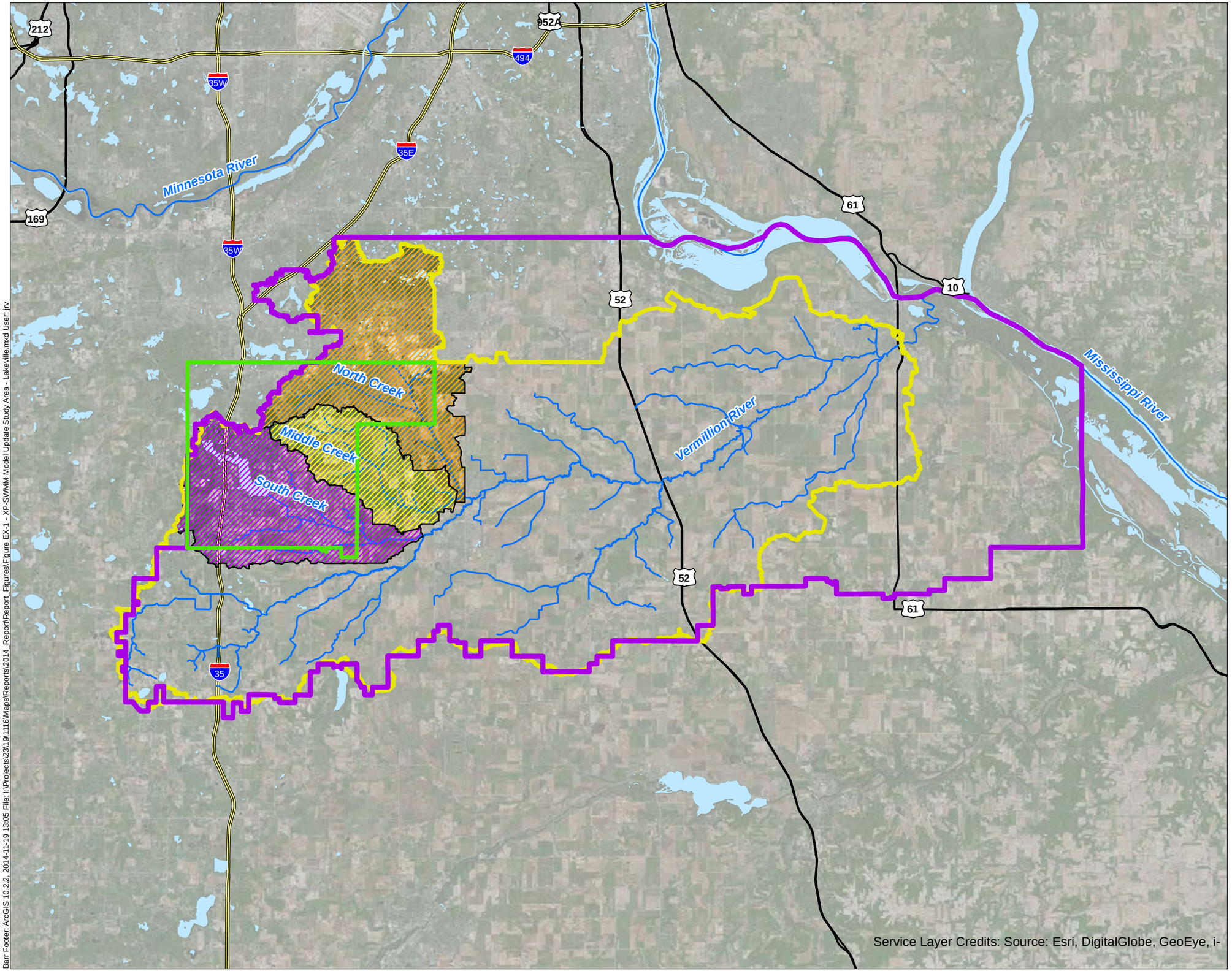
Using identical rainfall data, the updated model results were compared to the 2010 model at study-area gages used to calibrate the model in 2009. The comparison indicated that the updated model closely matched the stage hydrographs for the 2- and 100-year events. Therefore, the updated model could still be considered calibrated at the gage locations. However, modeling results for the 100-year event indicate there is an increase in peak flow rates and runoff volume at community standard locations near the Lakeville municipal boundary.

The existing conditions model was then used to simulate the 4-day rainfall event based on rainfall depths published in Atlas 14. At community standard locations near the Lakeville municipal boundary the peak discharge rates increased an average of 15 percent for the 2-year event and 84 percent for the 100-year event. The runoff volume was very similar for the 2-year event because there was not a significant change in precipitation depths. However, runoff volume increased an average 52 percent for the 100-year event. Figure EX-3 shows the 100-year peak flow rates for the 2010 XP-SWMM model to the 2014 updated XP-SWMM model using Atlas 14 rainfall depths.

Finally, a future-conditions model was developed by modifying the updated model to reflect future development conditions throughout the City. Using Atlas 14 rainfall depths, the model was used to

estimate the regional stormwater basin and outlet sizes that would be required to maintain existing-conditions peak flow rates at VRWJPO community standard locations. Future ponds were not sized to mitigate localized flooding concerns upstream of community standard locations. It is anticipated that these areas would be addressed as development or redevelopment occurs within the City. Increases in simulated runoff volume due to planned development were tabulated to aid planning for future volume-control practices. These typically occur on a smaller scale than what was considered in the updated XP-SWMM model.

When using the model to assess development impacts to flow-rate standards it is important to consider the hydrologic and hydraulic scale for which the model was originally developed and calibrated. It is also necessary to recognize that the model should be used as a tool to assess the relative impacts of development rather than to establish absolute values, since a detailed recalibration was not completed as part of this current update effort. Future model updates should include verification of simulation results using post-2005 storm events to improve the model's representation of real-world conditions.



City of Lakeville

VRWJPO Boundary

Vermillion River Drainage Area

Lakes & Ponds

Rivers and Streams

Major Subwatersheds

Middle Creek Study Area

North Creek Study Area

South Creek Study Area

N

Miles

3 0 3

BARR

Figure EX-1

XP-SWMM MODEL UPDATE
STUDY AREA

Barr Footer: ArcGIS 10.2.2, 2014-11-19 13:05 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Report_Figures\Figure EX-1 - XP-SWMM Model Update Study Area - Lakeville.mxd User: jrv

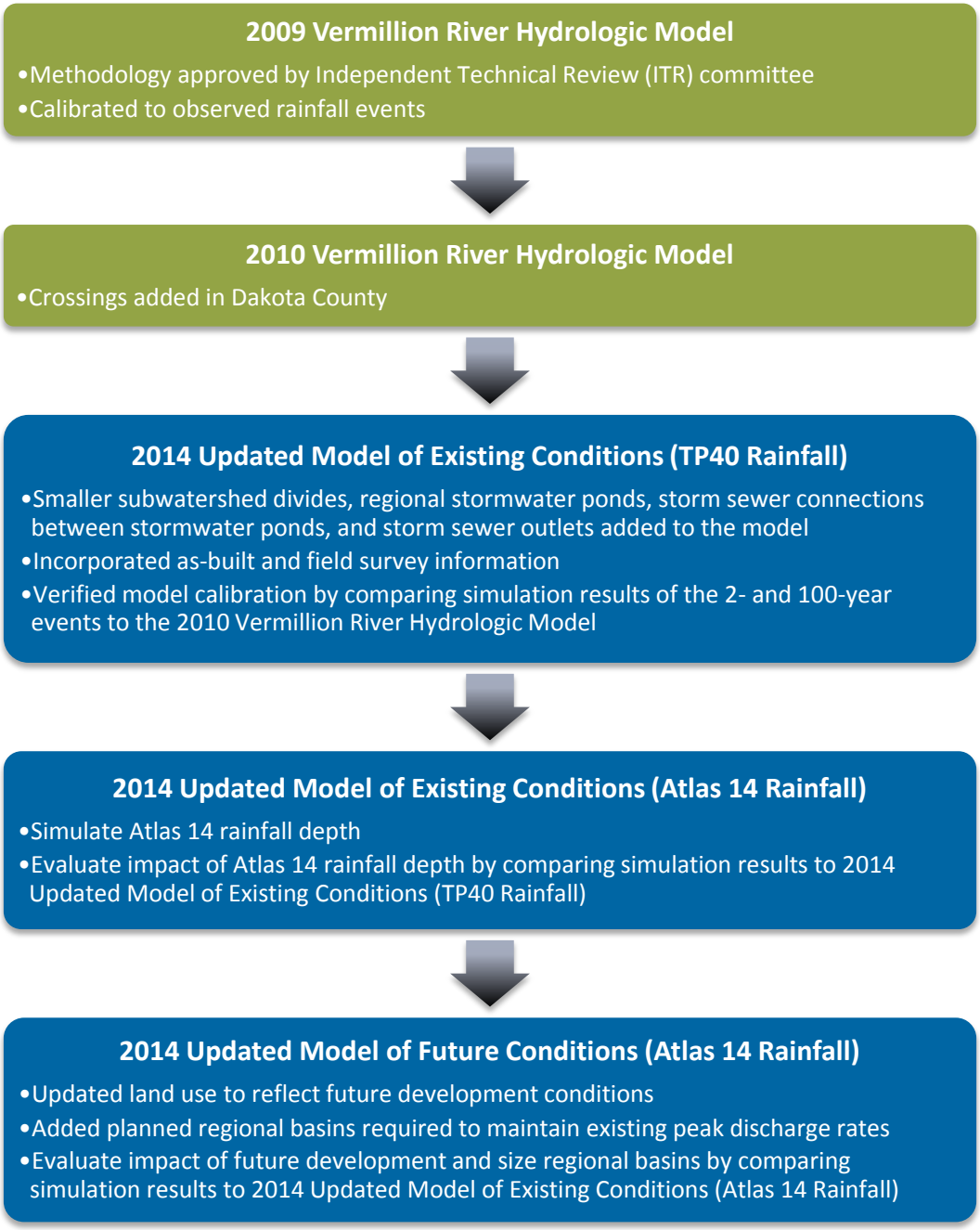
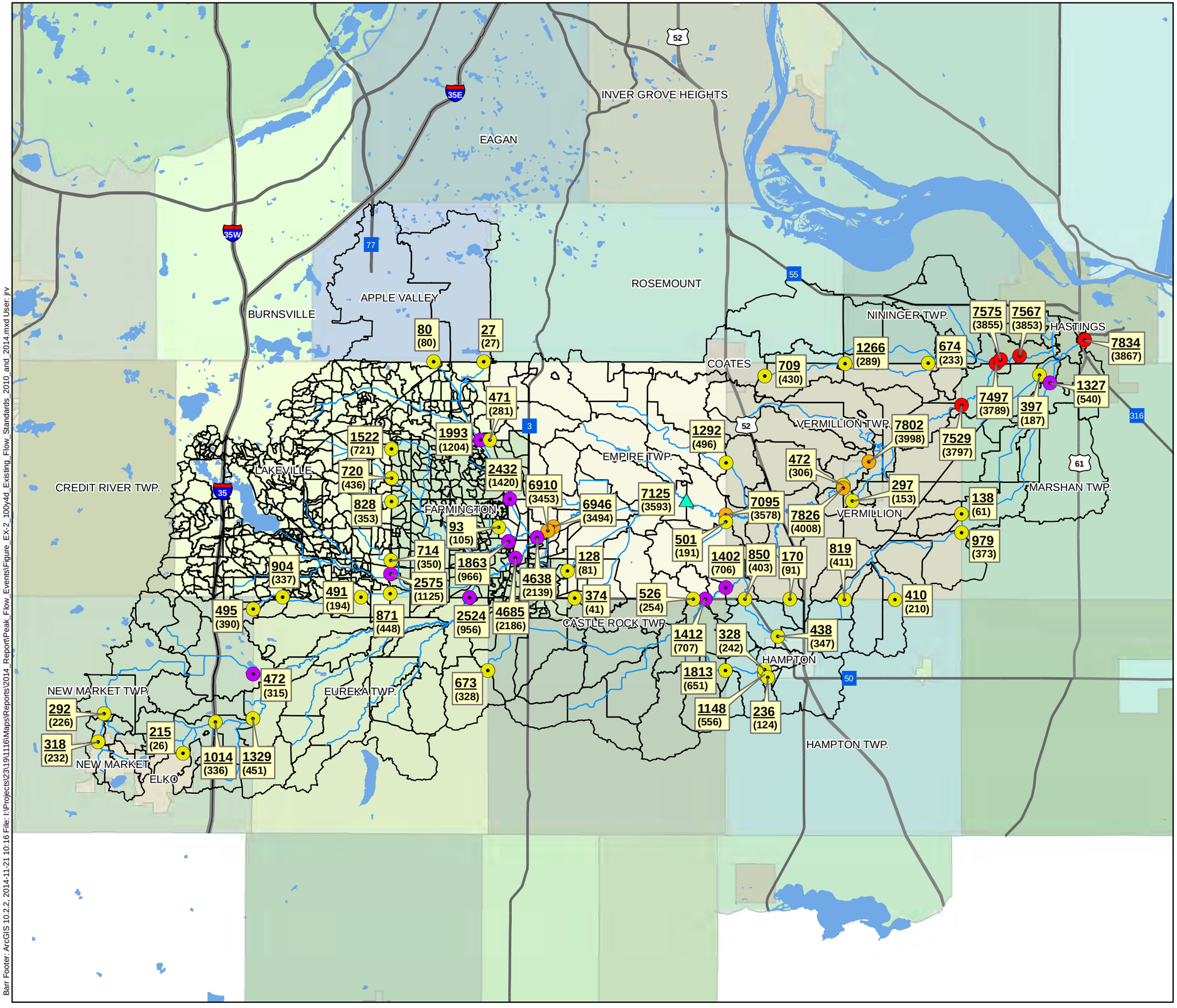


Figure EX-2 Hydrologic Model Update Process



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station
- SWMM Links
- Watersheds
- Lakes

100-Year Peak Flow Rate (CFS)

7125 (3593) 2014 Model (Atlas 14 Rainfall)
2010 Model (TP40 Rainfall)

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure EX-3

2010 (TP40) AND 2014 (ATLAS 14) COMMUNITY FLOW STANDARD LOCATIONS
EXISTING CONDITIONS
100-YEAR, 4-DAY PEAK FLOW

Barr Footer: ArcGIS 10.2.2, 2014-11-21 10:16 File: I:\Projects\23\19\116\Maps\Reports\2014_Report\Peak_Flow_Events\Figure_EX-2_100y4d_Existing_Flow_Standards_2010_and_2014.mxd User: jrv

1.0 Methodology

1.1 Existing Conditions

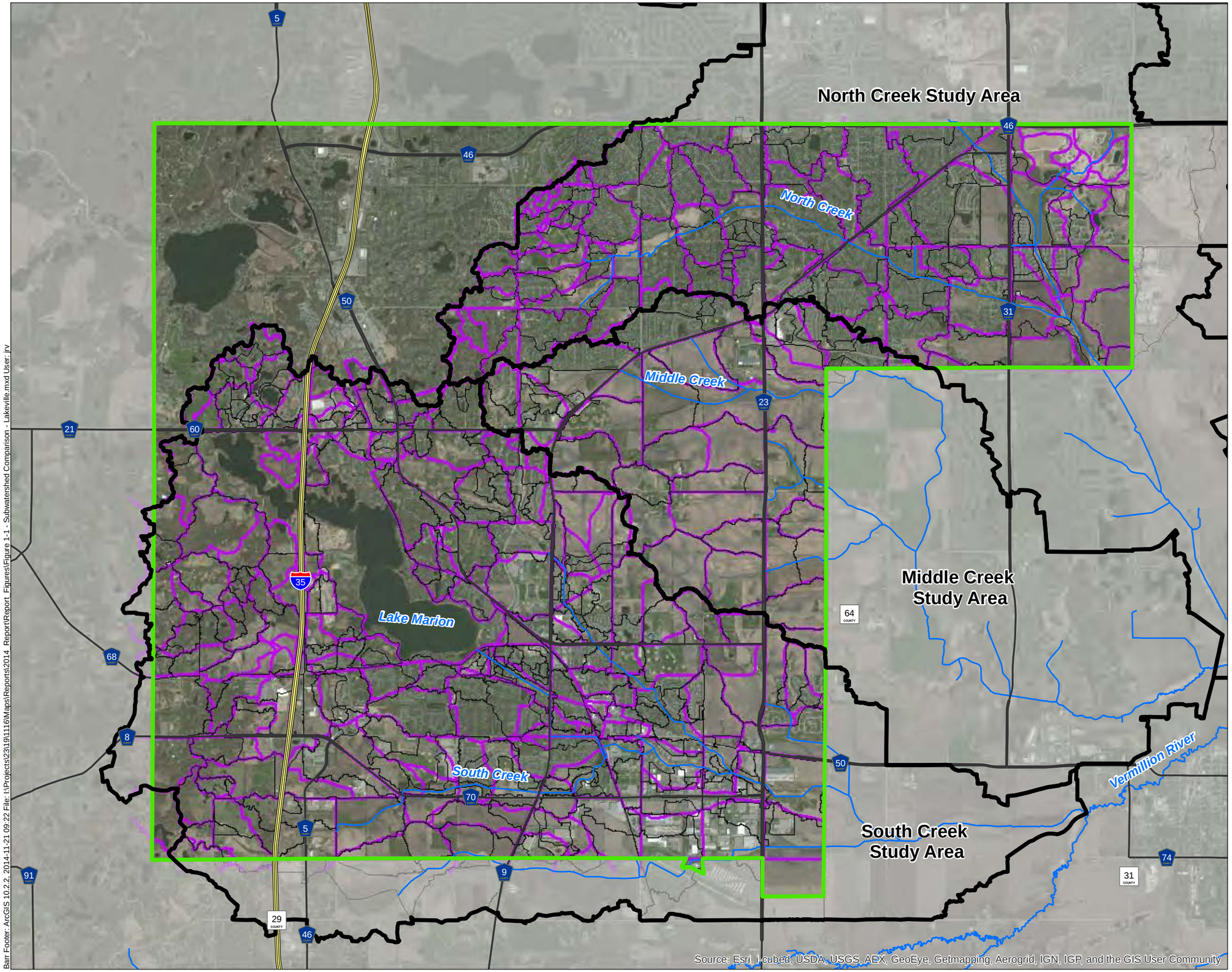
Development of the XP-SWMM model began in 2007 and was completed in 2009. At that time 2005 land cover was the best available information to characterize conditions within the watershed and was used to define existing conditions. In 2010 the XP-SWMM model was updated to include additional crossings in Dakota County. Additional hydrologic and hydraulic detail was added to the 2010 VRWJPO XP-SWMM model to revise the existing conditions modeling within the Cities of Farmington and Lakeville (Figure EX-1). Hydrologic and hydraulic model inputs were based on the methodology presented in *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr, 2009) and information provided by the Cities of Lakeville and Farmington. For purposes of this modeling revision effort, "existing conditions" represents 2005 land use and storm sewer conditions.

1.1.1 Hydrologic Model Parameters

Hydrologic model parameters were calculated using the calibrated values and methodology defined in *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr 2009). The following sections summarize how individual model parameters were calculated. Appendix A includes a summary of updated hydrologic parameters within Lakeville.

1.1.1.1 Subwatershed Divides

The modeled subwatershed divisions from the City's 2008 Water Resources Management Plan (WRMP) were modified using 2011 Dakota County LiDAR and the City's storm sewer database to delineate subwatersheds to pond outlets within the study area. Subwatershed divides were also modified to include contributing drainage areas outside the municipal boundary. Figure 1-1 shows a comparison of the subwatershed divisions from the City's WRMP and the revised subwatershed divisions used in the updated XP-SWMM model.



City of Lakeville

Major Subwatersheds

Subwatersheds From 2014 XP-SWMM Model Update

Subwatersheds From 2008 WRMP

Rivers and Streams

N

Feet

4,000 0 4,000

BARR

Figure 1-1

SUBWATERSHED COMPARISON

Barr Footer: ArcGIS 10.2.2, 2014-11-21 09:22 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Report_Figures\Figure 1-1 - Subwatershed Comparison - Lakeville.mxd User: jrv

1.1.1.2 Impervious Area

Land-cover within a watershed affects the quantity and timing of runoff. Each land use generates a different quantity of runoff due, primarily, to the amount of impervious area within that land-cover. The impervious area input into the XP-SWMM model is, by definition, hydraulically connected to the drainage systems being analyzed. This directly connected impervious percentage includes driveways, rooftops, and parking areas that are directly connected to the stormwater collection system. Runoff from the portion of a rooftop draining onto adjacent pervious areas was not treated as connected impervious area.

The percent of directly connected impervious area associated with each land-use type was calculated using 2005 land-cover data developed by Applied Ecological Services (AES) and based on the Minnesota Land-Cover Classification System (MLCCS) for the western portion of the Vermillion River watershed and the 2005 Metropolitan Council land-use classifications. The AES land-cover data set is shown in Figure 1-2, and the impervious percentages assigned to each land-cover classification are listed in Table 1-1.

The AES land-cover data set includes the roof outlines for each building and asphalt (i.e., paved) surface for roadways within the city. For residential developments predating the AES land-cover dataset areas not defined as building roofs or roadways are typically classified as lawn. However, for developments that occurred near or during the time the AES land-cover data set was developed the area between building roofs and roadways is shown as corn. For example, see the development downstream of Lake Marion in Figure 1-2. Although the land-cover dataset defines this area as corn instead of lawn, the difference does not have an impact on the percent impervious calculation for the development because the directly connected percent impervious for both corn and lawn is zero percent as shown in Table 1-1. Infiltration parameters, discussed in Section 1.1.1.5, were calibrated based on the hydrologic soil classification which is independent of the land-cover classification.

Table 1-1 Land-Cover, Percent Impervious

AES Land-Cover Classification [1]	Total Percent Impervious (%)	Directly Connected Percent Impervious (%)
Asphalt	100%	100% or 0%[2]
Concrete	100%	100% or 0%[2]
Commercial Roof	100%	86% or 0%[3]
Residential Roof	100%	33% or 0%[4]
Forest	0%	0%
Corn	0%	0%
Tall Grass	0%	0%
Lawn	0%	0%
Bare Soil	0%	0%
Pond	100%	100%
Reservoir	100%	100%
Wetland	6%	6%

[1] 2005 land-cover classifications from Applied Ecological Services. Dataset provided in 2007

[2] Assumed to be 100 percent directly connected. In agricultural, airport, and farmstead Metropolitan Council land-use classifications assumed to be 0 percent impervious.

[3] Assumed to be 86 percent directly connected. In airport Metropolitan Council land-use classification assumed to be 0 percent.

[4] Assumed to be 33 percent directly connected. In agricultural, airport, and farmstead Metropolitan Council land-use classifications assumed to be 0 percent impervious.

The percentages from Table 1-1 were used to calculate the percentage of directly connected impervious area for each 2005 Met Council land-use classification based on the land-cover types within each area. The 2005 Met Council land-use dataset is shown in Figure 1-3, and the percent impervious assigned to land-use classifications are listed in Table 1-2.

Table 1-2 Land Use, Percent Impervious

2005 Metropolitan Council Land-Use Classification	Directly Connected Percent Impervious (Percent)
Agricultural	0.0
Airport	0.0
Extractive (e.g., gravel pits)	5.7
Farmstead	0.0
Golf Course	4.8
Industrial and Utility	59.1
Institutional	34.3
Major Highway	54.2
Manufactured Housing Parks	32.3
Mixed-Use Commercial and Other	97.6
Mixed-Use Industrial	55.5
Mixed-Use Residential	28.4
Multifamily	47.3
Office	70.9
Park, Recreational, or Preserve	11.0
Retail and Other Commercial	75.7
Seasonal/Vacation	15.7
Single Family, Attached	30.3
Single Family, Detached	20.6
Undeveloped	6.5
Water	100.0

Land-use classifications from Metropolitan Council, June 2005.

The directly connected impervious area for each subwatershed was calculated using the same methodology as detailed *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr 2009) using the AES land-cover data. In locations that the AES dataset did not cover, the percent impervious values from the 2005 Metropolitan Council land-use classifications were used.

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

South Creek

Lake Marion

Vermillion River

City of Lakeville

Major Subwatersheds

Rivers and Streams

Land Cover Classification (AES, 2005)

- Asphalt
- Concrete
- Corn
- Bare Soil
- Forest
- Tall Grass
- Lawn
- Pond
- Reservoir
- Vegetated Pond
- Commercial Roof
- Residential Roof

N

Feet

4,000 0 4,000

BARR

Figure 1-2

2005 LAND COVER

Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

Barr Footer: ArcGIS 10.2.2, 2014-11-19 12:50 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Report_Figures\Figure 1-2 - 2005 Land Cover - Lakeville.mxd User: jrv

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

South Creek

Lake Marion

Vermillion River

Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

City of Lakeville

Major Subwatersheds

Rivers and Streams

Existing Land Use (Met Council, 2005)

- Agricultural
- Airport
- Extractive
- Farmstead
- Golf Course
- Industrial and Utility
- Institutional
- Major Highway
- Manufactured Housing Park
- Mixed Use Industrial
- Office
- Park, Recreational or Preserve
- Retail and Other Commercial
- Seasonal/Vacation
- Single Family Residential Attached
- Single Family Residential Detached
- Mixed Use Residential
- Multifamily Residential
- Undeveloped
- Water

N

Feet

4,000 0 4,000

BARR

Figure 1-3

2005 LAND USE

Barr Footer: ArcGIS 10.2.2, 2014-11-19 12:51 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Report_Figures\Figure 1-3 - 2005 Land Use - Lakeville.mxd User: jrv

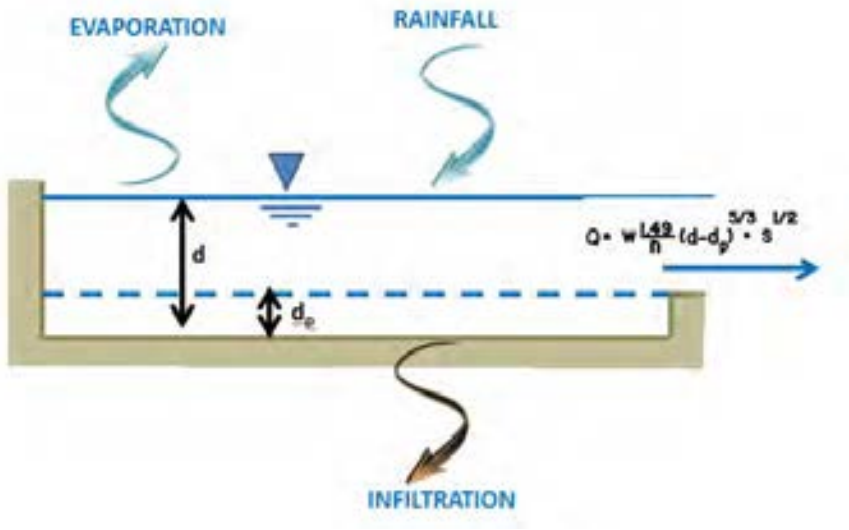
1.1.1.3 Watershed Slope

The average watershed slope was calculated in GIS. The methodology used to calculate the watershed slope for the updated areas is the same used for other watersheds within the VRWJPO XP-SWMM model. The area-weighted average watershed slope (feet/feet) for each subwatershed for both existing and future conditions was estimated using GIS and a digital elevation model (DEM) created from Dakota County LiDAR data (2005). LiDAR, which stands for light detection and ranging, is a remote sensing technology that measures the distance to the earth's surface, which can be converted to elevation. LiDAR data is typically provided in the form of a digital elevation model (DEM) which can be used to generate contour data.

The 2005 LiDAR data were used to calculate watershed slope in the calibrated 2009 XP-SWMM model. For comparison purposes the watershed slope was also calculated using the 2011 LiDAR data that is publically available from the MnDNR. On average the two datasets produced similar values for watershed slope. Therefore, the 2005 dataset that was used to define watershed slope for the 2009 calibrated model was also used for the updated model.

1.1.1.4 Watershed Width

In XP-SWMM, surface runoff from subwatersheds is routed to the stormwater system via the nonlinear reservoir methodology. During each time-step XP-SWMM calculates the surface runoff from the subwatershed as shown in Figure 1-4.



In the equation, "Q" is the flow rate from the subwatershed (cfs), "n" is the Manning's roughness coefficient, "d" is the depth of water (ft), "d_p" is the depression storage (ft), and "s" is the slope (ft/ft).

Figure 1-4 Nonlinear Reservoir Schematic of a Subwatershed Used in XP-SWMM

The flow rate from a subwatershed is directly related to the watershed slope, overland flow surface roughness, depression storage, and width parameter. As the watershed width increases, the flow rate from the subwatershed also increases. With a higher runoff rate, less runoff is stored within the subwatershed and less infiltration occurs. This increases the runoff volume for a given rainfall event. However, as the watershed width decreases the opposite occurs; the flow rate from the subwatershed decreases, infiltration increases, and less runoff volume is generated.

The SWMM user's manual (Storm Water Management Model; Version 4 User's Manual, U.S. EPA 1988) suggests estimating the watershed width for a given subwatershed by dividing the watershed area by the longest flow path. This is the methodology described in the *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr 2009) and used for this model update.

1.1.1.5 Infiltration Parameters

Infiltration is the movement of water into the soil surface. For a given storm event, the infiltration rate will vary with time. The infiltration rate at the beginning of the storm is the maximum rate because the soil surface is typically drier and full of air spaces. As the storm event continues, the infiltration rate will gradually decrease as the air space fills with water. For long storms, the infiltration rate will reach a constant value—the minimum infiltration rate or the soil's hydraulic conductivity. The Horton infiltration equation was used to simulate the relationship between infiltration rate and time.

The Natural Resource Conservation Service (NRCS) soil survey geographic database (SSURGO) released in July 2006 was used to determine the hydrologic soil group classifications of the soils within the study area. Horton infiltration input parameters for each hydrologic soil group were previously calibrated for the study area as described in the *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr 2009). Composite infiltration parameter values were estimated by computing an area-weighted average for each parameter based on the percentage of each soil type within the subwatershed, using the calibrated values from 2009.

1.1.1.6 Depression Storage and Overland Flow Roughness

Depression storage, which includes the areas that must be filled with water prior to generating runoff from both pervious and impervious areas, was set for each land-use classification based on the values described in the *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr 2009). The methodology defined in this study was also used to assign overland flow roughness values for each land-use classification.

1.1.2 Hydraulic Model Parameters

Hydraulic information in the model consists of storm sewer, pond outlets, and natural channels. The following sections describe the sources of hydraulic information for each portion of the stormwater conveyance system. Hydraulic model inputs are also summarized in Appendix B.

1.1.2.1 Storm Sewer Data

Storm sewer data were added to the GIS database developed for the 2009 VRWJPO XP-SWMM model. The GIS database was used to expedite data entry into the XP-SWMM model and provide a single source of information for developing the XP-SWMM model. The GIS database was populated with as-built drawings, GIS layers, and survey data provided by the City of Lakeville. Data included pipe invert elevations, lengths, diameters, shape, and material type.

In a few locations survey data were not obtainable and the GIS files or as-built plans provided by the City were missing sections of storm sewer or culvert information. In these areas, the invert elevations were estimated based on LiDAR data or interpolated from locations where invert information was available. Missing pipe diameters were assumed to be equivalent to the next known downstream pipe size. By using the same diameter as the downstream pipe or culvert, the model does not restrict flow through the system. A pipe was marked "assumed" in the GIS database (see figures in Appendix B) even if only a single hydraulic parameter was estimated in the model. For example, if only the downstream invert was estimated, and all other information was available, the pipe was marked "assumed." This was done so that additional data can be collected in these areas in the event of a future project. The amount of unknown or missing pipe information is relatively small and represents less than 4% of the entire storm sewer system within the City.

1.1.2.2 Stormwater Storage Areas

Stormwater storage-area locations, such as ponds and wetlands, were identified based on information provided by the City of Lakeville, aerial photographs, and LiDAR data. Storage-elevation curves for the ponds were calculated in ArcGIS based on Dakota County LiDAR data (2011). Pond outlet structure information was taken from as-built drawings, as provided. In areas where as-built plans and survey data were not available, overflow elevations were based on LiDAR data.

1.1.2.3 Stream Cross Sections

Stream cross sections used in the XP-SWMM model were developed using GIS and a DEM created from Dakota County LiDAR data (2011). The most restrictive cross section for a given reach was selected in accordance with the methodology presented in the *Vermillion River Watershed Hydrologic Study of Existing Conditions* (Barr 2009).

1.2 Future Conditions

A future-conditions XP-SWMM model, reflecting 2030 land-use classifications, was developed by updating the existing-conditions XP-SWMM model. The future-conditions model was then used to size regional stormwater detention ponds to achieve the 2014 existing-conditions peak flow rate at municipal standard locations. The following sections discuss the modifications made to the existing-conditions XP-SWMM model to evaluate 2030 development conditions.

1.2.1 Impervious Area Updates

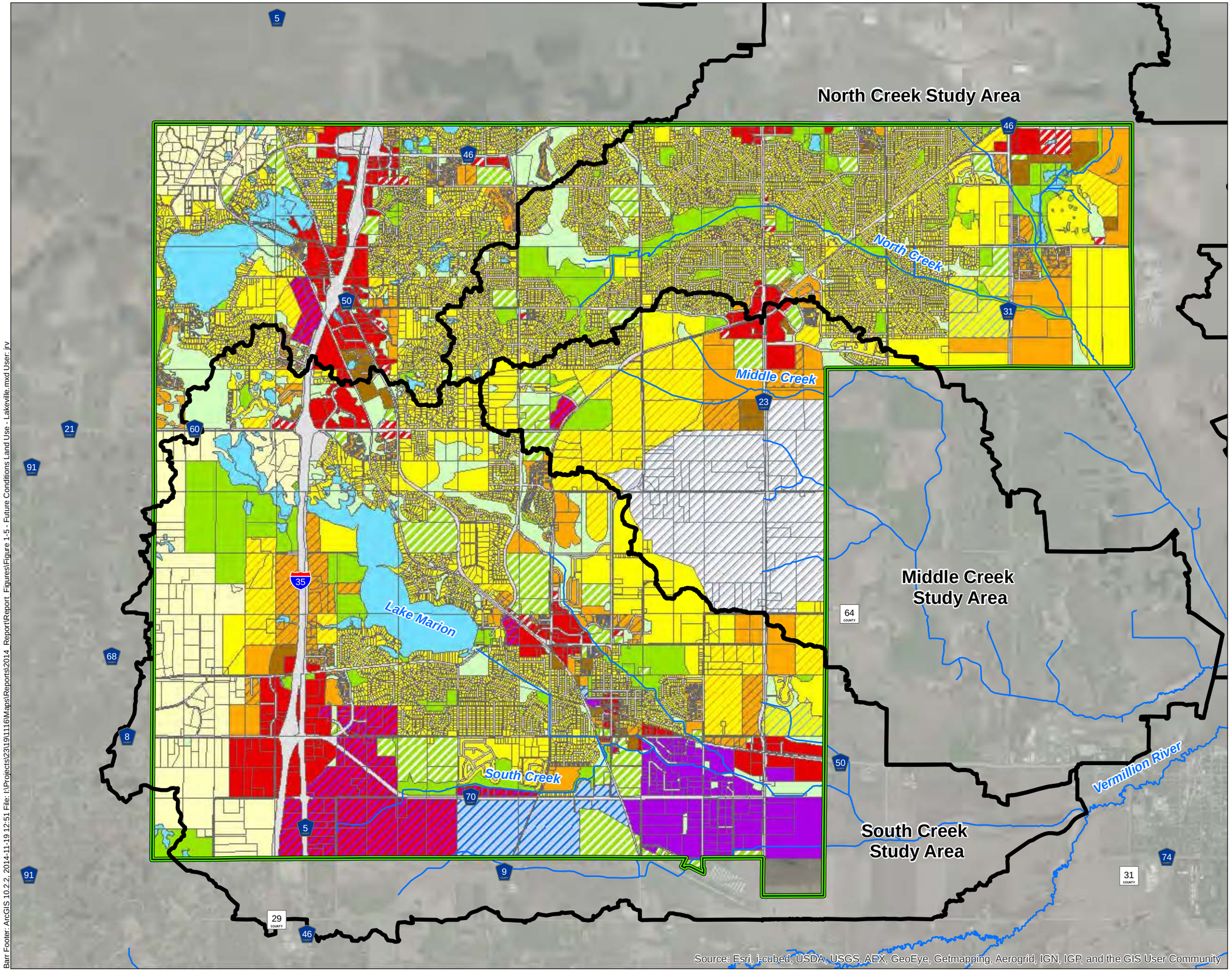
The future conditions directly connected impervious percentage was estimated using the 2030 land use classifications included in the City of Lakeville's 2008 WRMP. Some future land use categories listed in the City's WRMP differed from the Met Council land use categories. In areas where the land use categories were identically named, the impervious percentage value for the existing land use was assigned to the corresponding future use. For future land-use categories that did not have a clear connection to existing land-use categories, the future land use was based on a comparison between future land-use classifications and existing fully developed areas of Lakeville. Future-conditions land-use categories are shown in Figure 1-5. Existing and associated future-conditions land-use categories and their impervious percentages are presented in Table 1-3.

When calculating the directly connected impervious area for planned development conditions it was assumed that the percent of directly connected impervious area in the watershed did not decrease compared to existing conditions.

Table 1-3 Land Use, Percent Impervious

2005 Metropolitan Council Land-Use Classification[1]	2030 Lakeville Land-Use Classification[2]	2030 Directly Connected Percent Impervious (Percent)
Undeveloped	Rural Density Residential	6.5
Park, Recreational, or Preserve	Parks	11
Park, Recreational, or Preserve	Restricted Development	11
Single Family Detached	Low Density Residential	20.6
Single Family Detached	Low/Medium Density Residential	20.6
Mixed Use Residential	Office/Residential Transition	28.4
Single Family Attached	Medium Density Residential	30.3
Manufactured Housing Parks	Manufactured Housing	32.3
Institutional	Public and Quasi-Public	34.3
Single Family Attached/Multifamily[3]	Medium/High Density Residential	38.8
Multifamily	High Density Residential	47.3
Mixed Use Industrial	Warehouse/Light Industrial	55.5
Industrial & Utility	Industrial	59.1
Office	Office Park	70.9
Retail & Other Commercial	Commercial	75.7
Water	Water	100

[1] Land-use classifications from Metropolitan Council, June 2005
[2] Land-use classifications based on the City of Lakeville 2030 land use as shown in 2008 City of Lakeville WRMP.
[3] Percent impervious calculated as the average of Single Family Attached (30.3) and Multifamily (47.3) land use classifications.



City of Lakeville
Major Subwatersheds
Rivers and Streams

2030 Land Use (Lakeville)

- Commercial
- Industrial
- Low Density Residential
- Low/Medium Density Residential
- Manufactured Housing
- Medium Density Residential
- Medium/High Density Residential
- High Density Residential
- Office Park
- Office/Residential Transition
- Parks
- Public and Quasi Public
- Restricted Development
- Rural Density Residential
- Special Plan Area
- Warehouse/Light Industrial
- Water

N

Feet
4,000 0 4,000

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Figure 1-5

FUTURE CONDITIONS
LAND USE

Barr Footer: ArcGIS 10.2.2, 2014-11-19 12:51 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Report_Figures\Figure 1-5 - Future Conditions Land Use - Lakeville.mxd User: jrv

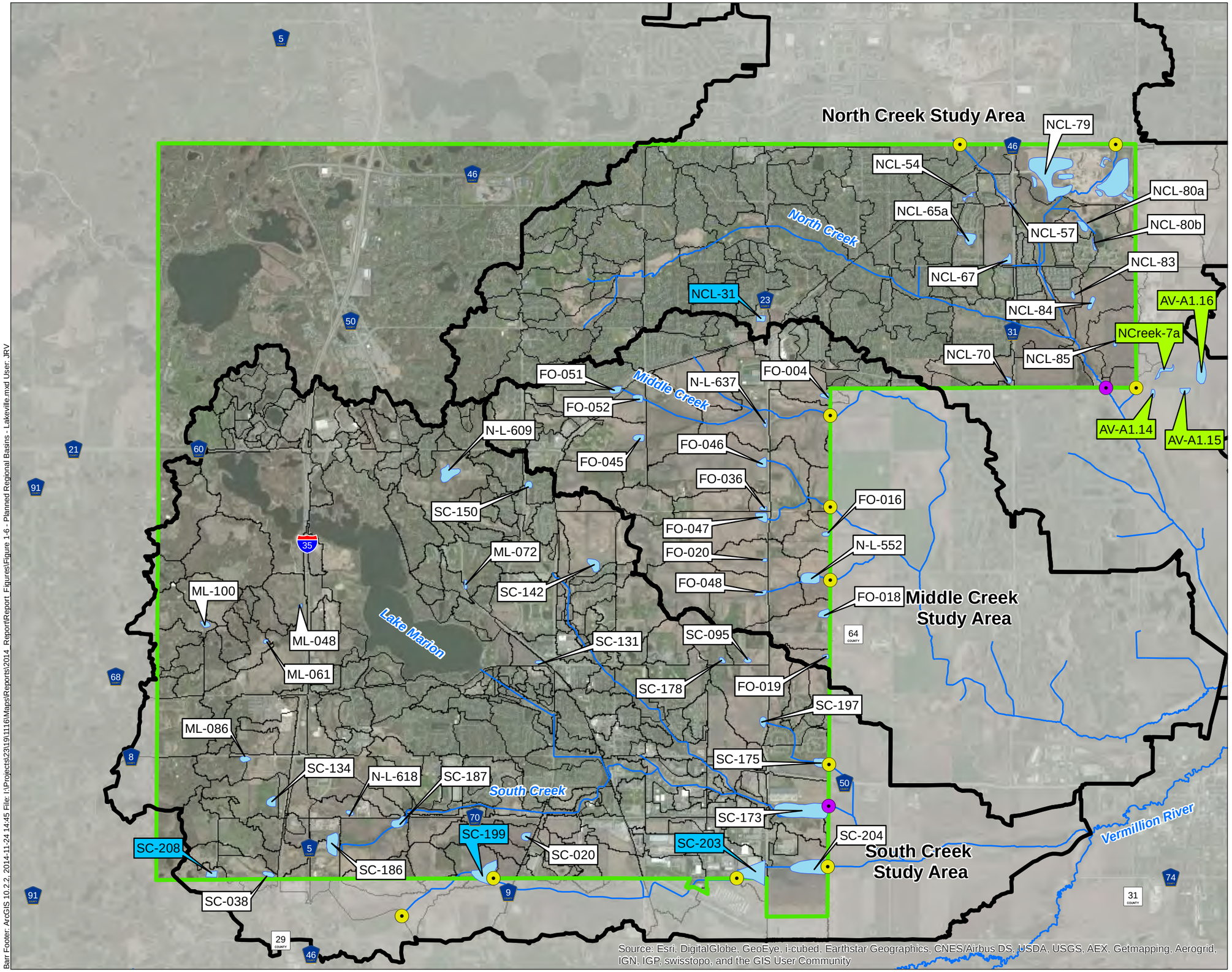
1.2.2 Storm Sewer and Pond Updates

Planned regional stormwater ponds within the City of Lakeville were added to the future conditions model based on information taken from Section 4.0 of the 2008 Lakeville WRMP, and are shown on Figure 1-6. Storage-elevation curves for planned stormwater ponds were taken from Table 4.5.6 of the 2008 Lakeville WRMP. Pond outlet structure details were not listed in the 2008 WRMP. Therefore pond outlets were assumed to be 48-inch diameter riser outlet structures, weir overflows, or natural cross-section overflows. All planned regional basins listed in the 2008 WRMP, which have not been constructed, were incorporated into this analysis (see the white callout boxes on Figure 1-6).

In addition to the planned regional stormwater ponds from the 2008 WRMP, four new regional ponds were added to the future conditions model upstream of community standard locations (see the blue callout boxes on Figure 1-6). The new ponds were necessary to meet existing conditions peak discharge rates at community standard locations. Pond NCL-31 was added near the intersection of Dodd Boulevard and Cedar Avenue, and ponds SC-199, SC-203, and SC-208 were added in Tributary 1 to South Creek watershed upstream of Dodd Boulevard, upstream of Grenada Avenue, and upstream of I-35 respectively as shown in Figure 1-6. There are also 4 regional ponds shown on Figure 1-6 (see green callout boxes) that are located outside the Lakeville municipal boundary, but discharge from these ponds flows into Lakeville.

Overall (white and blue callout boxes on Figure 1-6), 12 proposed regional ponds were added within the North Creek watershed, 14 were added within the Middle Creek watershed, and 24 were added within the South Creek watershed. Additionally, four proposed ponds were added outside the municipal boundaries that affect peak discharge rates at the North Creek community standard location. Planned regional stormwater ponds are shown in Figure 1-6.

Proposed stormwater basins shown on Figure 1-6 are shown in the approximate location where a regional basin would be required to maintain existing peak discharge rates for future development conditions. However, as development occurs the location of each basin will need to be reevaluated to ensure that existing peak discharge rates are maintained during future conditions, and that impacts to existing wetlands are avoided or minimized.



City of Lakeville
Major Subwatersheds
Subwatersheds
Planned Regional Basin*
Rivers and Streams

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

*Basin is assumed to be located at the watershed outlet.

NCL-85 — Planned Basin Listed in 2008 WRMP

NCL-85 — New Basin Proposed

NCL-85 — New Basin Proposed Outside Lakeville

Feet
4,000 0 4,000

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Figure 1-6

PLANNED REGIONAL BASINS

Barr Footer: ArcGIS 10.2.2, 2014-11-24 14:45 File: I:\Projects\2319\1116\Maps\Reports\2014_Report\Report_Figures\Figure 1-6 - Planned Regional Basins - Lakeville.mxd User: JRV

1.3 Precipitation Data

The 4-day design event was identified by the VRWJPO as the critical event for the Vermillion River watershed, and used to estimate peak flows and total runoff volumes at community standard locations. Two different 4-day design events were simulated with the XP-SWMM model. The first event was based primarily on precipitation depths published in Technical Paper 40 (TP40). The second was based on precipitation depths published in Atlas 14. The following sections present the rainfall depths used to develop the design events simulated with the XP-SWMM model.

1.3.1 Technical Paper 40 Rainfall Depths

The design event used in the XP-SWMM model is developed by combining precipitation totals from shorter duration storm events that have an equal return period to create the hyetograph for the overall 4-day event. The 4-day point precipitation totals are included in Table 1-4. The precipitation totals for the 2-, 10-, 50-, and 100-year return periods were defined in the U.S. Army Corps of Engineers (USACE) July 1998 study of the Vermillion River. This study used Technical Paper 40, Technical Paper 49, and the National Weather Service Hydro-35 to determine the point precipitation for each return frequency. The precipitation totals for the 1-year return period were calculated for the 2009 study of the Vermillion River based on precipitation values defined by the 1998 study of the Vermillion River.

Table 1-4 Hypothetical Rainfall Event Point Precipitation from Technical Paper 40 (inches)

	Return Frequency				
Duration	**1 Year**	**2 Year**	**10 Year**	**50 Year**	**100 Year**
5 minutes	0.4	0.43	0.59	0.76	0.84
15 minutes	0.7	0.84	1.2	1.6	1.7
1 hour	1.1	1.4	2.1	2.7	3.0
2 hours	1.3	1.7	2.5	3.2	3.5
3 hours	1.45	1.8	2.7	3.5	3.9
6 hours	1.7	2.1	3.2	4.0	4.5
12 hours	2.02	2.5	3.7	4.7	5.3
24 hours	2.2	2.8	4.2	5.4	6.0
2 days	2.6	3.3	4.8	6.3	7.0
4 days	3.2	4.0	5.6	7.5	8.3

Frequency-based rainfall distributions (hyetographs) were developed using the alternating-block method and precipitation depths from the shorter duration storms that have been spatially adjusted based on the analyzed drainage area (HEC-HMS User's Manual, USACE 2000). The design event hyetograph was developed so that the peak of the storm occurs at the center with decreasing intensities on either end. Following this methodology, critical storm events of lesser duration are nested in the overall 4-day event distribution for similar drainage areas. Consequently, only one design event is required to obtain critical flows throughout the watershed (i.e., the drainage area of any subwatershed is irrelevant because the

critical duration storm event for each subwatershed is nested within the 4-day precipitation hyetograph.). As shown in Figure 1-7, design events of shorter duration and similar drainage area are nested within the 4-day hyetographs used as the design event precipitation input in the XP-SWMM model. This methodology is similar to the methodology used to develop the standard SCS Type II 24-hour storm hyetograph; therefore, the 4-day frequency-based design storm has similar peak intensity to the SCS Type II 24-hour design event and shorter duration frequency-based storms as shown in Figure 1-8.

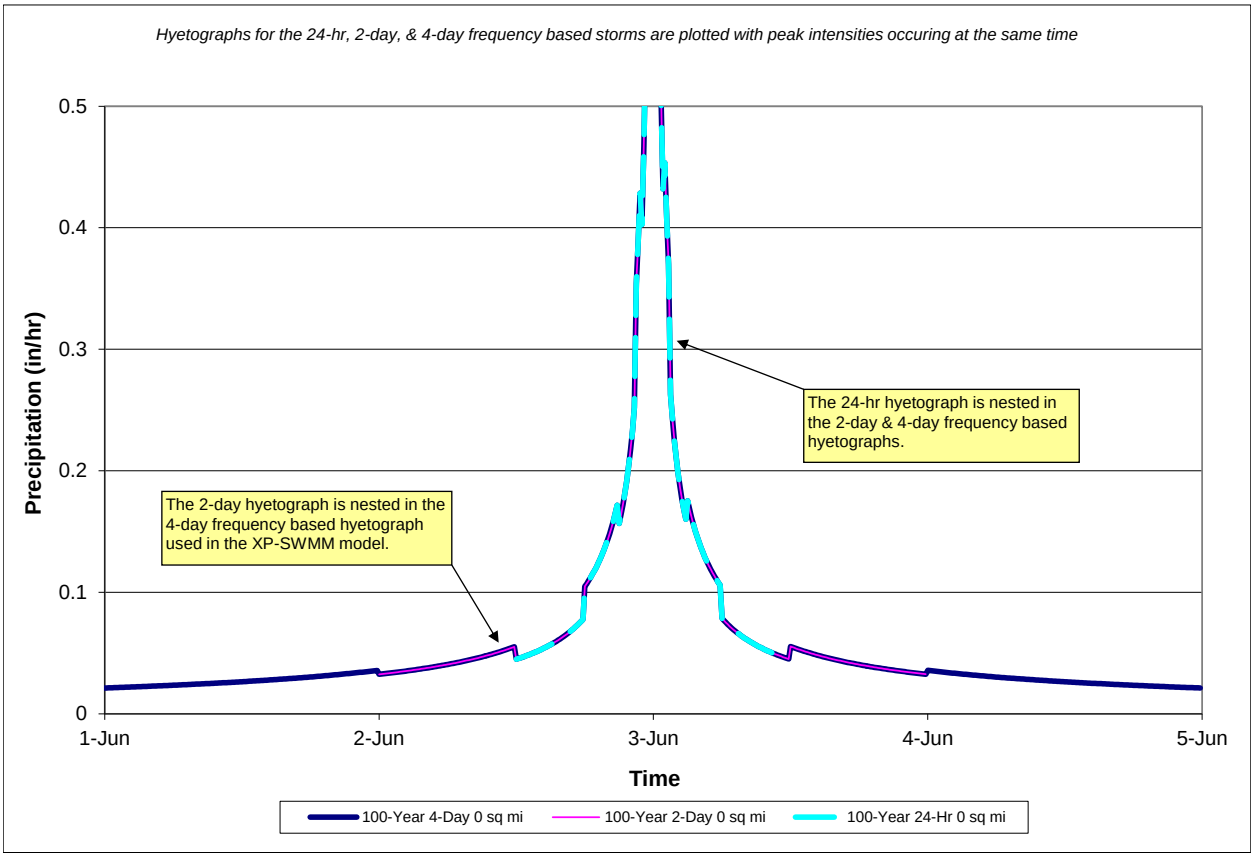


Figure 1-7 Nested Frequency-Based Storms of Shorter Duration based on TP40 Precipitation

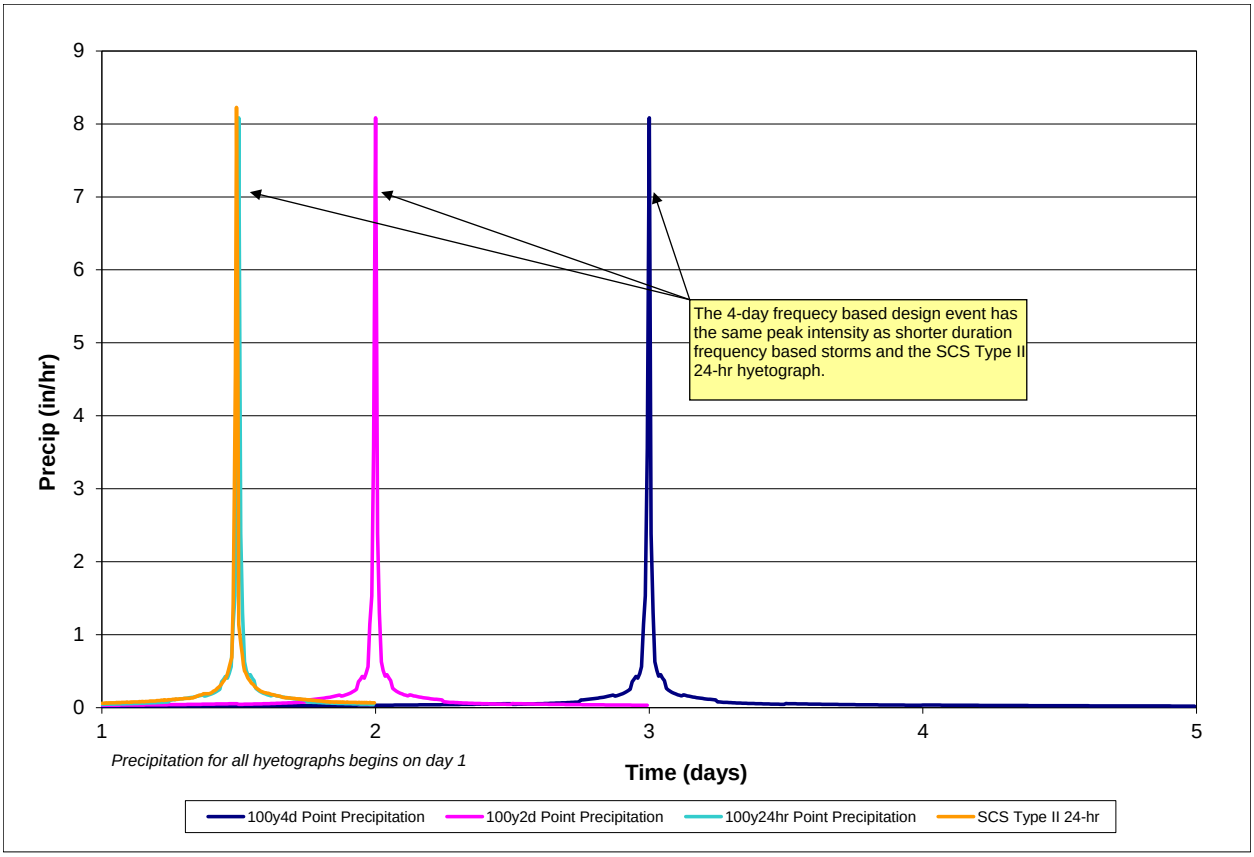


Figure 1-8 Frequency-Based and SCS Type II Peak Intensity Using TP40 Precipitation

1.3.2 Atlas 14 Rainfall Depths

In 2013 the National Oceanic and Atmospheric Administration (NOAA) released Atlas 14, Volume 8, which revised precipitation frequency estimates for 11 Midwestern states, including Minnesota. The estimates serve as an update to the U.S. Weather Bureau's *Technical Paper No. 40* (TP40), published in 1961, which was the primary source for precipitation depths used in the 2009 Vermillion River XP-SWMM model. The Atlas 14 rainfall estimates were developed for individual rainfall monitoring stations with long, consistent periods of record. After estimates were developed for individual stations, they were interpolated between stations to account for the spatial variability of rainfall depths.

Since Atlas 14 rainfall depths are interpolated spatially, rainfall estimates can vary across an area as large as the Vermillion River watershed. Therefore, it is important to characterize the spatial variability of precipitation estimates before selecting values to use for developing hyetographs for the hydrologic model.

Five locations, shown in Figure 1-9, were selected to characterize the spatial variability of Atlas 14 rainfall depths within the Vermillion River watershed. Precipitation depth-duration curves for each location were developed for the 100-year event and are shown in Figure 1-10. The five depth-duration curves are very similar, indicating that there is little spatial variability in the 100-year rainfall depth over the Vermillion

River watershed and suggesting that a single representative location within the watershed can be used to select precipitation depths. Depth-duration curves for the 1-, 2-, 10-, and 50-year events (not shown) are also very similar throughout the watershed. This indicates that a single representative location within the watershed can be used to select rainfall depths for the other modeled events.

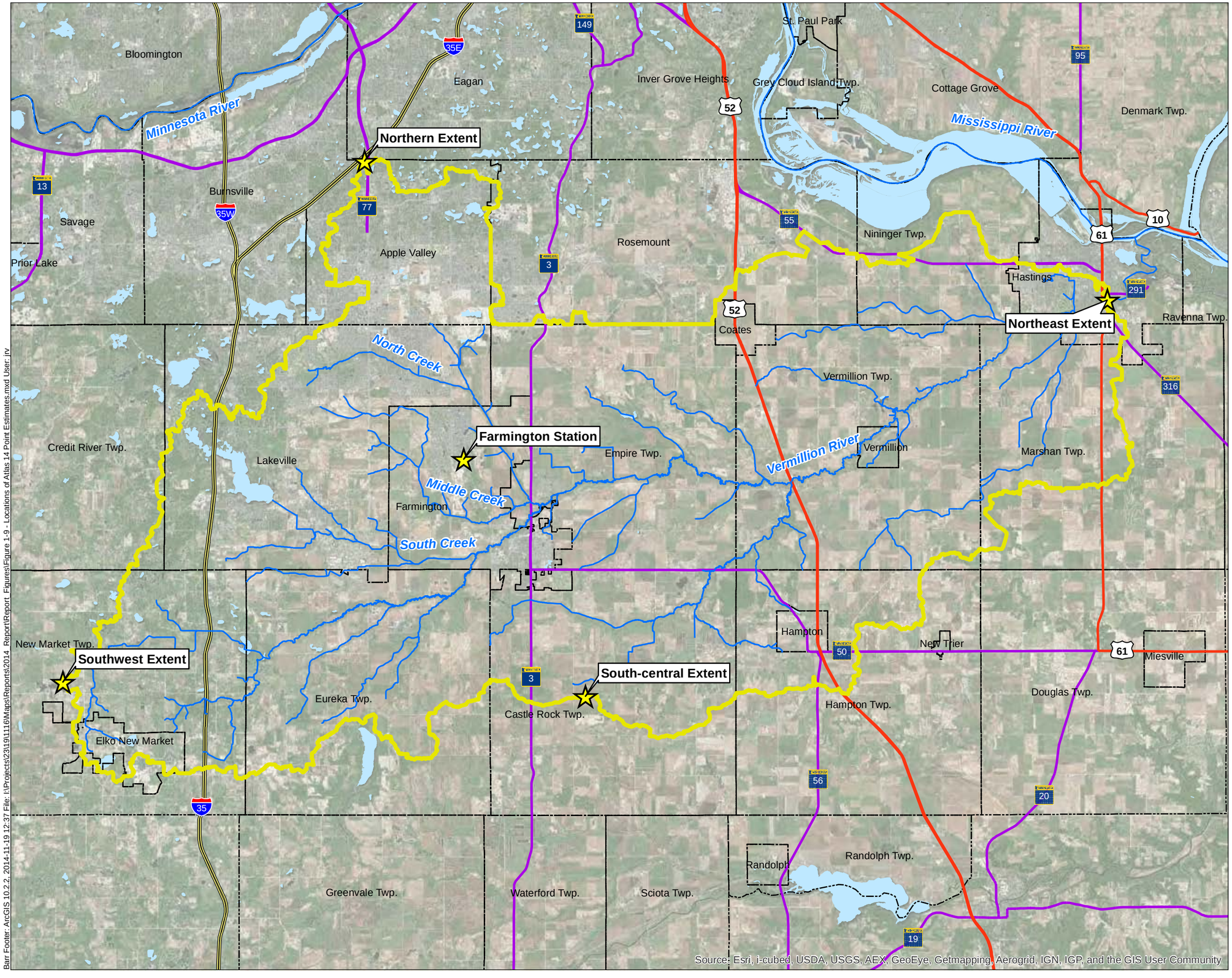
The Atlas 14 dataset includes the Farmington precipitation monitoring station (NWS Cooperative Station ID 21-2737), shown in Figure 1-9, which is centrally located within the Vermillion River watershed. As shown in Figure 1-10, the largest difference in rainfall depth between the Farmington station and any of the watershed extents is 0.18 inches.

Because the Farmington station is centrally located in the watershed and the Atlas 14 rainfall depths vary little across the watershed, Atlas 14 rainfall depths from the Farmington station were selected to develop rainfall distributions for the Vermillion River XP-SWMM model. The 4-day precipitation depths from the Farmington monitoring station are included in Table 1-5.

Table 1-5 Hypothetical Rainfall Event Point Precipitation from Atlas 14 (inches)

	Return Frequency				
Duration	**1 Year**	**2 Year**	**10 Year**	**50 Year**	**100 Year**
5 minutes	0.35	0.42	0.64	0.92	1.05
10 minutes	0.52	0.62	0.94	1.35	1.54
15 minutes	0.63	0.75	1.15	1.64	1.88
30 minutes	0.89	1.06	1.64	2.37	2.72
1 hour	1.16	1.38	2.18	3.27	3.81
2 hours	1.43	1.70	2.71	4.17	4.91
3 hours	1.59	1.89	3.04	4.77	5.67
6 hours	1.86	2.20	3.55	5.60	6.68
12 hours	2.13	2.49	3.88	5.96	7.04
24 hours	2.46	2.80	4.16	6.29	7.41
2 days	2.85	3.18	4.51	6.65	7.79
3 days	3.12	3.45	4.83	6.99	8.14
4 days	3.33	3.69	5.12	7.31	8.45

The rainfall precipitation depths from the Farmington monitoring station were used to develop rainfall hyetographs following current guidance suggested by the Minnesota Department of Transportation and the Minnesota Department of Natural Resources for developing hyetographs using Atlas 14 precipitation depths. This methodology is consistent with the methodology used to develop design rainfall hyetographs for the VRWJPO XP-SWMM model, although the resulting hyetograph is "stepped" rather than smoothed, as shown in Figure 1-11.



Atlas 14 Point Estimates
Vermillion River Watershed
Municipal Boundaries
Lakes & Ponds
Rivers and Streams

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Figure 1-9

LOCATIONS OF ATLAS 14 POINT ESTIMATES

Barr Footer: ArcGIS 10.2.2, 2014-11-19 12:37 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Report_Figures\Figure 1-9 - Locations of Atlas 14 Point Estimates.mxd User: jrv

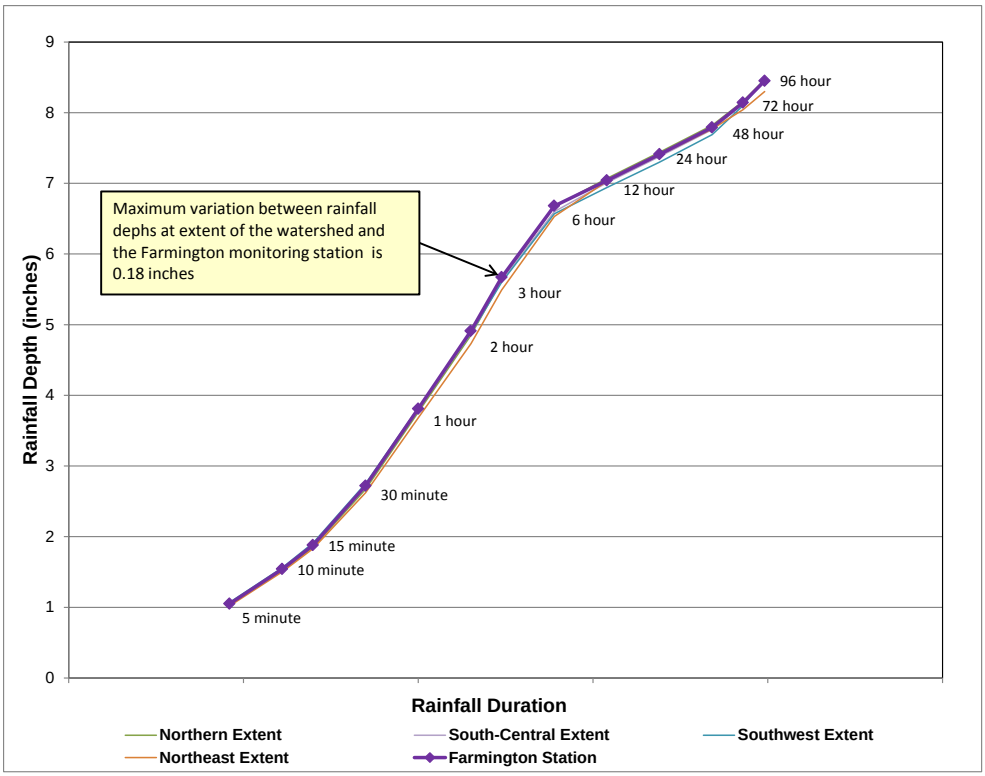


Figure 1-10 Atlas 14 100-Year Rainfall Depth-Duration Curves at Locations within the Vermillion River Watershed

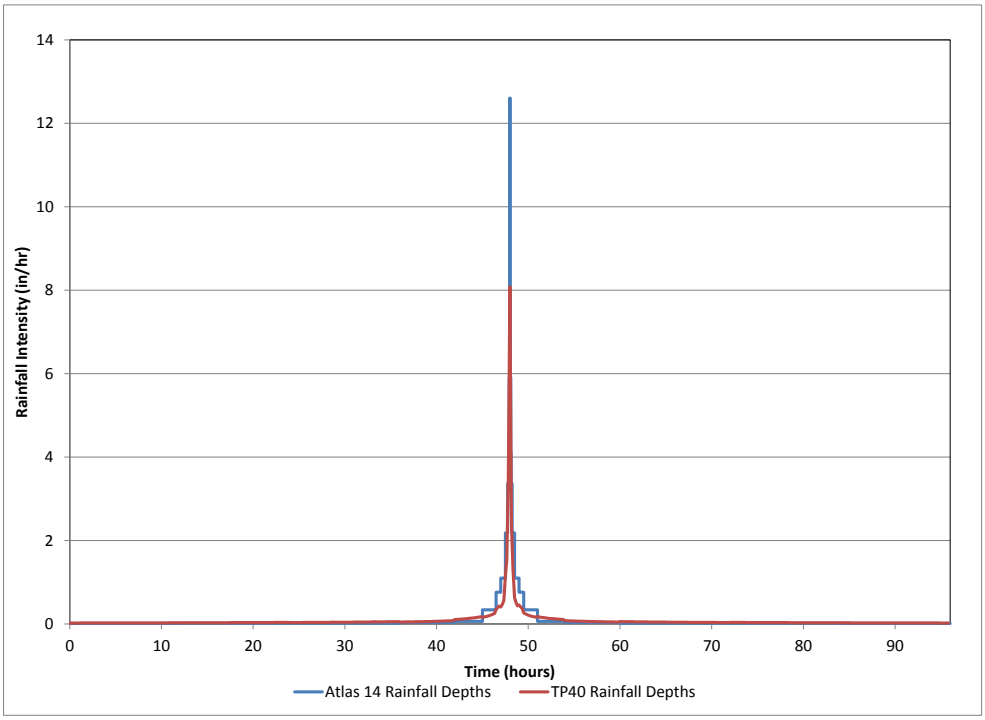


Figure 1-11 Comparison of Frequency-Based Rainfall Events Using Rainfall Depths from Technical Paper 40 and Atlas 14

2.0 Modeling Results

The XP-SWMM model was used to simulate three different combinations of development conditions and rainfall depths. First, the model was updated to include the trunk storm sewer system and development ponds included in the Farmington and Lakeville WRMPs. The updated model was used to simulate the 4-day event based on rainfall depths published in TP40. Peak discharge rates and runoff volumes from the updated model were compared to the 2010 VRWJPO XP-SWMM model at community standard locations. Differences between the two models are reviewed and presented in Section 2.1.

The second simulation was performed using the updated existing-condition model to simulate the 4-day event based on rainfall depths published in both Atlas 14 and TP40. The differences in peak discharge rates and runoff volumes between the two models at community standard locations were reviewed to quantify the impact of using the larger rainfall depths published in Atlas 14. These differences are presented in Section 2.2.

Finally, the updated model was revised to reflect future development conditions, including future land use and the planned regional stormwater basins from Lakeville's WRMP. The future-conditions model was used to evaluate peak flow rates and runoff volumes at community standard locations using the rainfall depths published in Atlas 14. Simulation results for the future-conditions model were compared to the updated existing-conditions model that also used Atlas 14 rainfall depths. The differences between these two models are presented in Section 2.3.

2.1 Existing-Conditions Technical Paper 40 Rainfall Depths

Following updates to the XP-SWMM model, the 1-, 2-, 10-, 50-, and 100-year design event peak flow rates and runoff volumes were compared to the VRWJPO standards at each of the 61 community standard locations. Discussion of model results is provided in the following sections.

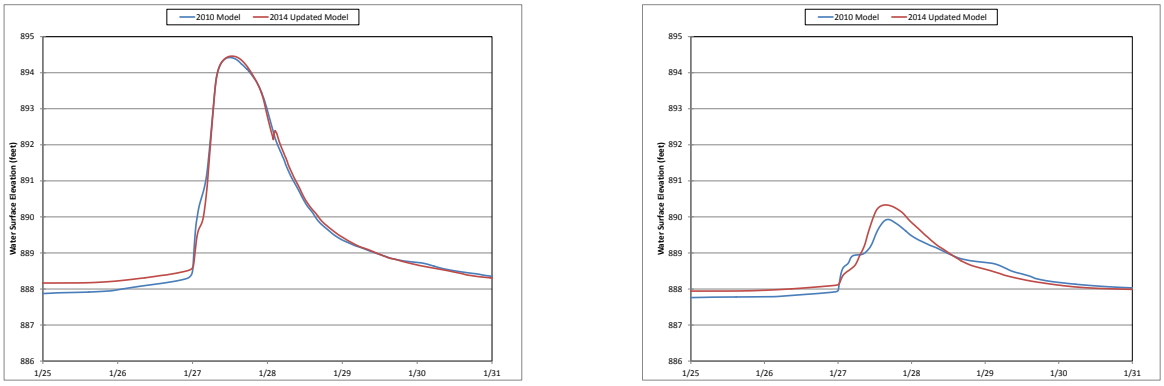
2.1.1 Water Surface Elevation at VRWJPO Gage Locations

Updates to the XP-SWMM model consisted of subdividing watersheds to simulate runoff to stormwater ponds within Lakeville and adding as-built storm sewer and culvert information provided by the City to connect stormwater ponds to the creeks. These updates can affect the amount of runoff volume reaching the creek and the timing of the runoff hydrograph.

Watershed divisions developed for the 2010 model were generally between 0.25 and 2.0 square miles. The watershed size used in the 2010 model was selected to simulate hydrologic processes in watersheds of similar scale. Uniform adjustments to hydrologic parameters may not be applicable if the subwatershed size varies significantly. The 238 subwatersheds from the 2010 model were subdivided into 932 subwatersheds varying is size from 0.5 to 815 acres (.0001 to 1.3 square miles). The average updated watershed size was 45 acres (< 0.1 square miles).

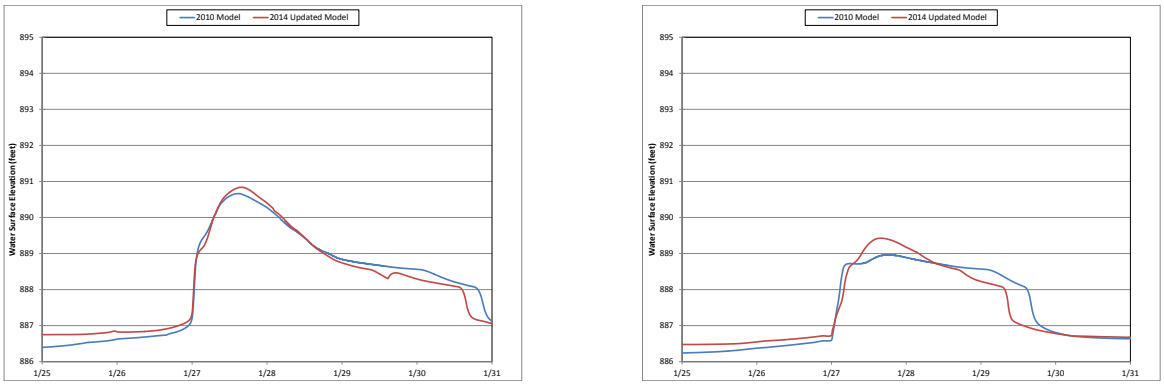
In addition, detail was added in the stormwater system. The 2010 model included 849 links to route the stormwater through the system. These represented culverts, pipe segments, or creek reaches. The updated model includes more than 3,000 links to route stormwater from ponds within Lakeville and Farmington to the creek. As a result, the hydrograph timing may be affected as the updated model routes flow through the main stormwater conveyance system within Lakeville.

To verify that the updated model could still be considered adequately calibrated, simulation results from the model were compared to results from the 2010 model at four gage stations used to calibrate the 2010 model. Figure 2-1 through Figure 2-4 show a comparison of simulation results for the 100-year and 2-year events. In general, the simulation results from the updated 2014 model match simulation results from the 2010 model for both the overall timing of the hydrograph and peak water surface elevation. Differences that precede the beginning of the rainfall event can be attributed to a constant inflow from Apple Valley due to a shorter "warm-up" period used for the 2010 model. For the 2-year event the maximum difference in peak water surface elevation of 0.7 feet occurs at the USGS gage (gage 05345000), and for the 100-year event the maximum difference of 0.2 feet occurs at MC-801. The simulation results indicate that—based on the available information—the XP-SWMM model can still be considered calibrated. The small increase in water surface elevation may be attributed to applying hydrologic parameters developed for subwatersheds of a larger scale to subwatersheds with much smaller drainage areas.



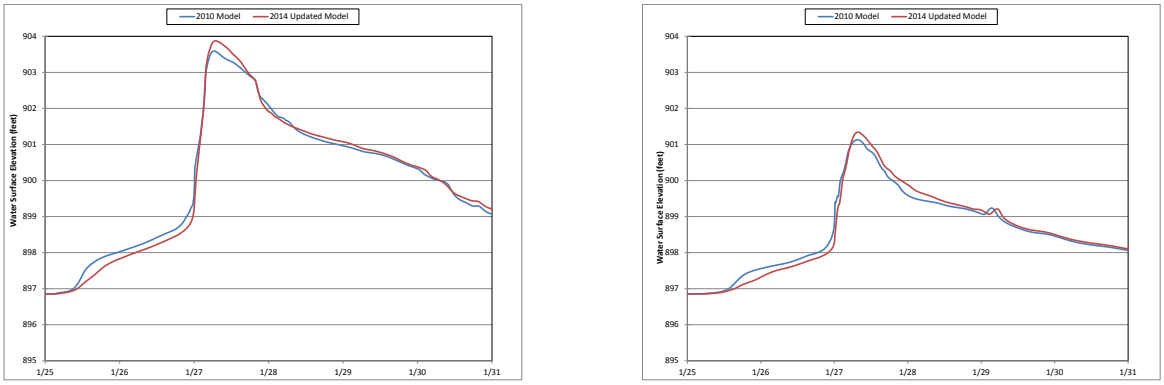
The differences in peak elevation during the 100-year event and the 2-year event are < 0.1 feet and 0.4 feet, respectively..

Figure 2-1 2010 XP-SWMM Model and 2014 Updated XP-SWMM Model Simulation Results at Gage NC-808



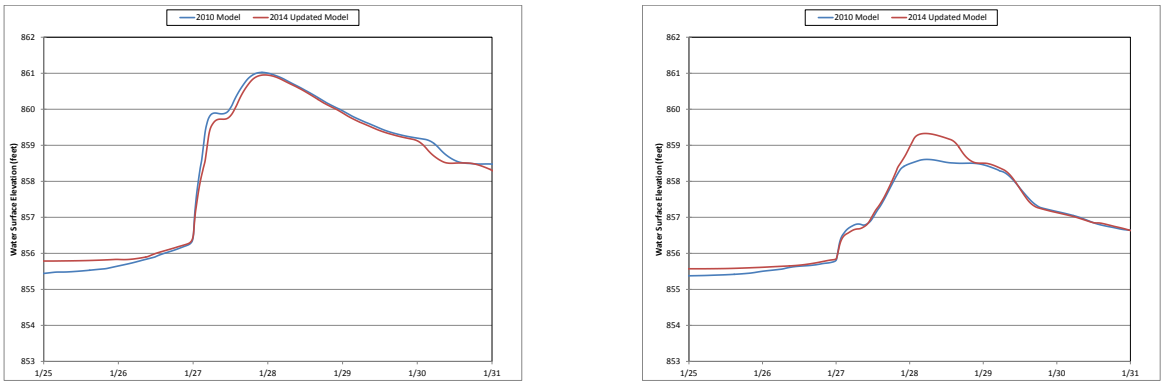
The differences in peak elevation during the 100-year event and the 2-year event are 0.2 feet and 0.5 feet, respectively..

Figure 2-2 2010 XP-SWMM Model and 2014 Updated XP-SWMM Model Simulation Results at Gage MC-801



The differences in peak elevation during the 100-year event and the 2-year event are 0.3 feet and 0.2 feet, respectively.

Figure 2-3 2010 XP-SWMM Model and 2014 Updated XP-SWMM Model Simulation Results at Gage VR-807



The differences in peak elevation during the 100-year event and the 2-year event are -0.1 feet and 0.7 feet, respectively.

Figure 2-4 2010 XP-SWMM Model and 2014 Updated XP-SWMM Model Simulation Results at USGS Gage

2.1.2 Peak Flow Rates and Runoff Volume at Community Standard Locations

Peak flow rates at community standard locations near the Lakeville municipal boundary increased on average by 10% for the 100-year event and 31% for the 2-year event. The largest increase for the 2-year event occurred on Tributary 1 to South Creek on the Lakeville – Farmington municipal boundary. In this location updated topographic information was used to update the model and resulted in a less restrictive cross section. The largest increase for the 100-year event occurred on Tributary 6A to Middle Creek on the Lakeville – Farmington municipal boundary.

The largest increase in runoff volume for the 100-year event occurred on South Creek; runoff volume increased by 305 acre-feet. The increase in runoff volume for the 100-year event is equivalent to 0.03-feet or 0.37 inches over the upstream drainage area modified for the model update. This increased volume is a result of the methodology used to calculate the watershed width parameters, which is discussed later in this section. The largest increase in runoff volume for the 2-year event occurred on North Creek; runoff volume increased by 92 acre-feet. The increase in runoff volume at this location is a result of a modification to how inflows from Apple Valley are represented in the model, which is discussed later in this section.

The updated peak flow rates and runoff volume at community standard locations near the Lakeville municipal boundary are shown in Figure 2-5 through Figure 2-7 for the 2- and 100-year events.

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to North Creek: Apple Valley – Lakeville (Link19, McNamara Pond)[1]				
2010 VRWJPO XP-SWMM Model	80	NA	55	NA
2014 Updated XP-SWMM Model	80	NA	55	NA
Difference	0 *[0.0%]*	NA	0 *[0.0%]*	NA

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1A to North Creek: Apple Valley – Lakeville (L-1167, Cobblestone Lake) [1]				
2010 VRWJPO XP-SWMM Model	27	NA	27	NA
2014 Updated XP-SWMM Model	27	NA	27	NA
Difference	0 *[0.0%]*	NA	0 *[0.0%]*	NA

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
North Creek: Lakeville – Farmington *(L-1584)*				
2010 VRWJPO XP-SWMM Model	364	6,347	1,204	9,118
2014 Updated XP-SWMM Model	391	6,439	1,158	9,232
Difference	27 *[7.4%]*	92 *[1.4%]*	-46 *[-3.8%]*	114 *[1.3%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 4 to North Creek: Lakeville – Farmington *(L-215)*				
2010 VRWJPO XP-SWMM Model	52	26	281	126
2014 Updated XP-SWMM Model	61	19	255	81
Difference	9 *[17.3%]*	-7 *[-26.9%]*	-26 *[-9.3%]*	-45 *[-35.7%]*

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

Lake Marion

South Creek

Vermillion River

35W

35

1 Discharge from McNamara Pond and Cobblestone Pond are simulated as a constant discharge so a total runoff volume calculation is not completed at these locations.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

City of Lakeville
Major Subwatersheds
Subwatersheds
Rivers and Streams

Standard Locations

Tributary Drainage Area
- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet
5,000 0 5,000

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Figure 2-5

NORTH CREEK
EXISTING CONDITIONS
COMPARISONS OF
2010 TO 2014
2-YEAR AND 100-YEAR PEAK
RATES BASED ON TP40 RAINFALL

Barr Footer: ArcGIS 10.2.2, 2014-12-18 10:46 File: I:\Projects\23\19\1116\Maps\2016\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-5 - EC_2010to2014_TP40_NC_Lakeville.mxd User: jrv

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Middle Creek: Lakeville – Farmington *(L-1595 in 2010 model & L-LMC-133 in 2014 model)*				
2010 VRWJPO XP-SWMM Model	199	124	721	467
2014 Updated XP-SWMM Model	211	146	682	502
Difference	12 *[6.0%]*	22 *[17.7%]*	-39 *[-5.4%]*	35 *[7.5%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 6A to Middle Creek: Lakeville – Farmington *(L-1589 in 2010 model & L-LMC-135 in 2014 model)*				
2010 VRWJPO XP-SWMM Model	77	28	353	129
2014 Updated XP-SWMM Model	114	36	493	142
Difference	37 *[48.1%]*	8 *[28.6%]*	140 *[39.7%]*	13 *[10.1%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 6 to Middle Creek: Lakeville – Farmington *(L-1200 in 2010 model & L-LMC-119 in 2014 model)*				
2010 VRWJPO XP-SWMM Model	110	47	436	212
2014 Updated XP-SWMM Model	127	48	412	204
Difference	17 *[15.5%]*	1 *[2.1%]*	-24 *[-5.5%]*	-8 *[-3.8%]*

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

Lake Marion

South Creek

Vermillion River

35W

35E

77

Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

City of Lakeville

Major Subwatersheds

Subwatersheds

Rivers and Streams

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet

5,000 0 5,000

BARR

Figure 2-6

MIDDLE CREEK
EXISTING CONDITIONS
COMPARISONS OF
2010 TO 2014
2-YEAR AND 100-YEAR PEAK
RATES BASED ON TP40 RAINFALL

Barr Footer: ArcGIS 10.2.2, 2014-11-19 09:12 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-6 - EC_2010to2014_TP40_MC_Lakeville.mxd User: jrv

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
South Creek: Lakeville – Farmington *(L-830)*				
2010 VRWJPO XP-SWMM Model	387	618	1,125	2,040
2014 Updated XP-SWMM Model	397	688	1,146	2,345
Difference	10 *[2.6%]*	70 *[11.3%]*	21 *[1.9%]*	305 *[15.0%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
East Branch South Creek: Lakeville – Farmington *(L-1351)*				
2010 VRWJPO XP-SWMM Model	109	40	349	149
2014 Updated XP-SWMM Model	117	48	393	170
Difference	8 *[7.3%]*	8 *[20.0%]*	44 *[12.6%]*	21 *[14.1%]*

North Creek Study Area

North Creek

Middle Creek

Middle Creek Study Area

Lake Marion

South Creek

South Creek Study Area

Vermillion River

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Lakeville – Farmington *(L-1339)*				
2010 VRWJPO XP-SWMM Model	80	144	446	578
2014 Updated XP-SWMM Model	171	151	517	595
Difference	91 *[113.8%]*	7 *[4.9%]*	71 *[15.9%]*	17 *[2.9%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Eureka Township – Lakeville *(L-1344 in 2010 model & L-LSC-816 in 2014 model)*				
2010 VRWJPO XP-SWMM Model	41	74	194	381
2014 Updated XP-SWMM Model	84	103	285	454
Difference	43 *[104.9%]*	29 *[39.2%]*	91 *[46.9%]*	73 *[19.2%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: New Market Township – Eureka Township *(L-131 in 2010 model & L-LSC-850 in 2014 model)*				
2010 VRWJPO XP-SWMM Model	154	24	373	92
2014 Updated XP-SWMM Model	149	21	379	87
Difference	-5 *[-3.2%]*	-3 *[-12.5%]*	6 *[1.6%]*	-5 *[-5.4%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Lakeville – Eureka Township *(L-1345 in 2010 model & L-LSC-803 in 2014 model)*				
2010 VRWJPO XP-SWMM Model	99	34	337	157
2014 Updated XP-SWMM Model	122	36	396	163
Difference	23 *[23.2%]*	2 *[5.9%]*	59 *[17.5%]*	6 *[3.8%]*

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

City of Lakeville
Major Subwatersheds
Subwatersheds
Rivers and Streams

Standard Locations

Tributary Drainage Area
- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet
5,000 0 5,000

BARR

Figure 2-7

SOUTH CREEK
EXISTING CONDITIONS
COMPARISONS OF
2010 TO 2014
2-YEAR AND 100-YEAR PEAK
RATES BASED ON TP40 RAINFALL

Barr Footer: ArcGIS 10.2.2, 2014-11-19 09:30 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-7 - EC_2010to2014_TP40_SC_Lakeville.mxd User: jrv

At some community standard locations the peak discharge rate or runoff volume differed from the 2010 XP-SWMM model. These locations are described below:

North Creek Community Standard Locations *(L-1584)* – North Creek community standard location comparisons are shown on Figure 2-5. The increase in runoff volume at the North Creek community standard locations is primarily a result of how inflows from Apple Valley are simulated in the XP-SWMM model. There are two locations that hydraulically connect the City of Apple Valley to the downstream watershed. One connection is the pumped outlet from Cobblestone Lake; the other is the outlet from McNamara Pond (Figure 2-5). Subwatersheds were delineated to both of these outlets at the beginning of the original model development in 2009. However, the Cities of Apple Valley and Lakeville reached an agreement defining the maximum allowable flow rates at these locations prior to calibrating the model. Therefore, the flow standards are based on the agreement between Apple Valley and Lakeville, rather than the modeled flows provided by Apple Valley. In 2009, the agreed-upon flow rates were reviewed by the Independent Technical Review (ITR) Committee and incorporated into the final flow standards. Based on discussions with the ITR Committee during the development of the 2009 VRWJPO XP-SWMM model it was determined that Apple Valley inflows would not be incorporated into the calibration or validation events. This is because no flow was generated from either Apple Valley subwatershed during the selected calibration events. The inflows are entered into the models as a constant discharge rather than a stormwater runoff hydrograph. Therefore, it takes time for the constant inflows to fill channel storage and reach an equilibrium water surface elevation along North Creek and the Vermillion River.

The 2009 VRWJPO XP-SWMM model was run for 4 days before the rainfall event to allow base flows in the Vermillion River (on the order of 10-50 cfs, depending on location) to reach an equilibrium. The 4-day-initialization period was selected during model calibration and left constant for simulation of the design events. However, the updated modeling suggests a 4-day-initialization period is not enough time for the constant inflows from Apple Valley to reach equilibrium throughout the entire Vermillion River model. To allow the constant discharge to reach equilibrium throughout the model prior to the rainfall event, the initialization period was extended to 24 days. As a result, the updated model simulates additional runoff volume (constant discharge from Apple Valley) at downstream community standard locations. The change in duration of the initialization period to reach a constant inflow from Apple Valley is consistent with the methodology used to define peak discharge rates at flow standard locations with the Vermillion River XP-SWMM model in 2009 that was discussed with the ITR and reviewed by municipalities within the Vermillion River watershed.

Middle Creek Community Standard Location (*L-LMC-133)* – Middle Creek community standard location comparisons are shown on Figure 2-6. The reduction in peak discharge rate at this location for the 100-year event was a result of adding additional detail to the stormwater system in Lakeville. The 2009 XP-SWMM model included a single subwatershed for the drainage area upstream of Dodd Boulevard, which resulted in Dodd Boulevard overtopped during the 100-year event. The 2014 model includes four subwatersheds, including two existing stormwater ponds upstream of Dodd Boulevard. When the additional detail was added to the model, Dodd Boulevard did not overtop and the peak discharge rate for the 100-year event at the community standard location decreased. The discharge rate for the 2-year

event was similar because Dodd Boulevard did not overtop in either the 2009 or the 2014 XP-SWMM model.

South Creek Community Standard Locations *(L-1351, L-830, L-1339)* – South Creek community standard location comparisons are show on Figure 2-7. Runoff volume increased at each of the South Creek community standard locations. The increase in runoff volume is a result of detail added to the XP-SWMM model in this area. In the 2010 model the tributary area upstream of these community standard locations was divided into 22 subwatersheds, varying from 67–5,033 acres. The 2014 updated model subdivides the area into 310 subwatersheds varying from 0.5–817 acres. The difference in runoff volume is a result of applying consistent methodology to calculate watershed width for both large and small watersheds. For the 2014 updated model, watershed width was calculated as watershed area divided by longest flow path, as described in Section 1.1.1.4, the same methodology used for the 2010 model. Following this methodology, as the number of subwatersheds increases, the total width (i.e., the sum of individual subwatershed widths for all watersheds) also increases. As discussed in Section 1.1.1.4, as watershed width increases there is a small increase in runoff rate and volume from a given subwatershed. These small increases result in larger cumulative volume differences at the community standard locations. In general, as more detail is incorporated into the XP-SWMM model (i.e., the more a subwatershed is subdivided) the larger the difference in runoff volume. This is especially true in undeveloped portions of the watershed, where increased runoff rates result in less infiltration and abstraction. Therefore, the largest difference in runoff volume at the community standard locations occurs on South Creek at L-830, which has the largest tributary area.

2.2 Existing Conditions – Atlas 14 Rainfall Depths

Following revisions to the XP-SWMM model, the 1-, 2-, 10-, 50-, and 100-year design events were simulated based on the rainfall depths published in Atlas 14. The peak discharge rates and runoff volumes for the Atlas 14 design events were compared to the peak discharge rates and runoff volumes calculated using the TP40 design events with the updated XP-SWMM model. A comparison of peak flow and runoff volume results is included in Appendix C. Appendix C also includes figures illustrating peak flows and total runoff volumes at each VRWJPO community standard location. The following sections provide additional discussion regarding the Atlas 14 model results.

2.2.1 Peak Flow Rates and Runoff Volume at Community Standard Locations

Peak flow rates increased throughout the Vermillion River watershed as a result of applying the rainfall depths published in Atlas 14. On average the peak discharge at community standard locations near the Lakeville municipal boundary increased by 84 percent for the 100-year event. The increase was less for the more frequent (i.e., smaller) rainfall events. For these events, the difference between the rainfall depths published in TP40 and Atlas 14 are smaller. The Atlas 14 simulation results were validated by comparing the simulated results to the discharge-frequency curve at the USGS monitoring station and comparing the simulated 100-year peak flow rates along the Vermillion River to the peak flow rates used for the 2010 Dakota County DFIRM.

The updated peak flow rates at community standard locations for the 2- and 100-year events based on Atlas 14 rainfall depths are summarized in Figure 2-8 through Figure 2-10. Results for the 1-year, 10-year, and 50-year events are included in Appendix C.

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to North Creek: Apple Valley – Lakeville (Link19, McNamara Pond)[1]				
2010 VRWJPO XP-SWMM Model	80	NA	55	NA
2014 Updated XP-SWMM Model	80	NA	55	NA
Difference	0 *[0.0%]*	NA	0 *[0.0%]*	NA

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1A to North Creek: Apple Valley – Lakeville (L-1167, Cobblestone Lake) [1]				
2010 VRWJPO XP-SWMM Model	27	NA	27	NA
2014 Updated XP-SWMM Model	27	NA	27	NA
Difference	0 *[0.0%]*	NA	0 *[0.0%]*	NA

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
North Creek: Lakeville – Farmington *(L-1584)*				
2014 Updated XP-SWMM Model (TP40)	391	6,439	1,158	9,232
2014 Updated XP-SWMM Model (Atlas 14)	456	6,415	1,991	9,822
Difference	65 [16.6%]	-24 [-0.4%]	833 [71.9%]	590 [6.4%]

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 4 to North Creek: Lakeville – Farmington *(L-215)*				
2014 Updated XP-SWMM Model (TP40)	61	19	255	81
2014 Updated XP-SWMM Model (Atlas 14)	68	20	471	127
Difference	7 [11.5%]	1 [5.3%]	216 [84.7%]	46 [56.8%]

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

Lake Marion

South Creek

Vermillion River

1 Discharge from McNamara Pond and Cobblestone Pond are simulated as a constant discharge so a total runoff volume calculation is not completed at these locations.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

City of Lakeville
Major Subwatersheds
Subwatersheds
Rivers and Streams

Standard Locations

Tributary Drainage Area
- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet
5,000 0 5,000

BARR

Figure 2-8

NORTH CREEK
EXISTING CONDITIONS
COMPARISONS OF
2-YEAR AND 100-YEAR
PEAK RATES FOR
TP40 TO ATLAS14

Barr Footer: ArcGIS 10.2.2, 2014-12-18 10:40 File: I:\Projects\23\19\1116\Maps\2016\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-8 - EC_TP40_to_AT14_NC__Lakeville.mxd User: jrv

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Middle Creek: Lakeville – Farmington *(L-1595 in 2010 model & L-LMC-133 in 2014 model)*				
2014 Updated XP-SWMM Model (TP40)	211	146	682	502
2014 Updated XP-SWMM Model (Atlas 14)	270	146	1,522	715
Difference	59 [28.0%]	0 [0.0%]	840 [123.2%]	213 [42.4%]

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 6A to Middle Creek: Lakeville – Farmington *(L-1589 in 2010 model & L-LMC-135 in 2014 model)*				
2014 Updated XP-SWMM Model (TP40)	114	36	493	142
2014 Updated XP-SWMM Model (Atlas 14)	138	38	828	216
Difference	24 *[21.1%]*	2 *[5.6%]*	335 *[68.0%]*	74 *[52.1%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 6 to Middle Creek: Lakeville – Farmington *(L-1200 in 2010 model & L-LMC-119 in 2014 model)*				
2014 Updated XP-SWMM Model (TP40)	127	48	412	204
2014 Updated XP-SWMM Model (Atlas 14)	145	49	720	321
Difference	18 *[14.2%]*	1 *[2.1%]*	308 *[74.8%]*	117 *[57.4%]*

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

Lake Marion

South Creek

Vermillion River

35W

35E

77

Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

City of Lakeville

Major Subwatersheds

Subwatersheds

Rivers and Streams

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet

5,000 0 5,000

BARR

Figure 2-9

MIDDLE CREEK
EXISTING CONDITIONS
COMPARISONS OF
2-YEAR AND 100-YEAR
PEAK RATES FOR
TP40 TO ATLAS14

Barr Footer: ArcGIS 10.2.2, 2014-11-19 09:19 File: I:\Projects\23\19\1116\Maps\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-9 - EC_TP40_to_AT14_MC_Lakeville.mxd User: jrv

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
South Creek: Lakeville – Farmington *(L-830)*				
2014 Updated XP-SWMM Model (TP40)	397	688	1,146	2,345
2014 Updated XP-SWMM Model (Atlas 14)	461	640	2,575	3,337
Difference	64 *[16.1%]*	-48 *[-7.0%]*	1,429 *[124.7%]*	992 *[42.3%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
East Branch South Creek: Lakeville – Farmington *(L-1351)*				
2014 Updated XP-SWMM Model (TP40)	117	48	393	170
2014 Updated XP-SWMM Model (Atlas 14)	138	47	714	264
Difference	21 *[17.9%]*	-1 *[-2.1%]*	321 *[81.7%]*	94 *[55.3%]*

North Creek Study Area

North Creek

Middle Creek

Middle Creek Study Area

Lake Marion

South Creek

South Creek Study Area

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Lakeville – Farmington *(L-1339)*				
2014 Updated XP-SWMM Model (TP40)	171	151	517	595
2014 Updated XP-SWMM Model (Atlas 14)	212	149	871	941
Difference	41 *[24.0%]*	-2 *[-1.3%]*	354 *[68.5%]*	346 *[58.2%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: New Market Township – Eureka Township *(L-131 in 2010 model & L-LSC-850 in 2014 model)*				
2014 Updated XP-SWMM Model (TP40)	149	21	379	87
2014 Updated XP-SWMM Model (Atlas 14)	135	20	495	142
Difference	-14 *[-9.4%]*	-1 *[-4.8%]*	116 *[30.6%]*	55 *[63.2%]*

Vermillion River

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Lakeville – Eureka Township *(L-1345 in 2010 model & L-LSC-803 in 2014 model)*				
2014 Updated XP-SWMM Model (TP40)	122	36	396	163
2014 Updated XP-SWMM Model (Atlas 14)	140	36	904	274
Difference	18 *[14.8%]*	0 *[0.0%]*	508 *[128.3%]*	111 *[68.1%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Eureka Township – Lakeville *(L-1344 in 2010 model & L-LSC-816 in 2014 model)*				
2014 Updated XP-SWMM Model (TP40)	84	103	285	454
2014 Updated XP-SWMM Model (Atlas 14)	96	105	491	750
Difference	12 *[14.3%]*	2 *[1.9%]*	206 *[72.3%]*	296 *[65.2%]*

Source: Esri, Pcubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

City of Lakeville
Major Subwatersheds
Subwatersheds
Rivers and Streams

Standard Locations

Tributary Drainage Area
- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet
5,000 0 5,000

BARR

Figure 2-10

SOUTH CREEK
EXISTING CONDITIONS
COMPARISONS OF
2-YEAR AND 100-YEAR
PEAK RATES FOR
TP40 TO ATLAS14

Barr Footer: ArcGIS 10.2.2, 2014-11-19 09:34 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-10 - EC_TP40_to_AT14_SC_Lakeville.mxd User: jrv

2.2.1.1 Comparison to the Discharge-Frequency Curve at the USGS Monitoring Station

The simulated peak discharge at the USGS monitoring station was compared to the discharge frequency curve developed as part of the 2009 study and updated with data from 2008–2013, as shown in Figure 2-11.

The peak discharges from the Atlas 14 XP-SWMM model are within the 90 percent confidence limits for the 100-year, 50-year, and 10-year events, while the 2-year event plots slightly above the 90 percent confidence limits. By comparison, the discharges calculated by the 2010 VRWJPO XP-SWMM model under-estimate the discharge at the USGS station for the 100-year, 50-year, and 10-year events. In general, the peak flow rates calculated by the updated XP-SWMM model using rainfall depths published in Atlas 14 are within the expected confidence limits.

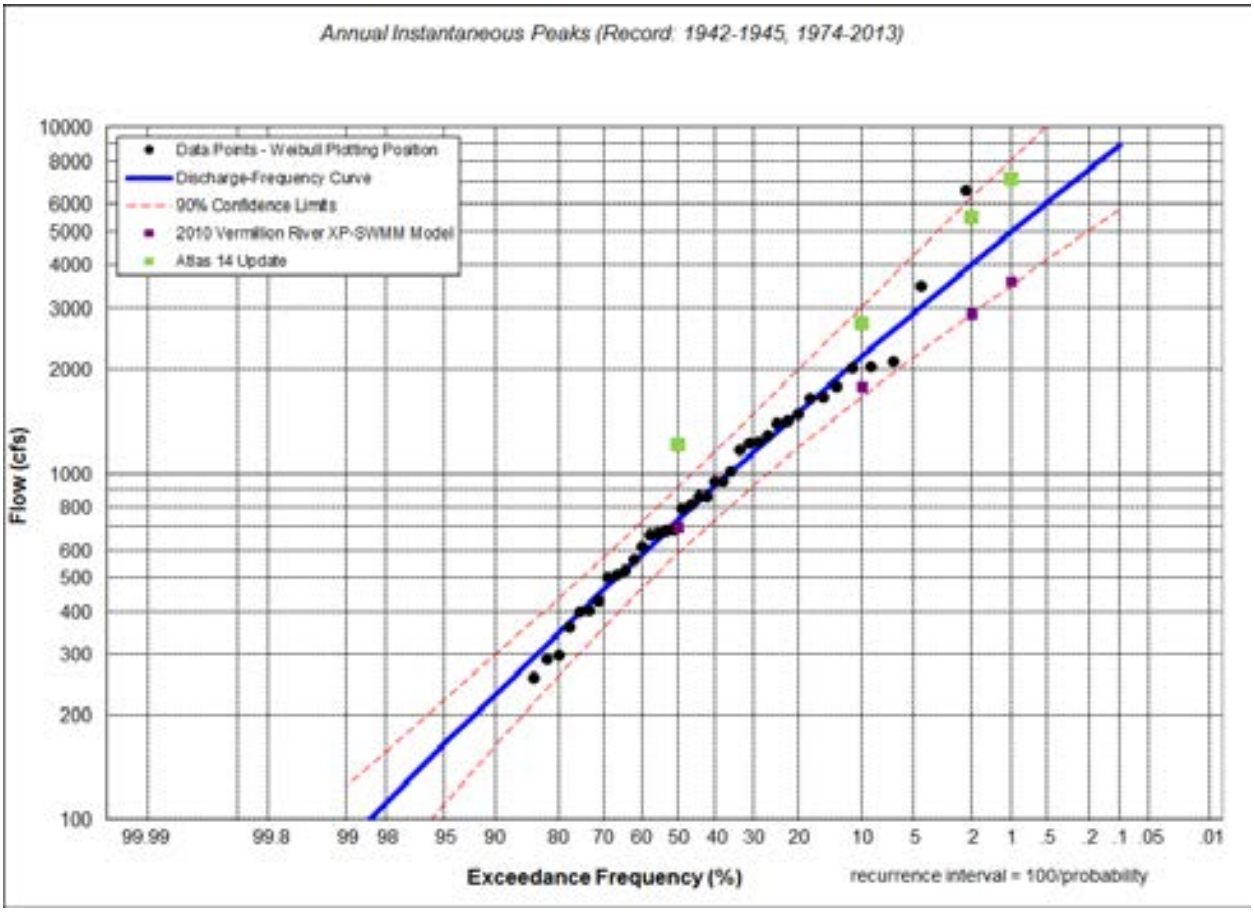

Figure 2-11 Discharge Frequency Curve at the USGS Monitoring Station

2.2.1.2 Dakota County DFIRM Flows

The XP-SWMM 100-year Atlas 14 simulated peak flows were also compared to flows calculated for the 2010 Dakota County DFIRM study at standard locations along the Vermillion River. DFIRM flows for the Vermillion River were obtained from the HEC-HMS model developed by Montgomery Watson Harza, which was based on the USACE HEC-1 model calibrated to the 1998 frequency curve. A comparison of calibrated XP-SWMM model and DFIRM flows is included in Table 2-1.

Table 2-1 Comparison to 100-year Discharge from Dakota County DFIRM

XP-SWMM Link	Upstream Municipality	Downstream Municipality	2010 Vermillion River XP-SWMM 100-Year Peak Flow (cfs) [1,4]	2014 Updated Vermillion River XP-SWMM 100-Year Peak Flow (cfs) [2,4]	100-Year Flow from Dakota County DFIRM(cfs) [3]
L-1473	New Market Twp.	Eureka Twp.	451 *(5%)*	1,329 *(210%)*	429
L-179	Farmington	Empire Twp.	2,139 *(-55%)*	4,583 *(-3%)*	4,712
L-225	Empire Twp.	Farmington	3,453 *(-27%)*	6,887 *(46%)*	4,712
L-1302	Farmington	Empire Twp.	3,494 *(-26%)*	6,923 *(47%)*	4,712
L-581	Empire Twp.	Vermillion Twp.	3,578 *(-39%)*	7,072 *(21%)*	5,834
L-1034	Marshan Twp.	Nininger Twp.	3,789 *(-52%)*	7,476 *(-4%)*	7,823
L-1031	Nininger Twp.	Hastings	3,855 *(-51%)*	7,554 *(-3%)*	7,823
WOMP	Hastings	-	3,867 *(-54%)*	7,837 *(-7%)*	8,424

[1] 2010 XP-SWMM model results using rainfall depths from TP40
[2] 2014 XP-SWMM model results using Atlas 14 rainfall depth
[3] Peak flow rates from the Dakota County DFIRM on the Vermillion River are based on the HEC-HMS model completed in 2002 by Montgomery Watson Harza. The HEC-HMS model was originally based on a HEC-1 model calibrated to the discharge-frequency curve completed in 1998 by the USACE.
[4] The percent difference from the discharge used for the Dakota County DFIRM is provided in *italics*.

Near the upstream end of the Vermillion River (i.e., near New Market and Eureka Township) the 2014 XP-SWMM model using Atlas 14 rainfall depths over-estimates the peak discharge compared to the Dakota County DFIRM. However, for the larger drainage areas the Atlas 14 simulation results better match the discharge values used in the Dakota County DFIRM.

2.3 Future Conditions – Atlas 14 Rainfall Depths

Following revisions to the XP-SWMM model, the 1-, 2-, 10-, 50-, and 100-year design event peak flow rates and runoff volumes for future conditions were compared to existing conditions at each of the 61 standard locations throughout the Vermillion River watershed. The following sections provide additional discussion regarding the future-conditions model results for peak flow rates and total runoff volume at community standard locations.

2.3.1 Pond Sizing

Planned regional stormwater basins were added to the future conditions XP-SWMM model in the locations shown on Figure 1-6.The storage volume and outlet from each proposed regional ponding basin was modified so that the peak flow rates from the future conditions model were equal or less than peak flow rates from the existing conditions XP-SWMM model. Table 2-2 includes the estimated storage volume and outlet structure for planned regional ponds within Lakeville to prevent peak flow rates from increasing at community standard locations. Table 2-2 also includes future conditions ponds located outside the municipal boundary that discharge into Lakeville.

The planned regional ponds were sized without accounting for smaller development stormwater retention basins or infiltration basins that will be necessary to meet the VRWJPO volume standards. Therefore, there is potential for the size of planned regional basins to be reduced when smaller stormwater BMPs are considered. Planned regional ponds were also evaluated without considering localized flooding concerns within the City. As such, it is possible that the size or configuration of the basins may need to be revised to mitigate for existing flood-prone areas within the City.

Table 2-2 Future Conditions Basins

Basin Name, 2014 Model Update	Basin Name, Lakeville Section 4 WRMP	Downstream Reference Link	NWL	1-year			2-year			10-year			50-year			100-year			Basin Outlet
				Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	
Lakeville North Creek Future Conditions Ponds																			
NCL-31	---[2]	LNCRK-514	1030.0	1031.7	3.1	6	1031.9	3.4	10	1032.4	4.5	34	1033.1	5.9	78	1033.5	6.6	97	15 in orifice
NCL-54	---[2]	LNCRK-290	924.3	925.9	2.1	6	926.3	2.9	10	927.7	6.1	34	929.4	10.9	78	930.1	13.1	98	18 in dia. pipe
NCL-57	NC-15-1	LNCRK-225	924.3	925.8	2.1	4	926.3	2.9	5	927.7	6.1	7	929.4	10.9	13	930.0	13.0	13	18 in dia. pipe
NCL-65a	---[2]	LNCRK-286	920.5	921.6	10.1	2	921.8	11.9	5	922.4	17.2	21	923.4	29.2	35	924.1	37.6	52	18 in dia. pipe
NCL-67	NC-17-1	LNCRK-288	920.0	921.6	6.2	3	921.7	6.7	6	922.3	9.1	28	923.4	13.8	46	924.1	16.8	49	12 in dia. pipe
NCL-70	NC-4-1	LNCRK-269	915.6	917.3	5.8	5	917.6	6.9	11	918.2	9.0	48	919.2	12.7	129	919.9	15.6	156	Two 12 in dia. pipes
NCL-79	Multiple Ponds[3]	LNCRK-297	918.0	918.9	38.7	0	919.0	46.0	0	919.4	75.8	0	920.1	123.4	0	920.4	148.5	0	N/A
NCL-80a	---[2]	L-1165	910.0	910.7	6.9	0	910.9	8.4	0	911.9	19.0	0	913.2	34.5	0	913.8	41.6	0	N/A
NCL-80b	NC-10-1	LNCRK-298	915.0	916.1	0.8	14	916.4	1.0	20	917.6	2.0	49	918.8	3.3	115	919.0	3.5	160	24 in dia. pipe
NCL-83	NC-7-1	LNCRK-225	918.0	919.0	5.1	4	919.4	5.7	5	920.7	7.9	7	921.6	10.1	13	921.6	10.3	13	18 in dia. pipe
NCL-84	NC-6-1	LNCRK-513	920.0	922.1	8.9	4	922.2	9.5	5	922.7	11.4	7	923.2	14.0	24	923.6	15.4	43	6 in orifice
NCL-85	NC-5-1	LNCRK-316	916.0	918.7	14.9	5	919.0	16.5	24	919.7	20.4	103	920.7	25.8	251	921.1	28.5	331	6 in orifice
NCreek-7A	---[3]	L-215	927.0	929.3	0.4	85	929.6	0.5	102	930.8	1.6	134	932.5	4.7	168	933.6	7.7	184	36 in dia. pipe
AV-A1.14	---[3]	L-FNC-994	934.0	934.9	0.8	9	935.2	0.9	12	936.5	1.6	18	938.6	3.0	22	939.6	3.9	24	Outlet structure[1]
AV-A1.15	---[3]	L-FNC-993	960.0	961.3	2.7	5	961.8	3.3	5	963.8	6.1	7	965.6	9.4	23	966.0	10.3	38	Outlet structure[1]
AV-A1.16	---[3]	L-FNC-992	942.0	943.8	18.9	3	944.1	21.0	7	945.4	30.6	22	947.7	49.3	36	949.1	60.3	42	Outlet structure[1]
Lakeville Middle Creek Future Conditions Ponds																			
FO-004	FO-4-1	L-LMC-054	968.0	969.8	9.6	9	970.1	11.0	10	971.4	17.2	15	972.8	25.3	43	973.1	27.3	77	Outlet structure[1]
FO-016	FO-22-1	L-LMC-052	972.0	972.8	2.4	7	973.1	2.8	9	974.1	5.2	20	975.4	9.5	38	976.0	11.8	46	Outlet structure[1]
FO-018	FO-27-1	L-LMC-051	970.0	971.2	7.0	12	971.5	8.5	15	972.7	16.0	25	974.0	27.1	51	974.7	33.1	60	Outlet structure[1]
FO-019	FO-28-1	L-LMC-091	1014.0	1015.4	1.9	4	1015.8	2.4	4	1017.1	4.6	7	1018.6	7.6	18	1018.8	8.0	35	Outlet structure[1]
FO-020	FO-24-1	L-LMC-047	1003.5	1004.5	0.7	13	1004.8	0.8	19	1006.2	1.9	42	1007.3	3.0	69	1007.6	3.3	76	Outlet structure[1]
FO-036	FO-19-1	L-LMC-040	990.7	991.0	1.5	2	991.2	1.5	3	991.7	2.1	5	993.3	4.2	20	994.1	5.3	25	Outlet structure[1]
FO-045	FO-14-1	L-LMC-129	1013.0	1016.4	10.4	25	1016.9	12.5	39	1018.1	19.6	106	1020.1	31.9	199	1021.2	39.0	241	Outlet structure[1]
FO-046	FO-17-1	L-LMC-113	982.4	984.0	6.7	14	984.5	8.9	18	986.0	17.3	51	987.4	26.6	129	987.7	31.5	167	Outlet structure[1]
FO-047	FO-20-1	L-LMC-115	982.2	983.9	5.5	31	984.3	7.1	46	985.6	15.3	110	987.8	31.1	195	989.2	41.6	233	Two 48 in dia. pipes
FO-048	FO-25-1	L-LMC-095	985.8	988.3	3.6	44	988.8	4.6	63	990.6	10.1	142	993.5	21.1	272	995.2	27.9	328	72 in dia. pipe
N-L-637	FO-6-1	L-LMC-124	964.7	970.8	62.0	146	971.4	79.2	166	973.0	132.5	263	974.9	202.1	456	976.2	248.5	666	Outlet structure[1]
FO-051	FO-11-1	L-LMC-131	1019.8	1023.6	11.9	56	1024.0	13.6	74	1025.1	20.1	145	1027.3	33.5	298	1027.6	36.0	467	Outlet structure[1]
FO-052	FO-10-1	L-LMC-128	1009.0	1011.7	6.2	53	1012.2	8.1	69	1014.0	15.7	130	1016.3	28.2	221	1018.1	39.3	269	4 ft mod. basket handle
N-L-552	FO-053	L-LMC-111	960.0	961.9	21.0	25	962.4	26.7	35	964.1	53.6	77	966.1	89.4	199	966.8	102.7	290	48 in dia. pipe
Lakeville South Creek Future Conditions Ponds																			
ML-048	ML-24-2	L-LSC-173	1002.0	1003.2	27.1	12	1003.5	28.2	15	1004.7	32.6	31	1005.9	37.0	80	1006.3	38.6	112	24 in arch pipe
ML-061	ML-19-1	L-LSC-124	1012.0	1016.4	7.9	63	1016.6	8.6	80	1017.6	11.3	159	1019.2	16.6	336	1019.7	18.7	474	1 ft x 6 in rect. orifice
ML-072	ML-50-1	L-LSC-683	997.9	1000.7	0.6	24	1001.3	0.7	26	1003.5	1.7	33	1006.5	4.3	40	1006.6	4.4	40	24 in arch pipe
ML-086	ML-9-1	L-LSC-130	1098.0	1099.4	5.0	7	1099.7	5.7	9	1100.8	8.9	19	1102.3	14.6	30	1103.3	18.3	32	Outlet structure[1]
ML-100	ML-23-2	L-LSC-112	1070.0	1070.8	6.7	8	1071.0	7.5	12	1071.9	10.8	32	1073.3	18.4	68	1073.8	21.5	91	Outlet structure[1]
N-L-609	ML-46-1	L-LSC-239	1046.5	1051.8	6.1	18	1052.2	7.9	21	1053.7	15.1	46	1055.4	24.4	114	1055.8	26.7	175	Outlet structure[1]
N-L-618	SC-32-1	L-LSC-865	1044.0	1045.7	5.5	19	1046.4	7.2	25	1048.5	15.6	42	1049.4	21.0	76	1049.5	21.7	81	Natural cross-section
SC-020	SC-7-1	L-LSC-417	987.0	988.9	14.9	5	989.2	17.3	6	990.0	24.8	6	990.9	35.0	9	991.3	40.5	9	Outlet structure[1]
SC-038	SC-27-1	L-LSC-159	1092.9	1093.5	3.2	9	1093.8	3.7	12	1094.7	6.8	21	1095.8	12.2	42	1096.2	14.4	58	Outlet structure[1]
SC-095	SC-75-1	L-LSC-499	1000.0	1001.2	3.8	12	1001.5	4.6	14	1002.7	8.4	17	1004.4	14.8	28	1005.3	18.6	30	Outlet structure[1]
SC-131	SC-44-1	L-LSC-403	985.0	986.4	4.0	5	986.6	4.5	5	987.4	6.9	6	988.4	10.4	10	988.8	12.3	12	Outlet structure[1]
SC-134	SC-33-1	L-LSC-151	1087.4	1092.7	13.6	13	1092.9	14.6	26	1093.8	19.1	74	1095.6	27.9	699	1096.6	32.9	1948	Outlet structure[1]
SC-142	SC-65-1	L-LSC-782	995.0	997.1	11.9	20	997.6	15.1	24	998.9	26.4	65	1000.1	36.7	166	1000.4	39.9	253	Outlet structure[1]
SC-150	SC-61-1	L-LSC-871	1032.8	1034.6	0.0	10	1035.0	0.0	12	1036.8	0.3	21	1038.8	1.5	35	1039.8	2.6	40	Outlet structure[1]
SC-173	SC-11-1	L-830	925.0	929.8	156.9	306	930.3	183.0	392	932.1	275.8	782	934.4	389.5	1748	935.4	444.5	2374	72 in dia. pipe
SC-175	SC-69-1	L-1351	930.0	932.8	12.9	87	933.2	16.2	109	934.8	29.0	202	936.1	40.5	393	936.5	44.4	504	48 in dia. pipe
SC-178	SC-76-1	L-LSC-739	1008.0	1009.1	2.9	13	1009.4	3.5	16	1010.5	6.5	27	1012.2	12.7	40	1012.8	14.9	68	Skimmer outlet structure[1]
SC-186	SC-25-1	L-LSC-832	1045.6	1048.0	21.7	12	1048.2	24.9	13	1049.1	37.2	17	1050.3	55.6	22	1050.6	61.0	92	18 in dia. pipe
SC-187	SC-24-1	L-LSC-831	1016.2	1020.2	39.7	9	1020.4	42.0	12	1020.8	46.3	21	1021.9	60.6	55	1022.3	65.6	98	Outlet structure[1]
SC-197	SC-73-1	L-LSC-741	949.9	951.4	3.3	51	951.7	4.1	66	952.8	7.7	122	954.2	14.5	212	955.0	18.7	250	Outlet structure[1]

Table 2-2 Future Conditions Basins

Basin Name, 2014 Model Update	Basin Name, Lakeville Section 4 WRMP	Downstream Reference Link	NWL	1-year			2-year			10-year			50-year			100-year			Basin Outlet
				Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	Peak Elevation (ft)	Storage Volume (ac-ft)	Peak Flow (cfs)	
SC-199	---[2]	L-LSC-803	988.3	992.0	17.1	88	992.4	19.5	113	993.7	30.9	230	995.5	52.9	440	996.3	65.5	545	Outlet structure[1]
SC-203	---[2]	L-LSC-816	937.6	939.3	13.7	70	939.6	15.0	95	940.7	20.9	194	942.1	29.4	354	942.7	33.1	429	Outlet structure[1]
SC-204	SC-1-1	L-1339	925.9	929.0	16.1	122	929.1	18.2	162	929.6	26.1	325	930.3	37.9	576	930.6	44.1	674	Two 60 in arch pipes
SC-208	---[2]	L-LSC-850	1022.7	1023.5	7.1	27	1024.0	8.7	37	1025.4	13.1	112	1027.0	20.0	260	1027.8	24.8	348	Outlet structure[1]

[1] Outlet structure based on City of Lakeville standard detail plate LV-STM-15A.

[2] New basins were proposed in subwatersheds NCL-31, SC-199, SC-203, and SC-208

[3] Basins are outside the City of Lakeville but flow into the City.

2.3.2 Peak Flow Rates and Runoff Volume at Community Standard Locations

The future-conditions peak flow rates at community standard locations near the Lakeville municipal boundary for the 2- and 100-year events based on Atlas 14 rainfall depths are summarized in Figure 2-12 through Figure 2-14.

At some community standard locations the future conditions peak discharge rate differed from the updated 2014 existing-conditions simulation using Atlas 14 rainfall depths. These locations are described below:

North Creek Community Standard Locations *(L-1584, & L-215)* – North Creek community standard location comparisons are shown on Figure 2-12 and proposed regional stormwater basins are shown on Figure 1-6. Peak flow rates at the community standard locations on North Creek are generally less than peak flow rates from the updated 2014 existing-conditions simulation. The maximum increase of 34 cfs occurred at Tributary 4 to North Creek (L-215) during the 2-year event. The maximum decrease of 287 cfs occurred at the same location during the 100-year event. At this location there is a planned regional basin upstream of the railroad tracks within the City of Farmington. The outlet from the planned basin was assumed to be a 36-inch-diameter culvert. This culvert does not restrict flows for more frequent events, but is restrictive during larger rainfalls. It is assumed that the outlet structure will be evaluated in more detail as development occurs.

Middle Creek Community Standard Locations *(L-LMC-133)* – Middle Creek community standard location comparisons are shown on Figure 2-13 and proposed regional stormwater basins are shown on Figure 1-6. Compared to the updated 2014 existing-conditions simulation, peak discharge at this location is reduced by 27 percent for the 2-year event and 49 percent for the 100-year event. The roadway upstream of this location overtops during the existing conditions 100-year event, resulting in a large peak flow rate at the community standard location. With the proposed pond, less discharge is conveyed over the upstream roadway, which significantly reduces the peak discharge for the 100-year event. Because the roadway does not overtop for more frequent events (i.e., 2-year) the reduction in peak discharge is less. Proposed stormwater basins were sized to prevent an increase to the peak discharge rate for future development conditions. It is assumed that a more detailed evaluation of stormwater basins will be completed when development occurs to prevent roadway overtopping during rainfall events of a given frequency.

South Creek Community Standard Locations *(L-1351, L-830, L-1339)* – South Creek community standard location comparisons are shown on Figure 2-14 and proposed regional stormwater basins are shown on Figure 1-6. The reduction in peak discharge rates at the community standard locations on South Creek were a result of planned regional basins in Lakeville. These basins were sized to meet peak discharge rates for the rainfall events evaluated. In general, pond outlets were sized to meet peak discharge rates for smaller events, while overflows were included to allow ponds to overtop during larger events. As a result, the discharge rates for more frequent events (i.e., 2-year) were similar to existing conditions, while the restrictive outlet typically resulted in greater reductions to the peak discharge for larger rainfall events (i.e., 100-year). The large reductions for the 100-year event indicate that the planned

regional basins will adequately reduce discharge rates to meet VRWJPO standards and that less restrictive overflows could, potentially, be constructed. It is assumed that a more detailed evaluation of the overflows will be completed when development occurs within the watershed.

Runoff Volume Differences – Runoff volume increased at each community standard location near the Lakeville municipal boundary. The increase in total runoff volume is attributed to land-use modifications between existing and future conditions. In general, planned development in the drainage area increased the percentage of impervious area and, subsequently, the volume of stormwater runoff. Planned regional ponding basins were incorporated in the XP-SWMM model to control peak flow rates; however, infiltration basins specific to each development are the preferred method for runoff management. Therefore, infiltration BMPs to address this increased runoff volume must be considered on a site-by-site basis when development occurs. Because individual development strategies to meet the runoff volume criteria are unknown, volume reduction best management practices were not included in the model.

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to North Creek: Apple Valley – Lakeville (Link19, McNamara Pond)[1]				
2010 VRWJPO XP-SWMM Model	80	NA	55	NA
2014 Updated XP-SWMM Model	80	NA	55	NA
Difference	0 *[0.0%]*	NA	0 *[0.0%]*	NA

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1A to North Creek: Apple Valley – Lakeville (L-1167, Cobblestone Lake) [1]				
2010 VRWJPO XP-SWMM Model	27	NA	27	NA
2014 Updated XP-SWMM Model	27	NA	27	NA
Difference	0 *[0.0%]*	NA	0 *[0.0%]*	NA

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
North Creek: Lakeville – Farmington *(L-1584)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	457	6,415	1,993	9,822
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	447	6,437	1,980	9,868
Difference	-10 [-2.2%]	22 [0.3%]	-13 [-0.7%]	46 [0.5%]

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 4 to North Creek: Lakeville – Farmington *(L-215)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	68	20	471	127
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	102	32	184	145
Difference	34 [50.0%]	12 [60.0%]	-287 [-60.9%]	18 [14.2%]

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

Lake Marion

South Creek

Vermillion River

35W

35

77

1 Discharge from McNamara Pond and Cobblestone Pond are simulated as a constant discharge so a total runoff volume calculation is not completed at these locations.

General Note: Future conditions runoff volume increases because the XP-SWMM model does not simulate volume reduction best management practices as discussed in Section 2.3.2.

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

City of Lakeville
Major Subwatersheds
Subwatersheds
Rivers and Streams

Standard Locations

Tributary Drainage Area
- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet
5,000 0 5,000

BARR

Figure 2-12

NORTH CREEK COMPARISONS OF PEAK 2-YEAR AND 100-YEAR RATES FOR EXISTING CONDITIONS (2005) TO FUTURE CONDITIONS (2030) BASED ON ATLAS 14 RAINFALL

Barr Footer: ArcGIS 10.2.2, 2014-12-18 10:01 File: I:\Projects\23\19\1116\Maps\2016\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-12 - EC_to_FC_AT14_NC_Lakeville.mxd User: jrv

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Middle Creek: Lakeville – Farmington *(L-1595 in 2010 model & L-LMC-133 in 2014 model)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	270	146	1,522	715
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	197	198	780	776
Difference	-73 [-27.0%]	52 [35.6%]	-742 [-48.8%]	61 [8.5%]

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 6A to Middle Creek: Lakeville – Farmington *(L-1589 in 2010 model & L-LMC-135 in 2014 model)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	138	38	828	216
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	38	41	312	218
Difference	-100 *[-72.5%]*	3 *[7.9%]*	-516 *[-62.3%]*	2 *[0.9%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 6 to Middle Creek: Lakeville – Farmington *(L-1200 in 2010 model & L-LMC-119 in 2014 model)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	145	49	720	321
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	91	57	521	334
Difference	-54 *[-37.2%]*	8 *[16.3%]*	-199 *[-27.6%]*	13 *[4.0%]*

Note: Future conditions runoff volume increases because the XP-SWMM model does not simulate volume reduction best management practices as discussed in Section 2.3.2.

North Creek Study Area
Middle Creek Study Area
South Creek Study Area
North Creek
Middle Creek
Lake Marion
South Creek
Vermillion River
35W
35E
77

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

City of Lakeville
Major Subwatersheds
Subwatersheds
Rivers and Streams

Standard Locations

Tributary Drainage Area
- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet
5,000 0 5,000

BARR

Figure 2-13

MIDDLE CREEK COMPARISONS OF PEAK 2-YEAR AND 100-YEAR RATES FOR EXISTING CONDITIONS (2005) TO FUTURE CONDITIONS (2030) BASED ON ATLAS 14 RAINFALL

Barr Footer: ArcGIS 10.2.2, 2014-11-21 09:31 File: I:\Projects\23\19\1116\Maps\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-13 - EC_to_FC_AT14_MC_Lakeville.mxd User: jrv

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
South Creek: Lakeville – Farmington *(L-830)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	461	640	2,575	3,337
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	362	895	2,195	3,649
Difference	-99 *[-21.5%]*	255 *[39.8%]*	-380 *[-14.8%]*	312 *[9.3%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
East Branch South Creek: Lakeville – Farmington *(L-1351)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	138	47	714	264
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	109	74	504	291
Difference	-29 *[-21.0%]*	27 *[57.4%]*	-210 *[-29.4%]*	27 *[10.2%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: New Market Township – Eureka Township *(L-131 in 2010 model & L-LSC-850 in 2014 model)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	135	20	495	142
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	37	21	348	143
Difference	-98 *[-72.6%]*	1 *[5.0%]*	-147 *[-29.7%]*	1 *[0.7%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Lakeville – Eureka Township *(L-1345 in 2010 model & L-LSC-803 in 2014 model)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	140	36	904	274
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	113	68	545	314
Difference	-27 *[-19.3%]*	32 *[88.9%]*	-358 *[-39.7%]*	40 *[14.6%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Lakeville – Farmington *(L-1339)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	212	149	871	941
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	162	244	674	1,105
Difference	-50 *[-23.6%]*	95 *[63.8%]*	-197 *[-22.6%]*	164 *[17.4%]*

Standard Location	2-year (cfs)	2-year (ac-ft)	100-year (cfs)	100-year (ac-ft)
Tributary 1 to South Creek: Eureka Township – Lakeville *(L-1344 in 2010 model & L-LSC-816 in 2014 model)*				
2014 Updated XP-SWMM Model (Existing Conditions Atlas 14)	96	105	491	750
2014 Updated XP-SWMM Model (Future Conditions Atlas 14)	95	190	429	897
Difference	-1 *[-1.0%]*	85 *[81.0%]*	-62 *[-12.6%]*	147 *[19.6%]*

Note: Future conditions runoff volume increases because the XP-SWMM model does not simulate volume reduction best management practices as discussed in Section 2.3.2.

North Creek Study Area

Middle Creek Study Area

South Creek Study Area

North Creek

Middle Creek

Lake Marion

South Creek

Vermillion River

35W

35E

77

e, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

City of Lakeville

Major Subwatersheds

Subwatersheds

Rivers and Streams

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles

Feet

5,000 0 5,000

BARR

Figure 2-14

SOUTH CREEK COMPARISONS OF PEAK 2-YEAR AND 100-YEAR RATES FOR EXISTING CONDITIONS (2005) TO FUTURE CONDITIONS (2030) BASED ON ATLAS 14 RAINFALL

Barr Footer: ArcGIS 10.2.2, 2014-11-21 09:32 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Standard_Flow_Locations\Lakeville\Figure 2-14 - EC_to_FC_AT14_SC_Lakeville.mxd User: jrv

3.0 Conclusions / Recommendations

This study modified the Lakeville portion of the VRWJPO XP-SWMM model to include smaller subwatersheds, existing regional stormwater ponds, existing storm sewer connections between stormwater ponds, and existing storm sewer outlets to North Creek, Middle Creek, and South Creek. The updated XP-SWMM model was used to simulate the 1-, 2-, 10-, 50-, and 100-year 4-day events without further calibration. The resulting flow rates and runoff volumes were compared to the established rates and volumes at the community standard locations.

Using identical rainfall data, the updated model results were compared to the 2010 model at study-area gages used to calibrate the model in 2009. The comparison indicated that the updated model closely matched the stage hydrographs for the 2- and 100-year events. Therefore, the updated model could be used to define baseline conditions for planning purposes within the watershed.

The existing-conditions model was then used to simulate the 4-day rainfall event based on rainfall depths published in Atlas 14. At community standard locations near the Lakeville municipal boundary the peak discharge rates increased an average of 15 percent for the 2-year event and 84 percent for the 100-year event. The runoff volume was very similar for the 2-year event because there was not a significant change in precipitation depths. However, runoff volume increased an average 52 percent for the 100-year event.

Finally, a future-conditions model was developed by modifying the updated model to reflect future development conditions throughout the City. Using Atlas 14 rainfall depths, the model was used to estimate the regional stormwater basin and outlet sizes that would be needed to maintain existing-conditions peak flow rates at VRWJPO community standard locations. Future ponds were not sized to mitigate localized flooding concerns upstream of community standard locations. It is anticipated that these areas would be addressed as development or redevelopment occurs within the City. Increases in simulated runoff volume due to planned development were tabulated to aid planning for future volume-control practices. These typically occur on a smaller scale than what was considered in the updated XP-SWMM model.

When using the model to assess development impacts to flow-rate standards it is important to consider the hydrologic and hydraulic scale for which the model was originally developed and calibrated. It is also necessary to recognize that the model should be used as a tool to assess the relative impacts of development rather than to establish absolute values, since a detailed recalibration was not completed as part of this current update effort. Future model updates should include a verification of the model calibration using post-2005 storm events to improve the model's representation of real-world conditions. Verification could occur as part of the next update to the City's WRMP or when additional information is available (i.e., additional gage locations are installed within the watershed).

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Appendix A

Hydrologic Model Inputs

Table A-1 Lakeville North Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville North Creek												
NCL-9b	38.0	3.8	725	0.040	0.280	0.014	0.176	0.06	1.40	0.05	0.00115	225
NCL-9a	38.4	24	717	0.059	0.367	0.014	0.17	0.06	1.00	0.13	0.00115	320
NCL-97	1.1	42.1	148	0.053	0.358	0.014	0.169	0.06	1.00	0.07	0.00115	126
NCL-96	4.7	14.6	345	0.053	0.322	0.014	0.17	0.06	1.10	0.10	0.00115	125
NCL-95	7.1	20.6	435	0.049	0.318	0.014	0.17	0.06	1.15	0.03	0.00115	117
NCL-94	5.9	33	380	0.075	0.373	0.014	0.169	0.06	1.00	0.12	0.00115	147
NCL-93	2.5	18.7	250	0.082	0.380	0.014	0.169	0.06	1.00	0.10	0.00115	146
NCL-92	6.7	25.4	449	0.028	0.341	0.014	0.17	0.06	1.05	0.11	0.00115	110
NCL-91	9.4	26.7	372	0.055	0.340	0.014	0.17	0.06	1.20	0.17	0.00115	138
NCL-90	15.6	50.1	492	0.063	0.277	0.014	0.169	0.06	1.03	0.14	0.00115	167
NCL-89	5.0	32.3	276	0.062	0.380	0.014	0.169	0.06	1.00	0.10	0.00115	171
NCL-88	3.7	31.2	289	0.050	0.380	0.014	0.169	0.06	1.00	0.13	0.00115	198
NCL-87	4.3	32	276	0.044	0.380	0.014	0.169	0.06	1.00	0.13	0.00115	201
NCL-86	4.9	27.5	391	0.066	0.380	0.014	0.169	0.06	1.00	0.09	0.00115	209
NCL-85	122.3	0.2	1391	0.028	0.294	0.014	0.195	0.06	1.11	0.15	0.00115	50
NCL-84	151.6	1.2	860	0.034	0.295	0.014	0.193	0.06	1.24	0.14	0.00115	57
NCL-83	25.1	8.4	545	0.037	0.293	0.014	0.191	0.06	1.05	0.15	0.00115	53
NCL-82	28.4	23.1	600	0.046	0.255	0.014	0.174	0.06	1.06	0.15	0.00115	61
NCL-81	35.5	1.4	868	0.055	0.299	0.014	0.196	0.06	1.28	0.18	0.00115	82
NCL-80b	29.7	10.3	506	0.065	0.267	0.014	0.183	0.06	1.36	0.19	0.00115	82
NCL-80a	137.4	4.3	987	0.058	0.263	0.014	0.182	0.06	1.16	0.16	0.00115	88
NCL-8	66.3	14	855	0.047	0.276	0.014	0.168	0.06	1.10	0.09	0.00115	258
NCL-79	275.4	16.1	2020	0.107	0.147	0.014	0.135	0.06	1.09	0.15	0.00115	91
NCL-78	112.8	36.8	1142	0.057	0.224	0.014	0.147	0.06	1.32	0.13	0.00115	61
NCL-77	13.5	28.4	388	0.028	0.257	0.014	0.173	0.06	1.00	0.14	0.00115	54
NCL-76	9.9	31.9	250	0.037	0.253	0.014	0.173	0.06	1.00	0.14	0.00115	57
NCL-75	26.9	24.3	761	0.045	0.253	0.014	0.172	0.06	1.00	0.14	0.00115	53
NCL-74	9.8	22.7	279	0.042	0.274	0.014	0.179	0.06	1.00	0.13	0.00115	48
NCL-73	65.7	2.4	729	0.026	0.294	0.014	0.191	0.06	1.04	0.11	0.00115	39
NCL-72	68.1	3.9	843	0.025	0.287	0.014	0.187	0.06	1.04	0.11	0.00115	38
NCL-71	114.0	0.2	954	0.019	0.277	0.014	0.182	0.06	1.00	0.13	0.00115	31
NCL-70	93.3	2.8	1180	0.041	0.293	0.014	0.191	0.06	1.07	0.15	0.00115	44
NCL-7	58.4	10.4	728	0.063	0.263	0.014	0.157	0.06	1.02	0.08	0.00115	259
NCL-69	10.0	51.8	176	0.063	0.256	0.014	0.171	0.06	1.00	0.13	0.00115	49
NCL-68	26.3	36.1	603	0.038	0.249	0.014	0.169	0.06	1.00	0.14	0.00115	53
NCL-67	80.5	3.2	1136	0.012	0.297	0.014	0.195	0.06	1.00	0.14	0.00115	65
NCL-66	28.0	13	677	0.026	0.306	0.014	0.17	0.06	1.00	0.14	0.00115	56
NCL-65a	71.7	0	1541	0.011	0.300	0.014	0.197	0.06	1.00	0.14	0.00115	69
NCL-64	15.3	21.1	598	0.040	0.368	0.014	0.17	0.06	1.00	0.14	0.00115	58
NCL-63	16.8	11	498	0.029	0.295	0.014	0.172	0.06	1.16	0.11	0.00115	48
NCL-62	140.2	24	1535	0.024	0.252	0.014	0.166	0.06	1.00	0.13	0.00115	46
NCL-61	22.5	25.6	533	0.031	0.377	0.014	0.169	0.06	1.00	0.14	0.00115	57

Table A-1 Lakeville North Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville North Creek												
NCL-60	24.0	27.9	635	0.040	0.375	0.014	0.169	0.06	1.00	0.14	0.00115	62
NCL-6	10.6	9.1	522	0.079	0.318	0.014	0.162	0.06	1.00	0.08	0.00115	245
NCL-59	55.1	23.6	863	0.048	0.369	0.014	0.17	0.06	1.00	0.14	0.00115	68
NCL-57	26.1	0	623	0.014	0.300	0.014	0.197	0.06	1.00	0.14	0.00115	79
NCL-56	35.5	5.8	597	0.063	0.278	0.014	0.188	0.06	1.05	0.15	0.00115	96
NCL-55	33.3	5	651	0.058	0.294	0.014	0.191	0.06	1.11	0.15	0.00115	111
NCL-54	32.0	0.7	725	0.016	0.302	0.014	0.196	0.06	1.00	0.14	0.00115	79
NCL-53	106.3	22.4	1313	0.036	0.367	0.014	0.172	0.06	1.00	0.14	0.00115	76
NCL-52	41.6	24.6	567	0.034	0.380	0.014	0.169	0.06	1.00	0.14	0.00115	77
NCL-51	103.6	24.7	1110	0.033	0.373	0.014	0.17	0.06	1.00	0.14	0.00115	89
NCL-50	193.2	25.7	1629	0.021	0.350	0.014	0.169	0.06	1.00	0.14	0.00115	105
NCL-5	29.2	28.2	493	0.067	0.325	0.014	0.163	0.06	1.07	0.13	0.00115	310
NCL-49	30.9	31.2	504	0.027	0.360	0.014	0.17	0.06	1.00	0.14	0.00115	82
NCL-48	14.3	29.2	383	0.049	0.358	0.014	0.171	0.06	1.00	0.14	0.00115	118
NCL-47	83.2	25.7	1141	0.050	0.376	0.014	0.169	0.06	1.16	0.16	0.00115	81
NCL-46	138.1	14.8	1141	0.051	0.348	0.014	0.177	0.06	1.04	0.14	0.00115	95
NCL-45	89.4	26.5	1386	0.057	0.378	0.014	0.169	0.06	1.06	0.11	0.00115	118
NCL-44	70.1	21.7	837	0.057	0.359	0.014	0.171	0.06	1.01	0.13	0.00115	95
NCL-43	105.1	21.2	988	0.035	0.360	0.014	0.17	0.06	1.00	0.14	0.00115	107
NCL-42	74.5	23.5	1587	0.024	0.322	0.014	0.162	0.06	1.00	0.14	0.00115	120
NCL-40	36.2	27.4	1084	0.062	0.295	0.014	0.174	0.06	1.00	0.12	0.00115	167
NCL-4	50.2	16	732	0.064	0.334	0.014	0.164	0.06	1.00	0.14	0.00115	304
NCL-39	23.3	32.3	509	0.063	0.292	0.014	0.177	0.06	1.00	0.13	0.00115	170
NCL-38	78.3	22.7	1259	0.056	0.305	0.014	0.172	0.06	1.00	0.12	0.00115	183
NCL-37	179.0	21.2	1504	0.048	0.353	0.014	0.171	0.06	1.00	0.14	0.00115	107
NCL-36	60.7	26.1	681	0.024	0.380	0.014	0.169	0.06	1.00	0.14	0.00115	112
NCL-35	26.3	25.8	766	0.032	0.275	0.014	0.174	0.06	1.00	0.14	0.00115	129
NCL-34	8.0	82.7	355	0.027	0.182	0.014	0.173	0.06	1.00	0.14	0.00115	133
NCL-33	63.2	42.3	746	0.053	0.356	0.014	0.169	0.06	1.00	0.13	0.00115	136
NCL-32	21.4	54.7	516	0.092	0.231	0.014	0.172	0.06	1.00	0.14	0.00115	153
NCL-31	31.1	25.8	617	0.060	0.289	0.014	0.184	0.06	1.00	0.13	0.00115	226
NCL-30	67.1	28.7	966	0.062	0.375	0.014	0.169	0.06	1.00	0.11	0.00115	191
NCL-3	45.1	24.1	694	0.058	0.379	0.014	0.169	0.06	0.90	0.11	0.00115	394
NCL-29	64.2	12.6	987	0.043	0.300	0.014	0.172	0.06	1.12	0.09	0.00115	129
NCL-28	97.1	23.1	1058	0.068	0.376	0.014	0.169	0.06	1.00	0.11	0.00115	191
NCL-27	80.0	31.8	731	0.061	0.346	0.014	0.171	0.06	1.00	0.12	0.00115	248
NCL-26	90.9	19	989	0.055	0.350	0.014	0.171	0.06	1.07	0.11	0.00115	178
NCL-25	67.7	16.9	1103	0.067	0.344	0.014	0.171	0.06	1.13	0.09	0.00115	157
NCL-24	53.3	25.2	1028	0.055	0.364	0.014	0.17	0.06	1.00	0.13	0.00115	226
NCL-23	149.4	21.8	1455	0.059	0.352	0.014	0.171	0.06	1.11	0.10	0.00115	185
NCL-22	48.4	5.8	865	0.043	0.298	0.014	0.182	0.06	1.32	0.05	0.00115	156
NCL-21	68.7	26.4	694	0.073	0.328	0.014	0.17	0.06	1.00	0.12	0.00115	206

Table A-1 Lakeville North Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville North Creek												
NCL-20	70.1	19.5	889	0.070	0.346	0.014	0.173	0.06	1.00	0.13	0.00115	246
NCL-2	31.1	24.4	730	0.052	0.342	0.014	0.169	0.06	0.96	0.13	0.00115	393
NCL-19	91.5	23.1	1292	0.077	0.359	0.014	0.171	0.06	1.00	0.12	0.00115	267
NCL-18	20.9	30.2	487	0.051	0.378	0.014	0.169	0.06	1.00	0.12	0.00115	324
NCL-17	25.4	25.5	566	0.047	0.380	0.014	0.169	0.06	1.00	0.09	0.00115	307
NCL-16	97.1	20.6	1249	0.071	0.352	0.014	0.171	0.06	1.00	0.11	0.00115	242
NCL-15	14.2	24.1	442	0.082	0.368	0.014	0.17	0.06	1.00	0.14	0.00115	206
NCL-14	20.9	2.6	503	0.070	0.270	0.014	0.165	0.06	1.53	0.03	0.00115	174
NCL-13	99.3	25.6	1342	0.058	0.353	0.014	0.169	0.06	1.01	0.14	0.00115	253
NCL-12	74.9	18.6	908	0.076	0.362	0.014	0.171	0.06	1.03	0.14	0.00115	372
NCL-11	87.1	19.9	1110	0.071	0.333	0.014	0.171	0.06	1.11	0.12	0.00115	297
NCL-10	66.2	17.6	653	0.049	0.334	0.014	0.173	0.06	1.13	0.08	0.00115	247
NCL-1	197.7	24.2	1364	0.068	0.352	0.014	0.167	0.06	0.99	0.13	0.00115	410

Table A-2 Lakeville Middle Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville 'Farmington District' Middle Creek												
FO-002	14.2	0	474	0.043	0.298	0.014	0.2	0.06	1.00	0.14	0.00115	122
FO-004	81.9	0	811	0.034	0.300	0.014	0.2	0.06	1.00	0.13	0.00115	131
FO-005	92.3	21	1311	0.073	0.369	0.014	0.17	0.06	1.00	0.11	0.00115	276
FO-006	31.1	49.6	579	0.053	0.237	0.014	0.18	0.06	1.00	0.12	0.00115	202
FO-007	41.8	13.9	707	0.049	0.280	0.014	0.18	0.06	1.00	0.12	0.00115	151
FO-008	65.9	0.3	926	0.054	0.301	0.014	0.2	0.06	1.00	0.13	0.00115	222
FO-009	69.2	1.5	980	0.043	0.303	0.014	0.19	0.06	1.00	0.11	0.00115	283
FO-010	6.7	2.3	307	0.083	0.310	0.014	0.17	0.06	1.00	0.14	0.00115	93
FO-011	6.8	0.2	371	0.034	0.280	0.014	0.18	0.06	1.00	0.14	0.00115	99
FO-012	69.3	23.8	1197	0.047	0.302	0.014	0.18	0.06	1.00	0.13	0.00115	131
FO-013	8.4	24.4	329	0.038	0.304	0.014	0.18	0.06	1.00	0.14	0.00115	127
FO-014	27.9	23	542	0.051	0.366	0.014	0.17	0.06	1.00	0.14	0.00115	131
FO-015	13.3	0	512	0.059	0.300	0.014	0.2	0.06	1.00	0.14	0.00115	123
FO-016	55.2	0.1	948	0.050	0.299	0.014	0.2	0.06	1.00	0.13	0.00115	157
FO-017	9.9	4.2	292	0.034	0.294	0.014	0.19	0.06	1.00	0.11	0.00115	246
FO-018	104.4	0.3	1272	0.064	0.301	0.014	0.2	0.06	1.00	0.11	0.00115	170
FO-019	30.2	0.3	542	0.040	0.300	0.014	0.2	0.06	1.00	0.13	0.00115	211
FO-020	70.3	0	995	0.055	0.299	0.014	0.2	0.06	1.00	0.13	0.00115	239
FO-021	136.0	0.1	1483	0.041	0.301	0.014	0.2	0.06	1.00	0.11	0.00115	259
FO-022	43.0	13.4	701	0.051	0.311	0.014	0.18	0.06	1.00	0.13	0.00115	224
FO-023	9.7	28.3	307	0.065	0.365	0.014	0.17	0.06	1.00	0.11	0.00115	229
FO-024	41.6	26	1065	0.065	0.366	0.014	0.17	0.06	1.00	0.13	0.00115	231
FO-025	57.4	9.5	803	0.055	0.289	0.014	0.18	0.06	1.00	0.13	0.00115	388
FO-026	106.3	0.73	1081	0.042	0.215	0.014	0.187	0.06	1.00	0.16	0.00115	290
FO-027	12.0	13.6	222	0.053	0.282	0.014	0.18	0.06	1.00	0.14	0.00115	309
FO-028	7.3	39	251	0.047	0.255	0.014	0.17	0.06	1.06	0.13	0.00115	332
FO-029	57.2	31.9	923	0.042	0.262	0.014	0.17	0.06	1.01	0.11	0.00115	320
FO-030	9.7	0	480	0.058	0.289	0.014	0.19	0.06	1.00	0.13	0.00115	305
FO-031	11.8	18.4	239	0.045	0.280	0.014	0.19	0.06	1.00	0.10	0.00115	323
FO-032	60.7	12.8	577	0.038	0.312	0.014	0.18	0.06	1.04	0.09	0.00115	353
FO-033	18.1	9.2	367	0.037	0.283	0.014	0.18	0.06	1.34	0.02	0.00115	284
FO-034	7.7	0	356	0.074	0.300	0.014	0.2	0.06	1.00	0.10	0.00115	278
FO-035	17.7	12.6	453	0.054	0.267	0.014	0.17	0.06	1.00	0.13	0.00115	337
FO-036	16.6	0.6	475	0.062	0.290	0.014	0.19	0.06	1.00	0.14	0.00115	181
FO-037	150.0	0.4	1482	0.050	0.298	0.014	0.2	0.06	1.00	0.09	0.00115	193
FO-038	121.0	0.5	1003	0.043	0.300	0.014	0.2	0.06	1.00	0.11	0.00115	180
FO-039	88.5	0.6	1443	0.066	0.298	0.014	0.19	0.06	1.00	0.10	0.00115	158
FO-040	77.5	0	1258	0.060	0.300	0.014	0.2	0.06	1.00	0.11	0.00115	85
FO-041	26.5	36	495	0.049	0.218	0.014	0.182	0.06	0.41	0.17	0.00115	173
FO-042	41.6	0.6	711	0.053	0.295	0.014	0.19	0.06	1.00	0.10	0.00115	123
FO-043	139.9	1.4	1606	0.059	0.296	0.014	0.19	0.06	1.00	0.11	0.00115	146
FO-044	142.3	0.5	1394	0.039	0.300	0.014	0.2	0.06	1.00	0.10	0.00115	131

Table A-2 Lakeville Middle Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville 'Farmington District' Middle Creek												
FO-045	142.1	0.5	1432	0.053	0.293	0.014	0.186	0.06	1.00	0.10	0.00115	274
FO-046	223.9	0.5	1499	0.041	0.300	0.014	0.19	0.06	1.00	0.10	0.00115	208
FO-047	228.1	1.07	1264	0.051	0.226	0.014	0.192	0.06	1.00	0.18	0.00115	240
FO-048	136.5	0.7	1799	0.063	0.300	0.014	0.19	0.06	1.00	0.10	0.00115	216
FO-049	223.1	6.8	1834	0.040	0.293	0.014	0.19	0.06	1.03	0.11	0.00115	158
FO-050	105.8	21.7	954	0.054	0.301	0.014	0.17	0.06	1.00	0.13	0.00115	228
FO-051	61.2	0.1	733	0.048	0.298	0.014	0.2	0.06	1.00	0.05	0.00115	251
FO-052	57.3	2.6	859	0.057	0.304	0.014	0.19	0.06	1.00	0.12	0.00115	238
FO-053	61.7	0	1205	0.057	0.300	0.014	0.2	0.06	1.00	0.12	0.00115	114

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
SC-001	15.8	9.8	324	0.057	0.217	0.014	0.194	0.06	1.00	0.23	0.00115	315
SC-002	31.8	4.6	628	0.054	0.277	0.014	0.178	0.06	0.44	0.22	0.00115	292
SC-003	12.7	38.2	416	0.052	0.269	0.014	0.179	0.06	1.00	0.22	0.00115	293
SC-004	57.2	17.1	546	0.035	0.222	0.014	0.187	0.06	0.44	0.20	0.00115	239
SC-005	105.5	14.9	731	0.040	0.230	0.014	0.182	0.06	1.02	0.23	0.00115	262
SC-006	39.5	1.2	488	0.051	0.220	0.014	0.193	0.06	1.00	0.21	0.00115	206
SC-007	15.5	1	396	0.078	0.233	0.014	0.191	0.06	0.40	0.23	0.00115	303
SC-008	66.8	2.2	609	0.051	0.236	0.014	0.188	0.06	1.00	0.20	0.00115	255
SC-009	51.1	7.4	617	0.070	0.256	0.014	0.183	0.06	0.44	0.19	0.00115	282
SC-010	17.1	50.4	916	0.025	0.256	0.014	0.171	0.06	1.00	0.21	0.00115	206
SC-011	66.4	9.7	767	0.043	0.254	0.014	0.171	0.06	1.00	0.22	0.00115	240
SC-012	29.8	75.9	443	0.047	0.251	0.014	0.17	0.06	1.00	0.19	0.00115	235
SC-013	9.4	19.7	290	0.041	0.279	0.014	0.176	0.06	0.39	0.16	0.00115	220
SC-014	78.0	18	805	0.049	0.280	0.014	0.177	0.06	0.48	0.14	0.00115	233
SC-015	16.0	23.1	199	0.028	0.279	0.014	0.178	0.06	1.00	0.11	0.00115	181
SC-016	10.2	27.4	240	0.061	0.272	0.014	0.171	0.06	0.37	0.20	0.00115	188
SC-017	8.0	4.3	270	0.065	0.280	0.014	0.177	0.06	0.39	0.23	0.00115	231
SC-018	27.9	9.3	349	0.032	0.217	0.014	0.192	0.06	1.00	0.18	0.00115	162
SC-019	76.6	0	572	0.033	0.217	0.014	0.194	0.06	1.00	0.22	0.00115	180
SC-020	30.5	0	571	0.031	0.212	0.014	0.196	0.06	1.00	0.22	0.00115	150
SC-021	92.0	0.1	1149	0.050	0.224	0.014	0.193	0.06	0.51	0.21	0.00115	210
SC-022	57.9	0	884	0.065	0.229	0.014	0.192	0.06	1.00	0.22	0.00115	179
SC-023	12.9	0	386	0.031	0.219	0.014	0.192	0.06	0.40	0.23	0.00115	131
SC-024	19.6	0	538	0.021	0.215	0.014	0.194	0.06	0.42	0.23	0.00115	123
SC-025	7.6	0	342	0.019	0.210	0.014	0.197	0.06	1.00	0.23	0.00115	127
SC-026	22.6	20.4	321	0.036	0.239	0.014	0.189	0.06	0.38	0.20	0.00115	112
SC-027	29.5	0	616	0.032	0.210	0.014	0.197	0.06	1.00	0.23	0.00115	117
SC-028	1.1	0	185	0.022	0.228	0.014	0.192	0.06	1.00	0.23	0.00115	98
SC-029	54.6	5.5	1147	0.021	0.222	0.014	0.193	0.06	0.50	0.21	0.00115	102
SC-030	4.6	0	189	0.017	0.214	0.014	0.196	0.06	1.00	0.23	0.00115	106
SC-031	56.6	42.4	659	0.025	0.233	0.014	0.182	0.06	0.45	0.23	0.00115	103
SC-032	10.3	60.3	313	0.029	0.242	0.014	0.171	0.06	0.39	0.23	0.00115	86
SC-033	22.5	18	463	0.065	0.282	0.014	0.178	0.06	0.41	0.16	0.00115	363
SC-034	62.3	4.5	658	0.070	0.282	0.014	0.178	0.06	1.00	0.16	0.00115	368
SC-035	25.3	12.7	565	0.068	0.277	0.014	0.175	0.06	1.00	0.18	0.00115	355
SC-036	9.1	0.9	294	0.066	0.220	0.014	0.193	0.06	1.00	0.19	0.00115	335
SC-037	66.1	0.9	610	0.053	0.250	0.014	0.185	0.06	0.46	0.15	0.00115	323
SC-038	64.2	0.8	826	0.057	0.263	0.014	0.181	0.06	1.00	0.14	0.00115	295
SC-039	34.9	8.4	662	0.065	0.271	0.014	0.179	0.06	0.43	0.16	0.00115	314
SC-040	34.4	38.8	739	0.045	0.257	0.014	0.174	0.06	0.45	0.16	0.00115	233
SC-041	18.6	9.9	539	0.046	0.276	0.014	0.179	0.06	1.00	0.16	0.00115	256
SC-042	30.8	37.2	397	0.061	0.276	0.014	0.178	0.06	0.41	0.20	0.00115	279

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
SC-043	33.6	12.5	503	0.051	0.263	0.014	0.183	0.06	1.00	0.14	0.00115	255
SC-044	44.4	76.3	771	0.035	0.244	0.014	0.172	0.06	1.00	0.23	0.00115	66
SC-045	6.8	35	356	0.051	0.249	0.014	0.172	0.06	1.00	0.23	0.00115	50
SC-046	18.1	13.3	398	0.024	0.270	0.014	0.176	0.06	1.00	0.23	0.00115	56
SC-047	5.0	6.5	349	0.039	0.277	0.014	0.177	0.06	0.51	0.23	0.00115	43
SC-048	39.7	35.1	646	0.044	0.252	0.014	0.17	0.06	1.00	0.23	0.00115	84
SC-049	0.8	60.4	82	0.074	0.245	0.014	0.171	0.06	0.44	0.23	0.00115	49
SC-050	3.6	72.6	203	0.034	0.251	0.014	0.172	0.06	1.00	0.20	0.00115	49
SC-051	6.1	24.8	234	0.032	0.275	0.014	0.177	0.06	1.00	0.20	0.00115	49
SC-052	8.9	88.9	280	0.033	0.183	0.014	0.173	0.06	0.39	0.23	0.00115	54
SC-053	16.0	50.2	496	0.040	0.216	0.014	0.175	0.06	1.00	0.23	0.00115	63
SC-054	26.2	24	352	0.036	0.248	0.014	0.183	0.06	0.40	0.23	0.00115	59
SC-055	26.8	58.2	367	0.045	0.246	0.014	0.171	0.06	1.00	0.23	0.00115	64
SC-056	1.4	83.2	108	0.032	0.243	0.014	0.171	0.06	1.00	0.23	0.00115	55
SC-057	6.7	44.3	292	0.030	0.251	0.014	0.173	0.06	0.42	0.23	0.00115	58
SC-058	15.0	57.4	413	0.048	0.239	0.014	0.172	0.06	1.00	0.23	0.00115	69
SC-059	12.6	43.5	532	0.038	0.246	0.014	0.17	0.06	0.46	0.22	0.00115	62
SC-060	4.6	23.2	326	0.036	0.274	0.014	0.174	0.06	1.00	0.23	0.00115	68
SC-061	17.5	44.2	546	0.049	0.254	0.014	0.173	0.06	1.00	0.23	0.00115	67
SC-062	10.6	5.2	493	0.024	0.215	0.014	0.193	0.06	0.48	0.23	0.00115	114
SC-063	1.2	0.7	124	0.037	0.215	0.014	0.196	0.06	0.58	0.23	0.00115	107
SC-064	12.3	4.5	226	0.040	0.265	0.014	0.182	0.06	0.37	0.22	0.00115	106
SC-065	20.1	21.7	302	0.036	0.282	0.014	0.178	0.06	0.39	0.23	0.00115	129
SC-066	12.8	16.8	235	0.048	0.266	0.014	0.179	0.06	0.37	0.14	0.00115	131
SC-067	29.1	14.1	650	0.029	0.220	0.014	0.192	0.06	0.44	0.23	0.00115	124
SC-068	108.2	25.1	984	0.057	0.264	0.014	0.167	0.06	0.52	0.22	0.00115	138
SC-069	20.9	74.5	570	0.022	0.227	0.014	0.171	0.06	0.43	0.23	0.00115	113
SC-070	8.6	9.7	372	0.022	0.279	0.014	0.177	0.06	1.00	0.23	0.00115	80
SC-071	112.0	8.6	1319	0.052	0.271	0.014	0.177	0.06	0.53	0.21	0.00115	158
SC-072	20.3	39.2	589	0.020	0.260	0.014	0.169	0.06	0.43	0.23	0.00115	104
SC-073	110.8	3.9	1368	0.082	0.251	0.014	0.182	0.06	0.53	0.17	0.00115	204
SC-074	28.6	26.5	703	0.044	0.247	0.014	0.166	0.06	0.45	0.15	0.00115	133
SC-075	70.5	0.5	1116	0.068	0.213	0.014	0.196	0.06	1.00	0.18	0.00115	208
SC-076	20.1	23.2	714	0.043	0.271	0.014	0.17	0.06	1.00	0.20	0.00115	107
SC-077	19.5	27.5	456	0.026	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	85
SC-078	9.1	23	312	0.035	0.253	0.014	0.168	0.06	1.00	0.23	0.00115	94
SC-079	31.9	16.3	616	0.050	0.245	0.014	0.163	0.06	0.43	0.21	0.00115	147
SC-080	154.9	31.9	1532	0.056	0.248	0.014	0.173	0.06	1.00	0.21	0.00115	174
SC-081	49.3	26.4	698	0.032	0.259	0.014	0.172	0.06	1.00	0.23	0.00115	86
SC-082	6.4	27.4	332	0.036	0.270	0.014	0.177	0.06	1.00	0.20	0.00115	152
SC-083	3.3	42.4	396	0.052	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	134
SC-084	2.4	9.6	255	0.074	0.352	0.014	0.171	0.06	1.00	0.23	0.00115	123

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
SC-085	1.9	3.7	231	0.078	0.275	0.014	0.174	0.06	1.00	0.23	0.00115	137
SC-086	13.5	56.5	369	0.038	0.252	0.014	0.173	0.06	1.00	0.22	0.00115	62
SC-087	7.5	22.3	402	0.019	0.282	0.014	0.178	0.06	1.00	0.21	0.00115	139
SC-088	0.6	0	101	0.037	0.282	0.014	0.178	0.06	1.00	0.06	0.00115	150
SC-089	14.0	19.6	400	0.070	0.255	0.014	0.171	0.06	1.00	0.23	0.00115	222
SC-090	10.1	22.1	345	0.060	0.282	0.014	0.178	0.06	1.00	0.40	0.00115	180
SC-091	21.7	28.3	508	0.074	0.255	0.014	0.171	0.06	1.00	0.16	0.00115	203
SC-092	23.8	30.6	609	0.060	0.251	0.014	0.168	0.06	1.00	0.22	0.00115	156
SC-093	9.5	55.7	372	0.037	0.253	0.014	0.169	0.06	0.42	0.23	0.00115	128
SC-094	75.7	46.4	599	0.030	0.232	0.014	0.172	0.06	0.47	0.23	0.00115	151
SC-095	57.2	3.2	956	0.058	0.264	0.014	0.18	0.06	1.00	0.17	0.00115	211
SC-096	50.4	6.5	592	0.053	0.233	0.014	0.19	0.06	1.00	0.20	0.00115	138
SC-097	4.3	12.9	271	0.060	0.267	0.014	0.182	0.06	0.46	0.23	0.00115	97
SC-098	2.9	16.5	129	0.048	0.276	0.014	0.174	0.06	0.37	0.15	0.00115	57
SC-099	51.7	10.6	601	0.054	0.248	0.014	0.185	0.06	1.00	0.18	0.00115	139
SC-101	20.2	21.9	552	0.051	0.219	0.014	0.184	0.06	1.00	0.20	0.00115	108
SC-102	24.6	51.8	488	0.038	0.245	0.014	0.182	0.06	0.41	0.23	0.00115	36
SC-103	55.6	53.1	744	0.032	0.241	0.014	0.174	0.06	1.00	0.23	0.00115	40
SC-104	4.0	42.9	141	0.062	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	108
SC-105	46.4	25.3	594	0.042	0.270	0.014	0.169	0.06	0.44	0.23	0.00115	121
SC-106	27.5	21.4	425	0.053	0.271	0.014	0.17	0.06	1.00	0.23	0.00115	103
SC-107	49.5	26.2	583	0.057	0.271	0.014	0.17	0.06	1.00	0.21	0.00115	124
SC-108	11.6	30.6	318	0.053	0.270	0.014	0.169	0.06	0.39	0.23	0.00115	116
SC-109	19.6	24.1	516	0.060	0.251	0.014	0.16	0.06	1.00	0.23	0.00115	107
SC-110	1.2	81.7	70	0.084	0.276	0.014	0.174	0.06	1.00	0.23	0.00115	111
SC-111	89.0	21.1	1274	0.054	0.271	0.014	0.17	0.06	0.52	0.22	0.00115	148
SC-112	73.5	22.8	1150	0.052	0.270	0.014	0.169	0.06	1.00	0.21	0.00115	179
SC-113	33.9	30.4	618	0.024	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	147
SC-114	31.3	23	510	0.052	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	173
SC-115	132.8	20.5	1272	0.075	0.271	0.014	0.171	0.06	0.55	0.16	0.00115	228
SC-116	3.0	8.4	159	0.027	0.264	0.014	0.169	0.06	1.00	0.23	0.00115	149
SC-117	8.3	61.1	328	0.029	0.247	0.014	0.169	0.06	1.00	0.23	0.00115	148
SC-118	9.5	42.1	265	0.058	0.253	0.014	0.169	0.06	1.00	0.23	0.00115	150
SC-119	8.2	6	446	0.031	0.260	0.014	0.17	0.06	1.00	0.23	0.00115	151
SC-120	2.8	41.6	192	0.046	0.271	0.014	0.17	0.06	1.00	0.23	0.00115	144
SC-121	5.9	2.3	287	0.053	0.250	0.014	0.169	0.06	1.00	0.23	0.00115	150
SC-122	5.4	14.3	228	0.074	0.272	0.014	0.171	0.06	1.00	0.23	0.00115	123
SC-123	2.4	4.9	157	0.042	0.270	0.014	0.169	0.06	0.46	0.23	0.00115	152
SC-124	7.9	30.4	480	0.041	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	136
SC-125	4.8	4	202	0.032	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	140
SC-126	15.5	54.8	359	0.046	0.226	0.014	0.171	0.06	1.00	0.23	0.00115	155
SC-127	5.0	29.6	233	0.038	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	144

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
SC-128	2.7	21.6	264	0.032	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	147
SC-129	8.0	30.2	278	0.041	0.252	0.014	0.171	0.06	1.00	0.23	0.00115	146
SC-130	8.1	65.1	202	0.037	0.236	0.014	0.171	0.06	1.00	0.23	0.00115	153
SC-131	27.2	3.5	408	0.015	0.216	0.014	0.195	0.06	1.00	0.23	0.00115	163
SC-132	3.6	3.2	198	0.049	0.270	0.014	0.169	0.06	1.00	0.23	0.00115	140
SC-133	3.9	46.5	255	0.051	0.271	0.014	0.17	0.06	1.00	0.23	0.00115	125
SC-134	96.3	1.6	867	0.061	0.261	0.014	0.183	0.06	1.00	0.22	0.00115	360
SC-135	23.3	56.9	732	0.039	0.244	0.014	0.173	0.06	1.00	0.23	0.00115	334
SC-136	9.4	25.5	330	0.033	0.259	0.014	0.169	0.06	1.00	0.23	0.00115	158
SC-137	13.4	48.6	321	0.048	0.257	0.014	0.175	0.06	0.40	0.21	0.00115	42
SC-138	14.2	4.98	517	0.075	0.283	0.014	0.192	0.06	1.00	0.20	0.00115	268
SC-139	32.1	0	534	0.056	0.300	0.014	0.197	0.06	1.00	0.17	0.00115	257
SC-140	23.3	1.24	815	0.046	0.295	0.014	0.194	0.06	1.00	0.23	0.00115	287
SC-141	16.8	3.4	554	0.049	0.294	0.014	0.195	0.06	1.00	0.23	0.00115	299
SC-142	131.2	1.3	1130	0.066	0.297	0.014	0.195	0.06	1.00	0.15	0.00115	222
SC-143	24.2	24.4	465	0.079	0.272	0.014	0.17	0.06	0.41	0.22	0.00115	271
SC-144	3.9	14.4	171	0.076	0.274	0.014	0.173	0.06	0.39	0.20	0.00115	196
SC-145	46.2	5.1	503	0.061	0.278	0.014	0.176	0.06	0.45	0.12	0.00115	252
SC-146	22.7	23.5	584	0.089	0.271	0.014	0.17	0.06	1.00	0.19	0.00115	273
SC-147	22.8	29	456	0.069	0.265	0.014	0.169	0.06	0.41	0.16	0.00115	246
SC-148	37.9	28.4	661	0.086	0.266	0.014	0.17	0.06	0.44	0.20	0.00115	255
SC-149	1.5	34.8	223	0.064	0.258	0.014	0.167	0.06	1.00	0.11	0.00115	199
SC-150	43.1	20.9	805	0.066	0.250	0.014	0.166	0.06	1.00	0.17	0.00115	295
SC-151	19.0	11.3	400	0.062	0.277	0.014	0.175	0.06	1.00	0.17	0.00115	287
SC-152	5.4	31.7	310	0.084	0.272	0.014	0.171	0.06	1.00	0.07	0.00115	192
SC-153	54.6	17	764	0.050	0.273	0.014	0.173	0.06	0.46	0.23	0.00115	343
SC-154	22.8	4	340	0.076	0.283	0.014	0.189	0.06	1.00	0.18	0.00115	196
SC-155	15.5	18.1	240	0.045	0.285	0.014	0.181	0.06	1.00	0.09	0.00115	162
SC-156	17.8	17.6	357	0.055	0.282	0.014	0.178	0.06	1.00	0.14	0.00115	168
SC-157	3.8	8.1	180	0.018	0.282	0.014	0.178	0.06	1.00	0.20	0.00115	126
SC-158	32.6	22.6	538	0.069	0.280	0.014	0.178	0.06	1.00	0.19	0.00115	192
SC-159	10.9	13.5	337	0.055	0.259	0.014	0.17	0.06	0.40	0.23	0.00115	85
SC-160	51.0	36.1	1006	0.019	0.262	0.014	0.169	0.06	1.00	0.23	0.00115	126
SC-161	45.6	57.3	831	0.026	0.238	0.014	0.17	0.06	0.46	0.23	0.00115	97
SC-162	25.6	65.9	578	0.045	0.248	0.014	0.171	0.06	0.43	0.23	0.00115	51
SC-163	8.3	45.3	358	0.039	0.254	0.014	0.173	0.06	1.00	0.23	0.00115	43
SC-164	134.2	1.5	888	0.041	0.258	0.014	0.181	0.06	1.00	0.20	0.00115	174
SC-165	8.8	34.4	565	0.040	0.269	0.014	0.169	0.06	1.00	0.23	0.00115	162
SC-167	3.1	4.7	283	0.081	0.272	0.014	0.171	0.06	1.00	0.23	0.00115	141
SC-169	10.5	78.9	533	0.032	0.243	0.014	0.171	0.06	1.00	0.23	0.00115	51
SC-170	76.3	1	881	0.047	0.216	0.014	0.194	0.06	0.48	0.21	0.00115	133
SC-171	11.1	19.3	430	0.052	0.275	0.014	0.173	0.06	1.00	0.15	0.00115	330

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
SC-172	7.7	2.3	210	0.025	0.271	0.014	0.176	0.06	1.00	0.03	0.00115	173
SC-173	139.9	15	1132	0.042	0.241	0.014	0.185	0.06	1.00	0.19	0.00115	44
SC-174	2.0	13.4	151	0.041	0.282	0.014	0.178	0.06	0.48	0.04	0.00115	202
SC-175	107.0	21.9	1313	0.039	0.221	0.014	0.178	0.06	1.00	0.18	0.00115	50
SC-176	39.7	22.8	502	0.048	0.254	0.014	0.181	0.06	1.00	0.20	0.00115	60
SC-177	39.8	7.4	511	0.041	0.269	0.014	0.176	0.06	0.44	0.07	0.00115	172
SC-178	67.2	2.4	814	0.054	0.246	0.014	0.185	0.06	1.00	0.20	0.00115	229
SC-179	117.5	49.8	973	0.027	0.235	0.014	0.179	0.06	1.00	0.21	0.00115	39
SC-180	185.8	0.7	1396	0.045	0.431	0.014	0.193	0.06	0.59	0.21	0.00115	153
SC-181	14.1	37.3	456	0.028	0.235	0.014	0.168	0.06	0.42	0.23	0.00115	80
SC-182	16.8	27.9	436	0.060	0.273	0.014	0.178	0.06	1.00	0.14	0.00115	34
SC-183	61.3	44.2	588	0.050	0.258	0.014	0.174	0.06	1.00	0.20	0.00115	60
SC-184	18.7	8.7	496	0.032	0.249	0.014	0.177	0.06	0.42	0.23	0.00115	100
SC-185	18.4	4.5	299	0.034	0.279	0.014	0.177	0.06	1.00	0.06	0.00115	190
SC-186	56.4	24.5	822	0.057	0.265	0.014	0.174	0.06	1.00	0.13	0.00115	238
SC-187	130.1	1.1	1224	0.046	0.225	0.014	0.193	0.06	1.00	0.19	0.00115	206
SC-188	47.3	21.1	565	0.041	0.247	0.014	0.176	0.06	1.00	0.21	0.00115	73
SC-189	23.8	15	569	0.035	0.260	0.014	0.169	0.06	1.00	0.23	0.00115	127
SC-190	40.9	14.7	807	0.043	0.276	0.014	0.175	0.06	0.46	0.23	0.00115	119
SC-191	24.0	10.6	529	0.058	0.273	0.014	0.173	0.06	0.42	0.21	0.00115	94
SC-192	92.8	19.4	1148	0.070	0.273	0.014	0.174	0.06	1.00	0.13	0.00115	191
SC-193	7.0	0	216	0.023	0.282	0.014	0.178	0.06	1.00	0.07	0.00115	123
SC-194	4.9	1.4	265	0.037	0.282	0.014	0.178	0.06	1.00	0.09	0.00115	140
SC-195	2.6	51.1	355	0.097	0.260	0.014	0.171	0.06	1.00	0.23	0.00115	132
SC-196	41.3	28.2	706	0.038	0.261	0.014	0.176	0.06	1.01	0.23	0.00115	138
SC-197	147.0	2.1	1482	0.047	0.221	0.014	0.193	0.06	0.56	0.18	0.00115	128
SC-198	97.9	11.1	762	0.050	0.244	0.014	0.182	0.06	1.00	0.18	0.00115	110
SC-199	70.8	0.7	959	0.036	0.232	0.014	0.191	0.06	1.00	0.19	0.00115	160
SC-200	335.6	1.6	1670	0.046	0.227	0.014	0.191	0.06	1.00	0.17	0.00115	118
SC-201	60.0	0.5	891	0.020	0.216	0.014	0.19	0.06	0.47	0.23	0.00115	91
SC-202	136.5	21.3	1396	0.032	0.234	0.014	0.17	0.06	1.00	0.21	0.00115	63
SC-203	214.9	0.3	1077	0.030	0.227	0.014	0.175	0.06	0.61	0.22	0.00115	61
SC-204	241.5	0.1	1654	0.015	0.211	0.014	0.197	0.06	0.65	0.18	0.00115	24
SC-206	4.2	80.7	353	0.055	0.231	0.014	0.168	0.06	1.00	0.23	0.00115	140
SC-207	2.8	5.6	141	0.036	0.280	0.014	0.178	0.06	1.00	0.20	0.00115	142
SC-208	445.8	9.2	1288	0.063	0.221	0.014	0.194	0.06	0.88	0.24	0.00115	252
CD12-5a	502.1	19.4	2790	0.100	0.240	0.014	0.17	0.06	4.09	0.24	0.00115	228
CD12-5b	63.5	16	902	0.115	0.260	0.014	0.16	0.06	3.36	0.25	0.00115	310
CD12-5c	235.6	24.7	1892	0.082	0.250	0.014	0.17	0.06	4.18	0.23	0.00115	249
ML-001	8.1	10.4	473	0.100	0.272	0.014	0.17	0.06	0.52	0.19	0.00115	446
ML-002	5.3	37	280	0.099	0.270	0.014	0.169	0.06	0.43	0.23	0.00115	410
ML-003	71.4	17	1164	0.063	0.272	0.014	0.171	0.06	0.50	0.20	0.00115	399

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
ML-004	33.3	29.3	640	0.057	0.270	0.014	0.169	0.06	1.00	0.22	0.00115	371
ML-005	7.5	22.1	512	0.058	0.275	0.014	0.174	0.06	1.00	0.23	0.00115	351
ML-006	182.3	8.9	1557	0.075	0.278	0.014	0.176	0.06	0.62	0.16	0.00115	293
ML-007	13.3	27.6	400	0.089	0.272	0.014	0.171	0.06	1.00	0.23	0.00115	273
ML-008	94.4	11.6	1385	0.122	0.263	0.014	0.169	0.06	0.53	0.20	0.00115	218
ML-009	14.7	10.2	507	0.128	0.282	0.014	0.178	0.06	0.43	0.19	0.00115	326
ML-010	30.5	24.8	657	0.114	0.258	0.014	0.166	0.06	1.00	0.20	0.00115	307
ML-011	21.5	25.1	684	0.101	0.258	0.014	0.165	0.06	0.48	0.17	0.00115	319
ML-012	10.3	27	415	0.089	0.273	0.014	0.171	0.06	1.00	0.20	0.00115	357
ML-013	20.9	13.4	417	0.081	0.272	0.014	0.17	0.06	0.92	0.20	0.00115	377
ML-014	7.9	4.4	251	0.172	0.282	0.014	0.178	0.06	0.38	0.22	0.00115	275
ML-015	23.0	15.9	574	0.114	0.260	0.014	0.167	0.06	0.46	0.21	0.00115	278
ML-016	6.5	5.1	246	0.094	0.282	0.014	0.178	0.06	1.00	0.19	0.00115	315
ML-017	14.6	23.2	400	0.044	0.270	0.014	0.169	0.06	1.21	0.25	0.00115	183
ML-018	19.2	21.3	477	0.068	0.277	0.014	0.178	0.06	0.41	0.21	0.00115	303
ML-019	53.2	40.2	839	0.093	0.236	0.014	0.175	0.06	0.46	0.18	0.00115	267
ML-020	28.4	47.9	806	0.102	0.225	0.014	0.185	0.06	1.00	0.22	0.00115	264
ML-021	374.7	40.5	2361	0.077	0.220	0.014	0.146	0.06	0.71	0.22	0.00115	121
ML-022	8.1	49.6	370	0.098	0.222	0.014	0.193	0.06	0.44	0.19	0.00115	207
ML-023	4.7	18.5	267	0.079	0.282	0.014	0.178	0.06	0.45	0.17	0.00115	166
ML-024	7.7	16.1	281	0.058	0.280	0.014	0.177	0.06	1.00	0.17	0.00115	171
ML-025	35.4	21.1	625	0.086	0.244	0.014	0.155	0.06	0.83	0.18	0.00115	226
ML-026	17.0	34.2	663	0.057	0.191	0.014	0.124	0.06	0.40	0.13	0.00115	184
ML-027	50.1	33.1	668	0.090	0.258	0.014	0.179	0.06	0.47	0.17	0.00115	201
ML-028	15.2	16	489	0.084	0.280	0.014	0.177	0.06	0.86	0.19	0.00115	243
ML-029	11.6	21.8	395	0.100	0.270	0.014	0.169	0.06	1.00	0.20	0.00115	196
ML-030	17.8	6.1	546	0.079	0.242	0.014	0.153	0.06	1.00	0.23	0.00115	184
ML-031	13.5	2.2	479	0.093	0.244	0.014	0.156	0.06	0.43	0.23	0.00115	175
ML-032	31.0	17.8	631	0.102	0.254	0.014	0.161	0.06	0.43	0.20	0.00115	179
ML-033	11.4	21.4	476	0.088	0.275	0.014	0.174	0.06	1.00	0.18	0.00115	180
ML-034	8.8	30	378	0.107	0.275	0.014	0.175	0.06	0.43	0.19	0.00115	176
ML-035	6.8	1.2	254	0.099	0.244	0.014	0.156	0.06	0.39	0.22	0.00115	154
ML-036	16.3	32	832	0.059	0.279	0.014	0.176	0.06	0.55	0.23	0.00115	189
ML-037	9.9	3.4	346	0.094	0.279	0.014	0.176	0.06	1.00	0.23	0.00115	169
ML-038	6.9	35.4	285	0.083	0.281	0.014	0.177	0.06	0.40	0.23	0.00115	169
ML-039	0.8	0	140	0.073	0.282	0.014	0.178	0.06	0.33	0.23	0.00115	164
ML-040	16.5	30	359	0.089	0.268	0.014	0.171	0.06	0.39	0.20	0.00115	146
ML-041	51.7	0	949	0.075	0.241	0.014	0.154	0.06	1.00	0.17	0.00115	162
ML-042	124.6	0.6	957	0.093	0.269	0.014	0.18	0.06	1.01	0.18	0.00115	270
ML-043	26.6	0.6	570	0.090	0.281	0.014	0.177	0.06	1.00	0.19	0.00115	180
ML-044	41.3	17.8	840	0.099	0.277	0.014	0.176	0.06	1.00	0.20	0.00115	354
ML-045	207.9	2.6	1521	0.095	0.278	0.014	0.177	0.06	0.68	0.22	0.00115	239

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
ML-046	86.6	0.8	1017	0.054	0.251	0.014	0.185	0.06	0.51	0.18	0.00115	285
ML-047	10.3	0	313	0.063	0.280	0.014	0.177	0.06	0.90	0.20	0.00115	269
ML-048	78.9	4.1	1227	0.091	0.273	0.014	0.179	0.06	0.52	0.24	0.00115	207
ML-049	41.3	38.6	357	0.094	0.246	0.014	0.183	0.06	0.43	0.25	0.00115	200
ML-050	21.9	5.7	425	0.096	0.270	0.014	0.177	0.06	0.41	0.24	0.00115	218
ML-051	27.9	40.2	648	0.099	0.239	0.014	0.163	0.06	0.96	0.17	0.00115	177
ML-052	192.3	2.6	1581	0.091	0.263	0.014	0.175	0.06	0.61	0.19	0.00115	274
ML-053	50.6	2.7	835	0.072	0.268	0.014	0.174	0.06	1.00	0.14	0.00115	261
ML-054	9.6	25.8	432	0.087	0.280	0.014	0.176	0.06	0.77	0.16	0.00115	292
ML-055	28.5	1.7	643	0.086	0.266	0.014	0.179	0.06	1.00	0.15	0.00115	288
ML-056	30.4	7.9	800	0.076	0.275	0.014	0.173	0.06	1.00	0.19	0.00115	150
ML-057	184.8	6	1993	0.073	0.264	0.014	0.181	0.06	0.65	0.14	0.00115	241
ML-058	28.5	0.5	515	0.087	0.280	0.014	0.177	0.06	1.00	0.15	0.00115	289
ML-059	57.6	2.5	754	0.065	0.278	0.014	0.177	0.06	0.47	0.16	0.00115	237
ML-060	4.5	22.1	376	0.056	0.276	0.014	0.176	0.06	1.50	0.34	0.00115	217
ML-061	41.4	0	796	0.104	0.256	0.014	0.17	0.06	1.23	0.28	0.00115	236
ML-062	29.8	0.7	534	0.087	0.271	0.014	0.18	0.06	0.43	0.13	0.00115	241
ML-063	20.9	0.7	663	0.093	0.278	0.014	0.179	0.06	1.00	0.16	0.00115	269
ML-064	40.8	0.1	552	0.096	0.281	0.014	0.177	0.06	0.44	0.24	0.00115	255
ML-065	179.9	5.2	1026	0.076	0.264	0.014	0.175	0.06	1.13	0.25	0.00115	233
ML-066	15.4	26.3	550	0.096	0.271	0.014	0.176	0.06	1.00	0.23	0.00115	192
ML-067	7.4	24.1	263	0.061	0.270	0.014	0.169	0.06	0.41	0.28	0.00115	202
ML-068	22.4	80.5	663	0.100	0.249	0.014	0.172	0.06	1.00	0.23	0.00115	208
ML-069	24.1	41.1	560	0.074	0.233	0.014	0.148	0.06	0.45	0.22	0.00115	157
ML-070	37.8	13.8	610	0.106	0.256	0.014	0.169	0.06	0.43	0.22	0.00115	249
ML-071	15.2	18.8	461	0.080	0.270	0.014	0.169	0.06	0.41	0.19	0.00115	160
ML-072	90.0	17.5	1535	0.066	0.268	0.014	0.172	0.06	1.00	0.19	0.00115	256
ML-073	24.4	26.5	485	0.102	0.268	0.014	0.171	0.06	0.48	0.21	0.00115	210
ML-074	5.4	44.4	484	0.046	0.278	0.014	0.175	0.06	0.68	0.16	0.00115	147
ML-075	40.8	31.6	803	0.052	0.256	0.014	0.174	0.06	1.22	0.27	0.00115	168
ML-076	5.3	15.9	217	0.048	0.280	0.014	0.177	0.06	0.39	0.24	0.00115	214
ML-077	23.6	21.8	387	0.074	0.249	0.014	0.164	0.06	0.41	0.24	0.00115	213
ML-078	30.9	43.7	438	0.086	0.248	0.014	0.186	0.06	1.00	0.11	0.00115	247
ML-079	7.8	34.5	339	0.060	0.253	0.014	0.174	0.06	1.00	0.21	0.00115	324
ML-080	9.8	27.1	452	0.104	0.243	0.014	0.185	0.06	1.00	0.23	0.00115	222
ML-081	94.9	20.6	604	0.071	0.263	0.014	0.176	0.06	1.05	0.21	0.00115	291
ML-082	46.8	12.9	701	0.072	0.249	0.014	0.186	0.06	0.45	0.20	0.00115	336
ML-083	28.7	56.4	394	0.071	0.221	0.014	0.185	0.06	0.40	0.23	0.00115	321
ML-084	47.5	18.5	795	0.060	0.258	0.014	0.181	0.06	0.49	0.19	0.00115	270
ML-085	44.4	1.1	670	0.064	0.275	0.014	0.179	0.06	1.02	0.16	0.00115	300
ML-086	56.0	4.2	891	0.091	0.280	0.014	0.177	0.06	0.96	0.20	0.00115	407
ML-087	15.9	19.5	406	0.088	0.257	0.014	0.173	0.06	1.00	0.23	0.00115	191

Table A-3 Lakeville South Creek Hydrologic Model Inputs

Watershed	Area	Directly Connected Percent Impervious	Width	Slope	Pervious Roughness	Impervious Roughness	Pervious Depression Storage	Impervious Depression Storage	Maximum Infiltration	Minimum Infiltration	Decay Rate of Infiltration	Maximum Infiltration
(-)	(acres)	(%)	(ft)	(ft/ft)	(-)	(-)	(inches)	(inches)	(in/hr)	(in/hr)	(1/sec)	(inches)
Lakeville South Creek												
ML-088	33.3	23	530	0.097	0.273	0.014	0.171	0.06	0.47	0.27	0.00115	166
ML-089	24.3	28.2	764	0.046	0.270	0.014	0.169	0.06	0.51	0.28	0.00115	197
ML-090	53.5	25.6	820	0.090	0.268	0.014	0.171	0.06	0.46	0.19	0.00115	254
ML-091	54.5	24.4	710	0.094	0.270	0.014	0.169	0.06	1.06	0.23	0.00115	237
ML-092	70.8	33.3	907	0.100	0.248	0.014	0.165	0.06	1.21	0.25	0.00115	168
ML-093	23.9	33.7	735	0.066	0.270	0.014	0.169	0.06	0.47	0.25	0.00115	172
ML-094	11.1	26.6	337	0.070	0.243	0.014	0.155	0.06	0.95	0.17	0.00115	281
ML-095	18.9	20.6	452	0.091	0.257	0.014	0.167	0.06	0.41	0.22	0.00115	267
ML-096	23.6	30.5	404	0.093	0.261	0.014	0.174	0.06	0.40	0.23	0.00115	313
ML-097	32.2	29.6	526	0.082	0.261	0.014	0.17	0.06	0.43	0.17	0.00115	241
ML-098	38.9	5.3	604	0.068	0.272	0.014	0.178	0.06	1.00	0.16	0.00115	237
ML-099	10.2	26.9	391	0.073	0.270	0.014	0.169	0.06	0.42	0.23	0.00115	363
ML-100	96.5	4.7	732	0.061	0.260	0.014	0.179	0.06	0.48	0.16	0.00115	269
ML-101	32.0	17.2	860	0.110	0.270	0.014	0.169	0.06	0.47	0.21	0.00115	231
ML-102	3.6	18.2	201	0.089	0.282	0.014	0.178	0.06	0.42	0.18	0.00115	318
ML-103	13.7	36.6	383	0.058	0.268	0.014	0.175	0.06	0.96	0.19	0.00115	287
ML-104	16.9	34.4	493	0.086	0.270	0.014	0.169	0.06	0.41	0.22	0.00115	202
ML-105	817.9	61.4	2775	0.048	0.180	0.014	0.121	0.06	0.77	0.24	0.00115	89
ML-106	46.4	24.5	504	0.057	0.241	0.014	0.182	0.06	1.00	0.17	0.00115	264

Appendix B

Hydraulic Model Inputs

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
LNCRK-315	LNCRK-315	NCreek-8	NCL-85	Natural	1463.9	922.2	912	275	495	0.080	0.040	0.080						
LNCRK-317	LNCRK-317	NCreek-21	NCL-80a	Natural	1319.7	908.96	910	300	485	0.080	0.040	0.080						
L-1597	L-1597	N-857	N-1372	Natural	777.255	910.9	910.9	2318	2355	0.080	0.040	0.080						
LNCRK-299	LNCRK-299	NCreek-25	79BM003	Circular	178	922.03	921.98						0	5	0.013	0.50	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-310	LNCRK-310	N-1005	NCL-72	Natural	2900.6	915.47	913.95	375	495	0.080	0.040	0.080						
L-1130	L-1130	N-1007	NCL-44	Natural	1694.675	927.8	925.39	335	375	0.060	0.040	0.060						
L-1132	L-1132	N-1009	N-1010	Natural	1403.251	924.5	920.7	1163	1218	0.080	0.040	0.080						
L-1133.1	L-1133	N-1010	N-1011	Natural	45	929.6	929.6	655	725	0.013	0.013	0.013						
L1133_1	L-1133	N-1010	N-1011	Rectangular	45	929.6	929.6	655	725	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
LNCRK-246	LNCRK-246	N-1011	63BA023	Natural	1636.13	920.472	917.38	150	220	0.080	0.040	0.080						
L-1136	L-1136	N-1013	N-1016	Natural	1357	938.4	933.9	1170	1205	0.080	0.040	0.080						
L-1139.1	L-1139	N-1016	N-1017	Natural	80.7	940.39	940.39	510	585	0.013	0.013	0.013						
L1139_1	L-1139	N-1016	N-1017	Rectangular	80.7	940.39	940.39	510	585	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L1139_2	L-1139	N-1016	N-1017	Rectangular	80.7	940.39	940.39	510	585	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-1140	L-1140	N-1017	N-1018	Natural	1113.911	933.8	933.6	1195	1238	0.080	0.040	0.080						
L1141.1	L-1141	N-1018	N-1019	Natural	36	933.6	933.6	550	650	0.080	0.040	0.080						
L-1144	L-1144	N-1019	NCL-37	Natural	1234	933.6	930.4	1100	1227	0.080	0.040	0.080						
L-1154	L-1154	N-1029	NCL-10	Natural	1821.5	1024.35	991.4	1260	1338	0.080	0.040	0.080						
L-1156	L-1156	N-1031	NCL-14	Natural	921.5	990.8	983.01	1350	1380	0.080	0.040	0.080						
LNCRK-219	LNCRK-219	NCreek-24	NCL-78	Circular	3087.8	938.88	918.7						0	4.25	0.013	1.20	1.00	
L-1172.1	L-1172	N-1044	N-1045	Natural	45	920.5	920.5	760	900	0.013	0.013	0.013						
L1172_1	L-1172	N-1044	N-1045	Arch	45	920.5	920.5	760	900	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L1172_2	L-1172	N-1044	N-1045	Arch	45	920.5	920.5	760	900	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-1641.1	L-1641	N-1045	N-1400	Natural	50	920	920	26	347	0.013	0.013	0.013						
L1641_1	L-1641	N-1045	N-1400	Arch	50	920	920	26	347	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L1641_2	L-1641	N-1045	N-1400	Arch	50	920	920	26	347	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-1173	L-1173	N-1400	NCL-73	Natural	1876.5	915.09	914.87	418	523	0.060	0.040	0.060						
5621.1	LNCRK-133	NCL-1	51BC042	Circular	25	1063	1062.5						0	1.5	0.013	0.11	1.00	Square Edge with Headwall (Circ, Conc)
5621_1	LNCRK-133	NCL-1	51BC042	Trapezoidal	25	1063	1062.5											Square Edge with Headwall (Circ, Conc)
5622.1	LNCRK-134	51BC042	52AC001	Circular	25	1062.49	1062.35						0	1.5	0.013	0.10	0.20	
5622_1	LNCRK-134	51BC042	52AC001	Trapezoidal	25	1062.49	1062.35											
LNCRK-251	LNCRK-251	52AA006	52AA009	Natural	1266.6	1041.94	1026.35	405	530	0.080	0.040	0.080						
6120.1	LNCRK-152	52AA007	52AC024	Circular	59	1043.95	1042.11						0	3.5	0.013	0.40	0.50	Square Edge with Headwall (Circ, Conc)
6120_1	LNCRK-152	52AA007	52AC024	Natural	59	1043.95	1042.11											Square Edge with Headwall (Circ, Conc)
LNCRK-252	LNCRK-252	52AA009	NCL-11	Arch	80	1026.35	1025.83						0	3.917	0.013	1.00	0.50	
LNCRK-265	LNCRK-265	52AA016	52AA007	Natural	810.1	1057.8	1043.95	270	360	0.080	0.040	0.080						
5623.1	LNCRK-135	52AC001	52AC002	Circular	34	1062.35	1062.21						0	1.5	0.013	0.89	0.20	
5623_1	LNCRK-135	52AC001	52AC002	Trapezoidal	34	1062.35	1062.21											
LNCRK-136	LNCRK-136	52AC002	52AM011	Circular	165	1062.21	1061.19						0	1.5	0.013	0.10	0.20	
LNCRK-320	LNCRK-320	52AC002	52AA020	Natural	311.422	1074.34	1065.15	0	102	0.080	0.040	0.080						
5631.1	LNCRK-142	52AC006	52AC007	Circular	40.7	1056.94	1056.3						0	1.5	0.013	0.89	0.20	
5631.2	LNCRK-142	52AC006	52AC007	Trapezoidal	40.7	1056.94	1056.3											
5632.1	LNCRK-143	52AC007	52AC010	Circular	56.4	1056.3	1055.8						0	1.5	0.013	0.16	0.20	
5632.2	LNCRK-143	52AC007	52AC010	Trapezoidal	56.4	1056.3	1055.8											
5633.1	LNCRK-144	52AC010	52AC102	Circular	312.7	1055.8	1052.68						0	1.5	0.013	0.16	0.20	
5633.2	LNCRK-144	52AC010	52AC102	Trapezoidal	312.7	1055.8	1052.68											
6117.1	LNCRK-149	52AC015	52AM005	Circular	263.7	1046.29	1044.62						0	2.5	0.013	1.00	0.20	
6117_1	LNCRK-149	52AC015	52AM005	Trapezoidal	263.7	1046.29	1044.62											
6116.1	LNCRK-148	52AC017	52AC015	Circular	48.4	1046.88	1046.43						0	2.25	0.013	1.00	0.20	
6116_1	LNCRK-148	52AC017	52AC015	Trapezoidal	48.4	1046.88	1046.43											
6115.1	LNCRK-147	52AC019	52AC017	Circular	157.9	1048.79	1046.88						0	2.25	0.013	0.15	0.20	
6115_1	LNCRK-147	52AC019	52AC017	Trapezoidal	157.9	1048.79	1046.88											
6119.1	LNCRK-151	52AC022	52AC024	Circular	76.8	1043.3	1042.7						0	2.5	0.013	1.00	0.20	
6119_1	LNCRK-151	52AC022	52AC024	Trapezoidal	76.8	1043.3	1042.7											
6121.1	LNCRK-153	52AC024	52AA006	Circular	38	1042.11	1041.94						0	3.5	0.013	1.00	0.40	
6121_1	LNCRK-153	52AC024	52AA006	Natural	38	1042.11	1041.94											
6113.1	LNCRK-145	52AC102	52AM008	Circular	160.8	1052.2	1050.42						0	2	0.013	0.34	0.20	
6113_1	LNCRK-145	52AC102	52AM008	Trapezoidal	160.8	1052.2	1050.42											
5630.1	LNCRK-141	52AM004	52AC006	Circular	12.94	1056.96	1056.94						0	1.5	0.013	0.13	0.20	
5630.2	LNCRK-141	52AM004	52AC006	Trapezoidal	12.94	1056.96	1056.94											
6118.1	LNCRK-150	52AM005	52AC022	Circular	94.4	1044.08	1043.3						0	2.5	0.013	0.10	0.20	
6118_1	LNCRK-150	52AM005	52AC022	Trapezoidal	94.4	1044.08	1043.3											
LNCRK-138	LNCRK-138	52AM007	52AM012	Circular	131.33	1060.7	1059.12						0	1.5	0.013	0.10	0.20	
6114.1	LNCRK-146	52AM008	52AC019	Circular	165.4	1050.42	1049.79						0	2	0.013	0.26	0.20	
6114_1	LNCRK-146	52AM008	52AC019	Trapezoidal	165.4	1050.42	1049.79											
LNCRK-137	LNCRK-137	52AM011	52AM007	Circular	119.77	1061.19	1060.7						0	1.5	0.013	0.89	0.20	
LNCRK-139	LNCRK-139	52AM012	52AM013	Circular	146.38	1059.12	1057.37						0	1.5	0.013	0.18	0.20	
5629.1	LNCRK-140	52AM013	52AM004	Circular	36.8	1057.37	1056.96						0	1	0.013	1.10	0.20	

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
5629.2	LNCRK-140	52AM013	52AM004	Trapezoidal	36.8	1057.37	1056.96											
LNCRK-175	LNCRK-175	NCL-46	55AC032	Circular	148	923.6	923.41						0	2.25	0.013	0.15	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-176	LNCRK-176	55AC032	55AC033	Circular	269	923.41	923						0	3	0.013	0.10	0.20	
LNCRK-177	LNCRK-177	55AC033	55AC034	Circular	102.4	923	922.73						0	3	0.013	0.17	0.20	
LNCRK-178	LNCRK-178	55AC034	63AC026	Circular	115.3	922.73	922.44						0	3	0.013	0.17	0.20	
5748.1	LNCRK-268	NCL-70	56AA006	Arch	132	915.39	915.39						0	1.833	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
5748_1	LNCRK-268	NCL-70	56AA006	Natural	132	915.39	915.39											Square Edge with Headwall (Circ, Conc)
LNCRK-269	LNCRK-269	56AA006	56AA012	Natural	1782.65	915.39	913.5	360	415	0.080	0.040	0.080						
5751.1	LNCRK-270	56AA012	NCL-71	Arch	110	913.5	913.3						0	1.833	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
5751.2	LNCRK-270	56AA012	NCL-71	Circular	110	913.5	913.3						0	1.833	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
5751.3	LNCRK-270	56AA012	NCL-71	Circular	110	913.5	913.3						0	1.833	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
5751_1	LNCRK-270	56AA012	NCL-71	Weir	110	913.5	913.3											Square Edge with Headwall (Circ, Conc)
5583.1	LNCRK-1	NCL-3	59BC036	Circular	17.1	1081.57	1081.12						0	1.5	0.013	0.30	0.50	Square Edge with Headwall (Circ, Conc)
5583_1	LNCRK-1	NCL-3	59BC036	Weir	17.1	1081.57	1081.12											Square Edge with Headwall (Circ, Conc)
5812.1	LNCRK-4	59BC033	59BC037	Circular	15	1080.66	1080.3						0	1.75	0.013	0.30	0.20	
5812_1	LNCRK-4	59BC033	59BC037	Trapezoidal	15	1080.66	1080.3											
5783.1	LNCRK-3	59BC036	59BC033	Circular	38.1	1081.12	1080.66						0	1.75	0.013	0.15	0.20	
5783_1	LNCRK-3	59BC036	59BC033	Trapezoidal	38.1	1081.12	1080.66											
5814.1	LNCRK-5	59BC037	60AC058	Circular	170	1077.3	1070.41						0	1.25	0.013	0.10	0.20	
5814_1	LNCRK-5	59BC037	60AC058	Trapezoidal	170	1077.3	1070.41											
LNCRK-255	LNCRK-255	NCL-2	59BM009	Circular	143.3	1085.1	1081.2						0	1.833	0.013	0.33	0.20	Square Edge with Headwall (Circ, Conc)
LNCRK-17	LNCRK-17	59BM009	60AM003	Circular	77.5	1081.2	1080.2						0	2.25	0.013	1.00	0.20	
LNCRK-12	LNCRK-12	60AA001	NCL-8	Natural	1529.8	1035.35	1005.8	165	210	0.080	0.040	0.080						
LNCRK-16	LNCRK-16	60AA007	NCL-8	Natural	582.3	1006.82	998.04	20	240	0.080	0.040	0.080						
LNCRK-19	LNCRK-19	60AC001	60AC002	Circular	319.6	1078.79	1072.54						0	2	0.013	0.28	0.20	
LNCRK-20	LNCRK-20	60AC002	60AC016	Circular	104.3	1071.96	1070.45						0	2.25	0.013	0.28	0.20	
5833.1	LNCRK-8	60AC005	60AP005	Circular	48	1060.57	1059.82						0	1.75	0.013	0.10	0.20	
5833_1	LNCRK-8	60AC005	60AP005	Trapezoidal	48	1060.57	1059.82											
LNCRK-21	LNCRK-21	60AC016	60AC017	Circular	236.3	1067.72	1061.14						0	2	0.013	0.10	0.20	
LNCRK-22	LNCRK-22	60AC017	60AC032	Circular	310.5	1050.96	1046.5						0	2.25	0.013	0.10	0.20	
LNCRK-23	LNCRK-23	60AC032	60AC033	Circular	71.8	1044	1043.23						0	2.25	0.013	0.10	0.20	
LNCRK-24	LNCRK-24	60AC033	60AC034	Circular	247	1042.81	1039.17						0	2.25	0.013	0.93	0.20	
LNCRK-25	LNCRK-25	60AC034	60AC035	Circular	40.3	1038.8	1038.58						0	2.75	0.013	0.86	0.20	
LNCRK-26	LNCRK-26	60AC035	60AM002	Circular	34.8	1038.58	1038.4						0	2.75	0.013	0.93	0.20	
5844.1	LNCRK-9	60AC049	60AC050	Circular	254.1	1058.5	1052.95						0	1.75	0.013	0.50	0.20	
5844_1	LNCRK-9	60AC049	60AC050	Trapezoidal	254.1	1058.5	1052.95											
5584.1	LNCRK-10	60AC050	60AC057	Circular	299.1	1052.95	1044						0	2	0.013	0.10	0.20	
5584_1	LNCRK-10	60AC050	60AC057	Trapezoidal	299.1	1052.95	1044											
LNCRK-29	LNCRK-29	60AC053	NCL-9a	Circular	68.4	1032.52	1032						0	2.5	0.013	1.00	0.20	
5595.1	LNCRK-11	60AC057	60AA001	Circular	333.3	1044	1035.35						0	2	0.013	1.00	0.20	
5595_1	LNCRK-11	60AC057	60AA001	Trapezoidal	333.3	1044	1035.35											
5815.1	LNCRK-6	60AC058	60AP001	Circular	167	1070.41	1063.6						0	1.75	0.013	0.10	0.20	
5815_1	LNCRK-6	60AC058	60AP001	Trapezoidal	167	1070.41	1063.6											
LNCRK-28	LNCRK-28	60AM001	60AC053	Circular	59.5	1032.74	1032.52						0	2.25	0.013	0.67	0.20	
LNCRK-27	LNCRK-27	60AM002	60AM001	Circular	161.2	1034.5	1033.58						0	2.25	0.013	0.12	0.20	
LNCRK-18	LNCRK-18	60AM003	60AC001	Circular	126.4	1080.23	1079.46						0	2.25	0.013	1.00	0.20	
5822.1	LNCRK-7	60AP001	60AC005	Circular	75	1063.6	1060.57						0	1.75	0.013	0.77	0.20	
5822_1	LNCRK-7	60AP001	60AC005	Trapezoidal	75	1063.6	1060.57											
5697.1	LNCRK-216	60AP005	60AC049	Circular	100	1059.82	1058.5						0	1.75	0.013	1.00	0.20	
5697_1	LNCRK-216	60AP005	60AC049	Trapezoidal	100	1059.82	1058.5											
5817.1	LNCRK-65	NCL-24	61BM005	Circular	148.7	1007.52	1004.88						0	2	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
5817_1	LNCRK-65	NCL-24	61BM005	Trapezoidal	148.7	1007.52	1004.88											Square Edge with Headwall (Circ, Conc)
6307.1	LNCRK-77	NCL-30	61BM025	Circular	66	969.5	969						0	2.5	0.013	0.50	1.00	Square Edge with Headwall (Circ, Conc)
6307.2	LNCRK-77	NCL-30	61BM025	Weir	66	969.5	969											Square Edge with Headwall (Circ, Conc)
6305.1	LNCRK-75	61BC015	61BM011	Circular	79	977.47	975						0	2	0.013	0.77	0.20	
6305_1	LNCRK-75	61BC015	61BM011	Trapezoidal	79	977.47	975											
6297.1	LNCRK-68	61BC030	NCL-86	Circular	288.9	1003.58	1002.69						0	2.25	0.013	1.00	0.20	
6297_1	LNCRK-68	61BC030	NCL-86	Trapezoidal	288.9	1003.58	1002.69											
6296.1	LNCRK-67	61BC040	61BC030	Circular	32.1	1003.74	1003.58						0	2.25	0.013	0.10	0.20	
6296_1	LNCRK-67	61BC040	61BC030	Trapezoidal	32.1	1003.74	1003.58											
6295.1	LNCRK-66	61BM005	61BC040	Circular	77.5	1004.88	1004.37						0	2	0.013	1.00	0.20	
6295_1	LNCRK-66	61BM005	61BC040	Trapezoidal	77.5	1004.88	1004.37											
6302.1	LNCRK-72	61BM008	NCL-88	Circular	153.8	1000.45	997						0	2.25	0.013	0.10	0.20	
6302_1	LNCRK-72	61BM008	NCL-88	Trapezoidal	153.8	1000.45	997											
6300.1	LNCRK-70	61BM009	NCL-87	Circular	153	1001.08	1001.08						0	2.5	0.013	0.12	0.20	
6300_1	LNCRK-70	61BM009	NCL-87	Trapezoidal	153	1001.08	1001.08											
6304.1	LNCRK-74	61BM010	61BC015	Circular	374.5	995.41	977.47						0	1.75	0.013	0.24	0.20	
6304_1	LNCRK-74	61BM010	61BC015	Trapezoidal	374.5	995.41	977.47											

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
6306.1	LNCRK-76	61BM011	NCL-89	Circular	50.2	975	973.8						0	2	0.013	0.23	0.20	
6306_1	LNCRK-76	61BM011	NCL-89	Trapezoidal	50.2	975	973.8											
LNCRK-104	LNCRK-104	61BM016	61BM023	Circular	642.2	989.96	987.37						0	3	0.013	1.00	0.20	
LNCRK-103	LNCRK-103	NCL-31	61BM016	Circular	379.6	996.32	990.16						0	2.5	0.013	0.12	0.20	
LNCRK-107	LNCRK-107	61BM019	NCL-30	Circular	61.8	970.6	970						0	3.5	0.013	1.00	0.20	
LNCRK-106	LNCRK-106	61BM020	61BM019	Circular	130.7	972	970.7						0	3.5	0.013	0.31	0.20	
LNCRK-105	LNCRK-105	61BM023	61BM020	Circular	231.1	980.35	977.5						0	3	0.013	0.10	0.20	
6308.1	LNCRK-78	61BM025	61BM026	Circular	110	968.9	965.28						0	2.5	0.013	0.80	0.20	
6308_1	LNCRK-78	61BM025	61BM026	Trapezoidal	110	968.9	965.28											
6309.1	LNCRK-79	61BM026	NCL-93	Circular	15.4	965.28	963.2						0	2.5	0.013	0.38	0.40	
6309_1	LNCRK-79	61BM026	NCL-93	Trapezoidal	15.4	965.28	963.2											
6072.1	LNCRK-108	NCL-38	62AM003	Circular	86.2	975.93	975.8						0	2	0.013	0.28	1.00	Square Edge with Headwall (Circ, Conc)
6072_1	LNCRK-108	NCL-38	62AM003	Trapezoidal	86.2	975.93	975.8											Square Edge with Headwall (Circ, Conc)
6075.1	LNCRK-110	62AC038	62AC175	Circular	206	975.22	974.59						0	2.25	0.013	0.13	0.20	
6075_1	LNCRK-110	62AC038	62AC175	Trapezoidal	206	975.22	974.59											
LNCRK-121	LNCRK-121	62AC089	62AP032	Circular	39	965.69	965.34						0	2	0.013	1.00	0.20	
LNCRK-120	LNCRK-120	62AC090	62AC089	Circular	31	965.91	965.69						0	2	0.013	0.52	0.20	
LNCRK-119	LNCRK-119	62AC091	62AC090	Circular	37	966.24	965.91						0	2	0.013	0.52	0.20	
LNCRK-509	LNCRK-509	62AC091	62AP032	Trapezoidal	80.9	975.51	975.79											
6083.1	LNCRK-118	62AC092	62AC091	Circular	140	967.92	966.24						0	1.75	0.013	0.38	0.20	
6083_1	LNCRK-118	62AC092	62AC091	Trapezoidal	140	967.92	966.24											
6080.1	LNCRK-115	62AC171	62AC177	Circular	51	971	970.8						0	4	0.013	0.10	0.20	
6080_1	LNCRK-115	62AC171	62AC177	Trapezoidal	51	971	970.8											
6079.1	LNCRK-114	62AC172	62AC171	Circular	33	973.31	973.08						0	2.25	0.013	0.10	0.20	
6079_1	LNCRK-114	62AC172	62AC171	Trapezoidal	33	973.31	973.08											
6078.1	LNCRK-113	62AC173	62AC172	Circular	7	973.58	973.41						0	2.25	0.013	0.10	0.20	
6078_1	LNCRK-113	62AC173	62AC172	Trapezoidal	7	973.58	973.41											
6077.1	LNCRK-112	62AC174	62AC173	Circular	51	974.19	973.68						0	2.25	0.013	0.10	0.20	
6077_1	LNCRK-112	62AC174	62AC173	Trapezoidal	51	974.19	973.68											
6076.1	LNCRK-111	62AC175	62AC174	Circular	20	974.49	974.29						0	2.25	0.013	1.00	0.20	
6076_1	LNCRK-111	62AC175	62AC174	Trapezoidal	20	974.49	974.29											
6081.1	LNCRK-116	62AC177	NCL-39	Circular	11	968.74	968.7						0	4	0.013	1.00	0.20	
6081_1	LNCRK-116	62AC177	NCL-39	Trapezoidal	11	968.74	968.7											
318.2	LNCRK-318	NCL-39	62ACS01	Weir	0	973.22	973.22											
318.3	LNCRK-318	NCL-39	62ACS01	Weir	0	973.22	973.22											
318.1	LNCRK-318	NCL-39	62ACS01	Orifice	0	973.22	973.22											
39.1	Link5120	NCL-39	62AC092	Weir	0	977.35	977.35											
LNCRK-508	LNCRK-508	NCL-40	NCL-45	Trapezoidal	1200	968	942.14											
319.2	LNCRK-319	NCL-40	62ACS03	Weir	0	967.51	967.51											
319.3	LNCRK-319	NCL-40	62ACS03	Weir	0	967.51	967.51											
319a.1	LNCRK-319	NCL-40	62ACS03	Orifice	0	967.51	967.51											
6073.1	LNCRK-109	62AM003	62AC038	Circular	157.1	975.8	975.22						0	2	0.013	0.13	0.20	
6073_1	LNCRK-109	62AM003	62AC038	Trapezoidal	157.1	975.8	975.22											
LNCRK-124	LNCRK-124	62AM017	62BS001	Circular	8	962.62	962.56						0	2.75	0.013	0.10	0.20	
6088.1	LNCRK-122	62AP032	NCL-40	Circular	67	964.34	964.15						0	3	0.013	1.00	0.20	
6088_1	LNCRK-122	62AP032	NCL-40	Trapezoidal	67	964.34	964.15											
LNCRK-154	LNCRK-154	NCL-45	62BC076	Circular	174.5	941.97	939.15						0	2.75	0.013	0.50	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-155	LNCRK-155	62BC076	62BS005	Circular	222.4	939.15	931.68						0	2.75	0.013	0.12	0.20	
LNCRK-158	LNCRK-158	62BC079	62BC088	Circular	122	930.68	930.07						0	4.5	0.013	0.18	0.20	
LNCRK-161	LNCRK-161	62BC086	NCL-44	Circular	160.2	928.61	928.61						0	4.5	0.013	1.00	0.20	
LNCRK-159	LNCRK-159	62BC088	62BM007	Circular	295.2	930.07	928.72						0	4.5	0.013	0.16	0.20	
LNCRK-160	LNCRK-160	62BM007	62BC086	Circular	22.9	928.72	928.61						0	4.5	0.013	0.10	0.20	
LNCRK-126	LNCRK-126	62BM009	62BM010	Circular	135.6	962.56	961.45						0	2.75	0.013	0.20	0.20	
LNCRK-127	LNCRK-127	62BM010	62BP001	Circular	57	961.45	960.44						0	2.75	0.013	0.22	0.20	
LNCRK-132	LNCRK-132	62BM011	NCL-45	Circular	155.7	943.43	942.14						0	3	0.013	1.00	0.20	
LNCRK-128	LNCRK-128	62BP001	62BP002	Circular	94.3	958.54	957.53						0	3	0.013	0.22	0.20	
LNCRK-129	LNCRK-129	62BP002	62BP003	Circular	339.8	957.53	957.53						0	3	0.013	0.10	0.20	
LNCRK-130	LNCRK-130	62BP003	62BP006	Circular	401.1	952.77	947.92						0	3	0.013	0.84	0.20	
LNCRK-131	LNCRK-131	62BP006	62BM011	Circular	43.9	947.25	945.81						0	3	0.013	0.84	0.20	
LNCRK-125	LNCRK-125	62BS001	62BM009	Circular	10	962.67	962.56						0	2.75	0.013	0.10	0.20	
LNCRK-157	LNCRK-157	62BS005	62BC079	Circular	187.4	931.68	930.68						0	4.5	0.013	0.10	0.20	
LNCRK-179	LNCRK-179	63AC026	63AC027	Circular	179.9	922.44	921.86						0	3	0.013	0.16	0.20	
LNCRK-180	LNCRK-180	63AC027	63AC035	Circular	207.6	921.86	921.03						0	3	0.013	0.62	0.20	
LNCRK-182	LNCRK-182	63AC034	NCL-61	Circular	214.6	920.63	920.26						0	3.5	0.013	0.57	0.20	
LNCRK-181	LNCRK-181	63AC035	63AC034	Circular	30	920.82	920.63						0	3.5	0.013	0.10	0.20	
LNCRK-174	LNCRK-174	NCL-59	N-1011	Circular	150.8	921.26	920.95						0	4	0.013	1.00	0.20	
LNCRK-173	LNCRK-173	63AC065	NCL-59	Circular	602.9	923.01	921.26						0	4	0.013	0.12	0.20	
6239.1	LNCRK-279	NCL-48	N-1009	Circular	38	928.24	927.52						0	1.75	0.013	1.00	0.20	

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
6239_1	LNCRK-279	NCL-48	N-1009	Trapezoidal	38	928.24	927.52											
LNCRK-183	LNCRK-183	NCL-61	63BA023	Circular	369.7	920.26	919.07						0	3.5	0.013	1.00	0.20	
LNCRK-172	LNCRK-172	63AM027	63AC065	Circular	551.4	923.93	923.01						0	4	0.013	0.10	0.20	
LNCRK-206	LNCRK-206	NCL-49	N-1009	Circular	310.2	925.13	925.05						0	5	0.013	1.00	0.20	
6168.1	LNCRK-205	63AS002	NCL-49	Circular	168	925.17	925.13						0	5	0.013	0.13	0.20	
6168_1	LNCRK-205	63AS002	NCL-49	Trapezoidal	168	925.17	925.13											
LNCRK-257	LNCRK-257	63BA010	N-2466	Natural	971.7	916	917.12	285	475	0.080	0.040	0.080						
LNCRK-260	LNCRK-260	NCL-63	63BS001	Arch	42.3	916.5	916.32						0	3	0.013	0.10	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-184	LNCRK-184	NCL-68	63BP012	Circular	108	918.5	918.3						0	1.5	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-247	LNCRK-247	63BA023	63BA026	Rectangular	65.75	917.38	917.38						12	6	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-248	LNCRK-248	63BA026	N-2466	Natural	1845.1	917.38	917.12	440	585	0.080	0.040	0.080						
LNCRK-188	LNCRK-188	NCL-69	NCL-62	Arch	298	917.38	916.8						0	2.75	0.013	1.00	0.20	
LNCRK-187	LNCRK-187	63BP010	NCL-69	Arch	285	917.66	917.38						0	2.75	0.013	0.19	0.20	
LNCRK-186	LNCRK-186	63BP011	63BP010	Arch	310	917.97	917.66						0	2.208	0.013	0.10	0.20	
LNCRK-185	LNCRK-185	63BP012	63BP011	Arch	324	918.3	917.97						0	2.208	0.013	0.12	0.20	
LNCRK-259	LNCRK-259	63BS001	63BS002	Arch	26.2	916.32	916.16						0	3	0.013	0.10	0.20	
LNCRK-258	LNCRK-258	63BS002	63BA010	Arch	45.2	916.16	916						0	3	0.013	1.00	0.20	
L-1171	L-1171	64AA001	N-1044	Natural	1357.68	916.82	915.3	239	271	0.060	0.040	0.060						
LNCRK-189	LNCRK-189	NCL-75	64AM005	Circular	177	918.53	918.19						0	1.25	0.013	0.44	1.00	Square Edge with Headwall (Circ, Conc)
5691.1	LNCRK-207	NCL-74	N-1044	Circular	64	917.04	916.62						0	1	0.013	1.00	1.00	
5691_1	LNCRK-207	NCL-74	N-1044	Weir	64	917.04	916.62											
253b.1.1	LNCRK-253a	NCL-83	64ACS02	Weir	0	921	921											
253b.2.1	LNCRK-253a	NCL-83	64ACS02	Weir	0	921	921											
253.1	LNCRK-253a	NCL-83	64ACS02	Orifice	0	921	921											
253b.1	LNCRK-253b	NCL-83	N-1044	Weir	0	921.5	921.5											
267.2	LNCRK-267a	NCL-82	64AM015	Weir	0	920	920											
267.1	LNCRK-267a	NCL-82	64AM015	Orifice	0	920	920											
267b.1	LNCRK-267b	NCL-82	N-1044	Weir	0	920.7	920.7											
LNCRK-225	LNCRK-225	64ACS02	N-1044	Circular	50.5	918	917.5						0	1.5	0.013	1.00	0.20	
LNCRK-190	LNCRK-190	64AM005	N-1044	Circular	292	918.19	917.51						0	1.25	0.013	1.00	0.20	
LNCRK-293	LNCRK-293	64AM015	N-1044	Circular	54	918.5	918						0	1.5	0.013	1.00	0.20	
LNCRK-98c	LNCRK-98c	NCL-5	NCL-6	Natural	10	1027	1023	125	235	0.080	0.040	0.080						
98a.1	LNCRK-98a	NCL-5	68ACS03a	Orifice	0	1017.19	1017.19											
LNCRK-95c	LNCRK-95c	NCL-4	68AC013	Natural	10	1035	1027	150	360	0.080	0.040	0.080						
95a.1	LNCRK-95a	NCL-4	68ACS02a	Orifice	0	1027.1	1027.1											
100a.1	LNCRK-100a	NCL-6	68ACS04a	Orifice	0	1015.09	1015.09											
100c.1	LNCRK100c	NCL-6	68AC067	Weir	0	1023	1023											
13a.1	LNCRK-13a	NCL-7	68ACS05a	Orifice	0	1007.78	1007.78											
13c.1.1	LNCRK-13c	NCL-7	60AA007	Weir	0	1016	1016											
5852.1	LNCRK-97	68AC013	NCL-5	Circular	90	1019.26	1016.78						0	3	0.013	1.00	0.20	
5852_1	LNCRK-97	68AC013	NCL-5	Natural	90	1019.26	1016.78											
5848.1	LNCRK-93	68AC051	68AC066	Circular	318	1042.96	1029.96						0	2.5	0.013	0.22	0.40	
5848_1	LNCRK-93	68AC051	68AC066	Trapezoidal	318	1042.96	1029.96											
5849.1	LNCRK-94	68AC066	NCL-4	Circular	200	1029.96	1029.35						0	3	0.013	1.00	0.20	
5849_1	LNCRK-94	68AC066	NCL-4	Trapezoidal	200	1029.96	1029.35											
5587.1	LNCRK-102	68AC067	NCL-7	Circular	348.6	1014.03	1008.2						0	3	0.013	1.00	0.20	
5587_1	LNCRK-102	68AC067	NCL-7	Natural	348.6	1014.03	1008.2											
95b.1	LNCRK-95b	68ACS02a	68ACS02b	Weir	0	1031	1031											
98b.1	LNCRK-98b	68ACS03a	68ACS03b	Weir	0	1021	1021											
100b.1	LNCRK-100b	68ACS04a	68ACS04b	Weir	0	1019	1019											
13b.1	LNCRK-13b	68ACS05a	68ACS05b	Weir	0	1012	1012											
6324.1	LNCRK-92	NCL-17	68AC051	Circular	144.2	1046.4	1042.96						0	2.25	0.013	0.50	0.20	
6324_1	LNCRK-92	NCL-17	68AC051	Trapezoidal	144.2	1046.4	1042.96											
LNCRK-90	LNCRK-90	NCL-18	68AM020	Circular	402.6	1051.6	1047.54						0	2.5	0.013	0.19	0.20	
LNCRK-91	LNCRK-91	68AM020	68AC051	Circular	444.1	1047.54	1042.96						0	2.5	0.013	1.00	0.20	
5722.1	LNCRK-243	NCL-22	69AA014	Rectangular	73	974.81	974.08						5	3	0.013	1.00	0.50	0 deg Wingwall Flares (Rect, Conc)
5722.2	LNCRK-243	NCL-22	69AA014	Rectangular	73	974.81	974.08						5	3	0.013	1.00	0.50	0 deg Wingwall Flares (Rect, Conc)
5722_3	LNCRK-243	NCL-22	69AA014	Natural	73	974.81	974.08											0 deg Wingwall Flares (Rect, Conc)
LNCRK-277	LNCRK-277	69AA007	NCL-26	Natural	943.8	967	953.3	165	515	0.080	0.040	0.080						
LNCRK-226	LNCRK-226	NCL-21	69AA007	Arch	120	968	967						0	5.917	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-244	LNCRK-244	69AA014	NCL-23	Natural	1654.6	974.08	961.1	460	495	0.080	0.040	0.080						
LNCRK-276	LNCRK-276	69AA020	NCL-21	Natural	1467.7	985.98	968	270	415	0.080	0.040	0.080						
5835.1	LNCRK-81	69BC020	NCL-94	Circular	56.2	961	960.04						0	2.5	0.013	0.10	0.20	
5835_1	LNCRK-81	69BC020	NCL-94	Trapezoidal	56.2	961	960.04											
5839.1	LNCRK-85	69BC030	NCL-92	Circular	32	947.42	946.96						0	3	0.013	0.24	0.20	
5839_1	LNCRK-85	69BC030	NCL-92	Trapezoidal	32	947.42	946.96											
6177.1	LNCRK-218	NCL-28	NCL-29	Circular	166.4	944.75	944.1						0	4	0.013	1.00	0.20	
6177_1	LNCRK-218	NCL-28	NCL-29	Trapezoidal	166.4	944.75	944.1											

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
LNCRK-61	LNCRK-61	NCL-33	NCL-29	Circular	104.2	940.52	940.3						0	5	0.013	1.00	0.20	
5838.1	LNCRK-84	69BM013	69BC030	Circular	164.1	948.67	947.42						0	3	0.013	0.24	0.20	
5838_1	LNCRK-84	69BM013	69BC030	Trapezoidal	164.1	948.67	947.42											
LNCRK-233	LNCRK-233	70BA008	70BA011	Natural	860.85	929.5	929.28	305	400	0.080	0.040	0.080						
LNCRK-232	LNCRK-232	70BA009	70BA008	Arch	200	929.5	929.5						0	3.917	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-235	LNCRK-235	70BA010	NCL-37	Natural	525.1	929.08	930.4	70	150	0.080	0.040	0.080						
5716.1	LNCRK-234	70BA011	70BA010	Arch	200	929.28	929.08						0	3.75	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
5716.2	LNCRK-234	70BA011	70BA010	Arch	200	929.28	929.08						0	3.75	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
5654.1	LNCRK-166	70BC061	70BC064	Circular	260.9	926.43	926.14						0	5	0.013	0.10	0.20	
5654_1	LNCRK-166	70BC061	70BC064	Trapezoidal	260.9	926.43	926.14											
5775.1	LNCRK-292	70BC062	70BM012	Circular	29.2	926.73	926.72						0	5	0.013	0.10	0.20	
5775_1	LNCRK-292	70BC062	70BM012	Trapezoidal	29.2	926.73	926.72											
5652.1	LNCRK-164	70BC063	70BM011	Circular	104.4	926.68	926.56						0	5	0.013	0.10	0.20	
5652_1	LNCRK-164	70BC063	70BM011	Trapezoidal	104.4	926.68	926.56											
LNCRK-167	LNCRK-167	70BC064	70BM010	Circular	266.5	926.14	925.85						0	5	0.013	0.10	0.20	
6166.1	LNCRK-202	70BM009	71AS001	Circular	39.7	925.2	925.19						0	5	0.013	0.15	0.20	
6166_1	LNCRK-202	70BM009	71AS001	Trapezoidal	39.7	925.2	925.19											
LNCRK-294	LNCRK-294	70BM010	71AS004	Circular	457	925.85	925.21						0	5	0.013	0.10	0.20	
5653.1	LNCRK-165	70BM011	70BC061	Circular	118.8	926.56	926.43						0	5	0.013	0.10	0.20	
5653_1	LNCRK-165	70BM011	70BC061	Trapezoidal	118.8	926.56	926.43											
5651.1	LNCRK-163	70BM012	70BC063	Circular	49.3	926.72	926.68						0	5	0.013	0.10	0.20	
5651_1	LNCRK-163	70BM012	70BC063	Trapezoidal	49.3	926.72	926.68											
LNCRK-224	LNCRK-224	NCL-50	70BC062	Circular	378	927.15	926.73						0	5	0.013	0.17	0.20	
LNCRK-168	LNCRK-168	NCL-52	71AC016	Circular	75.6	924.8	924.73						0	2.5	0.013	0.74	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-169	LNCRK-169	71AC016	71AM004	Circular	209.9	924.73	924.54						0	2.5	0.013	0.10	0.20	
LNCRK-171	LNCRK-171	71AC017	63AM027	Circular	67.2	924.11	923.98						0	2.5	0.013	0.25	0.20	
LNCRK-170	LNCRK-170	71AM004	71AC017	Circular	112	924.23	924.11						0	2.5	0.013	0.82	0.20	
6167.1	LNCRK-203	71AS001	63AS002	Circular	54.6	925.19	925.17						0	5	0.013	0.15	0.20	
6167_1	LNCRK-203	71AS001	63AS002	Trapezoidal	54.6	925.19	925.17											
6165.1	LNCRK-201	71AS004	70BM009	Circular	52.6	925.21	925.2						0	5	0.013	0.15	0.20	
6165_1	LNCRK-201	71AS004	70BM009	Trapezoidal	52.6	925.21	925.2											
LNCRK-287	LNCRK-287	NCL-67	71BC003	Arch	15	924.5	922.51						0	3.333	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-285	LNCRK-285	71BA019	NCL-65a	Natural	1059.6	920.34	922	395	440	0.080	0.040	0.080						
LNCRK-288	LNCRK-288	71BC003	72AM003	Arch	151	920	919.7						0	3.333	0.013	0.10	0.20	
LNCRK-262	LNCRK-262	71BM002	71BA019	Circular	51	920.99	920.34						0	2	0.013	1.00	0.20	
5683.1	LNCRK-193	NCL-78	64AA001	Arch	165.6	917.17	916.82						0	4	0.013	1.10	1.00	Square Edge with Headwall (Circ, Conc)
5683.2	LNCRK-193	NCL-78	64AA001	Arch	165.6	917.17	916.82						0	4	0.013	1.10	1.00	Square Edge with Headwall (Circ, Conc)
5683.3	LNCRK-193	NCL-78	64AA001	Circular	165.6	917.17	916.82						0	4	0.013	1.10	1.00	Square Edge with Headwall (Circ, Conc)
5683.4	LNCRK-193	NCL-78	64AA001	Weir	165.6	917.17	916.82											Square Edge with Headwall (Circ, Conc)
5682.1	LNCRK-191	NCL-76	NCL-77	Circular	89	918.21	917.74						0	3	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
5682.2	LNCRK-191	NCL-76	NCL-77	Circular	89	918.21	917.74						0	3	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
5682.3	LNCRK-191	NCL-76	NCL-77	Weir	89	918.21	917.74											Square Edge with Headwall (Circ, Conc)
209a.4	LNCRK-209a	NCL-77	72ACS02	Weir	0	921	921											
209a.5	LNCRK-209a	NCL-77	72ACS02	Weir	0	921	921											
209a.1	LNCRK-209a	NCL-77	72ACS02	Orifice	0	921	921											
209a.2	LNCRK-209a	NCL-77	72ACS02	Orifice	0	921	921											
209a.3	LNCRK-209a	NCL-77	72ACS02	Orifice	0	921	921											
209b.1	LNCRK-209b	NCL-77	NCL-78	Weir	0	922	922											
LNCRK-195	LNCRK-195	NCL-81	72AM009	Circular	28	916.23	918.78						0	1.25	0.013	0.10	1.00	Square Edge with Headwall (Circ, Conc)
5694.1	LNCRK-211	72ACS02	NCL-78	Circular	39	917.8	917.34						0	2.5	0.013	1.00	0.20	
5694.2	LNCRK-211	72ACS02	NCL-78	Circular	39	917.8	917.34						0	2.5	0.013	1.00	0.20	
5694.3	LNCRK-211	72ACS02	NCL-78	Circular	39	917.8	917.34						0	2.5	0.013	1.00	0.20	
LNCRK-308	LNCRK-308	72AM001	NCL-78	Circular	1000	917.87	916.08						0	5	0.013	1.00	0.20	
LNCRK-289	LNCRK-289	72AM003	NCL-76	Arch	437	919.7	919.18						0	3.333	0.013	1.10	0.20	
LNCRK-283	LNCRK-283	72AM009	NCL-78	Circular	77	918.06	918.01						0	1.25	0.013	1.00	0.20	
LNCRK-223	LNCRK-223	NCL-19	76BA009	Circular	136	997.9	997.9						0	5	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-274	LNCRK-274	76BA009	NCL-20	Natural	1091	997.9	987.38	85	275	0.080	0.040	0.080						
6235.1	LNCRK-275	NCL-20	69AA020	Circular	117	987.38	985.98						0	3	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
6235_1	LNCRK-275	NCL-20	69AA020	Natural	117	987.38	985.98											Square Edge with Headwall (Circ, Conc)
5811.1	LNCRK-39	77BC184	NCL-27	Circular	20	946.55	945						0	1.25	0.013	1.10	0.20	
5809.1	LNCRK-37	77BM046	78AC052	Circular	268.6	940.72	938.8						0	3.5	0.013	0.16	0.20	
5809_1	LNCRK-37	77BM046	78AC052	Trapezoidal	268.6	940.72	938.8											
5810.1	LNCRK-38	NCL-27	77BM046	Circular	323	945	941.05						0	3	0.013	0.33	0.20	
5810_1	LNCRK-38	NCL-27	77BM046	Trapezoidal	323	945	941.05											
40a.2	LNCRK-40a	NCL-32	77BC184	Weir	0	952.1	952.1											
40a.1	LNCRK-40a	NCL-32	77BC184	Orifice	0	952.1	952.1											
40b.1	LNCRK-40b	NCL-32	77BM046	Weir	0	956.65	956.65											
LNCRK-87	LNCRK-87	NCL-35	78AM006	Circular	88	936.85	933.52						0	3	0.013	0.24	1.00	Square Edge with Headwall (Circ, Conc)

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
3542.1	Link5117	NCL-35	NCL-42	Weir	0	939.85	939.85											
5843.1	LNCRK-89	NCL-42	78BA011	Circular	62.5	934.54	934.39						0	1.5	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
5843_1	LNCRK-89	NCL-42	78BA011	Natural	62.5	934.54	934.39											Square Edge with Headwall (Circ, Conc)
LNCRK-32	LNCRK-32	78AC043	NCreek-25	Circular	116	936.68	936						0	3.5	0.013	1.00	0.20	
5805.1	LNCRK-33	78AC043	NCL-34	Circular	37	937.14	937.1						0	3.5	0.013	1.20	0.20	
5805_1	LNCRK-33	78AC043	NCL-34	Trapezoidal	37	937.14	937.1											
5808.1	LNCRK-36	78AC052	78AC053	Circular	150	938.8	938.6						0	3.5	0.013	0.10	0.20	
5808_1	LNCRK-36	78AC052	78AC053	Trapezoidal	150	938.8	938.6											
5807.1	LNCRK-35	78AC053	78AM001	Circular	182.7	938.6	937.21						0	3.5	0.013	0.95	0.20	
5807_1	LNCRK-35	78AC053	78AM001	Trapezoidal	182.7	938.6	937.21											
5806.1	LNCRK-34	78AM001	78AC043	Circular	38	937.21	937.14						0	3.5	0.013	0.41	0.20	
5806_1	LNCRK-34	78AM001	78AC043	Trapezoidal	38	937.21	937.14											
LNCRK-88	LNCRK-88	78AM006	NCL-42	Circular	187.8	933.1	931.8						0	3.5	0.013	1.00	0.20	
LNCRK-236	LNCRK-236	NCL-36	78BA008	Circular	186.3	934.32	934.12						0	3.5	0.013	1.00	0.20	
LNCRK-230	LNCRK-230	78BA003	78BA004	Circular	200.5	932.57	931.57						0	3.5	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-231	LNCRK-231	78BA004	70BA009	Natural	1371.6	931.57	929.5	345	490	0.080	0.040	0.080						
LNCRK-228	LNCRK-228	78BA008	78BA009	Circular	200.5	933.76	932.76						0	3.5	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-229	LNCRK-229	78BA009	78BA003	Natural	181.5	932.76	932.57	325	570	0.080	0.040	0.080						
LNCRK-227	LNCRK-227	78BA011	78BA008	Natural	931.5	934.39	933.76	100	255	0.080	0.040	0.080						
LNCRK-280	LNCRK-280	NCL-51	79BB001	Arch	24	926.94	926.76						0	5.58	0.027	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-290	LNCRK-290	NCL-54	NCL-57	Circular	108	924.33	924.34						0	1.5	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
LNCRK-281	LNCRK-281	79BB001	NCL-55	Natural	628.4	926.76	924.99	190	240	0.080	0.040	0.080						
LNCRK-300	LNCRK-300	79BM003	79BM004	Circular	320.9	921.98	921.58						0	5	0.013	0.30	0.20	
LNCRK-301	LNCRK-301	79BM004	79BM005	Circular	115	921.58	921.41						0	5	0.013	0.16	0.20	
LNCRK-302	LNCRK-302	79BM005	79BM006	Circular	484	921.41	921.01						0	5	0.013	0.10	0.20	
LNCRK-303	LNCRK-303	79BM006	79BM008	Circular	456	921.01	920.65						0	5	0.013	0.10	0.20	
LNCRK-304	LNCRK-304	79BM008	79BM009	Circular	243.9	920.65	920.39						0	5	0.013	0.28	0.20	
LNCRK-305	LNCRK-305	79BM009	79BM010	Circular	716.7	920.39	919.78						0	5	0.013	0.18	0.20	
LNCRK-306	LNCRK-306	79BM010	79BM011	Circular	1005.1	919.78	918.78						0	5	0.013	0.28	0.20	
LNCRK-307	LNCRK-307	79BM011	72AM001	Circular	1012.9	918.78	917.87						0	5	0.013	0.32	0.20	
L-1129.1	L-1129	NCL-43	N-1007	Natural	96	945	945	25	385	0.013	0.013	0.013						
L1129_1	L-1129	NCL-43	N-1007	Rectangular	96	945	945	25	385	0.013	0.013	0.013	0	0	0	0.00	0.00	
L1129_2	L-1129	NCL-43	N-1007	Rectangular	96	945	945	25	385	0.013	0.013	0.013	0	0	0	0.00	0.00	
L1129_3	L-1129	NCL-43	N-1007	Circular	96	945	945	25	385	0.013	0.013	0.013	0	0	0	0.00	0.00	
L-1131.1	L-1131	NCL-44	N-1009	Natural	45	933.22	933.22	505	2045	0.013	0.013	0.013						
L1131_1	L-1131	NCL-44	N-1009	Circular	45	933.22	933.22	505	2045	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-1135.1	L-1135	NCL-29	N-1013	Natural	130	948	948	690	765	0.013	0.013	0.013						
L1135_2	L-1135	NCL-29	N-1013	Circular	130	948	948	690	765	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L1135_3	L-1135	NCL-29	N-1013	Arch	130	948	948	690	765	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-1153.1	L-1153	NCL-11	N-1029	Natural	92.395	1032.1	1032.1	370	1000	0.013	0.013	0.013						
L1153_1	L-1153	NCL-11	N-1029	Arch	92.395	1032.1	1032.1	370	1000	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-1155.1	L-1155	NCL-10	N-1031	Natural	42.7	997.28	996.3	685	810	0.080	0.040	0.080						
L1155_1	L-1155	NCL-10	N-1031	Circular	42.7	997.28	996.3	685	810	0.080	0.040	0.080	0	0	0	0.00	0.00	
5746.1	LNCRK-266	NCL-53	71BM002	Circular	46	924.82	924.47						0	2	0.027	0.38	1.00	Square Edge with Headwall (Circ, Conc)
5746_1	LNCRK-266	NCL-53	71BM002	Weir	46	924.82	924.47											Square Edge with Headwall (Circ, Conc)
LNCRK-263	LNCRK-263	NCL-64	N-1471	Natural	56.7	920.5	920.4	180	380	0.080	0.040	0.080						
LNCRK-284	LNCRK-284	N-1471	N-1485	Natural	1101.2	920.3	916.3	110	505	0.080	0.040	0.080						
5744.1	LNCRK-264	NCL-12	52AA016	Circular	62	1060.5	1057.8						0	2	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
5744_1	LNCRK-264	NCL-12	52AA016	Natural	62	1060.5	1057.8											Square Edge with Headwall (Circ, Conc)
LNCRK-271	LNCRK-271	NCL-71	N-857	Natural	114.7	911.8	911.91	825	1030	0.080	0.040	0.080						
LNCRK-214	LNCRK-214	NCL-9b	NCL-14	Natural	1105.9	988.6	983.01	115	180	0.080	0.040	0.080						
LNCRK-272	LNCRK-272	NCL-9a	N-1476	Natural	29.2	1035.9	1034.86	220	280	0.080	0.040	0.080						
LNCRK-30	LNCRK-30	N-1476	NCL-9b	Natural	1706.4	1034.86	988.6	120	230	0.080	0.040	0.080						
LNCRK-273	LNCRK-273	NCL-15	NCL-14	Natural	37.3	991.25	990.37	35	95	0.080	0.040	0.080						
LNCRK-278	LNCRK-278	NCL-16	NCL-22	Natural	183	981.9	980.3	120	180	0.080	0.040	0.080						
LNCRK-282	LNCRK-282	N-1479	NCL-56	Rectangular	163	923.59	923.03						8	4	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-286	LNCRK-286	NCL-65a	NCL-67	Natural	1545.1	922	924.5	50	80	0.080	0.040	0.080						
LNCRK-296	LNCRK-296	NCL-57	NCL-56	Trapezoidal	119.3	924	923.7											
5781.1	LNCRK-298	NCL-80b	NCL-80a	Circular	75	915	915						0	2	0.013	1.00	1.00	Square Edge with Headwall (Circ, Conc)
5781_1	LNCRK-298	NCL-80b	NCL-80a	Weir	75	915	915											Square Edge with Headwall (Circ, Conc)
LNCRK-312	LNCRK-312	N-1485	N-1486	Arch	83.3	916.3	916.3						0	3	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-313	LNCRK-313	N-1486	NCL-63	Natural	100.3	916.3	916.5	305	385	0.080	0.040	0.080						
L-1147	L-1147	NCL-25	NCL-29	Natural	1731.44	947.14	939	1608	1612	0.080	0.040	0.080						
L-1128	L-1128	NCL-37	NCL-43	Natural	180.1	930.4	928	1110	1150	0.060	0.040	0.060						
L-1126.1	L-1126	NCL-62	N-1005	Natural	95	925	925	680	880	0.013	0.013	0.013						
L1126_1	L-1126	NCL-62	N-1005	Rectangular	95	925	925	680	880	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
LNCRK-314	LNCRK-314	NCL-73	NCL-72	Natural	244.7	914.87	913.95	145	745	0.080	0.040	0.080						
LNCRK-291	LNCRK-291	N-2457	NCL-78	Natural	1325	922.5	918.4	120	375	0.080	0.040	0.080						

Table B-1 Hydraulic Parameters for Lakeville North Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville North Creek																		
								Natural Channels					*Pipes & Culverts*					
LNCRK-222	LNCRK-222	N-2459	N-1479	Natural	1233.3	924.55	923.59	135	215	0.080	0.040	0.080						
LNCRK-256	LNCRK-256	N-2466	NCL-62	Natural	788.11	917.12	915.58	320	425	0.080	0.040	0.080						
L-1165	L-1165	NCL-80a	NCL-78	Natural	2392.774	920	921.2	1480	1575	0.050	0.037	0.050						
LNCRK-31	LNCRK-31	NCL-8	NCL-9b	Natural	160.9	998.04	988.6	195	275	0.080	0.040	0.080						
LNCRK-242	LNCRK-242	NCL-14	NCL-22	Natural	1483.67	983.01	974.81	480	580	0.080	0.040	0.080						
LNCRK-249	LNCRK-249	NCL-13	NCL-10	Natural	96	996.01	993.4	56	89	0.080	0.040	0.080						
LNCRK-245	LNCRK-245	NCL-23	NCL-25	Natural	2175.2	961.1	947.143	380	450	0.080	0.040	0.080						
LNCRK-241	LNCRK-241	NCL-26	NCL-25	Natural	10	953.3	952	170	215	0.080	0.040	0.080						
LNCRK-309	LNCRK-309	NCL-47	N-1011	Circular	92.1	921.63	921.12						0	4	0.013	1.00	0.20	
LNCRK-220	LNCRK-220	NCL-55	N-2459	Arch	156	924.99	924.55						0	4.5	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-221	LNCRK-221	NCL-56	N-2457	Arch	328	922.9	922.5						0	2.75	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LNCRK-254	LNCRK-254	NCL-60	N-1471	Natural	59.4	922	921.5	230	335	0.080	0.040	0.080						
LNCRK-261	LNCRK-261	NCL-66	N-1486	Natural	73.1	919.5	918.5	75	120	0.080	0.040	0.080						
L-1125	L-1125	NCL-72	N-857	Natural	1628.4	913.95	910.9	1750	1810	0.080	0.040	0.080						
LNCRK-297	LNCRK-297	NCL-79	NCL-78	Natural	39.1	922.5	920	95	220	0.080	0.040	0.080						
LNCRK-316	LNCRK-316	NCL-85	N-1372	Natural	663.6	912	910.9	290	455	0.080	0.040	0.080						
LNCRK-117	LNCRK-117	62ACS01	62AC092	Circular	51	970	968.1						0	1.25	0.013	0.70	1.00	
LNCRK-123	LNCRK-123	62ACS03	62AM017	Circular	93	964.14	962.62						0	2.25	0.013	0.69	0.20	
LNCRK-101	LNCRK-101	68ACS04b	68AC067	Circular	53.8	1014.92	1014.03						0	3	0.013	0.10	0.20	
LNCRK-14	LNCRK-14	68ACS05b	60AA007	Circular	231.7	1007.78	1006.82						0	3	0.013	0.17	0.20	
5851.1	LNCRK-96	68ACS02b	68AC013	Circular	210	1026.74	1019.26						0	3	0.013	0.19	0.20	
5854.1	LNCRK-99	68ACS03b	NCL-6	Circular	253	1016.75	1014.98						0	3	0.013	1.00	0.20	
5908.1	LNCRK-321	52AA020	52AC119	Circular	121	1065.15	1060.62						0	1	0.013	0.10	0.50	Square Edge with Headwall (Circ, Conc)
5908_1	LNCRK-321	52AA020	52AC119	Natural	121	1065.15	1060.62											Square Edge with Headwall (Circ, Conc)
5907.1	LNCRK-322	52AC119	52AC118	Circular	75	1060.62	1060.17						0	1	0.013	0.00	0.00	
5907_1	LNCRK-322	52AC119	52AC118	Natural	75	1060.62	1060.17											
5906.1	LNCRK-323	52AC118	52AC117	Circular	35	1060.17	1059.66						0	1	0.013	0.33	0.20	
5906_1	LNCRK-323	52AC118	52AC117	Natural	35	1060.17	1059.66											
5905.1	LNCRK-324	52AC117	52AM013	Circular	35	1059.66	1058.77						0	1	0.013	0.90	0.20	
5905_1	LNCRK-324	52AC117	52AM013	Trapezoidal	35	1059.66	1058.77											
6303.1	LNCRK-73	NCL-88	61BM010	Circular	150.7	997	995.41						0	2.25	0.013	1.00	0.20	
6303_1	LNCRK-73	NCL-88	61BM010	Trapezoidal	150.7	997	995.41											
6175.1	LNCRK-215	NCL-89	61BM026	Circular	145.4	973.8	965.28						0	2	0.013	0.80	0.20	
6175_1	LNCRK-215	NCL-89	61BM026	Trapezoidal	145.4	973.8	965.28											
6298.1	LNCRK-69	NCL-86	61BM009	Circular	170	1002.69	1001.08						0	2.25	0.013	0.10	0.20	
6298_1	LNCRK-69	NCL-86	61BM009	Trapezoidal	170	1002.69	1001.08											
6301.1	LNCRK-71	NCL-87	61BM008	Circular	178.6	1001.08	1000.45						0	2.5	0.013	0.12	0.20	
6301_1	LNCRK-71	NCL-87	61BM008	Trapezoidal	178.6	1001.08	1000.45											
5834.1	LNCRK-80	NCL-93	69BC020	Circular	142.8	963.03	961						0	2.5	0.013	0.10	0.20	
5834_1	LNCRK-80	NCL-93	69BC020	Trapezoidal	142.8	963.03	961											
5836.1	LNCRK-82	NCL-94	NCL-96	Circular	400.2	958.87	951.71						0	2.5	0.013	0.28	0.20	
5836_1	LNCRK-82	NCL-94	NCL-96	Trapezoidal	400.2	958.87	951.71											
5837.1	LNCRK-83	NCL-96	69BM013	Circular	343.3	951.21	948.67						0	3	0.013	0.24	0.20	
5837_1	LNCRK-83	NCL-96	69BM013	Trapezoidal	343.3	951.21	948.67											
5840.1	LNCRK-86	NCL-92	NCL-29	Circular	191.4	946.47	945.27						0	3.5	0.013	1.00	0.20	
5840_1	LNCRK-86	NCL-92	NCL-29	Trapezoidal	191.4	946.47	945.27											
9291.1	Link5116	NCL-92	NCL-91	Weir	0	957	957											
6363.1	LNCRK-503	NCL-95	69BM003	Circular	273	950.81	949.61						0	1.75	0.013	0.21	0.20	
6363_1	LNCRK-503	NCL-95	69BM003	Trapezoidal	273	950.81	949.61											
6362.1	LNCRK-502	NCL-97	NCL-95	Circular	317	953.86	951.27						0	1.25	0.013	1.00	0.20	
6362_1	LNCRK-502	NCL-97	NCL-95	Trapezoidal	317	953.86	951.27											
6365.1	LNCRK-504	69BM003	69BC031	Circular	220	949.61	948.65						0	1.75	0.013	0.10	0.20	
6365_1	LNCRK-504	69BM003	69BC031	Trapezoidal	220	949.61	948.65											
LNCRK-500	LNCRK-500	NCL-91	NCL-29	Circular	200	948.4	946.4						0	1.75	0.013	1.00	0.20	
LNCRK-506	LNCRK-506	NCL-90	69BM009	Circular	245	960.59	952.33						0	1.75	0.013	0.50	0.20	
LNCRK-507	LNCRK-507	69BM009	NCL-29	Circular	41.4	947.8	947.8						0	2.25	0.013	1.00	0.50	
6364.1	LNCRK-505	69BC031	69BC030	Circular	41	948.65	948.47						0	2	0.013	1.00	0.20	
6364_1	LNCRK-505	69BC031	69BC030	Trapezoidal	41	948.65	948.47											
6361.1	LNCRK-501	NCL-98	NCL-29	Circular	186	950.68	948.64						0	1	0.013	1.00	0.20	
6361_1	LNCRK-501	NCL-98	NCL-29	Weir	186	950.68	948.64											

Table B-2 Hydraulic Parameters for Lakeville Middle Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville Middle Creek																		
								Natural Channels					*Pipes & Culverts*					
L-1201.1	L-1201	F-A2.1	N-1065	Natural	90.515	951	951	1795	1960	0.013	0.013	0.013						
L1201_1	L-1201	F-A2.1	N-1065	Circular	90.515	951	951	1795	1960	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-FMC430	L-FMC430	F-A1.1	N-FF315	Natural	337	958.55	956.8	1295	1335	0.050	0.037	0.050						
L-LMC-122	L-LMC-122	N-L-558	FO-049	Natural	635.629	974	968.2	2170	2225	0.050	0.037	0.050						
L-LMC-133	L-LMC-133	FO-044	F-A1.1	Natural	949.599	957.7	956.88	1100	1165	0.050	0.037	0.050						
L-LMC-118	L-LMC-118	FO-043	FO-042	Natural	1111.306	956.2	948.2	1170	1210	0.050	0.037	0.050						
L-LMC-135	L-LMC-135	FO-053	N-1368	Natural	1018.185	951.7	945.4	1200	1240	0.050	0.037	0.050						
L-LMC-113	L-LMC-113	N-L-596	FO-043	Natural	2322.565	982.35	956.2	965	1025	0.050	0.037	0.050						
L-LMC-115	L-LMC-115	N-L-555	N-L-553	Natural	590.743	982.1	976.783	1190	1240	0.050	0.037	0.050						
L-1207.1	L-LMC-116	N-L-553	N-L-554	Natural	75.053	983	983	640	730	0.013	0.013	0.013						
L1207_1	L-LMC-116	N-L-553	N-L-554	Circular	75.053	983	983	640	730	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LMC-117	L-LMC-117	N-L-554	FO-043	Natural	1488.574	972.938	956.2	1160	1225	0.050	0.037	0.050						
L-LMC-095	L-LMC-095	N-L-551	FO-039	Natural	1341.95	985.7	967.86	930	970	0.050	0.035	0.050						
L-1306.1	L-LMC-123	FO-049	N-L-557	Natural	184.67	975.6	975.6	2525	2665	0.014	0.014	0.014						
L1306_1	L-LMC-123	FO-049	N-L-557	Arch	184.67	975.6	975.6	2525	2665	0.014	0.014	0.014	0	0	0.014	0.00	0.00	
L1306_2	L-LMC-123	FO-049	N-L-557	Arch	184.67	975.6	975.6	2525	2665	0.014	0.014	0.014	0	0	0.014	0.00	0.00	
L1306_3	L-LMC-123	FO-049	N-L-557	Arch	184.67	975.6	975.6	2525	2665	0.014	0.014	0.014	0	0	0.014	0.00	0.00	
L-LMC-124	L-LMC-124	N-L-557	N-L-565	Natural	1908.173	968.15	962.06	795	820	0.050	0.037	0.050						
L-LMC-108	L-LMC-108	N-L-561	FO-038	Natural	2854.63	996.1	977.4	400	1100	0.050	0.035	0.050						
L-LMC-131	L-LMC-131	N-L-559	FO-052	Natural	1026.073	1019.75	1009.03	720	840	0.050	0.037	0.050						
L-1312.1	L-LMC-126	FO-052	N-L-560	Natural	81	1020.06	1020.06	700	1710	0.013	0.013	0.013						
L1312_1	L-LMC-126	FO-052	N-L-560	Modified basket-handle	81	1020.06	1020.06	700	1710	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LMC-128	L-LMC-128	N-L-560	FO-037	Natural	2595	1008.36	985.7	1150	1200	0.050	0.037	0.050						
L-LMC-096	L-LMC-096	N-1368	FO-040	Natural	1276.79	945.4	930.94	300	900	0.050	0.035	0.050						
L-LMC-111	L-LMC-111	N-L-552	FO-053	Natural	949.796	964.82	951.7	1135	1180	0.050	0.037	0.050						
L-LMC-125	L-LMC-125	N-L-565	FO-044	Natural	922.862	962.06	957.7	775	835	0.050	0.037	0.050						
L-LMC-129	L-LMC-129	N-L-562	FO-037	Natural	2469	1010.8	985.7	750	775	0.050	0.037	0.050						
LMC001.P1	L-LMC-001	FO-005	FO-051	Circular	41	1019.8	1019.8						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC001.OC	L-LMC-001	FO-005	FO-051	Natural	41	1019.8	1019.8											Groove End with Projecting (Circ, Conc)
L-LMC-010	L-LMC-010	FO-035	N-L-004	Natural	1609.87	1066.99	1039.68	250	400	0.050	0.035	0.050						
FO34NWL	LGrateFO34	FO-034	GrateFO034	Weir	0	1052.5	1052.5											
FO034HWL	LGrateFO34	FO-034	GrateFO034	Weir	0	1052.5	1052.5											
LMC003.P1	L-LMC-003	FO-033	N-L-003	Horizontal Ellipse	162	1051.9	1047.3						0	5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC003.P2	L-LMC-003	FO-033	N-L-003	Horizontal Ellipse	162	1051.9	1047.3						0	5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC003.OC1	L-LMC-003	FO-033	N-L-003	Natural	162	1051.9	1047.3											Groove End with Projecting (Circ, Conc)
L-LMC-005	L-LMC-005	FO-031	FO-033	Circular	30	1058	1053						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-009	L-LMC-009	N-L-022	N-L-044	Circular	78.76	1058.9	1055.11						0	2.25	0.013	0.20	0.10	
L-LMC-011	L-LMC-011	N-L-022	FO-033	Circular	76.2	1057.8	1057.51						0	1	0.013	1.00	0.50	
L-LMC-089	L-LMC-089	FO-030	N-L-445	Circular	25.32	1058.44	1058.44						0	2.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-008	L-LMC-008	N-L-044	FO-033	Circular	28.89	1054.44	1053.59						0	2.25	0.013	1.00	0.10	
LMC012.P1	L-LMC-012	FO-029	N-L-002	Circular	40	1065	1064.88						0	1.75	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC012.OC2	L-LMC-012	FO-029	N-L-002	Natural	40	1065	1064.88											Groove End with Projecting (Circ, Conc)
L-LMC-013	L-LMC-013	N-L-002	FO-033	Natural	801.933	1063.38	1051.9	660	820	0.050	0.035	0.050						
LMC015.P1	L-LMC-015	FO-028	FO-032	Circular	66.3	1069.41	1068.96						0	1	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC015.OC1	L-LMC-015	FO-028	FO-032	Natural	66.3	1069.41	1068.96											Groove End with Projecting (Circ, Conc)
L-LMC-020	L-LMC-020	FO-027	N-L-212	Circular	41.31	1063	1063						0	1.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-020A	L-LMC-020A	FO-027	N-L-020	Trapezoidal	41	1069	1066.6											
L-LMC-016	L-LMC-016	N-L-019	N-L-046	Natural	563.377	1042.76	1031.68	730	850	0.050	0.035	0.050						
LMC021.P1	L-LMC-021	N-L-020	N-L-023	Circular	117	1062.2	1055.39						0	1.25	0.013	0.20	0.10	
LMC021.OC	L-LMC-021	N-L-020	N-L-023	Trapezoidal	117	1062.2	1055.39											
LMC022.P1	L-LMC-022	N-L-023	N-L-024	Circular	164.82	1055.19	1050.25						0	1.25	0.013	1.00	0.50	
LMC022.OC	L-LMC-022	N-L-023	N-L-024	Trapezoidal	164.82	1055.19	1050.25											
LMC023.P1	L-LMC-023	N-L-024	N-L-048	Circular	170	1045.85	1043.83						0	1.25	0.013	0.20	0.10	
LMC023.OC	L-LMC-023	N-L-024	N-L-048	Trapezoidal	170	1045.85	1043.83											
LMC024.P1	L-LMC-024	N-L-048	N-L-047	Circular	81.02	1043.83	1043.57						0	1.25	0.013	0.20	0.10	
LMCO24.OC	L-LMC-024	N-L-048	N-L-047	Trapezoidal	81.02	1043.83	1043.57											
LMC019.P1	L-LMC-019	N-L-047	N-L-019	Circular	154	1043.32	1042.76						0	1.25	0.013	1.00	0.10	
LMC019.OC	L-LMC-019	N-L-047	N-L-019	Trapezoidal	154	1043.32	1042.76											
L-LMC-018	L-LMC-018	FO-026	N-L-046	Natural	270	1033.7	1031.68	1050	1150	0.050	0.035	0.050						
L-LMC-017	L-LMC-017	N-L-046	FO-045	Natural	1455.04	1031.68	1013.92	800	1000	0.050	0.035	0.050						
L-LMC-025	L-LMC-025	FO-025	N-L-446	Circular	32	1071.8	1071.8						0	2.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LMC-025A	L-LMC-025A	FO-025	N-L-516	Natural	30	1080.6	1080.6	800	1000	0.050	0.035	0.050						
L-LMC-026	L-LMC-026	N-L-045	N-L-516	Circular	74	1075.01	1074.63						0	2.5	0.013	1.00	0.10	
LMC027.P1	L-LMC-027	N-L-043	FO-050	Circular	185	997.5	996.89						0	4.5	0.013	1.00	0.50	
LMC027.OC	L-LMC-027	N-L-043	FO-050	Trapezoidal	185	997.5	996.89											
LMC028.P1	L-LMC-028	N-L-042	N-L-043	Arch	42	997.64	997.5						0	3.749	0.013	0.20	0.50	
LMC028.OC	L-LMC-028	N-L-042	N-L-043	Trapezoidal	42	997.64	997.5											

Table B-2 Hydraulic Parameters for Lakeville Middle Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville Middle Creek																		
								Natural Channels					*Pipes & Culverts*					
LMC032.P1	L-LMC-032	N-L-041	N-L-042	Circular	174	1003.8	1002.72						0	4	0.013	1.00	1.00	
LMC032.OC1	L-LMC-032	N-L-041	N-L-042	Trapezoidal	174	1003.8	1002.72											
LFO024Weir	LFO024Weir	FO-024	FO-024Weir	Weir	0	1010.5	1010.5											
LFO042NWL	LFO024Weir	FO-024	FO-024Weir	Weir	0	1010.5	1010.5											
LMC030.P1	L-LMC-030	N-L-040	N-L-039	Circular	9	1005.45	1005.29						0	3	0.013	0.20	1.00	
LMC030.OC	L-LMC-030	N-L-040	N-L-039	Trapezoidal	9	1005.45	1005.29											
LMC031.P1	L-LMC-031	N-L-039	N-L-041	Circular	32	1004.14	1003.8						0	4	0.013	0.20	0.10	
LMC031.OC	L-LMC-031	N-L-039	N-L-041	Trapezoidal	32	1004.14	1003.8											
L-LMC-033	L-LMC-033	N-L-038	FO-024	Circular	171	1008.69	1008.4						0	3.5	0.013	1.00	0.10	
L-LMC-035	L-LMC-035	N-L-037	N-L-038	Circular	107	1008.74	1008.69						0	3.5	0.013	0.20	0.10	
FO23Weir	LFO23Weir	FO-023	FO23Grate	Weir	0	1014.3	1014.3											
LFO023NWL	LFO23Weir	FO-023	FO23Grate	Weir	0	1014.3	1014.3											
LLMC038.P	L-LMC-038	N-L-036	N-L-035	Circular	79	1007.17	1001.99						0	2	0.013	0.20	0.50	
LLMC038.OC	L-LMC-038	N-L-036	N-L-035	Trapezoidal	79	1007.17	1001.99											
LLMC039.P1	L-LMC-039	N-L-035	N-L-034	Circular	322	1001.81	999.65						0	2.25	0.013	0.20	0.10	
LLMC039.OC	L-LMC-039	N-L-035	N-L-034	Trapezoidal	322	1001.81	999.65											
LLMC037.P	L-LMC-037	N-L-034	N-L-447	Circular	267	999.65	997.65						0	2.25	0.013	0.20	0.10	
LLMC037.OC	L-LMC-037	N-L-034	N-L-447	Trapezoidal	267	999.65	997.65											
LLMC036.P	L-LMC-036	N-L-447	FO-050	Circular	98	997.65	996.95						0	2.25	0.013	1.00	0.50	
LLMC036.OC	L-LMC-036	N-L-447	FO-050	Trapezoidal	98	997.65	996.95											
L-LMC-044	L-LMC-044	FO-009	N-L-033	Natural	243.18	1035.45	1030.98	600	960	0.050	0.035	0.050						
L-LMC-045	L-LMC-045	N-L-033	N-L-049	Natural	3188.97	1030.98	991.7	620	1000	0.050	0.035	0.050						
L-LMC-041	L-LMC-041	N-L-049	N-L-050	Natural	757.565	991.7	983.26	710	950	0.050	0.035	0.050						
L-LMC-040	L-LMC-040	FO-036	N-L-050	Circular	95.6	990.66	988.45						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-042	L-LMC-042	N-L-050	FO-047	Natural	319.054	983.26	982.53	900	1200	0.050	0.035	0.050						
L-LMC-043	L-LMC-043	FO-008	N-L-049	Circular	43	991.78	991.7						0	3.67	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-136	L-LMC-136	FO-008	FO-036	Trapezoidal	780	995.9	983.59											
L-LMC-046	L-LMC-046	FO-021	FO-048	Natural	2721.58	1020.46	993	750	950	0.050	0.035	0.050						
L-LMC-047	L-LMC-047	FO-020	N-L-032	Circular	211.286	1003.46	997.39						0	4	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-048	L-LMC-048	N-L-032	FO-039	Natural	1546.94	997.39	967.86	450	700	0.050	0.035	0.050						
L-LMC-094	L-LMC-094	FO-039	N-L-552	Natural	524.557	967.86	964.82	930	970	0.050	0.035	0.050						
L-LMC-091	L-LMC-091	FO-019	F-A4.1.2	Natural	2098.561	1013.36	984.19	400	550	0.050	0.035	0.050						
L-LMC-051	L-LMC-051	FO-018	F-A3.3	Natural	2241.379	966.51	940.51	600	620	0.060	0.037	0.060						
LLMC049.OC	LLMC049.OC	FO-017	FO-048	Natural	10	1043	1043	400	450	0.050	0.037	0.050						
LLMC049.P	L-LMC-049	FO-017	N-L-031	Circular	174.212	1038.186	1033.068						0	2.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC049.OC	L-LMC-049	FO-017	N-L-031	Natural	174.212	1038.186	1033.068											Groove End with Projecting (Circ, Conc)
L-LMC-050	L-LMC-050	N-L-031	FO-018	Natural	2715.04	1033.068	967.62	720	740	0.050	0.035	0.050						
L-LMC-052	L-LMC-052	FO-016	F-A2.3	Natural	1542.63	973.18	938	400	600	0.050	0.035	0.050						
L-LMC-053	L-LMC-053	FO-015	N-1065	Natural	351.089	957.97	949.25	600	1000	0.050	0.035	0.050						Groove End with Projecting (Circ, Conc)
L-LMC-054	L-LMC-054	FO-004	N-FF315	Natural	406.357	960.38	960.3	240	320	0.050	0.035	0.050						
L-LMC-063	L-LMC-063	FO-014	FO-007	Circular	24	963.29	963.08						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
FO014Grate	Link5157	FO-014	MHFO-014	Weir	0	964.9	964.9											
LMHFO014	Link5157	FO-014	MHFO-014	Orifice	0	964.9	964.9						0	0	0	0.00	0.00	
L-LMC-058	L-LMC-058	N-L-028	N-L-027	Circular	113	961.16	960.76						0	2	0.013	0.20	0.10	
L-LMC-061	L-LMC-061	N-L-027	FO-013	Circular	168	960.76	959.71						0	2	0.013	1.00	0.10	
L-LMC-062	L-LMC-062	FO-013	N-L-026	Circular	55	960.2	958.65						0	1.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-062A	L-LMC-062A	FO-013	FO-012	Natural	20	964.8	962.6	670	710	0.050	0.035	0.050						
L-LMC-060	L-LMC-060	N-L-026	N-L-025	Circular	52	958.65	958.6						0	1.5	0.013	0.20	0.50	
L-LMC-059	L-LMC-059	N-L-025	FO-012	Arch	57	958.6	958.23						0	3	0.013	1.00	0.50	
L-LMC-056A	L-LMC-056A	FO-012	FO-011	Natural	10	963.5	963.4	330	430	0.050	0.035	0.050						
FO012Grate	LFO012	FO-012	MHFO-012	Weir	0	961.3	961.3											
FO12Rectan	LFO012	FO-012	MHFO-012	Orifice	0	961.3	961.3						0	0	0	0.00	0.00	
LMC055.P1	L-LMC-055	FO-011	FO-010	Circular	32	958.2	957.88						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC055.OC	L-LMC-055	FO-011	FO-010	Natural	32	958.2	957.88											Groove End with Projecting (Circ, Conc)
LMC057DOC1	L-LMC-057D	FO-010	N-FF314	Natural	10	963.1	963.1	160	220	0.050	0.035	0.050						
FO010NWL	L-LMC-057A	FO-010	MHFO-010	Weir	0	958	958											
L-LMC-069	L-LMC-069	N-L-018	FO-012	Arch	52	958.25	958.17						0	3.333	0.013	1.00	0.40	
L-LMC-070	L-LMC-070	FO-007	N-L-017	Circular	39	962.15	959.24						0	1	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LMC070A	L-LMC-070A	FO-007	N-L-018	Natural	20	965	962	470	620	0.050	0.035	0.050						
L-LMC-071	L-LMC-071	N-L-017	N-L-018	Circular	52	958.98	958.98						0	1.5	0.013	0.40	0.10	
L-LMC-068	L-LMC-068	N-L-016	N-L-018	Arch	155	959.26	958.25						0	3	0.013	1.00	0.10	
L-LMC-067	L-LMC-067	N-L-015	N-L-016	Circular	161	960.24	959.26						0	3.5	0.013	0.20	0.10	
L-LMC-066	L-LMC-066	N-L-014	N-L-015	Circular	94	960.64	960.24						0	3	0.013	0.20	0.10	
L-LMC-065	L-LMC-065	N-L-013	N-L-014	Circular	187	962.71	960.64						0	3	0.013	0.20	0.10	
L-LMC-073	L-LMC-073	N-L-012	N-L-013	Circular	209	967.71	962.71						0	3	0.013	0.20	0.10	
L-LMC-072	L-LMC-072	N-L-011	N-L-012	Circular	300	980.99	967.71						0	3	0.013	0.20	0.10	
L-LMC-074	L-LMC-074	N-L-010	N-L-011	Circular	278	982.82	980.99						0	3	0.013	0.20	1.00	

Table B-2 Hydraulic Parameters for Lakeville Middle Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville Middle Creek																		
								Natural Channels					*Pipes & Culverts*					
L-LMC-076	L-LMC-076	N-L-009	N-L-008	Circular	28	983.72	983.41						0	3	0.013	0.20	0.50	
L-LMC-077	L-LMC-077	N-L-008	N-L-007	Circular	7	983.41	983.35						0	3	0.013	0.20	0.10	
L-LMC-078	L-LMC-078	N-L-007	N-L-010	Circular	40	983.35	982.82						0	3	0.013	0.20	0.10	
LMC079.P1	L-LMC-079	FO-006	FO-041	Circular	53	996	995.83						0	4.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC079.OC1	L-LMC-079	FO-006	FO-041	Trapezoidal	53	996	995.83											Groove End with Projecting (Circ, Conc)
L-LMC-082	L-LMC-082	FO-002	N-L-444	Circular	30	960.92	961.51						0	1.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-082A	L-LMC-082A	FO-002	N-FF241	Natural	10	968.9	967.8	450	490	0.050	0.035	0.050						
L-LMC-083	L-LMC-083	N-L-001	N-FF241	Circular	165	965.65	964						0	1	0.013	1.00	0.50	
L-LMC-007	L-LMC-007	N-L-004	FO-051	Natural	1739.13	1039.68	1019.8	400	510	0.050	0.035	0.050						
L-LMC-064	L-LMC-064	N-L-003	N-L-004	Natural	899.33	1047.3	1039.68	500	650	0.050	0.035	0.050						
L-LMC-014	L-LMC-014	FO-032	N-L-002	Natural	446.548	1066.81	1063.38	220	250	0.050	0.035	0.050						
L-LMC-088	L-LMC-088	N-L-444	N-L-001	Circular	20	966.22	965.65						0	1	0.013	0.20	0.10	
L-LMC-004	L-LMC-004	N-L-445	N-L-022	Circular	17	1061	1057.65						0	2.25	0.013	0.20	0.10	
L-LMC-085	L-LMC-085	N-L-446	N-L-045	Circular	20	1075.21	1075.01						0	2.5	0.013	0.20	0.10	
LLMC086.P	L-LMC-086	FO-022	N-L-036	Circular	60	1007.5	1007.17						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LLMC086.OC	L-LMC-086	FO-022	N-L-036	Trapezoidal	60	1007.5	1007.17											Groove End with Projecting (Circ, Conc)
LNL212Weir	LNL212Weir	N-L-212	NL212Weir	Weir	0	1063.8	1063.8											
L-LMC-109	L-LMC-109	FO-038	N-L-558	Natural	618.783	977.4	974	200	1200	0.050	0.035	0.050						
L-LMC-121	L-LMC-121	FO-037	N-L-558	Natural	2330	985.7	974	940	990	0.050	0.037	0.050						
L-LMC-097	L-LMC-097	FO-040	N-193	Natural	852.993	930.94	925.9	870	910	0.050	0.035	0.050						
LMHFO041.1	LMHFO041	FO-041	MHFO041	Weir	0	996	996											
FO041Grate	LMHFO041	FO-041	MHFO041	Weir	0	996	996											
F1410inch	LMHFO041	FO-041	MHFO041	Orifice	0	996	996						0	0	0	0.00	0.00	
L-1715.1	L-LMC-127	FO-045	N-L-562	Natural	95	1026.282	1026.282	355	935	0.013	0.013	0.013						
L1715_1	L-LMC-127	FO-045	N-L-562	Modified basket-handle	95	1026.282	1026.282	355	935	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1308.1	L-LMC-132	FO-050	N-L-561	Natural	52.695	1002.7	1002.7	1585	1795	0.013	0.013	0.013						
L1308_1	L-LMC-132	FO-050	N-L-561	Rectangular	52.695	1002.7	1002.7	1585	1795	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1310.1	L-LMC-130	FO-051	N-L-559	Natural	63.936	1026.8	1026.8	1185	1270	0.013	0.013	0.013						
L1310_1	L-LMC-130	FO-051	N-L-559	Circular	63.936	1026.8	1026.8	1185	1270	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1310_2	L-LMC-130	FO-051	N-L-559	Circular	63.936	1026.8	1026.8	1185	1270	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1205.1	L-LMC-114	FO-047	N-L-555	Natural	177.673	992.8	992.8	1240	1350	0.013	0.013	0.013						
L1205_1	L-LMC-114	FO-047	N-L-555	Circular	177.673	992.8	992.8	1240	1350	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1205_2	L-LMC-114	FO-047	N-L-555	Circular	177.673	992.8	992.8	1240	1350	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1209.1	L-LMC-110	FO-048	N-L-551	Natural	144.719	1006.569	1006.569	1945	2030	0.013	0.013	0.013						
L1209_1	L-LMC-110	FO-048	N-L-551	Circular	144.719	1006.569	1006.569	1945	2030	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LMC-090	L-LMC-090	N-L-516	FO-032	Natural	727.03	1074.63	1068.22	150	300	0.050	0.035	0.050						
L-1203.1	L-LMC-112	FO-046	N-L-596	Natural	188.14	986.6	986.6	620	2305	0.013	0.013	0.013						
L1203_1	L-LMC-112	FO-046	N-L-596	Arch	188.14	986.6	986.6	620	2305	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LMC-119	L-LMC-119	FO-042	F-A2.1	Natural	313.406	948.2	944.5	1035	1090	0.050	0.037	0.050						
L-LMC-029	L-LMC-029	FO-024Weir	N-L-040	Circular	139	1008.55	1005.82						0	3	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LMC084.P1	L-LMC-084	FO-024Weir	N-L-039	Circular	139	1008.37	1005.76						0	3	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMC084.OC	L-LMC-084	FO-024Weir	N-L-039	Natural	139	1008.37	1005.76											Groove End with Projecting (Circ, Conc)
L-LMC-002	L-LMC-002	GrateFO034	N-L-003	Circular	84	1044.18	1050						0	2	0.013	1.00	0.50	
L-LMC-087	L-LMC-087	NL212Weir	N-L-020	Circular	41.32	1063.8	1063.8						0	1.25	0.013	0.80	0.10	
LFO23Grate	LFO23Grate	FO23Grate	FO23Grate2	Weir	0	1013.81	1013.81											
L-LMC-034	L-LMC-034	FO23Grate2	N-L-037	Circular	31	1008.98	1008.74						0	3.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-056	L-LMC-056	MHFO-012	FO-011	Circular	52	958.2	957.94						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-075	L-LMC-075	MHFO041	N-L-009	Circular	76	992	990.97						0	1	0.013	1.00	0.50	
L-LMC-057B	L-LMC-057B	MHFO-010	MHFO-010A	Circular	3	956.25	956.24						0	1	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LMC-057C	L-LMC-057C	MHFO-010A	N-FF314	Circular	96	955.91	956.2						0	2	0.013	1.00	0.20	
L-LMC-006	L-LMC-006	MHFO-014	N-L-028	Circular	154	962.08	961.16						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
L-FSC018	L-FSC018	L-A1.1b	N-FL023	Circular	14	960.1	958.5						0	1.5	0.013	1.00	1.00	
L-FSC033	L-FSC033	L-A1.1b	L-A1.1a	Trapezoidal	50	957.9	957.9											
L-FSC021	L-FSC021	N-FL022	N-FL021	Circular	405	947.83	945.81						0	2.5	0.013	0.10	0.20	
L-FSC022	L-FSC022	N-FL023	N-FL022	Circular	332	949.5	947.84						0	5	0.013	0.50	0.20	
L-LSC-803	L-LSC-803	SC-199	SC-180	Natural	857.312	988.3	988.422	765	815	0.050	0.037	0.050						
L-134.1	L-LSC-806	N-L-571	N-L-572	Natural	38.92	965.433	965.433	290	320	0.013	0.013	0.013						
L134_1	L-LSC-806	N-L-571	N-L-572	Arch	38.92	965.433	965.433	290	320	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L134_2	L-LSC-806	N-L-571	N-L-572	Arch	38.92	965.433	965.433	290	320	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L134_3	L-LSC-806	N-L-571	N-L-572	Circular	38.92	965.433	965.433	290	320	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-807	L-LSC-807	N-L-572	SC-200	Natural	134.608	958.673	959.607	270	300	0.050	0.037	0.050						
L-LSC-809	L-LSC-809	N-L-573	N-L-574	Natural	720	959.607	953.392	430	480	0.050	0.037	0.050						
L-144.1	L-LSC-810	N-L-574	N-L-575	Natural	106.3	960.34	960.34	55	85	0.013	0.013	0.013						
L144_1	L-LSC-810	N-L-574	N-L-575	Circular	106.3	960.34	960.34	55	85	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-811	L-LSC-811	N-L-575	N-L-576	Natural	1217	952.897	947.805	715	750	0.050	0.037	0.050						
L-146.1	L-LSC-812	N-L-576	N-L-577	Natural	529.88	954.078	954.078	1495	1590	0.013	0.013	0.013						
L146_1	L-LSC-812	N-L-576	N-L-577	Circular	529.88	954.078	954.078	1495	1590	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L146_2	L-LSC-812	N-L-576	N-L-577	Circular	529.88	954.078	954.078	1495	1590	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-813	L-LSC-813	N-L-577	SC-202	Natural	735	944.695	942.692	345	395	0.050	0.037	0.050						
L-LSC-815	L-LSC-815	N-L-578	SC-203	Natural	1341	942.551	937.6	1185	1255	0.050	0.037	0.050						
L-LSC-816	L-LSC-816	SC-203	SC-179	Natural	1607.175	937.6	932.624	650	675	0.050	0.037	0.050						
L-LSC-728	L-LSC-728	N-L-595	N-L-229	Natural	1464.14	950.98	946.48	630	700	0.050	0.035	0.050						
L-1351	L-1351	SC-175	L-A1.4	Natural	1246.958	930.4	926.15	1240	1275	0.050	0.037	0.050						
L-LSC-800	L-LSC-800	N-L-567	SC-173	Natural	1855.785	928.6	927.1	1480	1510	0.080	0.035	0.080						
L-830	L-830	SC-173	L-A1.5	Natural	1178.178	926.36	922.532	1340	1365	0.080	0.035	0.080						
L-LSC-720	L-LSC-720	N-L-587	N-L-177	Natural	183.691	1013.6	1014.48	1000	1050	0.050	0.035	0.050						
L-LSC-722	L-LSC-722	N-807	SC-066	Natural	1378.64	984.63	975.02	130	200	0.050	0.035	0.050						
L-1342.1	L-LSC-801	SC-179	N-L-569	Natural	75	938.95	938.95	920	1610	0.013	0.013	0.013						
L1342_1	L-LSC-801	SC-179	N-L-569	Rectangular	75	938.95	938.95	920	1610	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1342_2	L-LSC-801	SC-179	N-L-569	Rectangular	75	938.95	938.95	920	1610	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-737	L-LSC-737	N-L-569	N-L-331	Natural	109.804	932.132	931.86	1020	1060	0.050	0.037	0.050						
L-1346.1	L-LSC-804	SC-180	N-L-570	Natural	23.5	991.443	991.443	45	1060	0.013	0.013	0.013						
L1346_1	L-LSC-804	SC-180	N-L-570	Rectangular	23.5	991.443	991.443	45	1060	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-805	L-LSC-805	N-L-570	N-L-571	Natural	5819.089	987.971	958.71	1180	1275	0.050	0.037	0.050						
L-LSC-735	L-LSC-735	N-L-568	N-L-421	Natural	375.011	929.27	929.8	300	450	0.050	0.035	0.050						
L-LSC-730	L-LSC-730	N-L-531	N-L-215	Natural	659.042	942.49	941.08	270	330	0.050	0.035	0.050						
L-LSC-839	L-LSC-839	N-L-597	N-L-530	Natural	791.922	957.35	955.5	58	119	0.070	0.035	0.070						
L-LSC-841	L-LSC-841	N-L-594	SC-048	Natural	2019.837	955.4	954.52	1182	1215	0.070	0.040	0.070						
L-LSC-832	L-LSC-832	N-1204	SC-187	Natural	3397.17	1045.6	1016.2	422	436	0.060	0.045	0.060						
L-1374.1	L-1374	SC-187	N-1206	Natural	41	1021.6	1021.6	300	340	0.013	0.013	0.013						
L1374_1	L-1374	SC-187	N-1206	Circular	41	1021.6	1021.6	300	340	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-831	L-LSC-831	N-1206	SC-174	Natural	235.057	1016.2	1014.7	1330	1343	0.060	0.045	0.060						
L-LSC-827	L-LSC-827	N-L-528	N-L-588	Natural	648.4	943.98	937.7	200	250	0.080	0.040	0.080						
L-1388.1	L-1388	SC-190	N-L-527	Natural	93	963.9	963.9	435	490	0.013	0.013	0.013						
L1388_1	L-1388	SC-190	N-L-527	Circular	93	963.9	963.9	435	490	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1388_2	L-1388	SC-190	N-L-527	Circular	93	963.9	963.9	435	490	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1392.1	L-1392	SC-191	N-1221	Natural	67.719	962.5	962.5	185	1100	0.013	0.013	0.013						
L1392_1	L-1392	SC-191	N-1221	Rectangular	67.719	962.5	962.5	185	1100	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1392_2	L-1392	SC-191	N-1221	Rectangular	67.719	962.5	962.5	185	1100	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-754	L-LSC-754	N-1221	N-L-271	Natural	679.53	951.36	952.08	300	340	0.050	0.035	0.050						
L-1408.1	L-LSC-824	SC-197	N-L-586	Natural	191.5	959.62	959.62	330	1275	0.013	0.013	0.013						
L1408_1	L-LSC-824	SC-197	N-L-586	Arch	191.5	959.62	959.62	330	1275	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1408_2	L-LSC-824	SC-197	N-L-586	Arch	191.5	959.62	959.62	330	1275	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-741	L-LSC-741	N-L-586	N-L-321	Natural	989.131	947.47	943.57	750	830	0.080	0.040	0.080						
L-1410.1	L-LSC-844	SC-198	N-L-598	Natural	55	945.7	945.7	285	365	0.013	0.013	0.013						
L1410_1	L-LSC-844	SC-198	N-L-598	Circular	55	945.7	945.7	285	365	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1410_2	L-LSC-844	SC-198	N-L-598	Circular	55	945.7	945.7	285	365	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1410_3	L-LSC-844	SC-198	N-L-598	Circular	55	945.7	945.7	285	365	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-744	L-LSC-744	N-L-598	N-L-322	Natural	1198.8	940.4	932.82	1550	1630	0.080	0.040	0.080						
L-LSC-818	L-LSC-818	N-L-579	N-L-571	Natural	814	960.9	958.71	100	130	0.050	0.037	0.050						
L-LSC-739	L-LSC-739	N-L-593	N-L-307	Natural	1415.33	1004	973.75	380	430	0.080	0.040	0.080						
L-1710.1	L-LSC-838	SC-178	N-L-593	Natural	60	1014	1014	100	455	0.013	0.013	0.013						
L1710_1	L-LSC-838	SC-178	N-L-593	Modified basket-handle	60	1014	1014	100	455	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-LSC-143	L-LSC-143	SC-001	N-L-173	Circular	10	1087.4	1087.01						0	3	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-142	L-LSC-142	N-L-175	N-L-174	Circular	110	1084.4	1082.58						0	3	0.013	0.20	0.10	
LSC140.P1	L-LSC-140	N-L-174	N-L-195	Circular	16	1082.58	1082.92						0	3	0.013	1.00	0.10	
LSC140.OC	L-LSC-140	N-L-174	N-L-195	Trapezoidal	16	1082.58	1082.92											
L-LSC-144	L-LSC-144	N-L-173	N-L-175	Circular	100	1087.01	1084.4						0	3	0.013	0.20	0.10	
LSC141.P1	L-LSC-141	SC-002	N-L-176	Circular	96	1068.77	1068.61						0	3	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LSC141.OC	L-LSC-141	SC-002	N-L-176	Natural	96	1068.77	1068.61											
L-LSC-145	L-LSC-145	N-L-176	SC-004	Natural	3982.2	1068.61	1021.73	220	320	0.050	0.035	0.050						
L-LSC-150	L-LSC-150	SC-033	SC-134	Natural	50	1115.21	1115.11	450	700	0.050	0.035	0.050						
L-LSC-153	L-LSC-153	SC-034	N-L-199	Circular	40	1115.89	1116.22						0	1.25	0.024	1.00	0.50	
LLSC155.OC	LLSC155.OC	SC-037	N-L-443	Natural	10	1095.1	1095	0	100	0.013	0.013	0.013						
L-LSC-159A	L-LSC-159A	SC-038	SC-037	Trapezoidal	20	1096.2	1096.2											
LSC150.P1	L-LSC-158	SC-038	N-L-201	Arch	144	1092.9	1091.2						0	2.99	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC150.oc	L-LSC-158	SC-038	N-L-201	Natural	144	1092.9	1091.2											
LSC152.P1	L-LSC-152	SC-134	N-L-418	Arch	37	1092.78	1092.32						0	1.833	0.013	1.00	0.50	
LSC152.OC1	L-LSC-152	SC-134	N-L-418	Natural	37	1092.78	1092.32											
L-LSC-151	L-LSC-151	N-L-418	SC-001	Natural	50	1092.32	1089.44	80	200	0.050	0.035	0.050						
L-LSC-154	L-LSC-154	N-L-199	SC-037	Natural	3201.77	1116.22	1089.4	400	550	0.050	0.035	0.050						
L-LSC-291	L-LSC-291	N-L-443	N-L-204	Natural	305.936	1078.9	1076.07	200	310	0.050	0.035	0.050						
L-LSC-160	L-LSC-160	SC-043	SC-042	Natural	97.092	1063.07	1062.3	650	720	0.050	0.035	0.050						
L-LSC-157	L-LSC-157	N-L-205	SC-186	Natural	1244.24	1059.24	1047.98	330	380	0.050	0.035	0.050						
L-LSC-159	L-LSC-159	N-L-201	N-L-443	Natural	754.689	1091.2	1078.9	170	220	0.050	0.035	0.050						
LSC161.P1	L-LSC-161	SC-042	N-L-205	Circular	84	1060.76	1059.24						0	4	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC161.OC1	L-LSC-161	SC-042	N-L-205	Natural	84	1060.76	1059.24											
L-LSC-163	L-LSC-163	SC-003	SC-041	Natural	1081.23	1072.6	1063.36	20	70	0.050	0.035	0.050						
L-LSC-164	L-LSC-164	SC-041	SC-042	Natural	66.863	1062.6	1060.47	30	100	0.050	0.035	0.050						
L-LSC-162	L-LSC-162	SC-040	SC-186	Natural	200.963	1047.4	1044.3	200	600	0.050	0.035	0.050						
L-LSC-198	L-LSC-198	SC-135	N-L-420	Circular	26	1077.81	1079.22						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC198.OC	L-LSC-198A	SC-135	N-L-485	Natural	20	1087.1	1087	300	500	0.030	0.030	0.030						
L-LSC-199	L-LSC-199	N-L-420	N-L-419	Circular	44.2	1079.22	1077.95						0	2	0.013	0.20	0.10	
L-LSC-201	L-LSC-201	SC-008	N-L-177	Natural	22	1016	1016	400	470	0.050	0.035	0.050						
L-LSC-721	L-LSC-721	N-L-177	SC-185	Natural	2317.82	1014.48	1004.1	700	750	0.050	0.035	0.050						
L-LSC-203	L-LSC-203	N-L-178	SC-008	Natural	1208.7	1036.75	1017.06	170	300	0.050	0.035	0.050						
L-LSC-202	L-LSC-202	N-L-514	N-L-178	Circular	100	1040.6	1039.9						0	1	0.013	1.00	0.50	
L-LSC-204A	L-LSC-204A	SC-007	N-L-514	Natural	10	1046.37	1046.2	250	350	0.050	0.035	0.050						
LSC204weir	LSC204weir	SC-007	N-L-514A	Weir	0	1044.57	1044.57											
LSC211.P1	L-LSC-211	N-L-180	N-L-181	Circular	156	1014.4	1014.33						0	4	0.013	0.20	0.10	
LSC211.OC	L-LSC-211	N-L-180	N-L-181	Trapezoidal	156	1014.4	1014.33											
LSC213.P1	L-LSC-213	N-L-181	N-L-182	Circular	169	1013.99	1013.92						0	4	0.013	0.20	0.10	
LSC213.OC	L-LSC-213	N-L-181	N-L-182	Trapezoidal	169	1013.99	1013.92											
LSC214.P1	L-LSC-214	N-L-182	N-L-183	Circular	226	1013.77	1013.68						0	4	0.013	0.20	0.10	
LSC214.OC	L-LSC-214	N-L-182	N-L-183	Trapezoidal	226	1013.77	1013.68											
LSC212.P1	L-LSC-212	N-L-183	N-L-184	Circular	228	1013.68	1013.6						0	4	0.013	0.20	0.10	
LSC212.OC	L-LSC-212	N-L-183	N-L-184	Trapezoidal	228	1013.68	1013.6											
LSC207.P1	L-LSC-207	N-L-184	SC-011	Circular	263	1013.6	1013.5						0	4	0.013	1.00	0.10	
LSC207.OC	L-LSC-207	N-L-184	SC-011	Trapezoidal	263	1013.6	1013.5											
L-LSC-702	L-LSC-702	SC-011	N-L-495	Circular	49	1010.5	1013.5						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC703.P1	L-LSC-703	SC-011	SC-010	Circular	55	1013.5	1010.5						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC703.P2	L-LSC-703	SC-011	SC-010	Circular	55	1013.5	1010.5						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC703.OC	L-LSC-703	SC-011	SC-010	Natural	55	1013.5	1010.5											
L-LSC-209	L-LSC-209	SC-010	N-L-185	Circular	18	1003.5	1003.5						0	3	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-698	L-LSC-698	SC-010	N-L-493	Circular	19	1003.5	1003.5						0	3	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-700	L-LSC-700	SC-010	N-L-494	Circular	21	1003.5	1003.5						0	3	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-699A	L-LSC-699A	SC-010	SC-185	Trapezoidal	40	1011.9	1011.9											
L-LSC-210	L-LSC-210	N-L-185	SC-185	Circular	82	1004	1003.5						0	3	0.013	1.00	0.10	
L-LSC-216	L-LSC-216	SC-004	SC-005	Natural	190	1021.73	1021.22	190	230	0.050	0.035	0.050						
LSC216A.W	L-LSC-216A	SC-004	SC-187	Weir	0	1022.5	1022.5											
LSC215.P1	L-LSC-215	SC-005	SC-174	Circular	42	1019.02	1018.14						0	2.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC215.oc	L-LSC-215	SC-005	SC-174	Natural	42	1019.02	1018.14											
L-LSC-217	L-LSC-217	SC-021	N-L-194	Natural	279.316	1010.14	1008.19	200	350	0.050	0.035	0.050						
L-LSC-218	L-LSC-218	SC-022	SC-164	Natural	232.308	1001.88	997.24	400	650	0.050	0.035	0.050						
L-LSC-719	L-LSC-719	N-L-194	SC-164	Natural	1572.304	1008.19	996.76	1050	1125	0.050	0.037	0.050						
L-LSC-718	L-LSC-718	SC-164	SC-199	Natural	1565	996.76	988.3	1050	1125	0.050	0.037	0.050						
L-LSC-219	L-LSC-219	SC-006	SC-174	Natural	150	1016.15	1016.14	450	570	0.050	0.035	0.050						
L-LSC-219A	L-LSC-219A	SC-006	N-L-587	Natural	10	1021.3	1021.3	540	580	0.050	0.035	0.050						
L-LSC-284	L-LSC-284	SC-035	N-L-200	Natural	20	1123.85	1119.47	550	750	0.013	0.013	0.013						
L-LSC-286	L-LSC-286	N-L-200	SC-036	Natural	409.946	1119.47	1109.55	300	440	0.050	0.035	0.050						
L-LSC-285	L-LSC-285	SC-036	N-L-202	Natural	20	1111.71	1111.61	150	220	0.013	0.013	0.013						
L-LSC-287	L-LSC-287	N-L-202	SC-038	Natural	2425.05	1109.43	1096.57	500	600	0.050	0.035	0.050						
L-LSC-289	L-LSC-289	SC-039	N-L-601	Circular	83	1086.65	1084.65						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-290	L-LSC-290	N-L-203	N-L-204	Natural	476.607	1081.54	1076.07	50	230	0.050	0.035	0.050						
L-LSC-156	L-LSC-156	N-L-204	N-L-483	Natural	673.315	1076.07	1063.8	270	390	0.050	0.035	0.050						
L-LSC-308	L-LSC-308	SC-114	N-L-368	Circular	185.014	989.86	989.52						0	2.25	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-334	L-LSC-334	SC-115	N-L-376	Circular	312.7	989.48	988.46						0	1.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
Link5246p	L-LSC-335	SC-115	N-L-377	Circular	301.8	990.83	988.45						0	1.5	0.013	0.50	1.00	Groove End with Projecting (Circ, Conc)
Link5246o	L-LSC-335	SC-115	N-L-377	Trapezoidal	301.8	990.83	988.45											
n-2575p	L-LSC-349	SC-113	SC-112	Circular	188.223	984.47	983.81						0	3	0.013	1.00	0.20	
n-2575o	L-LSC-349	SC-113	SC-112	Trapezoidal	188.223	984.47	983.81											
LMSCRK-90p	L-LSC-347	SC-112	N-L-354	Circular	113.3	983.81	983.69						0	4	0.013	0.50	0.20	
LMSCRK-90o	L-LSC-347	SC-112	N-L-354	Trapezoidal	113.3	983.81	983.69											
L-LSC-355	L-LSC-355	N-L-342	SC-111	Natural	207.936	979.2	973.94	520	600	0.050	0.035	0.050						
L-LSC-628	L-LSC-628	N-L-332	N-L-337	Circular	136	967.32	966.99						0	5	0.013	0.20	0.10	
L-LSC-628A	L-LSC-628A	N-L-332	N-L-333	Trapezoidal	1760	975.73	965.4											
L-LSC-357	L-LSC-357	SC-111	N-L-343	Circular	200	974.31	973.85						0	2.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
Link5206	Link5206	SC-111	SC-109	Trapezoidal	25	981.7	981.6											
L-LSC-327	L-LSC-327	SC-167	SC-085	Natural	10	978.84	978.8	339	372	0.050	0.050	0.050						
L-LSC-387	L-LSC-387	N-L-402	N-L-404	Circular	213	980.28	977.17						0	1	0.013	0.20	0.10	
L-LSC-364	L-LSC-364	SC-104	N-L-332	Circular	627	968.93	967.32						0	5	0.013	0.20	0.40	
L-LSC-364A	L-LSC-364A	SC-104	SC-106	Trapezoidal	2000	976.25	966											
L-LSC-370	L-LSC-370	SC-108	SC-104	Circular	130.1	970.33	968.93						0	3	0.013	1.00	0.10	
L-LSC-370A	L-LSC-370A	SC-108	SC-110	Trapezoidal	600	983	974.9											
L-LSC-407	L-LSC-407	SC-013	N-L-186	Circular	29	1005.77	1004.83						0	1	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-408	L-LSC-408	N-L-186	N-L-191	Circular	99	1004.83	1004.53						0	1	0.013	1.00	0.10	
L-LSC-412A	L-LSC-412A	SC-014	N-L-193	Trapezoidal	60	1004.8	1002.8											
LSC14LOW	Link5175	SC-014	MHSC014	Weir	0	1002.75	1002.75											
LSC14HI	Link5175	SC-014	MHSC014	Weir	0	1002.75	1002.75											
L-LSC-405	L-LSC-405	N-L-187	SC-014	Circular	43	1002.66	1002.49						0	3.5	0.013	1.00	0.50	
L-LSC-406	L-LSC-406	N-L-188	N-L-187	Circular	140	1002.77	1002.66						0	3.5	0.013	0.20	0.50	
L-LSC-409	L-LSC-409	N-L-189	N-L-188	Circular	41	1002.86	1002.77						0	3.5	0.013	0.20	0.50	
LSC404P	L-LSC-404	SC-015	N-L-497	Circular	40	996.77	997.25						0	2.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC404Gr	L-LSC-404	SC-015	N-L-497	Weir	40	996.77	997.25											
L-LSC-645	L-LSC-645	N-L-190	SC-172	Natural	1931.23	1000.36	996.97	200	380	0.050	0.035	0.050						
L-LSC-410	L-LSC-410	N-L-191	N-L-189	Circular	79	1003.33	1002.86						0	3.5	0.013	0.20	0.50	
LSC411.P1	L-LSC-411	SC-012	SC-010	Circular	387	1007.69	1007.5						0	5	0.013	1.00	0.50	
LSC411.OC	L-LSC-411	SC-012	SC-010	Natural	387	1007.69	1007.5											
LSC-415.P1	L-LSC-415	N-L-193	N-L-192	Circular	42.6	989.34	989.31						0	4	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC-415.P2	L-LSC-415	N-L-193	N-L-192	Circular	42.6	989.34	989.31						0	4	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC-415.OC	L-LSC-415	N-L-193	N-L-192	Natural	42.6	989.34	989.31											
L-LSC-646	L-LSC-646	N-L-192	SC-177	Natural	887.579	989.31	982.9	130	180	0.050	0.035	0.050						
L-LSC-414	L-LSC-414	SC-016	SC-177	Natural	10	995.73	995.63	180	220	0.050	0.035	0.050						
L-LSC-413	L-LSC-413	SC-017	N-L-496	Circular	36	998.27	998.32						0	1.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-413A	L-LSC-413A	SC-017	N-L-193	Natural	20	1005.3	1005.2	240	300	0.050	0.035	0.050						
L-LSC-418	L-LSC-418	SC-018	SC-177	Arch	90	988.05	987.1						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-417	L-LSC-417	SC-020	SC-018	Natural	354.81	988.02	988.05	750	860	0.050	0.035	0.050						
L-LSC-416	L-LSC-416	SC-019	SC-020	Natural	1203.19	989.1	989.07	400	510	0.050	0.035	0.050						
L-LSC-689	L-LSC-689	SC-023	N-L-487	Circular	23	978.87	981.05						0	1.25	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-689A	L-LSC-689A	SC-023	N-L-489	Trapezoidal	20	983.46	981.11											
LSC689Grat	L-LSC-689B	SC-023	N-L-487A	Weir	0	983.23	983.23											
LSC420.P1	L-LSC-420	N-L-196	N-L-488	Circular	91.5	972.3	971.8						0	3.5	0.013	1.00	0.50	
LSC420.OC	L-LSC-420	N-L-196	N-L-488	Natural	91.5	972.3	971.8											
LSC422.OC1	L-LSC-422	SC-024	SC-026	Trapezoidal	20	974.5	974.5											
LSC423.OC2	L-LSC-423	SC-026	SC-030	Natural	10	974.4	974.3	870	950	0.050	0.035	0.050						
L-LSC-426	L-LSC-426	SC-027	N-L-492	Circular	24	967.02	967.02						0	2	0.013	0.20	0.50	
L-LSC-695	L-LSC-695	SC-027	N-L-491	Circular	24	967.03	967.03						0	2	0.013	0.20	0.50	
Link5184	Link5184	SC-027	N-L-198	Trapezoidal	15	973.8	973.8											
LSC425.P1	L-LSC-425	SC-027	SC-028	Circular	60.5	970.05	966.96						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC425.P2	L-LSC-425	SC-027	SC-028	Circular	60.5	970.05	966.96						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-424B	L-LSC-424B	SC-028	SC-030	Natural	10	972.2	972	150	180	0.050	0.035	0.050						
LSC424.P1	L-LSC-424	SC-028	N-L-198	Trapezoidal	15	972	972											
LSC424.OC1	L-LSC-424	SC-028	N-L-198	Natural	15	972	972											
L-LSC-643	L-LSC-643	SC-029	SC-201	Natural	1253.7	965.57	962.93	530	650	0.050	0.035	0.050						
LSC421.P1	L-LSC-421	N-L-197	SC-024	Circular	58.5	972	969.23						0	1.5	0.013	1.00	0.50	
LSC421.P2	L-LSC-421	N-L-197	SC-024	Circular	58.5	972	969.23						0	1.5	0.013	1.00	0.50	
L693O	L-LSC-693	N-L-197	N-L-197A	Orifice	0	971.85	971.85						0	0	0	0.00	0.00	
LSC693B.1	LSC693B	N-L-197	SC-026	Weir	0	975.95	975.95											
L-LSC-428	L-LSC-428	N-L-198	SC-029	Natural	771.265	968.44	967.27	300	400	0.050	0.035	0.050						
L-LSC-427	L-LSC-427	SC-030	N-L-198	Trapezoidal	10	971	971											
LSC429.P1	L-LSC-429	SC-025	N-L-490	Circular	60	982.39	982.03						0	1.25	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC429.OC	L-LSC-429	SC-025	N-L-490	Natural	60	982.39	982.03											
L-LSC-527	L-LSC-527	SC-071	N-L-501	Circular	52	955.02	954.77						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-527A	L-LSC-527A	SC-071	N-L-249	Natural	25	965.22	965.1	550	670	0.050	0.035	0.500						
LSC498.P1	L-LSC-498	SC-095	N-L-306	Circular	40	994.82	994.25						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LSC498.OC	L-LSC-498	SC-095	N-L-306	Natural	40	994.82	994.25											
L-LSC-499	L-LSC-499	N-L-306	N-L-307	Natural	1181.93	994.25	978.13	490	550	0.080	0.040	0.080						
L-LSC-740	L-LSC-740	N-L-307	SC-197	Natural	1675.58	973.75	950.55	400	450	0.080	0.040	0.080						
L-LSC-500	L-LSC-500	SC-096	N-L-308	Circular	19	955.13	958.17						0	1.5	0.013	0.20	0.50	
L-LSC-500A	L-LSC-500A	SC-096	N-L-504	Natural	10	975.13	1048.5	160	200	0.050	0.350	0.050						
L-LSC-501	L-LSC-501	N-L-308	N-L-309	Circular	127	957.5	957.21						0	1.5	0.013	0.20	0.10	Groove End with Projecting (Circ, Conc)
LSC607.P1	L-LSC-607	N-L-309	N-L-504	Circular	14	956.59	956.56						0	1.5	0.013	1.00	0.10	
LSC607.OC	L-LSC-607	N-L-309	N-L-504	Trapezoidal	14	956.59	956.56											
L-LSC-743	L-LSC-743	N-L-320	SC-198	Natural	417.788	942.47	941.07	1270	1340	0.080	0.040	0.080						
L-LSC-504	L-LSC-504	SC-099	N-L-503	Circular	22	946.55	946.56						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC633.OC1	L-LSC-633	SC-099	SC-098	Trapezoidal	10	951.9	951.8											
LSC633.OC2	L-LSC-633	SC-099	SC-098	Natural	10	951.9	951.8											
L-LSC-503A	L-LSC-503A	SC-098	N-L-321	Natural	10	951.8	950	110	200	0.050	0.035	0.050						
LSC98Grate	L-LSC-503B	SC-098	MHSC098	Weir	0	949.45	949.45											
LSC986in	L-LSC-503B	SC-098	MHSC098	Orifice	0	949.45	949.45						0	0	0	0.00	0.00	
L-LSC-742	L-LSC-742	N-L-321	N-L-320	Natural	204.703	943.57	942.47	870	950	0.080	0.040	0.080						
L-LSC-505	L-LSC-505	SC-097	N-L-318	Circular	27	964.24	964.85						0	1	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-514	L-LSC-514	N-L-318	N-L-319	Circular	105	967.6	964.93						0	1	0.013	0.20	1.00	
LSC506.P1	L-LSC-506	N-L-317	SC-096	Circular	40	958.31	957.55						0	3	0.013	1.00	1.00	
LSC506.W	L-LSC-506	N-L-317	SC-096	Weir	40	958.31	957.55											
L-LSC-507	L-LSC-507	N-L-316	N-L-317	Circular	124	960.84	958.31						0	2	0.013	0.50	1.00	
L-LSC-515	L-LSC-515	N-L-319	N-L-315	Circular	133	964.59	963.98						0	1.25	0.013	0.20	1.00	
L-LSC-513	L-LSC-513	N-L-315	N-L-314	Circular	107	963.98	963.54						0	1.5	0.013	0.20	1.00	
L-LSC-512	L-LSC-512	N-L-314	N-L-313	Circular	50	963.54	963.34						0	1.5	0.013	0.20	1.00	
L-LSC-511	L-LSC-511	N-L-313	N-L-312	Circular	77	963.34	963.21						0	1.5	0.013	0.20	0.10	
L-LSC-510	L-LSC-510	N-L-312	N-L-311	Circular	70	963.21	962.93						0	1.5	0.013	0.20	0.10	
L-LSC-509	L-LSC-509	N-L-311	N-L-310	Circular	46	962.68	961.53						0	2	0.013	0.20	0.10	
L-LSC-508	L-LSC-508	N-L-310	N-L-316	Circular	45	961.53	960.84						0	2	0.013	0.20	0.50	
L-LSC-746	L-LSC-746	N-L-322	SC-175	Natural	992.358	932.82	930.87	1340	1370	0.080	0.040	0.080						
L-LSC-517	L-LSC-517	SC-102	SC-204	Natural	403.5	939.97	931.6	1120	1330	0.050	0.037	0.050						
L-LSC-093	L-LSC-093	SC-103	N-L-213	Natural	10	937.66	937.66	180	210	0.050	0.035	0.050						
L-LSC-093A	L-LSC-093A	SC-103	N-L-331	Natural	10	938.4	938.3	230	270	0.050	0.035	0.050						
L-LSC-738	L-LSC-738	N-L-331	SC-204	Natural	2450.04	931.86	925.9	1020	1060	0.050	0.037	0.050						
L-LSC-519	L-LSC-519	SC-047	N-L-508	Circular	18	936.93	936.93						0	1	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC553.OC1	L-LSC-553	SC-047	SC-182	Natural	10	943	942.9	100	500	0.050	0.035	0.050						
L-LSC-733	L-LSC-733	N-L-211	N-L-216	Natural	317.562	937.27	936.06	400	500	0.050	0.035	0.050						
LLSC521.P1	L-LSC-521	SC-162	N-L-214	Arch	200	943.2	941.5						0	2.609	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
LLSC521.P2	L-LSC-521	SC-162	N-L-214	Arch	200	943.2	941.5						0	2.609	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC521OC1	L-LSC-521	SC-162	N-L-214	Natural	200	943.2	941.5											
LSC477.P1	L-LSC-477	SC-163	N-L-211	Circular	25.2	939.7	939.74						0	1.25	0.01	1.00	0.50	Groove End with Headwall (Circ, Conc)
LSC477.OC1	L-LSC-477	SC-163	N-L-211	Natural	25.2	939.7	939.74											
LSC477.P2	L-LSC-477	SC-163	N-L-211	Circular	25.2	939.7	939.74						0	1.25	0.01	1.00	0.50	Groove End with Headwall (Circ, Conc)
L-LSC-520	L-LSC-520	N-L-214	SC-163	Natural	580.051	941.5	941.28	400	450	0.050	0.035	0.050						
L523.OC3	L-LSC-523	SC-049	N-L-531	Natural	10	946.2	946.1	150	400	0.050	0.030	0.050						
LSC522.P1	L-LSC-522	SC-050	N-L-215	Trapezoidal	43.684	941.09	941.56											
LSC522.OC	L-LSC-522	SC-050	N-L-215	Natural	43.684	941.09	941.56											
L-LSC-731	L-LSC-731	N-L-215	SC-176	Natural	648.475	941.08	938.33	250	310	0.050	0.035	0.050						
LSC524.P1	L-LSC-524	SC-086	N-L-229	Circular	30	947.9	947.6						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC524.OC	L-LSC-524	SC-086	N-L-229	Natural	30	947.9	947.6											
L-LSC-729	L-LSC-729	N-L-229	SC-183	Natural	1035.72	946.48	942.49	200	260	0.050	0.035	0.050						
L-LSC-525	L-LSC-525	SC-032	SC-031	Circular	195	961.6	960.9						0	3	0.013	1.00	0.50	Groove End with Headwall (Circ, Conc)
L-LSC-526	L-LSC-526	SC-031	SC-201	Natural	46.27	960.57	960.64	110	150	0.050	0.035	0.050						
L-LSC-757	L-LSC-757	N-L-249	SC-191	Natural	495.79	952.88	951.63	300	400	0.050	0.035	0.050						
LSC528.P1	L-LSC-528	N-L-248	N-L-249	Circular	118	955.56	954.77						0	2	0.013	1.00	0.10	
LSC528.OC1	L-LSC-528	N-L-248	N-L-249	Trapezoidal	118	955.56	954.77											
LSC529.P1	L-LSC-529	SC-072	N-L-251	Circular	48	959.74	959.44						0	3	0.013	0.20	0.50	
LSC529.OC	L-LSC-529	SC-072	N-L-251	Trapezoidal	48	959.74	959.44											
LSC530.P1	L-LSC-530	SC-160	N-L-527	Circular	107	956.64	956.08						0	4	0.013	1.00	0.40	
LSC530.OC	L-LSC-530	SC-160	N-L-527	Trapezoidal	107	956.64	956.08											
LSC531.P1	L-LSC-531	N-L-251	SC-160	Circular	338	959.44	956.93						0	4	0.013	1.00	0.20	
LSC531.OC	L-LSC-531	N-L-251	SC-160	Trapezoidal	338	959.44	956.93											
L-LSC-533	L-LSC-533	SC-076	N-L-269	Circular	16	955.95	955.2						0	1.5	0.013	0.20	0.50	
LSC533.OC	L-LSC-533A	SC-076	N-L-270	Natural	10	958.5	958	230	280	0.050	0.035	0.050						
L-LSC-534	L-LSC-534	N-L-269	N-L-270	Circular	86	952.6	951.01						0	2	0.013	1.00	0.10	
L-LSC-756	L-LSC-756	N-L-270	SC-188	Natural	1569.448	951.22	948.03	300	400	0.050	0.035	0.050						
LSC532.P1	L-LSC-532	SC-077	N-L-271	Circular	180	953.8	952.5						0	1.25	0.013	1.00	0.50	
LSC532.OC1	L-LSC-532	SC-077	N-L-271	Trapezoidal	180	953.8	952.5											
L-LSC-755	L-LSC-755	N-L-271	N-L-270	Natural	430.56	952.08	951.22	220	350	0.050	0.035	0.050						

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
Link5180	Link5180	SC-078	N-L-270	Trapezoidal	25	958.6	958.5											
Link5261	Link5261	SC-078	SC-076	Natural	10	958.2	958.1	280	320	0.050	0.035	0.060						
LSC078Rect	Link5177	SC-078	MHSC078-1	Orifice	0	953.5	953.5						0	0	0	0.00	0.00	
LSC78Grate	Link5177-2	SC-078	MHSC078-2	Weir	0	957.6	957.6											
L-LSC-536B	L-LSC-536B	SC-079	N-L-272	Trapezoidal	116	967.5	964.52											
LSC079GRAT	L-LSC-536A	SC-079	MHSC079	Weir	0	966.9	966.9											
LSC079Rect	L-LSC-536A	SC-079	MHSC079	Orifice	0	966.9	966.9						0	0	0	0.00	0.00	
LSC272.P1	L-LSC-537	N-L-272	N-L-273	Circular	53	960.27	960.02						0	1.5	0.013	0.20	0.10	
LSC272.OC	L-LSC-537	N-L-272	N-L-273	Trapezoidal	53	960.27	960.02											
LSC539.P1	L-LSC-539	N-L-273	N-L-274	Circular	39	959.92	959.59						0	1.5	0.013	0.20	1.00	
LSC539.OC	L-LSC-539	N-L-273	N-L-274	Trapezoidal	39	959.92	959.59											
LSC540.P1	L-LSC-540	N-L-274	N-L-275	Circular	32	959.59	959.29						0	1.75	0.013	0.20	0.50	
LSC540.OC	L-LSC-540	N-L-274	N-L-275	Trapezoidal	32	959.59	959.29											
LSC541.P	L-LSC-541	N-L-275	N-L-276	Circular	407	959.29	958.13						0	2	0.013	1.00	0.10	
LSC541.OC	L-LSC-541	N-L-275	N-L-276	Trapezoidal	407	959.29	958.13											
L-LSC-541A	L-LSC-541A	N-L-276	SC-170	Trapezoidal	20	963.15	960.53											
LSC543.P	L-LSC-543	N-L-276	N-L-277	Circular	363	958.13	957.45						0	2	0.013	0.20	1.00	
LSC543.OC	L-LSC-543	N-L-276	N-L-277	Trapezoidal	363	958.13	957.45											
LSC544.P1	L-LSC-544	N-L-277	N-L-280	Circular	35	957.25	956.9						0	3	0.013	0.20	1.00	
LSC544.OC	L-LSC-544	N-L-277	N-L-280	Trapezoidal	35	957.25	956.9											
LSC538.P1	L-LSC-538	N-L-278	SC-078	Circular	133	956.41	955.9						0	3	0.013	1.00	0.10	
LSC538.OC	L-LSC-538	N-L-278	SC-078	Trapezoidal	133	956.41	955.9											
L-LSC-542	L-LSC-542	N-L-279	N-L-278	Circular	288	956.74	956.41						0	3	0.013	0.20	1.00	
L-LSC-542A	L-LSC-542A	N-L-279	SC-188	Trapezoidal	30	963.34	954.3											
LSC545.P1	L-LSC-545	N-L-280	N-L-279	Circular	35	956.79	956.74						0	3	0.013	0.20	0.10	
LSC545.OC	L-LSC-545	N-L-280	N-L-279	Trapezoidal	35	956.79	956.74											
L-LSC-548	L-LSC-548	SC-105	SC-106	Natural	81.24	964.7	960.1	850	970	0.050	0.035	0.050						
L-LSC-547	L-LSC-547	SC-106	N-L-333	Natural	79.299	970.44	970.05	0	570	0.050	0.035	0.050						
L-LSC-546	L-LSC-546	N-L-333	N-L-334	Circular	60	965.4	965.1						0	1.25	0.013	1.00	0.50	
LSC707.P1	L-LSC-707	N-L-334	N-L-498	Circular	222	961.15	960.16						0	5.5	0.024	0.20	0.10	
LSC707.OC1	L-LSC-707	N-L-334	N-L-498	Trapezoidal	222	961.15	960.16											
LSC549.P1	L-LSC-549	SC-069	N-L-231	Circular	25	961.75	959.35						0	3.5	0.013	0.20	0.10	
LSC549.OC	L-LSC-549	SC-069	N-L-231	Trapezoidal	25	961.75	959.35											
LSC550.P1	L-LSC-550	N-L-231	N-L-232	Circular	221	958.82	957.31						0	4	0.013	0.20	1.00	
LSC550.P2	L-LSC-550	N-L-231	N-L-232	Circular	221	958.82	957.31						0	4	0.013	0.20	1.00	
LSC550.OC	L-LSC-550	N-L-231	N-L-232	Trapezoidal	221	958.82	957.31											
LSC551.P1	L-LSC-551	N-L-232	N-L-233	Circular	147	957.31	956.3						0	4	0.013	0.20	0.10	
LSC551.P2	L-LSC-551	N-L-232	N-L-233	Circular	147	957.31	956.3						0	4	0.013	0.20	0.10	
LSC551.OC	L-LSC-551	N-L-232	N-L-233	Trapezoidal	147	957.31	956.3											
LSC552.P1	L-LSC-552	N-L-233	N-L-236	Circular	336	956.43	955.78						0	4.5	0.013	1.00	1.00	
LSC552.P2	L-LSC-552	N-L-233	N-L-236	Circular	336	956.43	955.78						0	4.5	0.013	1.00	1.00	
LSC552.OC	L-LSC-552	N-L-233	N-L-236	Trapezoidal	336	956.43	955.78											
LSC555.P1	L-LSC-555	N-L-236	N-L-237	Circular	107	953.02	953.09						0	4.5	0.013	0.20	1.00	
LSC555.P2	L-LSC-555	N-L-236	N-L-237	Circular	107	953.02	953.09						0	4.5	0.013	0.20	1.00	
LSC555.OC	L-LSC-555	N-L-236	N-L-237	Trapezoidal	107	953.02	953.09											
LSC556.P1	L-LSC-556	N-L-237	N-L-238	Circular	192	953.09	950.04						0	4.5	0.013	0.20	0.10	
LSC556.P2	L-LSC-556	N-L-237	N-L-238	Circular	192	953.09	950.04						0	4.5	0.013	0.20	0.10	
LSC556.OC	L-LSC-556	N-L-237	N-L-238	Trapezoidal	192	953.09	950.04											
LSC557.P1	L-LSC-557	N-L-238	N-L-239	Circular	206	950.04	949.49						0	5	0.013	0.20	0.10	
LSC557.P2	L-LSC-557	N-L-238	N-L-239	Circular	206	950.04	949.49						0	5	0.013	0.20	0.10	
LSC557.OC	L-LSC-557	N-L-238	N-L-239	Trapezoidal	206	950.04	949.49											
LSC558.P1	L-LSC-558	N-L-239	SC-161	Circular	136	949.49	948.99						0	5	0.013	0.20	0.10	
LSC558.P2	L-LSC-558	N-L-239	SC-161	Circular	136	949.49	948.99						0	5	0.013	0.20	0.10	
LSC558.OC	L-LSC-558	N-L-239	SC-161	Trapezoidal	136	949.49	948.99											
Link5241	Link5241	SC-161	SC-070	Trapezoidal	10	958.1	957											
LSC559.P1	L-LSC-559	SC-161	N-L-241	Circular	910	948.99	946.05						0	5.5	0.013	1.00	1.00	
LSC559.P2	L-LSC-559	SC-161	N-L-241	Circular	910	948.99	946.05						0	5.5	0.013	1.00	1.00	
LSC639.P1	L-LSC-639	SC-070	N-L-246	Circular	20	955.99	954.39						0	1.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC639.OC1	L-LSC-639	SC-070	N-L-246	Trapezoidal	20	955.99	954.39											
L-LSC-562	L-LSC-562	N-L-241	N-L-229	Circular	1116	946.05	945.02						0	6	0.013	1.00	1.00	
L-LSC-563	L-LSC-563	SC-058	N-L-221	Circular	325	949.74	947.45						0	2.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-564	L-LSC-564	N-L-221	N-L-222	Circular	30	947.45	947.18						0	2.5	0.013	0.20	0.10	
L-LSC-565	L-LSC-565	N-L-222	SC-059	Circular	420	947.18	946.07						0	2.5	0.013	1.00	0.10	
LLSC566.P	L-LSC-566	SC-059	N-L-528	Circular	87	946.12	944.86						0	3.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LLSC566.OC	L-LSC-566	SC-059	N-L-528	Natural	87	946.12	944.86											
LSC051.OC	L-LSC-567	SC-051	SC-176	Natural	10	942.7	942.7	410	470	0.050	0.035	0.050						
LSC568.P1	L-LSC-568	SC-052	SC-182	Circular	38	934.84	934.3						0	1	0.01	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC568.OC	L-LSC-568	SC-052	SC-182	Natural	38	934.84	934.3											

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
L-LSC-736	L-LSC-736	N-L-421	N-L-567	Natural	623.65	929.8	928.6	500	700	0.050	0.035	0.050						
LSC569OC2	L-LSC-569	SC-137	N-L-421	Natural	10	935.5	935.4	270	330	0.050	0.035	0.050						
LSC570.P1	L-LSC-570	SC-053	N-L-216	Circular	95	940.35	936.78						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC570.OC1	L-LSC-570	SC-053	N-L-216	Trapezoidal	95	940.35	936.78											
L-LSC-734	L-LSC-734	N-L-216	SC-182	Natural	1071.52	936.06	932.34	300	600	0.050	0.035	0.050						
L-LSC-573	L-LSC-573	N-L-227	N-L-223	Circular	14	951.74	950.11						0	1.5	0.013	1.00	1.00	
LSC572.P1	L-LSC-572	N-L-223	N-L-224	Circular	42	947.76	947.55						0	1.5	0.013	0.20	0.10	
LSC572.OC1	L-LSC-572	N-L-223	N-L-224	Trapezoidal	42	947.76	947.55											
LSC571.P1	L-LSC-571	N-L-224	SC-188	Circular	62.5	947.54	947.33						0	1.75	0.013	1.00	0.10	
LSC571.OC1	L-LSC-571	N-L-224	SC-188	Trapezoidal	62.5	947.54	947.33											
L-LSC-574	L-LSC-574	SC-170	SC-188	Natural	292.485	956.67	950.5	440	460	0.050	0.035	0.050						
LLSC575.OC	LLSC575.OC	SC-159	SC-060	Natural	10	955.7	955.1	90	120	0.050	0.035	0.050						
L-LSC-834A	L-LSC-834A	SC-159	N-L-589	Circular	10	949.69	949.5						0	2.5	0.013	0.10	0.50	Groove End with Projecting (Circ, Conc)
LLSC834B.W	L-LSC-834B	SC-159	MHSC159	Weir	0	951.6	951.6											
L-LSC-834B	L-LSC-834B	SC-159	MHSC159	Orifice	0	951.6	951.6						0	0	0	0.00	0.00	
LSC576.P1	L-LSC-576	SC-060	N-L-223	Circular	119	951.18	948.34						0	1	0.013	1.00	0.50	
LSC576.OC1	L-LSC-576	SC-060	N-L-223	Trapezoidal	119	951.18	948.34											
LLSC577.P1	L-LSC-577	SC-060	N-L-228	Circular	31	951.18	949.53						0	1.25	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LLSC577.P2	L-LSC-577	SC-060	N-L-228	Circular	31	951.18	949.53						0	1.25	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC577.OC	L-LSC-577	SC-060	N-L-228	Natural	31	951.18	949.53											
L-LSC-649	L-LSC-649	N-L-228	N-L-227	Natural	80.821	949.53	951.74	90	150	0.050	0.035	0.050						
L-LSC-586	L-LSC-586	N-L-323	N-L-507	Circular	99.77	936.23	935						0	4	0.013	1.00	0.10	
L-LSC-585	L-LSC-585	N-L-324	N-L-323	Circular	102.67	937.03	936.23						0	4	0.013	0.20	0.10	
L-LSC-584	L-LSC-584	N-L-325	N-L-324	Circular	212.56	938.97	937.03						0	3.5	0.013	0.20	0.10	
L-LSC-583	L-LSC-583	N-L-326	N-L-325	Circular	365.36	942.6	938.97						0	3.5	0.013	0.20	0.10	
L-LSC-582	L-LSC-582	N-L-327	N-L-326	Circular	44	942.14	942.44						0	3.5	0.013	0.20	1.00	
L-LSC-578	L-LSC-578	SC-101	N-L-328	Circular	46.26	949.76	949.31						0	2.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-560	L-LSC-560	N-L-328	N-L-505	Circular	51.18	943.68	943.73						0	3.5	0.013	0.20	0.10	
L-LSC-580	L-LSC-580	N-L-329	N-L-327	Circular	195.87	943.49	942.14						0	3.5	0.013	0.20	1.00	
LSC050.P1	L-LSC-050	SC-169	N-L-149	Circular	75	948.5	947.93						0	1	0.013	0.00	0.00	Groove End with Projecting (Circ, Conc)
LSC050.OC1	L-LSC-050	SC-169	N-L-149	Natural	75	948.5	947.93											
LSC587.P1	L-LSC-587	SC-054	N-L-104	Arch	65.738	950.08	949.39						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC587.OC	L-LSC-587	SC-054	N-L-104	Natural	65.738	950.08	949.39											
LSC-589.P1	L-LSC-589	N-L-218	N-L-219	Arch	88.248	945.86	945.35						0	1.5	0.013	1.00	0.50	
LSC-589OC1	L-LSC-589	N-L-218	N-L-219	Natural	88.248	945.86	945.35											
LSC590.P1	L-LSC-590	N-L-219	SC-162	Arch	166.621	944.4	943.9						0	1.5	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC590.P2	L-LSC-590	N-L-219	SC-162	Arch	166.621	944.4	943.9						0	1.5	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC590.OC1	L-LSC-590	N-L-219	SC-162	Natural	166.621	944.4	943.9											
L-LSC-272	L-LSC-272	SC-055	N-L-240	Arch	8	950.38	950.22						0	1.833	0.013	0.20	0.50	
LSC135.P1	L-LSC-135	SC-055	N-L-217	Arch	81.728	950.41	949.6						0	1.833	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC135.OC	L-LSC-135	SC-055	N-L-217	Natural	81.728	950.41	949.6											
L-LSC-593	L-LSC-593	SC-056	N-L-220	Natural	140.319	949.75	949.03	20	40	0.050	0.035	0.050						
LSC592.P1	L-LSC-592	SC-057	SC-183	Circular	55.92	947.63	947.63						0	1	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC592.OC1	L-LSC-592	SC-057	SC-183	Trapezoidal	55.92	947.63	947.63											
L-LSC-594	L-LSC-594	N-L-220	SC-049	Circular	45	949.03	948.14						0	1	0.013	1.00	0.50	
LSC595.P1	L-LSC-595	SC-061	N-L-229	Arch	95	953.44	953.07						0	2.167	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC595.OC	L-LSC-595	SC-061	N-L-229	Natural	95	953.44	953.07											
L-LSC-727	L-LSC-727	SC-081	N-L-595	Natural	655.317	953.97	952.98	350	380	0.050	0.035	0.050						
LSC596.P1	L-LSC-596	SC-044	SC-045	Circular	75	950.58	950.58						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC596.OC	L-LSC-596	SC-044	SC-045	Natural	75	950.58	950.58											
L-LSC-597	L-LSC-597	SC-045	N-L-206	Circular	107.8	950.07	950.01						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC-600.P1	L-LSC-600	N-L-442	SC-202	Circular	68	946.43	945.61						0	3.5	0.024	1.00	0.50	
LSC-600.P2	L-LSC-600	N-L-442	SC-202	Circular	68	946.43	945.61						0	3.5	0.024	1.00	0.50	
LSC-600OC1	L-LSC-600	N-L-442	SC-202	Natural	68	946.43	945.61											
L-LSC-598	L-LSC-598	N-L-206	N-L-209	Natural	1094.09	950.01	948.48	250	300	0.050	0.035	0.050						
LSC-601.P1	L-LSC-601	N-L-207	N-L-208	Circular	60	947.31	947.26						0	2	0.024	1.00	0.50	
LSC-601OC1	L-LSC-601	N-L-207	N-L-208	Natural	60	947.31	947.26											
L-LSC-603	L-LSC-603	N-L-208	N-L-442	Natural	217.057	947.26	946.43	280	310	0.050	0.035	0.050						
LSC-599.P1	L-LSC-599	N-L-209	N-L-210	Circular	60	948.48	948.41						0	1.25	0.024	1.00	0.50	
LSC-599OC1	L-LSC-599	N-L-209	N-L-210	Natural	60	948.48	948.41											
L-LSC-602	L-LSC-602	N-L-210	N-L-207	Natural	243.056	948.41	947.31	190	210	0.050	0.035	0.050						
LLSC604.P	L-LSC-604	SC-046	SC-044	Circular	75	950.52	950.61						0	2	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LLSC604.OC	L-LSC-604	SC-046	SC-044	Natural	75	950.52	950.61											
L-LSC-726	L-LSC-726	SC-048	SC-081	Natural	56.099	953.71	954.07	710	750	0.050	0.035	0.050						
L-LSC-688	L-LSC-688	SC-062	N-L-486	Circular	25	966.2	966.2						0	1	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC618.P1	L-LSC-618	SC-062	SC-063	Circular	45	965.94	967.91						0	1	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC618.P2	L-LSC-618	SC-062	SC-063	Circular	45	965.94	967.91						0	1	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC618.OC	L-LSC-618	SC-062	SC-063	Natural	45	965.94	967.91											

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
L-LSC-724	L-LSC-724	N-L-515	SC-064	Natural	410.017	968.62	966.39	870	950	0.050	0.035	0.050						
L-LSC-619	L-LSC-619	SC-063	N-L-515	Natural	66.815	972.42	969.6	30	200	0.050	0.035	0.050						
L-LSC-725	L-LSC-725	SC-064	SC-184	Natural	1095.73	966.01	961.67	290	350	0.050	0.035	0.050						
LSC621.P1	L-LSC-621	SC-065	SC-068	Circular	18	965.82	963.83						0	1.75	0.013	1.00	1.00	Groove End with Projecting (Circ, Conc)
LSC621.OC1	L-LSC-621	SC-065	SC-068	Natural	18	965.82	963.83											
L-LSC-638	L-LSC-638	SC-068	SC-184	Natural	56.599	961.68	961.68	460	760	0.050	0.035	0.050						
L-LSC-723	L-LSC-723	SC-066	N-L-515	Natural	1157.16	975.02	968.62	1170	1300	0.050	0.035	0.050						
L-LSC-622A	L-LSC-622A	SC-067	SC-031	Trapezoidal	3000	976.5	965.4											
LSC622.P1	L-LSC-622	SC-067	SC-066	Arch	28.5	974.6	974.2						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC622.P2	L-LSC-622	SC-067	SC-066	Arch	28.5	974.6	974.2						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC622.P3	L-LSC-622	SC-067	SC-066	Arch	28.5	974.6	974.2						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC622.OC	L-LSC-622	SC-067	SC-066	Natural	28.5	974.6	974.2											
L-LSC-624	L-LSC-624	N-L-335	N-L-334	Circular	513	962.84	961.15						0	5.5	0.013	0.20	0.10	
L-LSC-625	L-LSC-625	N-L-336	N-L-335	Circular	300	964.04	962.84						0	5	0.013	0.20	0.10	
LSC630.P1	L-LSC-630	SC-107	N-L-340	Circular	72	957.64	957.35						0	5.5	0.013	0.20	1.00	
LSC630.OC	L-LSC-630	SC-107	N-L-340	Natural	72	957.64	957.35											
LSC630A.W	Link5266	SC-107	SC-068	Weir	0	966.6	966.6											
L-LSC-629	L-LSC-629	N-L-337	N-L-338	Circular	92	966.99	966.85						0	5	0.013	0.20	0.50	
L-LSC-627	L-LSC-627	N-L-338	N-L-339	Circular	374	966.85	965.27						0	5	0.013	0.20	1.00	
L-LSC-626	L-LSC-626	N-L-339	N-L-336	Circular	450	965.27	964.04						0	5	0.013	0.20	0.10	
LSC631.P1	L-LSC-631	N-L-340	N-L-530	Circular	72	957.35	957						0	5.5	0.013	1.00	0.10	
LSC631.W	L-LSC-631	N-L-340	N-L-530	Weir	72	957.35	957											
LSC167.P	L-LSC-167	N-L-243	SC-181	Circular	33	952.63	952.34						0	2.25	0.013	1.00	1.00	
LSC167.OC	L-LSC-167	N-L-243	SC-181	Trapezoidal	33	952.63	952.34											
LSC648.P1	L-LSC-648	N-L-244	N-L-243	Circular	140	953.19	952.64						0	2.25	0.013	0.20	0.10	
LSC648.OC1	L-LSC-648	N-L-244	N-L-243	Trapezoidal	140	953.19	952.64											
LSC640.P1	L-LSC-640	N-L-245	N-L-244	Circular	256	954.11	953.3						0	2	0.013	0.20	1.00	
LSC640.OC1	L-LSC-640	N-L-245	N-L-244	Trapezoidal	256	954.11	953.3											
LSC642.P1	L-LSC-642	N-L-246	N-L-245	Circular	42	954.35	954.17						0	1.5	0.013	0.20	0.10	
LSC642.OC1	L-LSC-642	N-L-246	N-L-245	Trapezoidal	42	954.35	954.17											
L-LSC-685	L-LSC-685	N-L-483	SC-043	Circular	13	1063.99	1063.33						0	1	0.014	1.00	0.50	
L-LSC-200	L-LSC-200	N-L-485	N-L-178	Natural	2168.11	1077.81	1036.75	320	400	0.050	0.035	0.050						
L-LSC-687	L-LSC-687	N-L-485	N-L-419	Circular	23.7	1077.95	1077.81						0	2	0.013	1.00	0.10	
L-LSC-620	L-LSC-620	N-L-486	N-L-515	Circular	225	969.07	968.33						0	1	0.013	0.10	0.50	
L690Weir	Link5185	N-L-487	N-L-487A	Weir	0	982.6	982.6											
L-LSC-691	L-LSC-691	N-L-488	N-L-197	Natural	670.313	971.8	969.23	220	280	0.050	0.035	0.050						
L-LSC-419	L-LSC-419	N-L-489	N-L-196	Natural	471.196	981.11	977.69	10	40	0.050	0.035	0.050						
L-LSC-692	L-LSC-692	N-L-490	N-L-196	Natural	451.408	982.03	972.3	110	150	0.050	0.035	0.050						
L-LSC-696	L-LSC-696	N-L-491	N-L-198	Circular	39	970.26	971.49						0	2	0.013	1.00	0.10	
L-LSC-694	L-LSC-694	N-L-492	N-L-198	Circular	30	970.26	971.45						0	2	0.013	1.00	0.10	
L-LSC-699	L-LSC-699	N-L-493	SC-185	Circular	71	1004	1003.5						0	3	0.013	1.00	0.10	
L-LSC-701	L-LSC-701	N-L-494	SC-185	Circular	105	1004	1003.5						0	3	0.013	1.00	0.10	
L-LSC-208	L-LSC-208	N-L-495	SC-010	Circular	54	1008	1007.5						0	3	0.013	1.00	0.50	
L-LSC-705	L-LSC-705	N-L-496	N-L-193	Circular	75	1000.65	997.65						0	1.25	0.013	1.00	0.10	
L-LSC-706	L-LSC-706	N-L-497	N-L-190	Circular	84	1002.38	1000.36						0	2.25	0.013	1.00	0.10	
LSC623.P1	L-LSC-623	N-L-498	SC-107	Circular	417	959	957.64						0	5.5	0.013	1.00	1.00	
LSC623.OC1	L-LSC-623	N-L-498	SC-107	Trapezoidal	417	959	957.64											
L-LSC-710	L-LSC-710	N-L-501	N-L-248	Circular	278	957.35	955.56						0	2	0.013	0.20	0.10	
L-LSC-641	L-LSC-641	N-L-503	SC-098	Circular	15	949.4	949.37						0	2	0.013	1.00	0.10	
L-LSC-502	L-LSC-502	N-L-504	N-L-320	Natural	590	956.56	946	150	380	0.050	0.035	0.050						
L-LSC-561	L-LSC-561	N-L-505	N-L-506	Circular	35.43	943.73	943.69						0	3.5	0.013	0.20	0.10	
L-LSC-579	L-LSC-579	N-L-506	N-L-329	Circular	35.43	943.69	943.49						0	3.5	0.013	0.20	0.10	
L-LSC-581	L-LSC-581	N-L-507	N-L-322	Natural	879.365	935	933.2	130	180	0.050	0.035	0.050						
L-LSC-554	L-LSC-554	N-L-508	SC-182	Circular	88	940.52	938.07						0	1	0.013	1.00	1.00	
LMSCRk32.1	L-LSC-399	N-L-511	N-L-226	Circular	234.85	973.57	973.31						0	3.5	0.013	0.00	0.00	Groove End with Projecting (Circ, Conc)
LMSCRK32.2	L-LSC-399	N-L-511	N-L-226	Natural	234.85	973.57	973.31											
L-LSC-319	L-LSC-319	N-L-226	SC-122	Circular	98	973.31	973.03						0	3.5	0.013	1.00	0.10	
L-LSC-591	L-LSC-591	N-L-225	N-L-219	Natural	590.236	947.46	944.4	200	230	0.050	0.035	0.050						
LSC205.P1	L-LSC-205	N-L-087	N-L-225	Circular	37	948.83	947.98						0	1.5	0.024	1.00	0.50	
LSC205.P2	L-LSC-205	N-L-087	N-L-225	Circular	37	948.83	947.98						0	1.5	0.024	1.00	0.50	
LSC205.P3	L-LSC-205	N-L-087	N-L-225	Circular	37	948.83	947.98						0	1.5	0.024	1.00	0.50	
LSC205.OC1	L-LSC-205	N-L-087	N-L-225	Natural	37	948.83	947.98											
L-LSC-148	L-LSC-148	N-L-240	N-L-217	Arch	68.774	950.22	949.6						0	1.833	0.013	1.00	0.10	
L-LSC-094	L-LSC-094	N-L-217	N-L-087	Natural	598.163	949.6	948.78	220	260	0.050	0.035	0.050						
L-LSC-588	L-LSC-588	N-L-149	N-L-218	Natural	591.307	947.93	945.86	30	80	0.050	0.035	0.050						
L-LSC-049	L-LSC-049	N-L-104	SC-169	Natural	614.119	949.39	948.63	20	50	0.050	0.035	0.050						
L-LSC-057	L-LSC-057	N-L-396	SC-002	Circular	87	1073.22	1072.29						0	4	0.013	1.00	0.50	
L-LSC-081	L-LSC-081	N-L-195	N-L-396	Natural	732.058	1082.92	1073.22	350	480	0.050	0.035	0.050						

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
L-LSC-518	L-LSC-518	N-L-213	N-L-331	Circular	57.41	933.72	933.23						0	0.667	0.013	1.00	0.50	
L-LSC-713	L-LSC-713	SC-172	N-L-193	Natural	1188.9	997.15	992.67	270	330	0.050	0.035	0.050						
L-LSC-644	L-LSC-644	N-L-529	N-L-190	Natural	612.63	1000.27	1000.36	120	180	0.050	0.035	0.050						
LMSCRK51	L-LSC-295	ML-105	SC-118	Circular	55.578	980.8	980.46						0	2.5	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LMSCRK51.1	L-LSC-295	ML-105	SC-118	Natural	55.578	980.8	980.46											
L-1372.1	L-1372	SC-186	N-1204	Natural	30	1049.8	1049.8	285	365	0.013	0.013	0.013						
L1372_1	L-1372	SC-186	N-1204	Circular	30	1049.8	1049.8	285	365	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1370.1	L-LSC-829	SC-185	N-L-529	Natural	155.957	1008.066	1008.066	815	865	0.013	0.013	0.013						
L1370_1	L-LSC-829	SC-185	N-L-529	Arch	155.957	1008.066	1008.066	815	865	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1370_2	L-LSC-829	SC-185	N-L-529	Arch	155.957	1008.066	1008.066	815	865	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1370_3	L-LSC-829	SC-185	N-L-529	Arch	155.957	1008.066	1008.066	815	865	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-859.1	L-LSC-830	SC-174	N-L-587	Natural	85	1021.7	1021.7	955	1245	0.013	0.013	0.013						
L859_1	L-LSC-830	SC-174	N-L-587	Circular	85	1021.7	1021.7	955	1245	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L859_2	L-LSC-830	SC-174	N-L-587	Circular	85	1021.7	1021.7	955	1245	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-871.1	L-871	SC-177	N-807	Natural	40	991.4	991.4	860	935	0.013	0.013	0.013						
L871_1	L-871	SC-177	N-807	Rectangular	40	991.4	991.4	860	935	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L871_2	L-871	SC-177	N-807	Arch	40	991.4	991.4	860	935	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L871_3	L-871	SC-177	N-807	Arch	40	991.4	991.4	860	935	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1339	L-1339	SC-204	L-A1.7	Natural	2727.158	925.9	919.1	570	720	0.050	0.037	0.050						
L-1704.1	L-LSC-817	SC-201	N-L-579	Natural	100	965	965	10	1215	0.050	0.050	0.050						
L1704_1	L-LSC-817	SC-201	N-L-579	Arch	100	965	965	10	1215	0.050	0.050	0.050	0	0	0.03	0.00	0.00	
L-LSC-753	L-LSC-753	N-L-527	N-L-249	Natural	1362.05	956.3	952.88	560	630	0.050	0.035	0.050						
L-LSC-732	L-LSC-732	SC-176	N-L-211	Natural	96.625	938.33	937.27	400	530	0.050	0.035	0.050						
L-1355.1	L-LSC-802	SC-182	N-L-568	Natural	147	940.37	940.37	345	1540	0.013	0.013	0.013						
L1355_1	L-LSC-802	SC-182	N-L-568	Rectangular	147	940.37	940.37	345	1540	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1355_2	L-LSC-802	SC-182	N-L-568	Rectangular	147	940.37	940.37	345	1540	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1355_3	L-LSC-802	SC-182	N-L-568	Rectangular	147	940.37	940.37	345	1540	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
Link5240	Link5240	SC-188	SC-059	Natural	34	952.1	952.1	255	345	0.013	0.013	0.013						
L1382_1	L-LSC-825A	SC-188	MHSC188	Rectangular	34	946.13	944.715						10	4	0.013	0.20	0.40	30 to 75 deg Wingwall Flares (Rect, Conc)
L1382_2	L-LSC-825A	SC-188	MHSC188	Rectangular	34	946.13	944.715						10	4	0.013	0.20	0.40	30 to 75 deg Wingwall Flares (Rect, Conc)
L-1357.1	L-LSC-828	SC-183	N-L-531	Natural	116.75	950.4	950.4	30	1199	0.013	0.013	0.013						
L1357_1	L-LSC-828	SC-183	N-L-531	Rectangular	116.75	950.4	950.4	30	1199	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L1357_2	L-LSC-828	SC-183	N-L-531	Rectangular	116.75	950.4	950.4	30	1199	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-148.1	L-LSC-814	SC-202	N-L-578	Natural	59.36	951.464	951.464	480	520	0.013	0.013	0.013						
L148_1	L-LSC-814	SC-202	N-L-578	Circular	59.36	951.464	951.464	480	520	0.013	0.013	0.013	0	0	0.013	0.50	0.50	
L148_2	L-LSC-814	SC-202	N-L-578	Circular	59.36	951.464	951.464	480	520	0.013	0.013	0.013	0	0	0.013	0.50	0.50	
L-1367.1	L-LSC-840	N-L-530	N-L-594	Natural	87.5	963.6	963.6	495	540	0.013	0.013	0.013						
L1367_1	L-LSC-840	N-L-530	N-L-594	Circular	87.5	963.6	963.6	495	540	0.013	0.013	0.013	0	0	0.013	0.00	0.00	
L-1365.1	L-LSC-843	SC-184	N-L-597	Natural	50	957.6	957.35	290	795	0.060	0.030	0.060						
L-LSC-842	L-LSC-842	SC-181	N-L-595	Natural	807.77	951.98	950.98	145	195	0.050	0.037	0.050						
LSC390.P1	L-LSC-390	SC-129	N-L-409	Circular	266.4	976.85	975.99						0	2	0.013	1.00	0.10	
LSC390.OC1	L-LSC-390	SC-129	N-L-409	Trapezoidal	266.4	976.85	975.99											
L-LSC-383	L-LSC-383	SC-123	N-L-402	Circular	108	981.04	980.28						0	1	0.013	0.20	0.50	
L-LSC-318	L-LSC-318	SC-125	N-L-394	Circular	162	984.75	984.01						0	1	0.013	0.20	0.10	
Link5276	Link5276	SC-125	SC-111	Trapezoidal	10	989.6	989.6											
LMSCRK36p	L-LSC-328	SC-083	N-L-391	Circular	134.4	981.16	980.14						0	1.5	0.013	0.20	0.50	
LMSCRK36o	L-LSC-328	SC-083	N-L-391	Trapezoidal	134.4	981.16	980.14											
LMSCRK-39.	L-LSC-324	SC-084	SC-085	Circular	134.824	979.13	976						0	1.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMSCRK39.2	L-LSC-324	SC-084	SC-085	Natural	134.824	979.13	976											
L-LSC-236	L-LSC-236	SC-085	N-L-511	Circular	97	973.93	973.57						0	3.5	0.013	0.20	0.50	
LMSCRK-50.	L-LSC-321	SC-120	SC-085	Circular	274.708	975.61	974.53						0	3.5	0.013	1.00	0.10	
LMSCRK50.1	L-LSC-321	SC-120	SC-085	Trapezoidal	274.708	975.61	974.53											
LMSCRK49.1	L-LSC-320	SC-119	SC-120	Circular	191.105	975.81	975.61						0	3.5	0.013	0.20	0.10	
LMSCRK49.2	L-LSC-320	SC-119	SC-120	Natural	191.105	975.81	975.61											
L-LSC-297	L-LSC-297	SC-121	SC-119	Natural	278.25	983	985.05	211	274	0.020	0.020	0.020						
outletstru	Link5208	SC-121	OutletStru	Weir	0	980.43	980.43											
L-LSC-293	L-LSC-293	SC-116	N-L-386	Circular	245	988.21	987.47						0	1.25	0.013	0.20	0.50	
Link5204	Link5204	SC-116	SC-125	Trapezoidal	10	992.98	992.9											
LMSCRK-47.	L-LSC-292	SC-117	SC-121	Circular	456.12	983.55	979.9						0	2.25	0.013	1.00	0.50	
LMSCRK47.2	L-LSC-292	SC-117	SC-121	Trapezoidal	456.12	983.55	979.9											
LSC403.P1	L-LSC-403	SC-131	N-L-414	Circular	74.999	982.4	982.1						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC403.OC	L-LSC-403	SC-131	N-L-414	Natural	74.999	982.4	982.1											
BIKE_P	L-LSC-296	SC-118	SC-121	Arch	20	980.48	980.04						0	3.167	0.024	1.00	0.50	Thin Wall Projecting (Arch, Corr Metal)
BIKE_OF	L-LSC-296	SC-118	SC-121	Natural	20	980.48	980.04											
Link5250	Link5250	SC-136	SC-122	Trapezoidal	10	985.49	985.06											
LMSCRK53p	L-LSC-330	SC-136	N-L-395	Circular	102	979.95	979.57						0	2	0.013	0.20	0.10	
LMSCRK53o	L-LSC-330	SC-136	N-L-395	Trapezoidal	102	979.95	979.57											
LMSCRK31.1	L-LSC-367	SC-122	SC-109	Circular	482.562	972.51	970.51						0	3.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LMSCRK31.2	L-LSC-367	SC-122	SC-109	Natural	482.562	972.51	970.51											
LMSC58.1	L-LSC-363	SC-109	SC-110	Circular	23.637	970.48	970.18						0	2.25	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMSC58.2	L-LSC-363	SC-109	SC-110	Arch	23.637	970.48	970.18						0	2.25	0.024	1.00	0.50	Groove End with Projecting (Circ, Conc)
LMSC58.3	L-LSC-363	SC-109	SC-110	Natural	23.637	970.48	970.18											
LSC359.P1	L-LSC-359	SC-110	N-L-351	Circular	60.277	970.26	969.44						0	4	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC359.OC	L-LSC-359	SC-110	N-L-351	Natural	60.277	970.26	969.44											
L-LSC-332	L-LSC-332	SC-165	N-L-397	Circular	179.01	979.16	978.19						0	2.25	0.013	0.20	1.00	
L-LSC-397	L-LSC-397	SC-130	N-L-416	Circular	417.501	973.82	972.06						0	2.5	0.013	0.20	0.50	
Link5207	Link5207	SC-130	SC-127	Trapezoidal	10	982.4	982.39											
LSC392.P1	L-LSC-392	SC-132	N-L-415	Circular	151.084	973.62	972.9						0	1	0.013	1.00	0.10	
LSC392.OC1	L-LSC-392	SC-132	N-L-415	Trapezoidal	151.084	973.62	972.9											
LMSCRK14p	L-LSC-366	SC-133	SC-109	Circular	59.7	970.93	970.33						0	3	0.013	1.00	0.10	
LMSCRK14oc	L-LSC-366	SC-133	SC-109	Trapezoidal	59.7	970.93	970.33											
LMSCRK16.1	L-LSC-376	SC-127	N-L-405	Circular	185.151	975.2	974.3						0	1.75	0.013	0.20	0.10	
LMSCRK16.2	L-LSC-376	SC-127	N-L-405	Trapezoidal	185.151	975.2	974.3											
LMSCRK15p	L-LSC-375	SC-126	N-L-407	Circular	319.782	976.32	974.24						0	2.5	0.013	0.20	0.10	
LMSCRK15oc	L-LSC-375	SC-126	N-L-407	Trapezoidal	319.782	976.32	974.24											
L-LSC-382	L-LSC-382	SC-128	N-L-408	Circular	165.8	973.4	972.9						0	3	0.013	0.20	0.10	
LMSCRK24.1	L-LSC-368	SC-124	SC-109	Circular	189.995	971.37	970.79						0	3.5	0.013	1.00	0.10	
LMSCRK24.2	L-LSC-368	SC-124	SC-109	Trapezoidal	189.995	971.37	970.79											
L-LSC-400	L-LSC-400	N-L-414	N-L-413	Trapezoidal	17.247	982.1	981.7											
LMSCRK3p	L-LSC-401	N-L-413	N-L-412	Circular	60.695	981.7	978.4						0	2	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LMSCRK3o	L-LSC-401	N-L-413	N-L-412	Trapezoidal	60.695	981.7	978.4											
LMSCRK4P	L-LSC-402	N-L-412	N-L-410	Circular	369	978.4	976.8						0	2	0.013	0.20	0.10	
LMSCRK4OC	L-LSC-402	N-L-412	N-L-410	Trapezoidal	369	978.4	976.8											
LSC393.P	L-LSC-393	N-L-410	N-L-409	Circular	47.518	976.8	975.89						0	2.5	0.013	0.40	0.50	
LSC393.OC	L-LSC-393	N-L-410	N-L-409	Trapezoidal	47.518	976.8	975.89											
LSC394.P1	L-LSC-394	N-L-409	N-L-411	Circular	324.96	975.89	974.35						0	2.5	0.013	0.20	0.40	
LSC394.OC1	L-LSC-394	N-L-409	N-L-411	Trapezoidal	324.96	975.89	974.35											
LSC398.P1	L-LSC-398	N-L-411	SC-130	Circular	39.594	974.35	973.82						0	2.5	0.013	0.20	0.50	
LSC398.OC1	L-LSC-398	N-L-411	SC-130	Trapezoidal	39.594	974.35	973.82											
L-LSC-396	L-LSC-396	N-L-416	N-L-415	Circular	95.518	972.06	971.58						0	2.5	0.013	0.40	0.50	
L-LSC-396A	L-LSC-396A	N-L-416	SC-132	Trapezoidal	30	980.41	978.6											
LSC395.P1	L-LSC-395	N-L-415	N-L-417	Circular	173.739	971.74	970.98						0	2.5	0.013	0.20	0.40	
LSC395.OC	L-LSC-395	N-L-415	N-L-417	Trapezoidal	173.739	971.74	970.98											
LMSCRK13P	L-LSC-391	N-L-417	SC-133	Circular	38.34	970.93	970.46						0	3	0.013	0.20	0.10	
LMSCRK13O	L-LSC-391	N-L-417	SC-133	Trapezoidal	38.34	970.93	970.46											
LMSCRK17.1	L-LSC-379	N-L-405	N-L-406	Circular	136.92	974.3	973.85						0	1.75	0.013	1.00	0.20	
LMSCRK17.2	L-LSC-379	N-L-405	N-L-406	Trapezoidal	136.92	974.3	973.85											
LMSCRK19.1	L-LSC-381	N-L-406	SC-128	Circular	27.129	973.55	973.4						0	3	0.013	0.20	0.40	
LMSCRK19.2	L-LSC-381	N-L-406	SC-128	Trapezoidal	27.129	973.55	973.4											
LMSCRK18P	L-LSC-380	N-L-407	N-L-406	Circular	106.304	974.24	973.85						0	3	0.013	0.20	0.50	
LMSCRK18O	L-LSC-380	N-L-407	N-L-406	Trapezoidal	106.304	974.24	973.85											
LMSCRK21.1	L-LSC-377	N-L-408	N-L-398	Circular	54.941	972.9	972.7						0	3	0.024	0.20	1.00	
LMSCRK21.2	L-LSC-377	N-L-408	N-L-398	Trapezoidal	54.941	972.9	972.7											
LMSCRK22.1	L-LSC-378	N-L-398	N-L-399	Circular	155.23	972.62	971.87						0	3	0.024	0.40	1.00	
LMSCRK22.2	L-LSC-378	N-L-398	N-L-399	Trapezoidal	155.23	972.62	971.87											
LMSCRK23.1	L-LSC-384	N-L-399	SC-124	Circular	38.714	971.48	971.37						0	3.5	0.024	0.20	0.40	
LMSCRK23.2	L-LSC-384	N-L-399	SC-124	Trapezoidal	38.714	971.48	971.37											
LMSCRK26p	L-LSC-388	N-L-404	N-L-403	Circular	24.559	977.17	977.11						0	1	0.013	0.20	0.50	
LMSCRK26o	L-LSC-388	N-L-404	N-L-403	Trapezoidal	24.559	977.17	977.11											
LMSCRK27p	L-LSC-389	N-L-403	N-L-401	Circular	121.069	976.77	975.39						0	1.25	0.013	0.40	0.50	
LMSCRK27o	L-LSC-389	N-L-403	N-L-401	Trapezoidal	121.069	976.77	975.39											
LMSCRK29p	L-LSC-385	N-L-401	N-L-400	Circular	66.398	975.39	974.71						0	1.25	0.013	0.20	0.40	
LMSCRK29o	L-LSC-385	N-L-401	N-L-400	Trapezoidal	66.398	975.39	974.71											
L-LSC-386	L-LSC-386	N-L-400	N-L-399	Circular	326.945	974.46	972.92						0	1.5	0.013	1.00	0.10	
L-LSC-322	L-LSC-322	N-L-394	N-L-393	Circular	40	984.01	981.8						0	1	0.013	0.20	0.50	
L-LSC-329	L-LSC-329	N-L-393	SC-083	Circular	51	981.5	981.03						0	1.5	0.013	0.20	1.00	
lmscrk37p	L-LSC-325	N-L-391	N-L-392	Circular	155.999	979.94	979.34						0	1.75	0.013	0.20	1.00	
lmscrk37o	L-LSC-325	N-L-391	N-L-392	Trapezoidal	155.999	979.94	979.34											
lmscrk38p	L-LSC-326	N-L-392	SC-084	Circular	96.095	979.34	979.13						0	1.5	0.013	1.00	0.50	
lmscrk38o	L-LSC-326	N-L-392	SC-084	Trapezoidal	96.095	979.34	979.13											
LMSCRK54p	L-LSC-333	N-L-395	SC-165	Circular	202	979.57	979.16						0	2.25	0.013	0.20	0.50	
LMSCRK54o	L-LSC-333	N-L-395	SC-165	Trapezoidal	202	979.57	979.16											
L-LSC-301	L-LSC-301	N-L-386	N-L-389	Circular	119.946	987.47	986.99						0	1.25	0.013	0.20	0.10	
L-LSC-300	L-LSC-300	N-L-389	N-L-390	Circular	29.606	986.99	986.75						0	1.25	0.013	0.20	0.50	
L-LSC-302	L-LSC-302	N-L-390	N-L-388	Circular	102.112	986.75	986.24						0	1.5	0.013	0.20	0.10	
LMSCRK44P	L-LSC-299	N-L-388	N-L-387	Circular	157.935	986.24	985.45						0	2.25	0.013	0.20	1.00	

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LMSCRK44O	L-LSC-299	N-L-388	N-L-387	Trapezoidal	157.935	986.24	985.45											
LMSCRK45.1	L-LSC-294	N-L-387	N-L-385	Circular	200.3	985.45	984.35						0	2.25	0.013	0.20	0.50	
LMSCRK45.2	L-LSC-294	N-L-387	N-L-385	Trapezoidal	200.3	985.45	984.35											
L-LSC-298	L-LSC-298	N-L-385	SC-117	Circular	39.523	984.35	984.05						0	2.25	0.013	0.20	0.50	
L-LSC-360A	L-LSC-360A	N-L-351	SC-105	Trapezoidal	20	977.14	977											
LSC360.P1	L-LSC-360	N-L-351	N-L-352	Circular	517.972	969.58	969.4						0	5	0.013	0.20	0.10	
LSC360.OC	L-LSC-360	N-L-351	N-L-352	Trapezoidal	517.972	969.58	969.4											
LSC362.P1	L-LSC-362	N-L-352	N-L-353	Circular	87.4	969.4	969.38						0	5	0.013	0.20	0.10	
LSC362.OC1	L-LSC-362	N-L-352	N-L-353	Trapezoidal	87.4	969.4	969.38											
LSC365.P1	L-LSC-365	N-L-353	SC-104	Circular	280.2	969.38	968.93						0	5	0.013	0.40	0.10	
LSC365.OC	L-LSC-365	N-L-353	SC-104	Trapezoidal	280.2	969.38	968.93											
L-LSC-358	L-LSC-358	N-L-343	N-L-344	Circular	242	973.85	973.2						0	2.5	0.013	0.20	1.00	
L-LSC-356	L-LSC-356	N-L-344	N-L-350	Circular	36	973.2	973.07						0	2.5	0.013	0.20	0.50	
L-LSC-361	L-LSC-361	N-L-350	N-L-349	Circular	125.629	973.07	972.92						0	2.5	0.013	0.20	0.10	
LSC369.P1	L-LSC-369	N-L-349	N-L-348	Circular	255	972.92	972.92						0	2.5	0.013	0.20	0.10	
LSC369.OC1	L-LSC-369	N-L-349	N-L-348	Trapezoidal	255	972.92	972.92											
LMSCR69P	L-LSC-371	N-L-348	N-L-347	Circular	170	972.14	972.14						0	2.5	0.013	0.20	0.10	
LMSCR69OC	L-LSC-371	N-L-348	N-L-347	Trapezoidal	170	972.14	972.14											
LMSCRK68P	L-LSC-372	N-L-347	N-L-346	Circular	195	971.4	970.94						0	3	0.013	0.20	0.10	
LMSCRK68oc	L-LSC-372	N-L-347	N-L-346	Trapezoidal	195	971.4	970.94											
L-LSC-373	L-LSC-373	N-L-346	N-L-345	Circular	33.034	970.94	970.86						0	3	0.013	0.10	0.20	
L-LSC-374	L-LSC-374	N-L-345	SC-108	Circular	195.082	970.86	970.33						0	3	0.013	0.40	0.15	
LMSCRK56.1	L-LSC-331	N-L-397	SC-167	Circular	86.211	978.19	978.03						0	2.25	0.013	1.00	0.50	
LMSCRK56.2	L-LSC-331	N-L-397	SC-167	Trapezoidal	86.211	978.19	978.03											
Link5209	Link5209	OutletStru	SC-119	Circular	101	976.68	975.81						0	3.5	0.013	0.20	0.50	
LMSCRK-75p	L-LSC-336	N-L-377	N-L-384	Circular	35.8	988.45	988.14						0	1.5	0.013	0.50	0.20	
LMSCRK-75o	L-LSC-336	N-L-377	N-L-384	Trapezoidal	35.8	988.45	988.14											
LMSCRK-76p	L-LSC-343	N-L-384	N-L-382	Circular	153	988.28	987.8						0	1.5	0.013	0.40	0.20	
LMSCRK-76o	L-LSC-343	N-L-384	N-L-382	Trapezoidal	153	988.28	987.8											
LMSCRK-80p	L-LSC-338	N-L-382	N-L-380	Circular	49.8	987.8	987.44						0	2	0.013	0.10	0.40	
LMSCRK-80o	L-LSC-338	N-L-382	N-L-380	Trapezoidal	49.8	987.8	987.44											
LMSCRK-81p	L-LSC-339	N-L-380	N-L-381	Circular	160.5	987.44	987.04						0	2	0.013	0.10	0.20	
LMSCRK-81o	L-LSC-339	N-L-380	N-L-381	Trapezoidal	160.5	987.44	987.04											
LMSCRK-82p	L-LSC-337	N-L-381	N-L-379	Circular	164.6	987.04	986.62						0	2	0.013	0.10	0.20	
LMSCRK-82o	L-LSC-337	N-L-381	N-L-379	Trapezoidal	164.6	987.04	986.62											
LMSCRK-83p	L-LSC-341	N-L-379	N-L-378	Circular	60.4	986.62	986.54						0	2.5	0.013	0.10	0.20	
LMSCRK-83o	L-LSC-341	N-L-379	N-L-378	Trapezoidal	60.4	986.62	986.54											
LMSCRK-84p	L-LSC-351	N-L-378	N-L-359	Circular	326.5	986.54	985.28						0	2.5	0.013	0.10	0.20	
LMSCRK-84o	L-LSC-351	N-L-378	N-L-359	Trapezoidal	326.5	986.54	985.28											
LMSCRK-85p	L-LSC-340	N-L-359	N-L-360	Circular	62	985.28	985						0	2.75	0.013	0.10	0.20	
LMSCRK-85o	L-LSC-340	N-L-359	N-L-360	Trapezoidal	62	985.28	985											
LMSCRK-86p	L-LSC-345	N-L-360	N-L-358	Circular	321.8	985	984.3						0	2.75	0.013	0.10	0.20	
LMSCRK-86o	L-LSC-345	N-L-360	N-L-358	Trapezoidal	321.8	985	984.3											
LMSCRK-87p	L-LSC-350	N-L-358	N-L-356	Circular	70.4	984.3	984.21						0	3	0.013	1.00	0.20	
LMSCRK-87o	L-LSC-350	N-L-358	N-L-356	Trapezoidal	70.4	984.3	984.21											
LMSCRK-88p	L-LSC-353	N-L-356	N-L-357	Circular	30.2	984.21	984						0	3	0.013	0.10	0.20	
LMSCRK-88o	L-LSC-353	N-L-356	N-L-357	Trapezoidal	30.2	984.21	984											
LMSCRK-89p	L-LSC-352	N-L-357	SC-112	Circular	170.6	984	983.81						0	3.5	0.013	1.00	0.20	
LMSCRK-89o	L-LSC-352	N-L-357	SC-112	Trapezoidal	170.6	984	983.81											
Link5248p	L-LSC-346	N-L-354	N-L-355	Circular	11.3	983.69	983.48						0	4	0.013	0.50	0.20	
Link5248o	L-LSC-346	N-L-354	N-L-355	Trapezoidal	11.3	983.69	983.48											
L-LSC-354	L-LSC-354	N-L-355	N-L-341	Natural	1186	983.48	979.6	240	350	0.050	0.040	0.050						
LMSCRK-93p	L-LSC-315	N-L-341	N-L-342	Arch	33	979.6	979.2						0	3.75	0.013	0.50	0.50	
LMSCRK-93o	L-LSC-315	N-L-341	N-L-342	Trapezoidal	33	979.6	979.2											
L-LSC-344	L-LSC-344	N-L-376	N-L-383	Circular	139	988.46	988.15						0	1.25	0.013	0.40	0.20	
LMSCRK78O	LMSCRK78OC	N-L-376	N-L-377	Trapezoidal	32	994.7	993.05											
LMSCRK78O	LMSCRK78O2	N-L-376	N-L-384	Trapezoidal	59	994.7	992.6											
LSC342.P1	L-LSC-342	N-L-383	N-L-382	Circular	44.3	988.15	987.98						0	1.25	0.013	0.40	0.20	
LSC342.OC	L-LSC-342	N-L-383	N-L-382	Trapezoidal	44.3	988.15	987.98											
L-LSC-310	L-LSC-310	N-L-368	N-L-369	Circular	47.291	989.52	989.48						0	2.25	0.013	0.10	0.20	
LSC309.P1	L-LSC-309	N-L-369	N-L-370	Circular	56.971	989.48	989.48						0	2.25	0.013	0.10	0.20	
LSC309.OC	L-LSC-309	N-L-369	N-L-370	Trapezoidal	56.971	989.48	989.48											
LSC311.P	L-LSC-311	N-L-370	N-L-373	Circular	226.362	989.48	988.98						0	2.25	0.013	0.10	0.20	
LSC311.OC	L-LSC-311	N-L-370	N-L-373	Trapezoidal	226.362	989.48	988.98											
LSC312.P1	L-LSC-312	N-L-373	N-L-372	Circular	50.113	988.98	988.87						0	2.25	0.013	1.00	0.20	
LSC312.OC	L-LSC-312	N-L-373	N-L-372	Trapezoidal	50.113	988.98	988.87											
LSC313.P1	L-LSC-313	N-L-372	N-L-371	Circular	291.354	988.87	988.36						0	2.25	0.013	1.00	0.20	
LSC313.OC	L-LSC-313	N-L-372	N-L-371	Trapezoidal	291.354	988.87	988.36											

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

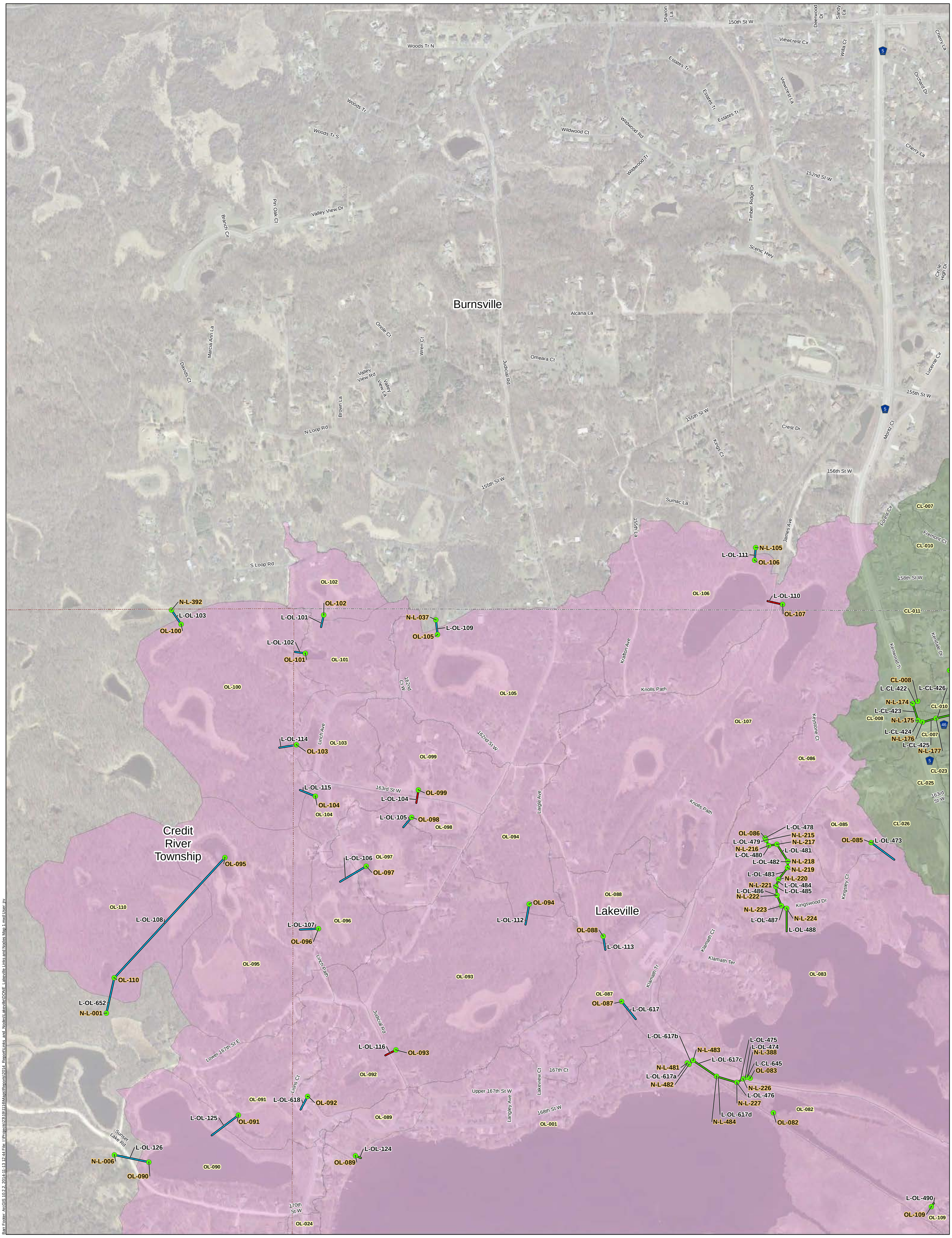
Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LSC314.P1	L-LSC-314	N-L-371	N-L-374	Circular	242.028	988.36	988.03						0	2.25	0.013	0.30	0.20	
LSC314.OC	L-LSC-314	N-L-371	N-L-374	Trapezoidal	242.028	988.36	988.03											
LSC304.P1	L-LSC-304	N-L-374	N-L-375	Circular	149.22	988.03	987.58						0	2.25	0.013	0.10	0.20	
LSC304.OC	L-LSC-304	N-L-374	N-L-375	Trapezoidal	149.22	988.03	987.58											
LSC303.P1	L-LSC-303	N-L-375	N-L-366	Circular	187.107	987.58	987.65						0	2.25	0.013	0.50	0.20	
LSC303.OC	L-LSC-303	N-L-375	N-L-366	Trapezoidal	187.107	987.58	987.65											
LMSCRK102p	L-LSC-307	N-L-366	N-L-364	Circular	231.619	986.65	986.44						0	2.25	0.013	0.10	0.20	
LMSCRK102c	L-LSC-307	N-L-366	N-L-364	Trapezoidal	231.619	986.65	986.44											
LMSCRK103p	L-LSC-306	N-L-364	N-L-363	Circular	22	986.44	986.36						0	2.25	0.013	1.00	0.20	
LMSCRK103c	L-LSC-306	N-L-364	N-L-363	Trapezoidal	22	986.44	986.36											
LMSCRK104p	L-LSC-305	N-L-363	N-L-361	Circular	306.162	986.36	985.57						0	2.75	0.013	0.50	0.20	
LMSCRK104c	L-LSC-305	N-L-363	N-L-361	Trapezoidal	306.162	986.36	985.57											
LMSCRK105p	L-LSC-316	N-L-361	N-L-362	Circular	41.325	985.57	985.52						0	2.75	0.013	0.50	0.20	
LMSCRK105c	L-LSC-316	N-L-361	N-L-362	Trapezoidal	41.325	985.57	985.52											
LMSCRK106p	L-LSC-317	N-L-362	N-L-365	Circular	174.37	985.52	984.96						0	2.75	0.013	0.30	0.20	
LMSCRK106c	L-LSC-317	N-L-362	N-L-365	Trapezoidal	174.37	985.52	984.96											
LMSCRK107p	L-LSC-323	N-L-365	N-L-367	Circular	122.548	984.96	984.56						0	2.75	0.013	0.20	0.20	
LMSCRK107c	L-LSC-323	N-L-365	N-L-367	Trapezoidal	122.548	984.96	984.56											
LMSCRK108p	L-LSC-348	N-L-367	SC-113	Circular	37.954	984.56	984.47						0	2.75	0.013	0.50	0.20	
LMSCRK108c	L-LSC-348	N-L-367	SC-113	Trapezoidal	37.954	984.56	984.47											
L-LSC-412	L-LSC-412	MHSC014	N-L-193	Circular	285	998.92	997.95						0	1	0.013	1.00	0.50	
L-LSC-536	L-LSC-536	MHSC079	N-L-272	Circular	112	961.94	961.02						0	1	0.013	0.20	0.50	
LSC078Weir	Link5178	MHSC078-1	MHSC078-2	Weir	0	956	956											
LSC78Grate	Link5178-2	MHSC078-1	SC-076	Weir	0	958.3	958.3											
LSC078O	Link5179	MHSC078-2	SC-076	Orifice	0	955	955						0	0	0	0.00	0.00	
L-LSC-503	L-LSC-503	MHSC098	N-L-321	Circular	24	944.47	944.33						0	1.25	0.013	1.00	0.50	
L-LSC-690	L-LSC-690	N-L-487A	N-L-489	Circular	35.5	980.06	981.11						0	1.25	0.013	1.00	0.20	
L693Weir	L-LSC-693A	N-L-197A	SC-026	Weir	0	975.03	975.03											
L-LSC-204	L-LSC-204	N-L-514A	N-L-514	Circular	50	1036.6	1040.6						0	1	0.013	0.50	0.50	
L-1382A1	L-LSC-825B	MHSC188	N-L-533	Rectangular	232	944.715	944.22						10	4	0.013	0.20	0.10	
L-1382A2	L-LSC-825B	MHSC188	N-L-533	Rectangular	232	944.715	944.22						10	4	0.013	0.20	0.10	
LkMarion1	Link5239	ML-105-2	ML-105	Trapezoidal	10	977.2	977.2											
LkMarion2	Link5239	ML-105-2	ML-105	Trapezoidal	10	977.2	977.2											
L1384_1	L-LSC-826	N-L-533	N-L-528	Rectangular	120	943.98	943.9						10	5	0.013	1.00	0.10	0 deg Wingwall Flares (Rect, Conc)
L1384_2	L-LSC-826	N-L-533	N-L-528	Rectangular	120	943.98	943.9						10	5	0.013	1.00	0.10	0 deg Wingwall Flares (Rect, Conc)
L-LSC-751	L-LSC-751	N-L-580	N-L-261	Natural	406.822	961.71	957.13	570	650	0.050	0.035	0.050						
L-LSC-752	L-LSC-752	N-L-261	SC-190	Natural	438.666	957.13	957.1	800	920	0.050	0.035	0.050						
L-136.1	L-LSC-808	SC-200	N-L-573	Natural	29.68	970.2	970.2	490	565	0.013	0.013	0.013						
L136_1	L-LSC-808	SC-200	N-L-573	Rectangular	29.68	970.2	970.2	490	565	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L136_2	L-LSC-808	SC-200	N-L-573	Circular	29.68	970.2	970.2	490	565	0.013	0.013	0.013	0	0	0.014	0.00	0.00	
L-LSC-833	L-LSC-833	N-L-588	SC-176	Natural	1086.68	937.7	937.58	480	680	0.080	0.040	0.080						
L-LSC-835	L-LSC-835	N-L-589	N-L-590	Circular	47	949.5	949.23						0	2.5	0.013	0.10	0.20	
L-LSC-836	L-LSC-836	N-L-590	N-L-591	Circular	38	949.23	949.1						0	2.5	0.013	0.10	0.20	
L-LSC-8374	L-LSC-8374	N-L-591	N-L-592	Circular	25	949.1	948.93						0	2.5	0.013	1.00	0.20	
L-LSC-575	L-LSC-575	N-L-592	N-L-588	Natural	277	948.93	937.7	90	120	0.050	0.035	0.050						
L-LSC-834C	L-LSC-834C	MHSC159	N-L-589	Circular	40	950	949.5						0	2	0.013	1.00	0.50	
LSC480.P1	L-LSC-480	SC-073	N-L-252	Circular	249	972.4	971.29						0	2	0.013	0.20	0.50	
LSC480.OC	L-LSC-480	SC-073	N-L-252	Trapezoidal	249	972.4	971.29											
LSC481.P1	L-LSC-481	N-L-252	N-L-258	Circular	144	971.29	970.71						0	2	0.013	0.20	0.10	
LSC4580.OC	L-LSC-481	N-L-252	N-L-258	Trapezoidal	144	971.29	970.71											
L-LSC-489	L-LSC-489	N-L-253	N-L-261	Circular	44	963	958						0	3	0.013	1.00	0.50	
L-LSC-482	L-LSC-482	N-L-254	N-L-502	Circular	23.07	969.1	968.97						0	4	0.013	1.00	0.10	
L-LSC-485	L-LSC-485	N-L-255	N-L-254	Circular	54.19	969.5	969.1						0	4	0.013	0.20	0.10	
L-LSC-484A	L-LSC-484A	SC-074	N-L-502	Natural	20	975.3	972	570	610	0.050	0.035	0.050						
LSC-484B	L-LSC-484B	SC-074	N-L-255A	Weir	0	971.68	971.68											
LSC479.P1	L-LSC-479	N-L-256	SC-074	Circular	66	969.34	969.31						0	3	0.013	1.00	0.10	
LSC479.OC	L-LSC-479	N-L-256	SC-074	Trapezoidal	66	969.34	969.31											
LSC486.P1	L-LSC-486	N-L-257	N-L-256	Circular	35	969.59	969.46						0	2.75	0.013	0.20	0.50	
LSC486.OC	L-LSC-486	N-L-257	N-L-256	Trapezoidal	35	969.59	969.46											
LSC483.P1	L-LSC-483	N-L-258	N-L-259	Circular	136	970.71	970.23						0	2	0.013	0.20	0.10	
LSC483.OC	L-LSC-483	N-L-258	N-L-259	Trapezoidal	136	970.71	970.23											
LSC488.P1	L-LSC-488	N-L-259	N-L-260	Circular	27	969.98	969.82						0	2.25	0.013	0.20	1.00	
LSC488.OC	L-LSC-488	N-L-259	N-L-260	Trapezoidal	27	969.98	969.82											
LSC487.P1	L-LSC-487	N-L-260	N-L-257	Circular	37	969.82	969.59						0	2.5	0.013	0.20	0.50	
LSC487.OC	L-LSC-487	N-L-260	N-L-257	Trapezoidal	37	969.82	969.59											
L-LSC-491A	L-LSC-491A	SC-075	N-L-264	Trapezoidal	25	982.9	981.13											
LMSC75Grat	Link5183	SC-075	MHSC075	Weir	0	979.9	979.9											
LMSC75Rect	Link5183	SC-075	MHSC075	Orifice	0	979.9	979.9						0	0	0	0.00	0.00	

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LSC490.P1	L-LSC-490	N-L-262	SC-074	Circular	43	970.06	969.31						0	3.5	0.013	1.00	1.00	
LSC490.OC	L-LSC-490	N-L-262	SC-074	Trapezoidal	43	970.06	969.31											
LSC493.P1	L-LSC-493	N-L-263	N-L-262	Circular	30	970.61	970.31						0	3.5	0.013	0.20	1.00	
LSC493.OC	L-LSC-493	N-L-263	N-L-262	Trapezoidal	30	970.61	970.31											
LSC492.P	L-LSC-492	N-L-264	N-L-266	Circular	239	975.42	973.38						0	3	0.013	0.20	0.10	
LSC492.OC	L-LSC-492	N-L-264	N-L-266	Trapezoidal	239	975.42	973.38											
LSC497.P1	L-LSC-497	N-L-265	N-L-267	Circular	42	971.98	971.6						0	3.5	0.013	0.20	1.00	
LSC497.OC	L-LSC-497	N-L-265	N-L-267	Trapezoidal	42	971.98	971.6											
L-LSC-495	L-LSC-495	N-L-266	N-L-268	Circular	34	973.38	972.96						0	3	0.013	0.20	0.10	
L-LSC-495A	L-LSC-495A	N-L-266	N-L-265	Trapezoidal	430	979.21	978.03											
LSC494.P1	L-LSC-494	N-L-267	N-L-263	Circular	147	971.6	970.86						0	3.5	0.013	0.20	0.10	
LSC494.OC	L-LSC-494	N-L-267	N-L-263	Trapezoidal	147	971.6	970.86											
LSC496.P1	L-LSC-496	N-L-268	N-L-265	Circular	167	972.71	971.98						0	3.5	0.013	0.20	1.00	
LSC496.OC	L-LSC-496	N-L-268	N-L-265	Trapezoidal	167	972.71	971.98											
L-LSC-650	L-LSC-650	N-L-502	N-L-253	Natural	100	968.97	963	390	440	0.050	0.035	0.050						
L-LSC-491	L-LSC-491	MHSC075	N-L-264	Circular	41	977	975.42						0	3	0.013	0.20	0.50	
L-LSC-484	L-LSC-484	N-L-255A	N-L-255	Circular	23.57	969.68	969.5						0	4	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC770.OC	L-LSC-770	SC-189	N-L-580	Natural	98	969.14	969.14	620	670	0.014	0.014	0.014						
LSC770.P1	L-LSC-770	SC-189	N-L-580	Circular	98	969.14	969.14	620	670	0.014	0.014	0.014	0	0	0.013	0.00	0.00	
LSC770.P2	L-LSC-770	SC-189	N-L-580	Circular	98	969.14	969.14	620	670	0.014	0.014	0.014	0	0	0.013	0.00	0.00	
L-LSC-745	L-LSC-745	N-L-581	N-L-539	Natural	157.7	985.08	982.39	1200	1300	0.050	0.035	0.050						
L-LSC-790	L-LSC-790	N-L-582	N-L-542	Natural	175.9	977.22	977.29	160	200	0.050	0.035	0.050						
L-LSC-748	L-LSC-748	N-L-583	SC-207	Natural	432.7	976.19	974.31	120	160	0.050	0.035	0.050						
LLSC769	L-LSC-769	SC-195	SC-196	Natural	62.5	968	968	1238	1258	0.013	0.013	0.013						
LLSC769.oc	L-LSC-769	SC-195	SC-196	Natural	62.5	968	968	1238	1258	0.013	0.013	0.013						
L-LSC-256	L-LSC-256	SC-143	N-L-440	Circular	14	1031.35	1025.42						0	1	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LLSC256.OC	LLSC256.OC	SC-143	SC-145	Natural	10	1034.55	1034.4	660	720	0.014	0.014	0.014						
L-LSC-257	L-LSC-257	N-L-440	SC-145	Circular	131	1025.32	1021.5						0	1	0.013	0.20	0.10	
L-LSC-262	L-LSC-262	N-L-439	N-L-545	Arch	307	1005.93	1004.25						0	2.609	0.013	1.00	0.50	
L-LSC-259	L-LSC-259	SC-145	SC-144	Natural	10	1006.5	1006.4	580	620	0.050	0.035	0.050						
L-LSC-260	L-LSC-260	SC-145	N-L-439	Arch	13	1006.13	1006.06						0	2.609	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LLSC260.OC	LLSC260.OC	SC-145	N-L-545	Natural	20	1014.15	1014	1000	1300	0.014	0.014	0.014						
L-LSC-258	L-LSC-258	SC-146	SC-145	Natural	15	1019	1018	227	248	0.050	0.033	0.050						
LLSC261.P1	L-LSC-261	SC-147	N-L-545	Circular	59	1012.3	1011.1						0	3	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LLSC261.P2	L-LSC-261	SC-147	N-L-545	Circular	59	1012.3	1011.1						0	3	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LLSC261.P3	L-LSC-261	SC-147	N-L-545	Circular	59	1012.3	1011.1						0	3	0.013	1.00	0.50	Square Edge with Headwall (Circ, Conc)
LSC261.OC1	L-LSC-261	SC-147	N-L-545	Natural	59	1012.3	1011.1											
L-LSC-263	L-LSC-263	SC-148	N-L-482	Circular	262	1014.29	1012.1						0	3.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
L-LSC-264	L-LSC-264	N-L-482	N-L-545	Circular	155	1012.05	1011.7						0	3.5	0.013	1.00	0.50	
LSC265.P	L-LSC-265	SC-152	N-L-536	Circular	148	1000.82	999.88						0	1	0.013	1.00	0.50	
LSC265.OC	L-LSC-265	SC-152	N-L-536	Natural	148	1000.82	999.88											
LSC266.P	L-LSC-266	SC-150	SC-147	Arch	59	1032.75	1031.47						0	2.609	0.013	1.00	0.50	
LSC266.OC	L-LSC-266	SC-150	SC-147	Natural	59	1032.75	1031.47											
LLSC267.OC	LLSC267.OC	SC-153	SC-147	Natural	20	1056.1	1056	480	520	0.014	0.014	0.014						
LSC267.P	L-LSC-267	SC-153	SC-150	Circular	205	1051.31	1047.45						0	2.5	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC267.OC	L-LSC-267	SC-153	SC-150	Natural	205	1051.31	1047.45											
LSC268.P	L-LSC-268	SC-171	N-L-522	Circular	20	1064	1063.8						0	1	0.013	1.00	0.50	Groove End with Projecting (Circ, Conc)
LSC268.OC	L-LSC-268	SC-171	N-L-522	Natural	20	1064	1063.8											
LSC274.P	L-LSC-274	N-L-438	N-L-426	Circular	47	1049.39	1046.58						0	1.5	0.013	0.20	0.50	Groove End with Projecting (Circ, Conc)
LSC274.OC	L-LSC-274	N-L-438	N-L-426	Trapezoidal	47	1049.39	1046.58											
LSC276.P	L-LSC-276	N-L-426	N-L-427	Circular	132	1046.58	1044.76						0	1.75	0.013	0.20	1.00	
LSC276.OC	L-LSC-276	N-L-426	N-L-427	Trapezoidal	132	1046.58	1044.76											
LSC278.P	L-LSC-278	N-L-427	N-L-435	Circular	39	1044.76	1043.67						0	1.75	0.013	0.20	0.40	
LSC278.OC	L-LSC-278	N-L-427	N-L-435	Trapezoidal	39	1044.76	1043.67											
LSC269.P	L-LSC-269	N-L-428	SC-146	Circular	78	1019.31	1019.08						0	3	0.013	0.20	1.00	
LSC269.OC	L-LSC-269	N-L-428	SC-146	Trapezoidal	78	1019.31	1019.08											
LSC270.P	L-LSC-270	N-L-429	N-L-428	Circular	130	1021.18	1019.71						0	2.5	0.013	0.20	1.00	
LSC270.OC	L-LSC-270	N-L-429	N-L-428	Trapezoidal	130	1021.18	1019.71											
LSC271.P	L-LSC-271	N-L-430	N-L-429	Circular	35	1021.54	1021.18						0	2.5	0.013	0.20	1.00	
LSC271.OC	L-LSC-271	N-L-430	N-L-429	Trapezoidal	35	1021.54	1021.18											
LSC277.P	L-LSC-277	N-L-431	N-L-432	Circular	173	1039.13	1025.84						0	2.25	0.013	0.20	1.00	
LSC277.OC	L-LSC-277	N-L-431	N-L-432	Trapezoidal	173	1039.13	1025.84											
LSC275.P	L-LSC-275	N-L-432	N-L-433	Circular	152	1025.74	1024						0	2.5	0.013	0.20	0.10	
LSC275.OC	L-LSC-275	N-L-432	N-L-433	Trapezoidal	152	1025.74	1024											
LSC273.P	L-LSC-273	N-L-433	N-L-430	Circular	31	1021.92	1021.54						0	2.5	0.013	0.20	0.10	
LSC273.OC	L-LSC-273	N-L-433	N-L-430	Trapezoidal	31	1021.92	1021.54											
LSC280.P	L-LSC-280	N-L-434	N-L-436	Circular	127	1040.92	1039.87						0	2.25	0.013	0.20	0.10	
LSC280.OC	L-LSC-280	N-L-434	N-L-436	Trapezoidal	127	1040.92	1039.87											

Table B-3 Hydraulic Parameters for Lakeville South Creek Conduits and Reaches

Conduit	Link	Upstream Node	Downstream Node	Shape	Length (ft)	Upstream Invert (ft)	Downstream Invert (ft)	Left Bank Station (ft)	Right Bank Station (ft)	Left Overbank Roughness Coefficient	Channel Roughness Coefficient	Right Overbank Roughness Coefficient	Bottom Width (ft)	Depth (Height) (ft)	Roughness Coefficient	Exit Loss Coefficient	Entrance Loss Coefficient	Inlet Type
Lakeville South Creek Conduits and Reaches																		
								Natural Channels					*Pipes & Culverts*					
LSC279.P	L-LSC-279	N-L-435	N-L-434	Circular	71	1043.67	1042.82						0	2	0.013	0.20	0.10	



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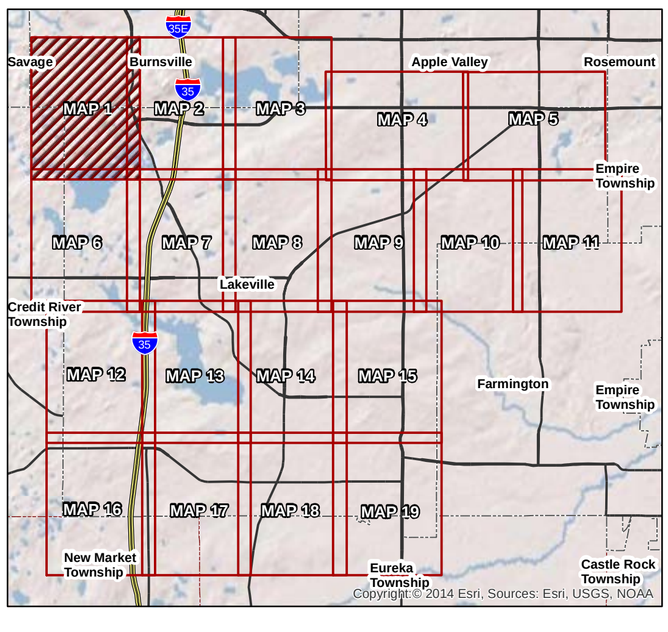


SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

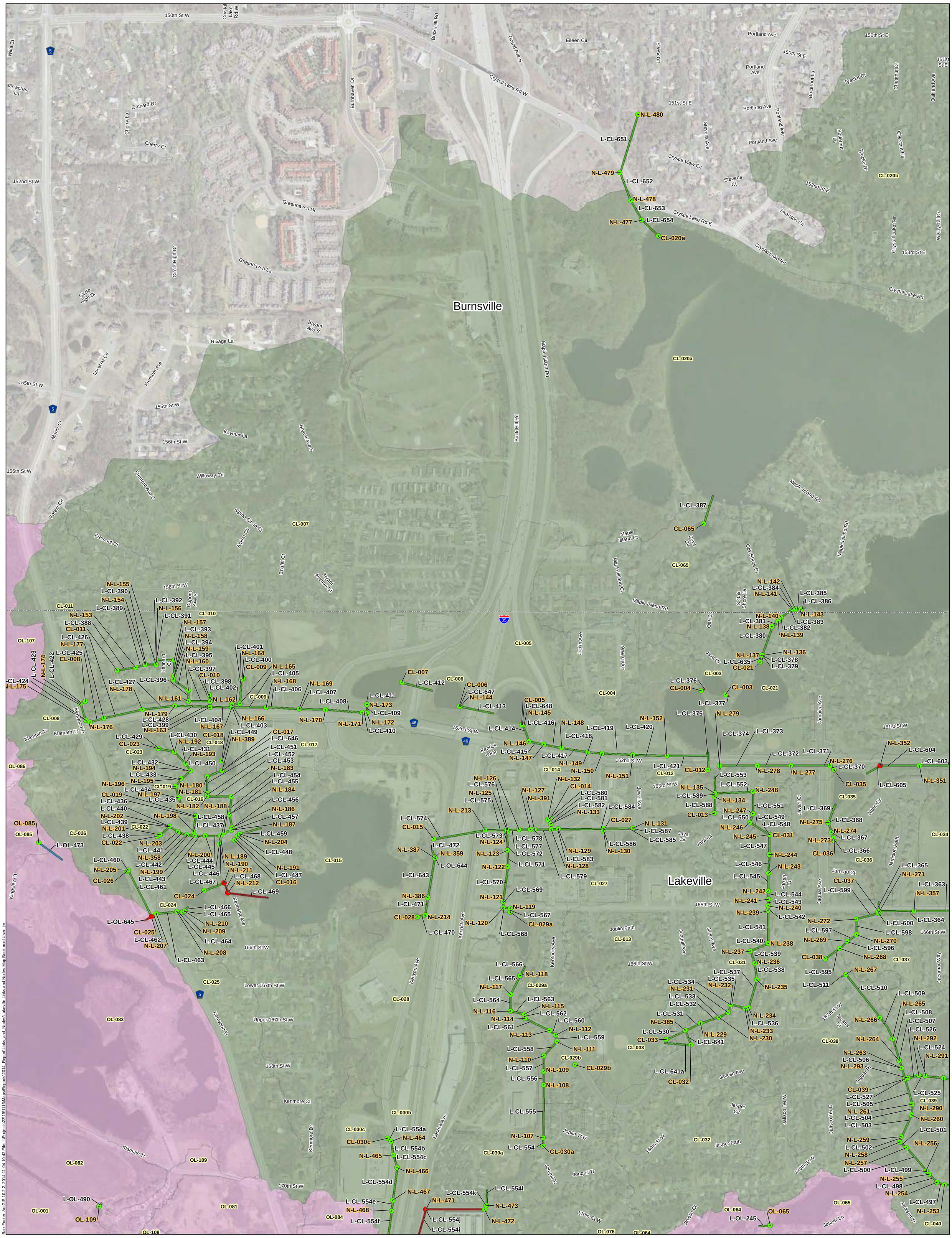
Subwatersheds
- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800
Feet

Figure B-1

XP-SWMM NODES & LINKS
City of Lakeville

Map 1 of 19


Burnsville
Lakeville
CL-020a
CL-020b
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CL-005
CL-027
CL-015
CL-025
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CL-030b
CL-030c
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155th St W
156th St W
152nd St W
158th St W
162nd St W
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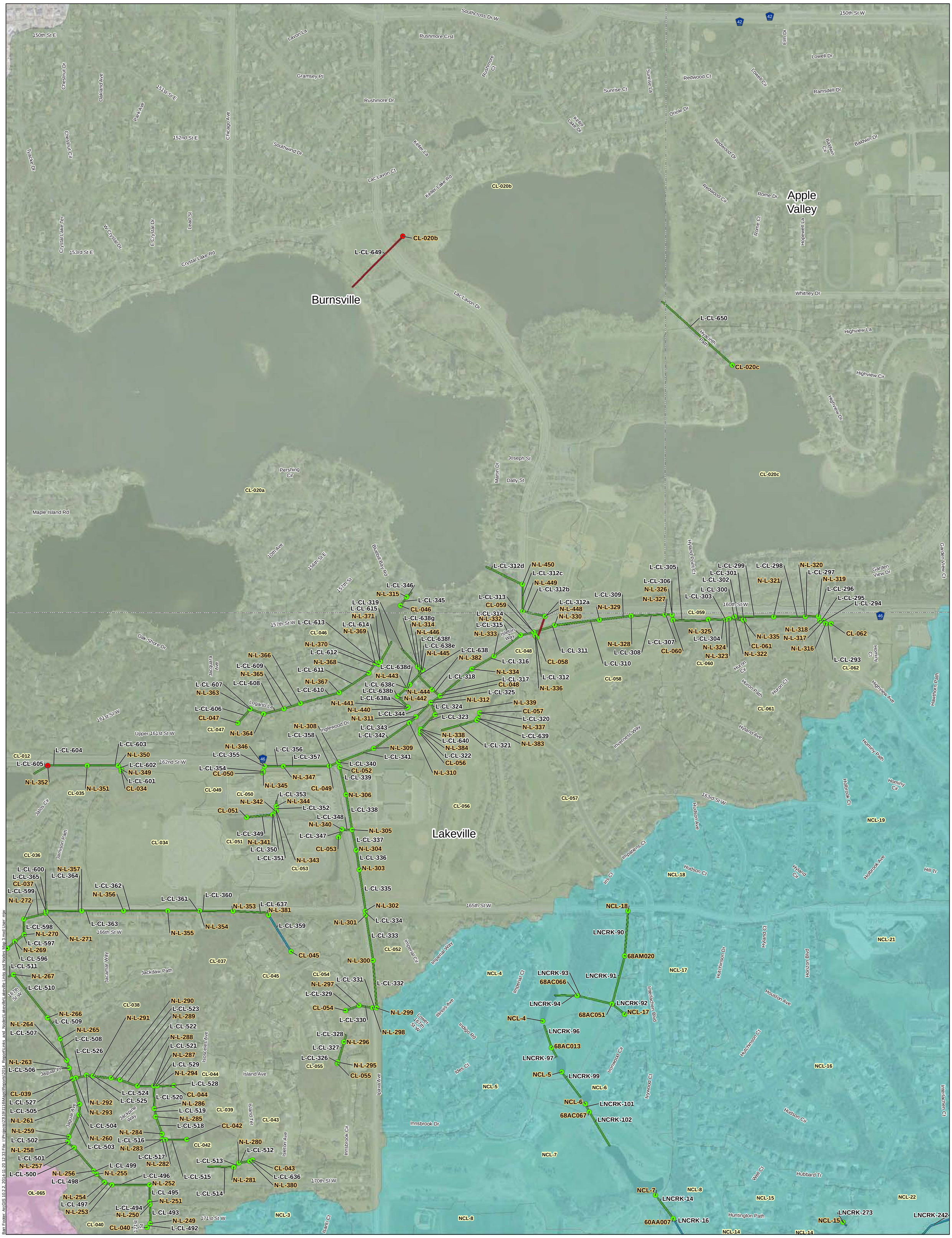
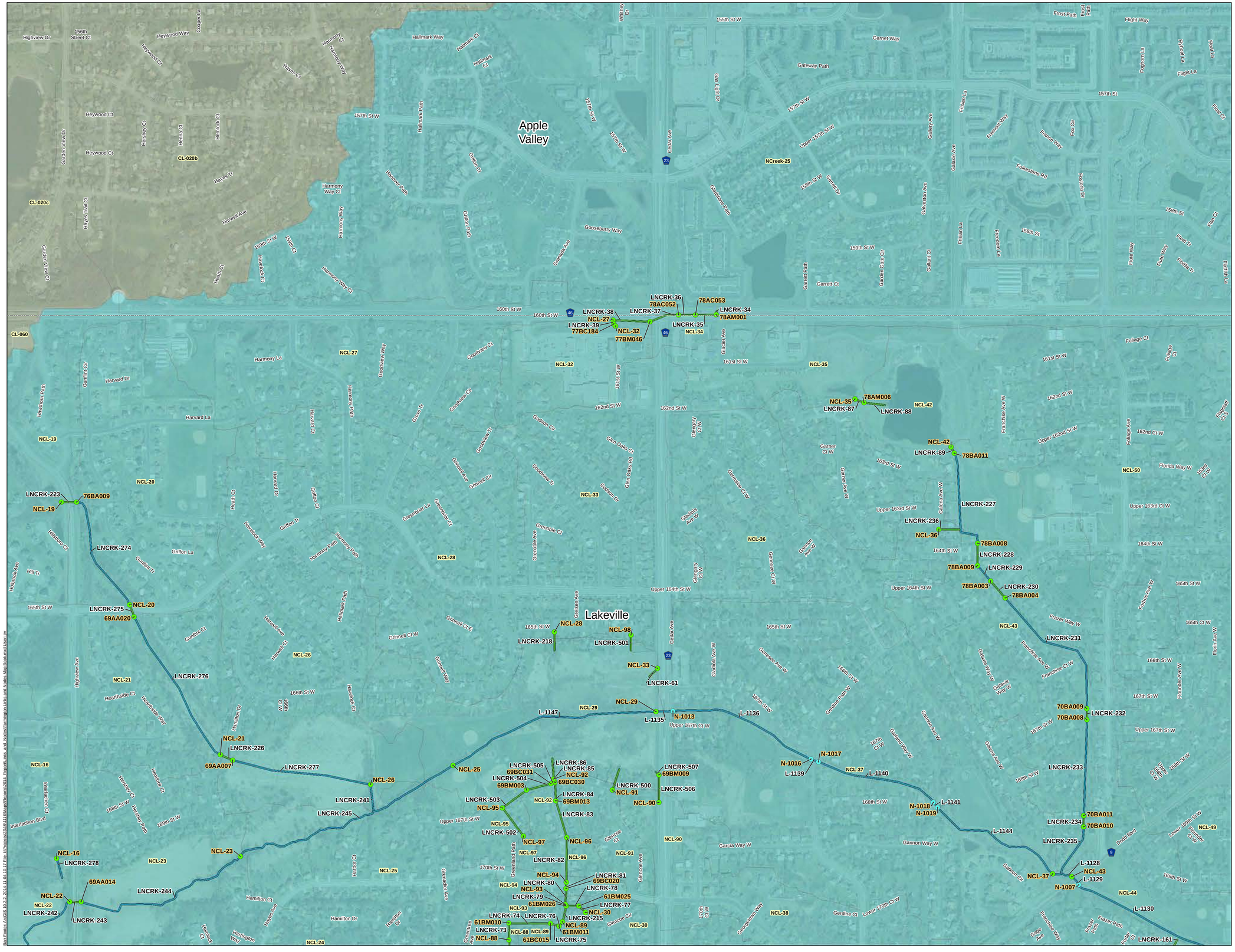
165th St W
166th St W
167th St W
168th St W
169th St W
170th St W
170th Ct W
Lower 167th St W
Upper 167th St W
151st St E
150th St E
152nd St E
153rd St E
161st St W
Crystal Lake Rd W
Crystal Lake Rd E
Crystal Lake Rd
Buck Hill Rd
Grand Ave S
Eileen Cir
1st Ave S
Portland Ave
Burnhaven Dr
Orchard Dr
Cherry La
Cherry Ct
Greenhaven Dr
Greenhaven La
Circle High Dr
Viewcrest La
Willa Ct
Stevens Ave
Stevens Ct
Crystal View Cir
Butternut La
Tyacke Dr
Chestnut Dr
Oakland Ave
Crystal Lake Ter
W Crystal Dr
Swanson Cir
Bryant Ave S
Rivage La
Maple Island Rd
Maple Island Ct
Cove Cir
Oak Shore Dr
S Oak Shore Dr
Oak Cv
Java Dr
Java La
Java Cir
Javari Ct
Jalos Ct
Jamaica Ave
Jamison Path
Jarreau Ct
Jaguar Ave
Jaguar Pl
Jaguar Ct
Jacamar Way
Jacana Ct
Joplin Ave
Joplin Way
Joplin Path
Jasper Cir
Jasper Path
Jasper La
Jalisco Ter W
Jalisco Ter E
Javelin Ave
Javelin Ct
Jonquil Tr
Jackson Tr
Kenrick Ave
Kenrick Loop
Kentucky Ave
Kenyon Ave
Kenwood Tr
Kenosha Ave
Kenmore Ct
Kenmore Dr
Kingsley Ct
Kennard Ct
Dupont Ave S
Bryant Avenue Ct
Alpine Circle Ct
Alpine Cir
Chalet Ct
Fremont Ct
Fremont Ave S
Forest Cir
Willoway Cir
Kaymar La
Moritz Ct
Lucerne Cir
Maple Island Ct
Maple Island Rd
Klamath Tr
Maple Island Rd
Maple Island Ct
Maple Island Rd
Maple Island Rd
Maple Island Rd


Burnsville
Apple Valley
Lakeville
CL-020b
CL-020c
CL-020a
L-CL-649
L-CL-650
Southcross Dr W
150th St E
150th St W
Rushmore Crst
Lavon La
Gramsey Pl
Rushmore Dr
Rushmore Ct
Sunrise Ct
Sunrise La
Redwood Ct
Lowell Dr
Lowell Cir
Elm Dr
Ramsdell Dr
Oriole Dr
Redwood Dr
Baldwin Cir
Baldwin Dr
Rome Dr
Rome Ct
Hopewell La
Whitney Dr
Highview La
Highview Cir
Highview Dr
Hyacinth Path
Chestnut Dr
Oakland Ave
151st St E
Park Ave
Chestnut Ct
152nd St E
Chicago Ave
Tyacke Dr
Southwind Dr
Keller La
Keller Lake Dr
Lac Lavon Ct
Keller Lake Rd
Lac Lavon Dr
Crystal Lake Ter
W Crystal Dr
E Crystal Dr
Lead St
153rd St E
Crystal Lake Rd
Pershing Cir
Joseph St
Martin Dr
Dally St
Maple Island Rd
10th Ave
156th St E
Bluebill Bay Rd
157th St
157th St W
Oak Shore Dr
Jacquara Ave
Logarto La
161st St W
Upper 161st St W
Inglewood Dr
162nd St W
Jatos Cir
Jamison Path
166th St W
Jacamar Way
Jackdaw Path
167th St W
Jaguar Pl
Jaguar Ave
Jackpine Way
Island Ter
Island Ave
Isosceles Ave
Ipava Ave
Isleton Way
Inverness Way
Hyland Point Ct
Garden View Dr
Garden View Ct
160th St W
Hyland Ave
Hominy Path
Hominy Cir
Holbrook Ct
Holbrook Ave
Hill Tr
Hyland Cir
Hyland Ct
Hudson Ave
163rd St W
Hudson Ct
Inpatiens Ct
Iris Ct
165th St W
Imperial Cir
Imperial Way
Imperial Ct
Hutchinson Dr
Horizon Blvd
Houston Ave
Interlachen Blvd
Hutchinson Ct
Ironwood Cir
Ivywood Ct
Hudson Cir
Huron Cir
Huron Path
Huron Ct
Hominy Ct
Highview Ave
Hawthorn Path
Indigo Rd
Ides Ct
Illinois Ave
Lower 167th St W
Innsbrook Dr
Innsbrook Cir
Isanti Ct
170th St W
171st St W
121st St
Weil Cir
Hubbard Tr
Huntington Path
Interlachen Ct
Jacaranda Ave
Jasmine Ave
Jamaica Ave
Jacaranda Ct
Jamison Ct
Jacaranda Path
Jacaranda Cir
Jamison Cir
Jacaranda Pl
Jamison Pl
Jacaranda Ter
Jamison Ter
Jacaranda Way
Jamison Way
Jacaranda Trl
Jamison Trl
Jacaranda Loop
Jamison Loop
Jacaranda Ln
Jamison Ln
Jacaranda Dr
Jamison Dr
Jacaranda Rd
Jamison Rd
Jacaranda Blvd
Jamison Blvd
Jacaranda Cir
Jamison Cir
Jacaranda Ct
Jamison Ct
Jacaranda Path
Jamison Path
Jacaranda Ave
Jamison Ave
Jacaranda Pkwy
Jamison Pkwy



SWMM Node Data Source

- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source

- Pipe
- Natural Channel
- Assumed Pipe
- Municipal Boundaries
- Civil Townships

Subwatersheds

- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800
Feet

Figure B-4

XP-SWMM NODES & LINKS
City of Lakeville
Map 4 of 19

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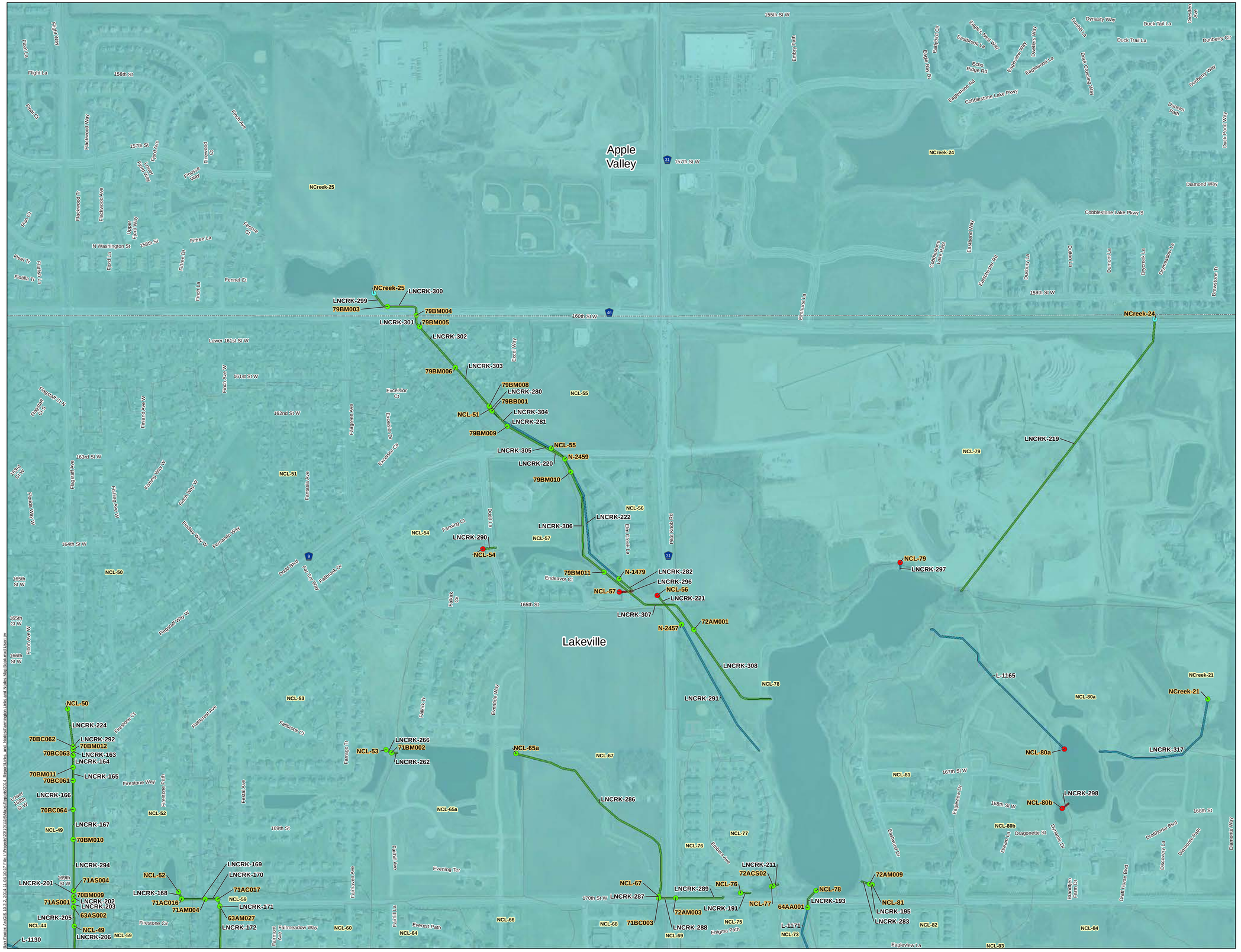
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162nd St W
163rd St W
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165th St W
165th St
167th St W
168th St
169th St
170th St W
Lower 161st St W
Lower 165th St W
N Washington St
156th St
157th St
158th St
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Fern Ct
Fennel Ct
Fairtree La
Fairtree Dr
Upper Fern Way
Fern La
Flackwood Way
Flackwood Ln
Flackwood Ave
Flackwood Tr
Fleet Tr
Florida Tr
Flight Way
Fourth Ct
Frost Ct
Firelane Way
Firewood Ct
Fern Cir
Fern Cove
Excelsior Ct
Excelsior Cir
Excelsior Dr
Evening Ter
Everest Path
Everglade Way
Evinrude Way
Excel Way
Fairgreen Ave
Fairhaven Ave
Fairhill Ln
Fairmeadow Way
Fairmont Ave
Fairtale Ave
Fantasia Ave
Farmington Ct
Farmington Ln
Farrago Tr
Falkirk Tr
Falkirk Cir
Fallbrook Ct
Fallbrook Ave
Fallbrooke Ave
Firestone Ct
Firestone Way
Firestone Path
Firestone Cir
Fetzal Ave
Finnland Ave W
Flagstaff Ave
Flagstaff Cir N
Flagstaff Cir S
Flagstaff Way W
Florin Ave W
Fulling Way W
Finch Way W
Finlay Way W
Fernando Way
Fernando Way W
Fernando Way W
Dodd Blvd
Dodd Ln
Fair Oaks Way
Fabbrosa Dr
Fanning Ct
Eagle Bluff Cir
Eaglebluff Cir
Eastbrook Ln
Eagle's Nest Way
Eagleview Way
Eagleview Ln
Eagleview Dr
Eagleview Rd
Echo Ridge Rd
Eagleridge Rd
Eagleridge Way
Eagleridge Ln
Eagleridge Cir
Eagleridge Ct
Einhorn Path
Elmhurst Ln
Elm Creek Ln
Endeavor Ct
Eastbrook Way
Eastbrook Rd
Eastwood Dr
Embark Ave
Enigma Path
Dynasty Way
Dunhill Ln
Duck Trail Ln
Duck Crossing Way
Dunberry Cir
Dunberry Way
Dresden Ave
Duncan Path
Duck Pond Way
Diamond Way
Cobblestone Lake Pkwy
Cobblestone Lake Pkwy S
Cobblestone Lake Path
Dudley Ln
Dumont Ln
Daycreek Ln
Daymeadow Ln
Drakestone Tr
Dragonette St
Dragonette Ln
Dragonette Cir
Dragonette Path
Dragonfire Blvd
Discovery Ln
Diamonte Path
Diamonte Way
Dark Horse Blvd
Blandthei Farm Dr
Eagleview Dr
Eagleview La
Duck Trail La
Rockhoop Rd
Dodd Blvd
Fabbrosa Dr
Fair Oaks Way
Flagstaff Way W
Florin Ave W
Fulling Way W
Finch Way W
Finlay Way W
Fernando Way
Fernando Way W
Fernando Way W
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Fairgreen Ave
Fairmont Ave
Fairmeadow Way
Fairhill Ln
Fallbrook Ave
Fallbrooke Ave
Fetzal Ave
Finnland Ave W
Flagstaff Ave
Flagstaff Cir N
Flagstaff Cir S
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Firestone Way
Firestone Path
Firestone Cir
Fallbrook Ct
Fallbrooke Ave
Farrago Tr
Falkirk Tr
Falkirk Cir
Evinrude Way
Excel Way
Excelsior Ct
Excelsior Cir
Excelsior Dr
Evening Ter
Everest Path
Everglade Way
Fairgreen Ave
Fairhaven Ave
Fairhill Ln
Fairmeadow Way
Fairmont Ave
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Fantasia Ave
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Farmington Ln
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Falkirk Tr
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Fallbrook Ct
Fallbrooke Ave
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Firestone Way
Firestone Path
Firestone Cir
Fetzal Ave
Finnland Ave W
Flagstaff Ave
Flagstaff Cir N
Flagstaff Cir S
Flagstaff Way W
Florin Ave W
Fulling Way W
Finch Way W
Finlay Way W
Fernando Way
Fernando Way W
Fernando Way W
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Fanning Ct
Eagle Bluff Cir
Eaglebluff Cir
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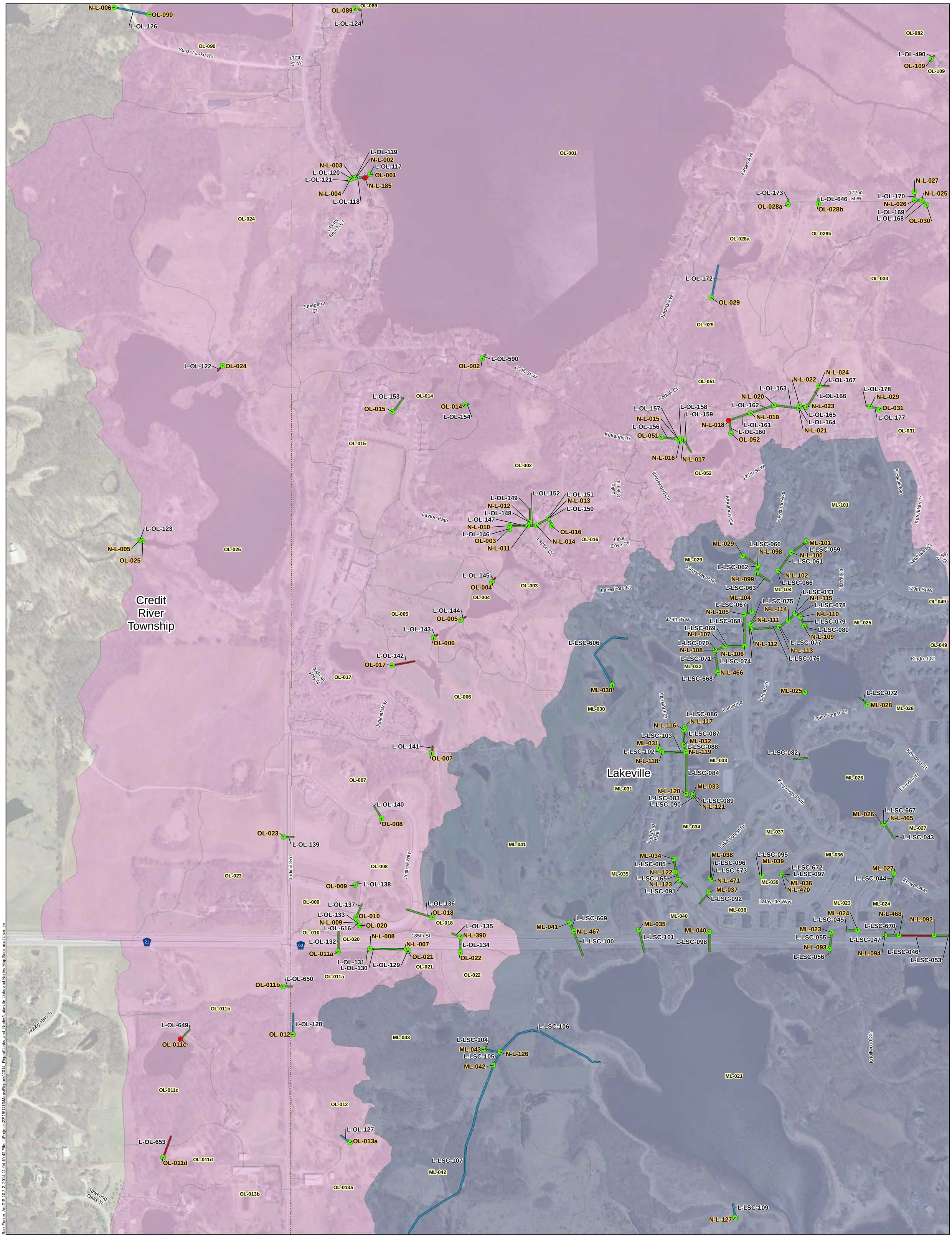
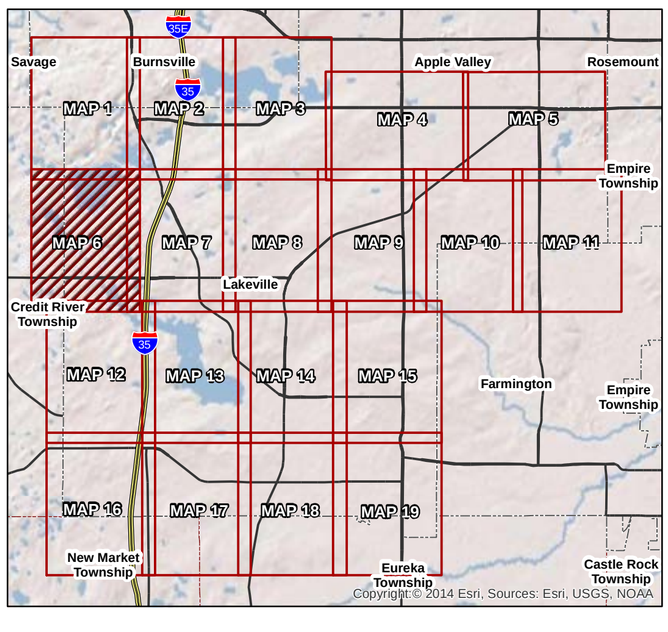
Eagle's Nest Way
Eagleview Way





SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds
- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

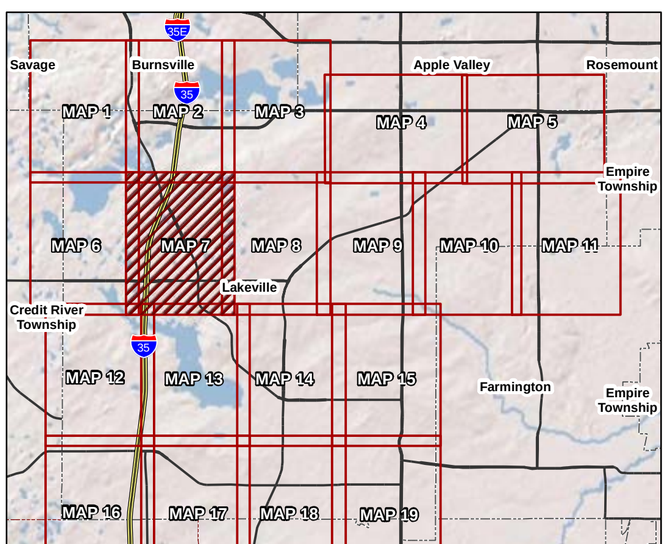
0 200 400 800
Feet

Figure B-6

XP-SWMM NODES & LINKS
City of Lakeville

Map 6 of 19

Lakeville



SWMM Node Data Source

- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source

- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds

- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800

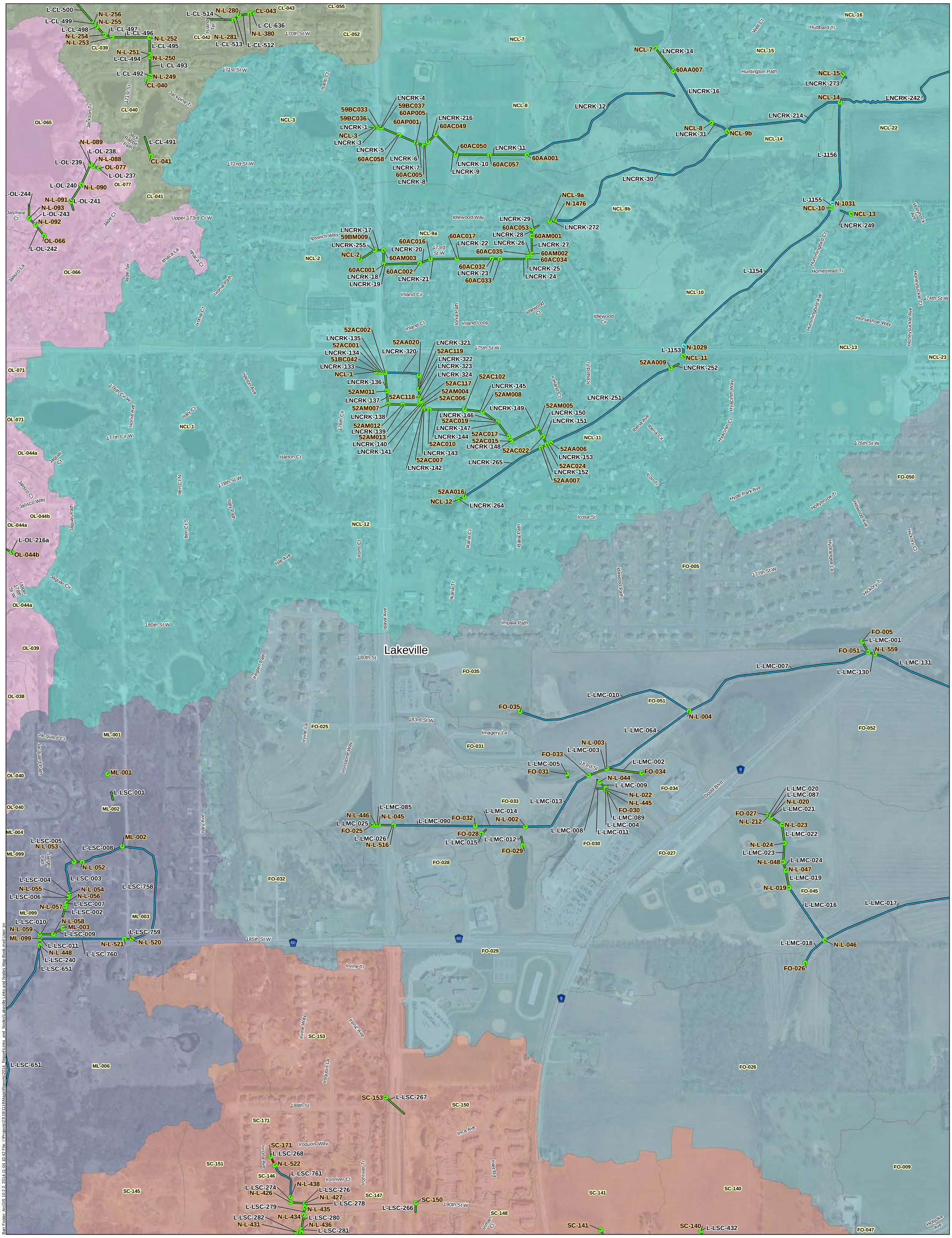
Feet

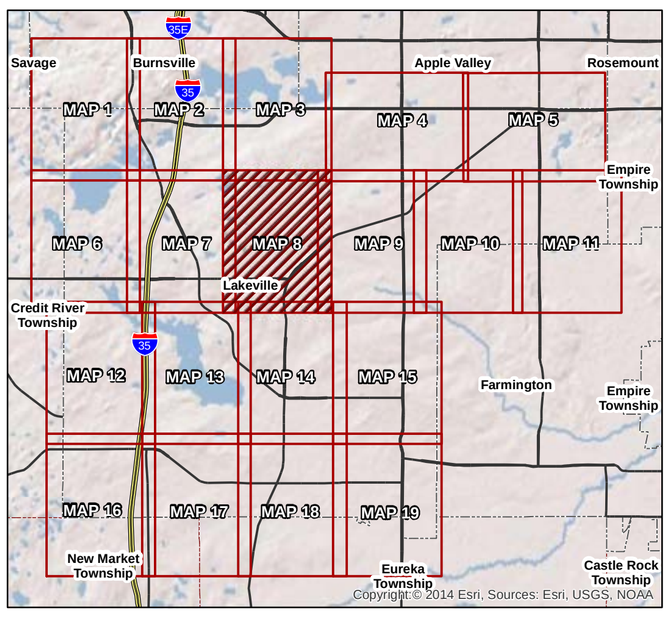
Figure B-7

XP-SWMM NODES & LINKS
City of Lakeville

Map 7 of 19

Barr Footer: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Links_and_NodesLakeville Links and Nodes Map Book.mxd User: jrv





SWMM Node Data Source

- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source

- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds

- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

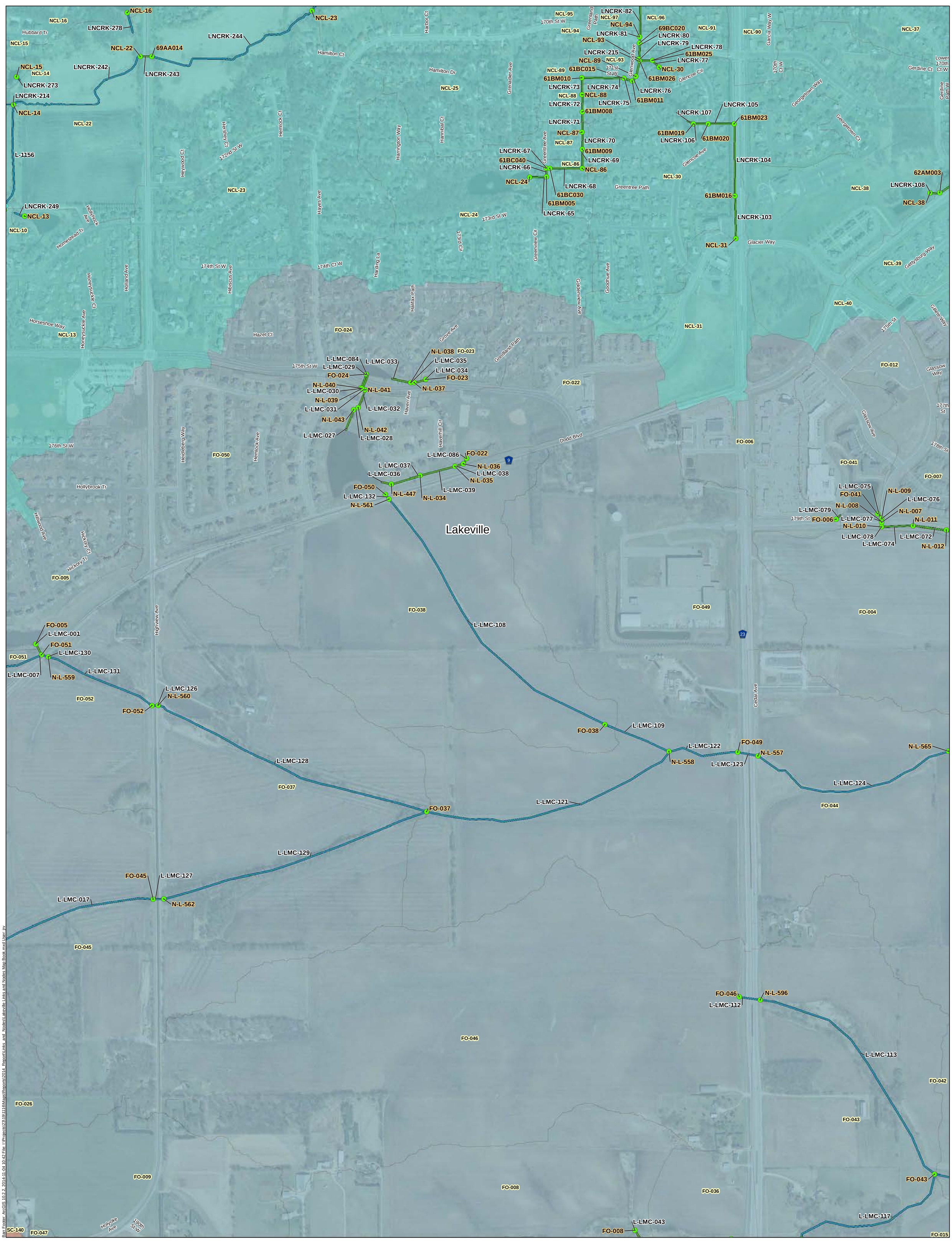
0 200 400 800

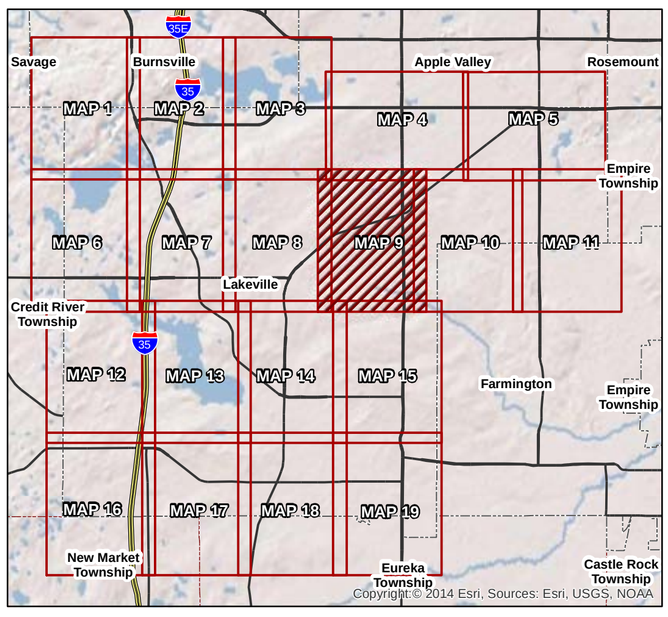
Feet

Figure B-8

XP-SWMM NODES & LINKS
City of Lakeville

Map 8 of 19





SWMM Node Data Source

- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source

- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds

- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800

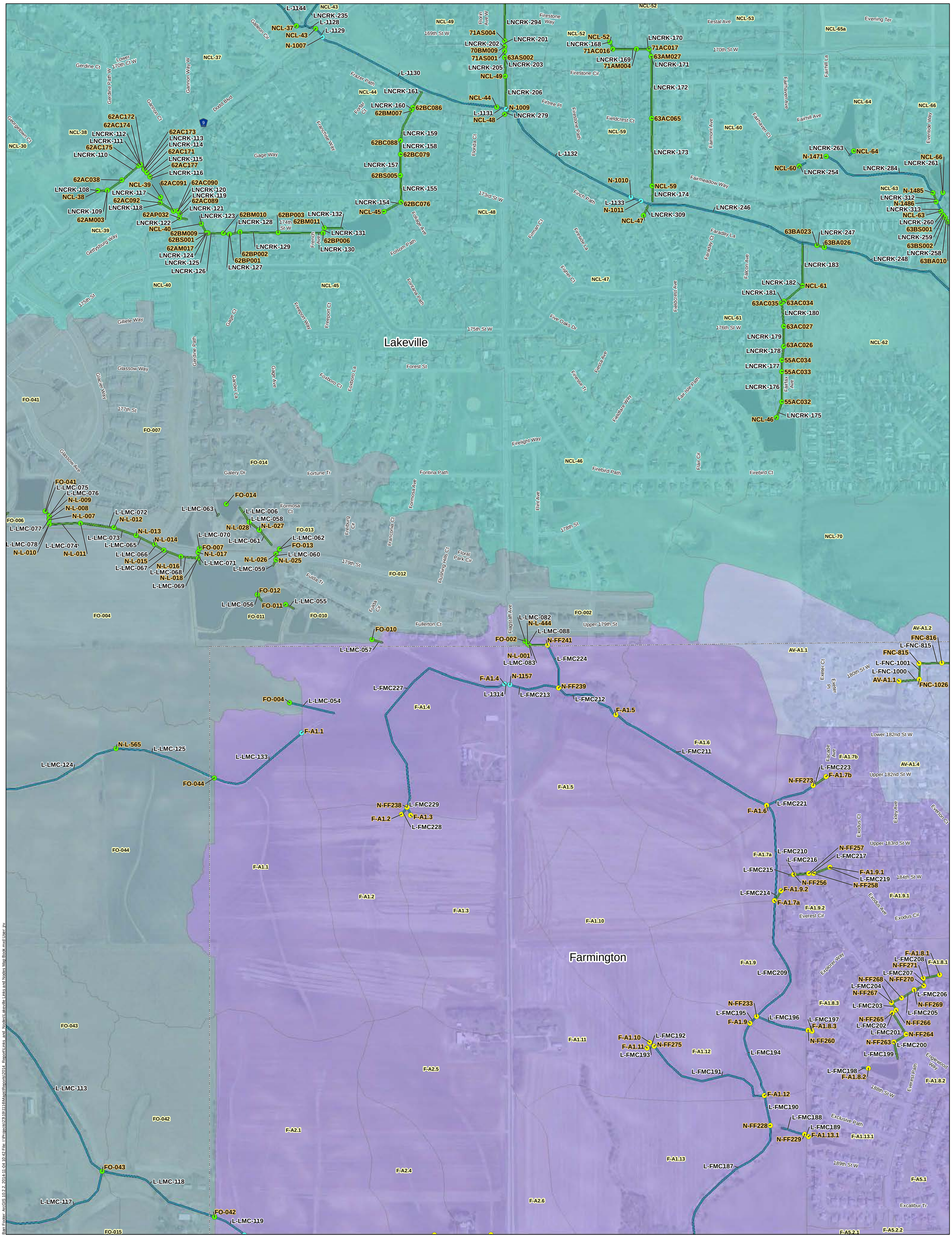
Feet

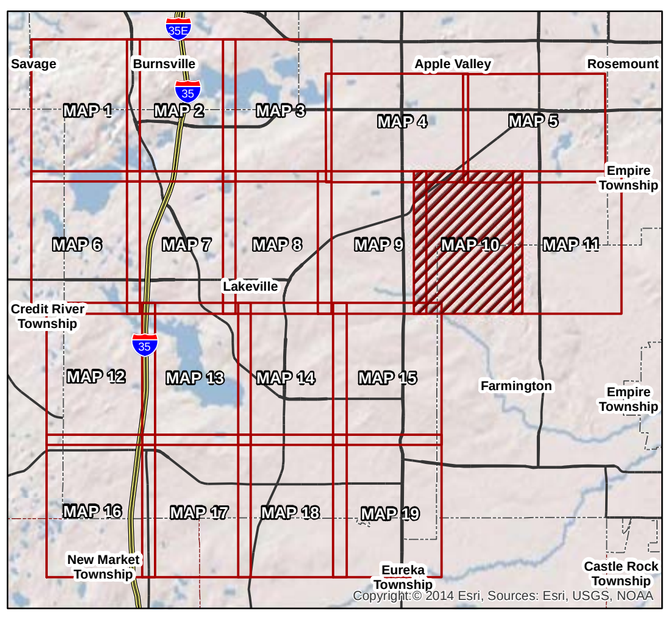
Figure B-9

XP-SWMM NODES & LINKS
City of Lakeville

Map 9 of 19

Barr Footer: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\19\1116\Maps\Reports\2014 Report\Links and Nodes\Lakeville Links and Nodes Map Book.mxd User: jrv





SWMM Node Data Source

- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source

- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds

- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800

Feet

Figure B-10

XP-SWMM NODES & LINKS
City of Lakeville

Map 10 of 19

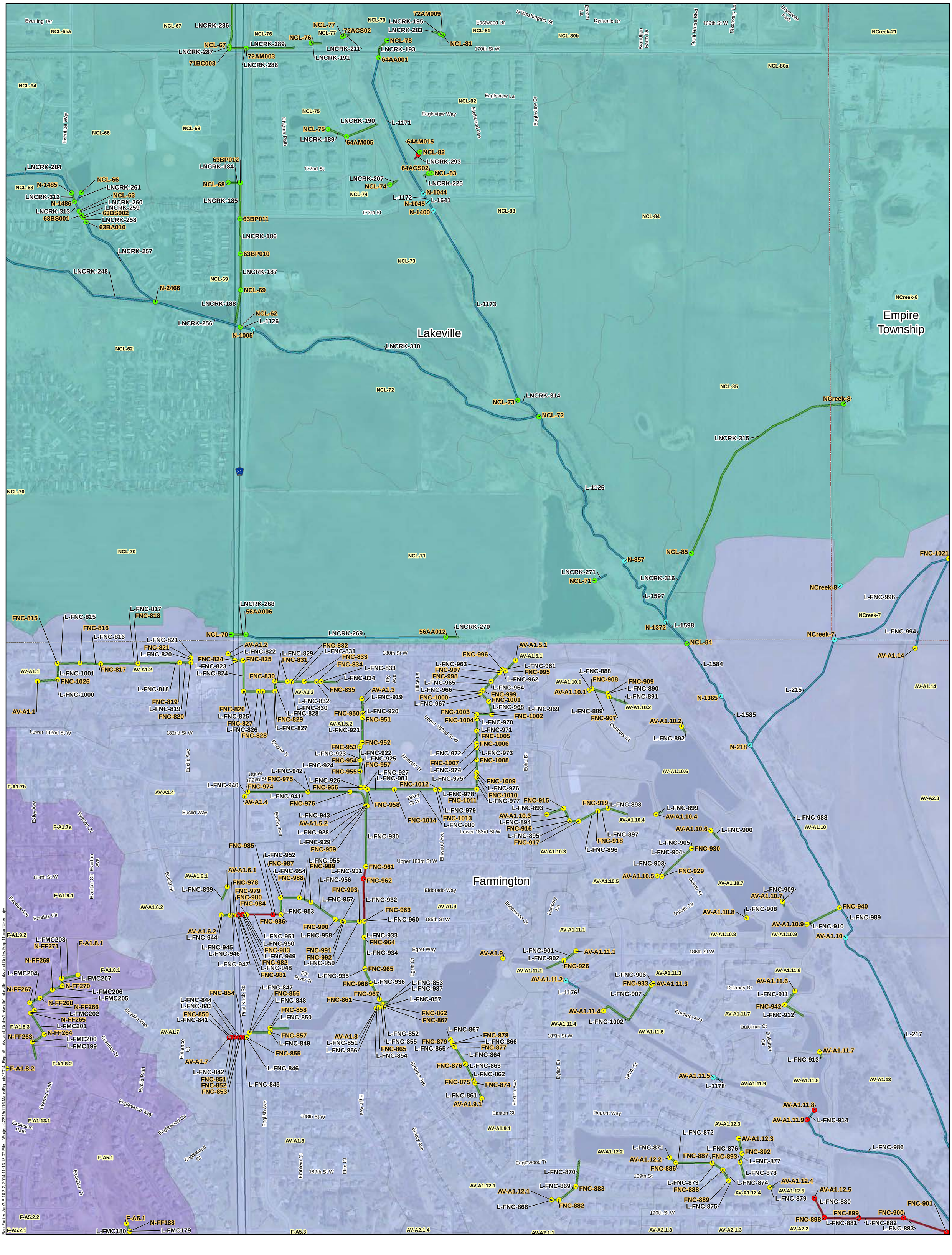
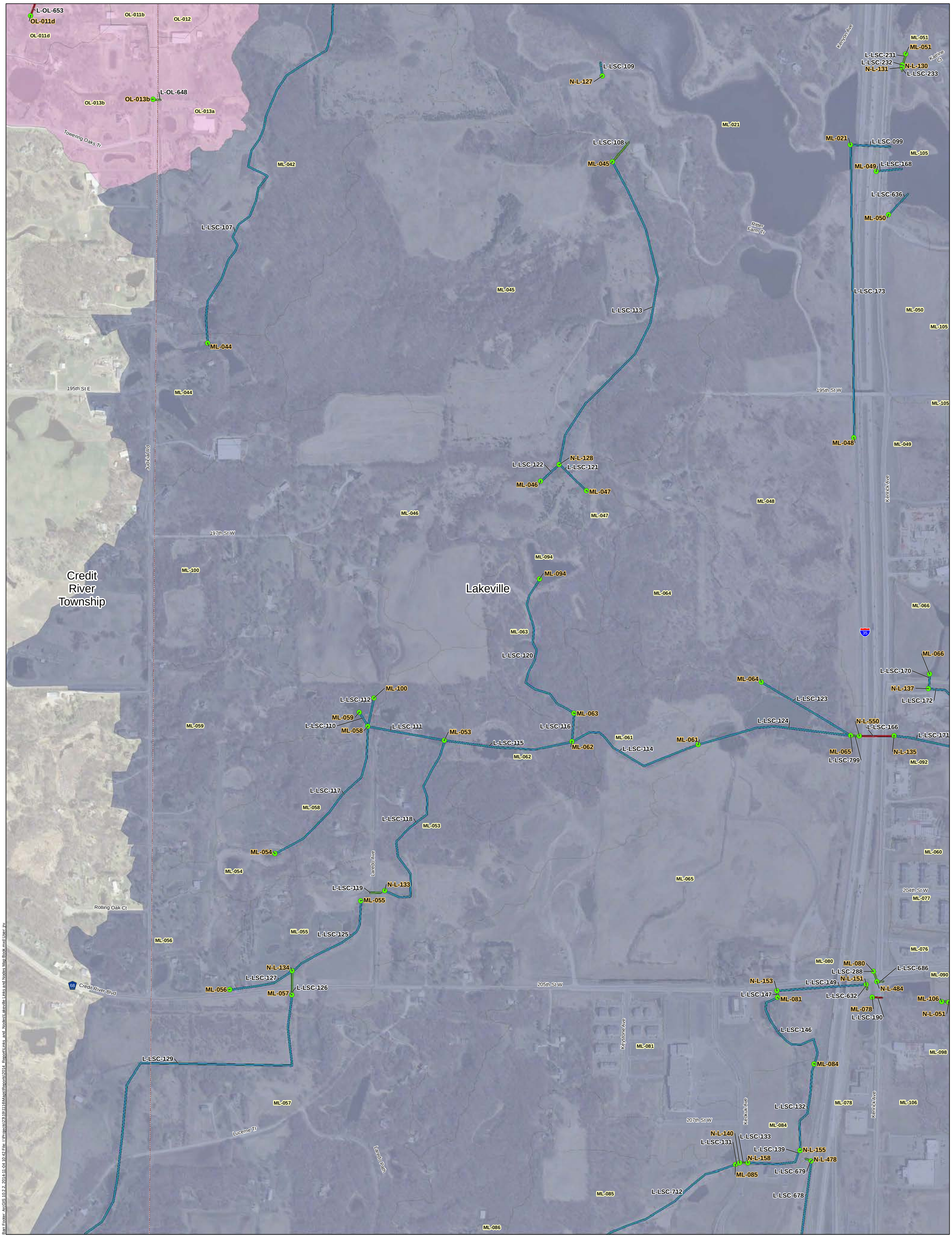
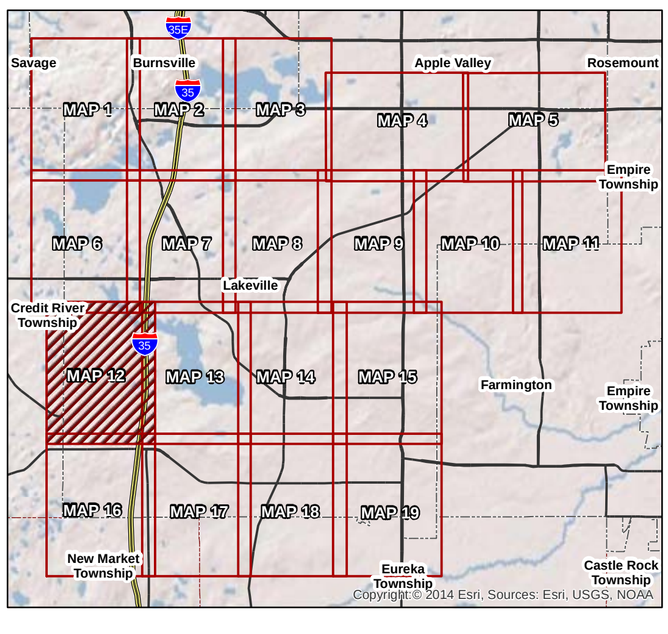


Figure B-11

XP-SWMM NODES & LINKS
City of Lakeville

Map 11 of 19





SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds
- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800
Feet

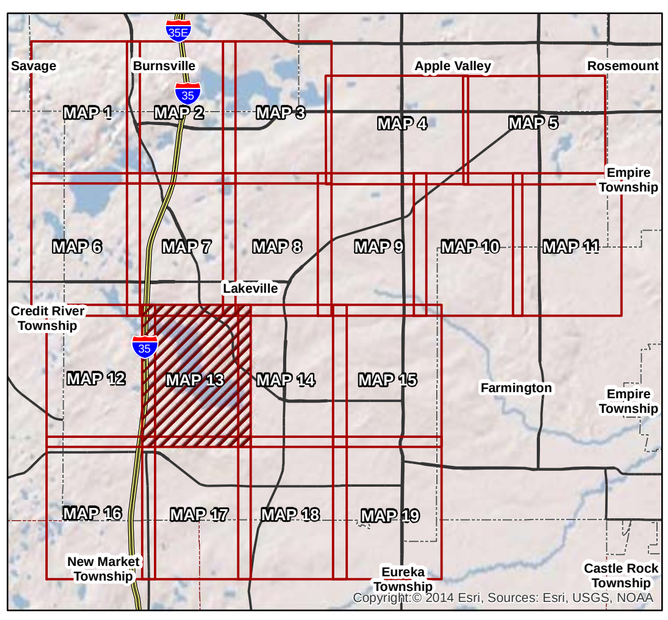
Figure B-12

XP-SWMM NODES & LINKS
City of Lakeville

Map 12 of 19

Barr Footer: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\19\1116\Mapsl\Reports\2014_Report\Links_and_Nodes\Lakeville Links and Nodes Map Book.mxd User: jrv

Lakeville



SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

Subwatersheds
- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

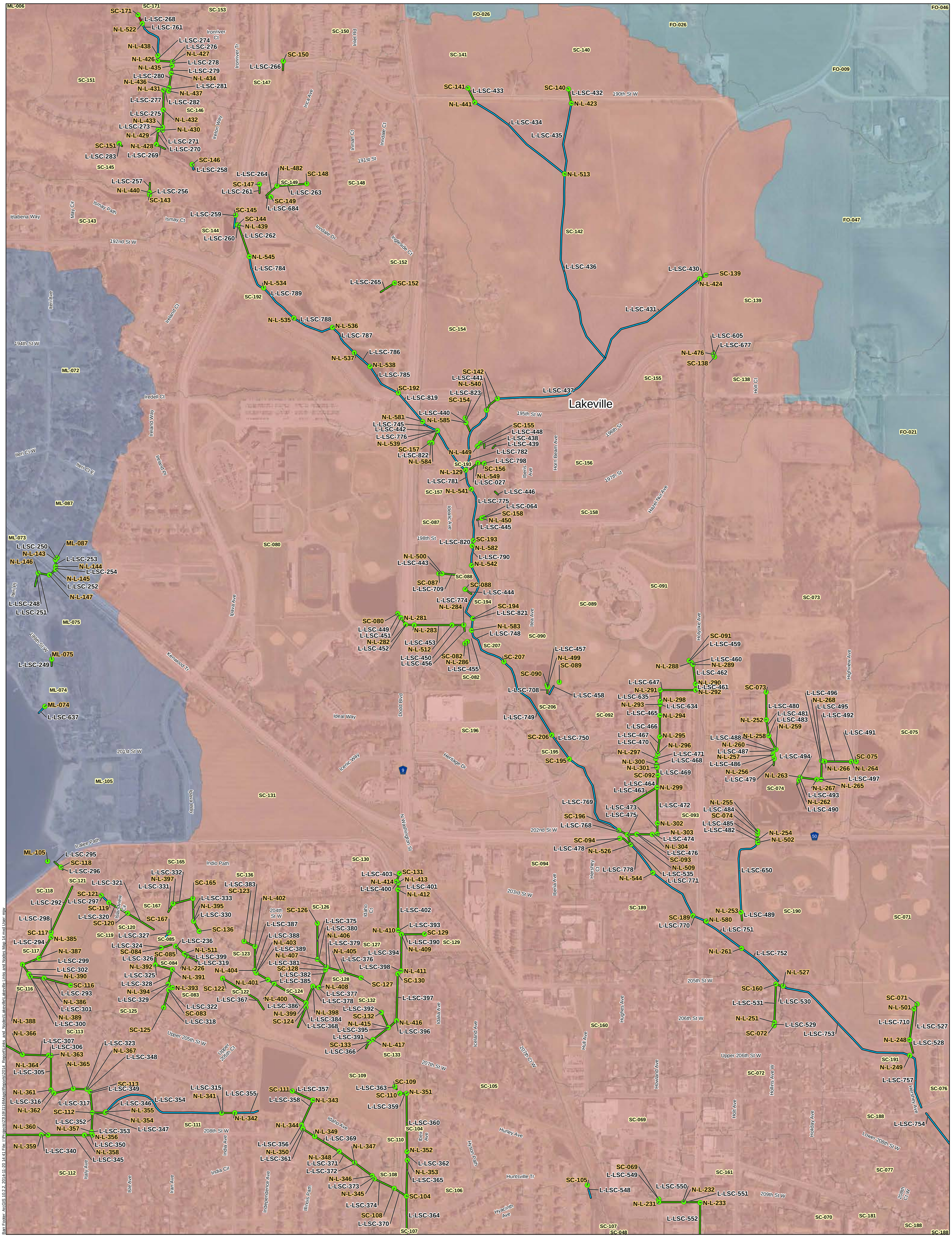
0 200 400 800
Feet

Figure B-13

XP-SWMM NODES & LINKS
City of Lakeville

Map 13 of 19

Barr Footer: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\1911\6\Maps\Reports\2014_ReportLinks and_NodesLakeville Links and Nodes Map Book.mxd User: jrv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Ittabena Way
May Cir
Ismay Path
Ismay Ct
192nd St W
Iteri Ave
Ireland Ct
194th St W
Iredell Ct
Ireland Way
Ireland Pl
Iteri Ct W
Iteri Ct E
Iteri Pl
Ipava Ave
Ipava Way
Kenwood Tr
Ideal Way
Icalee Path
Indio Path
Idaho Ct
Idaho Ave
Idealic Ave
Idalia Ave
Iceland Ave
Icenic Way
Heritage Dr
N Washington St
Iberia Ave
Iberis Ave
Horn Beam Ave
Hazel Nut Ave
Hershey Ct
Holyoke Ave
Hughes Ave
Hull Ave
Howland Ave
Hollins Ave W
Highview Ave
Holt Ct
Holt Ave
Holiday Ave
Hershey Ave
Hurley Ave
Huntsville Tr
Hyacinth Ave
Hyson Path
Ibex Ave
India Ave
India Cir
Italy Ave
Isle Ave
Iran Ave
Independence Ave
Illinois Path
Islandview Cir
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Upper 205th Ct
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207th Ct W
208th St W
Lower 208th St W
195th St W
196th St
197th St
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202nd St W
203rd St W
204th St W
205th St W
206th St W
209th St W
208th Ct W
Upper 206th St W
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ML-072
ML-073
ML-074
ML-075
ML-087
ML-105
FO-026
FO-046
FO-009
FO-047
FO-021
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SC-489
SC-650
SC-254
SC-485
SC-482
SC-074
SC-255
SC-484
SC-502
SC-263
SC-483
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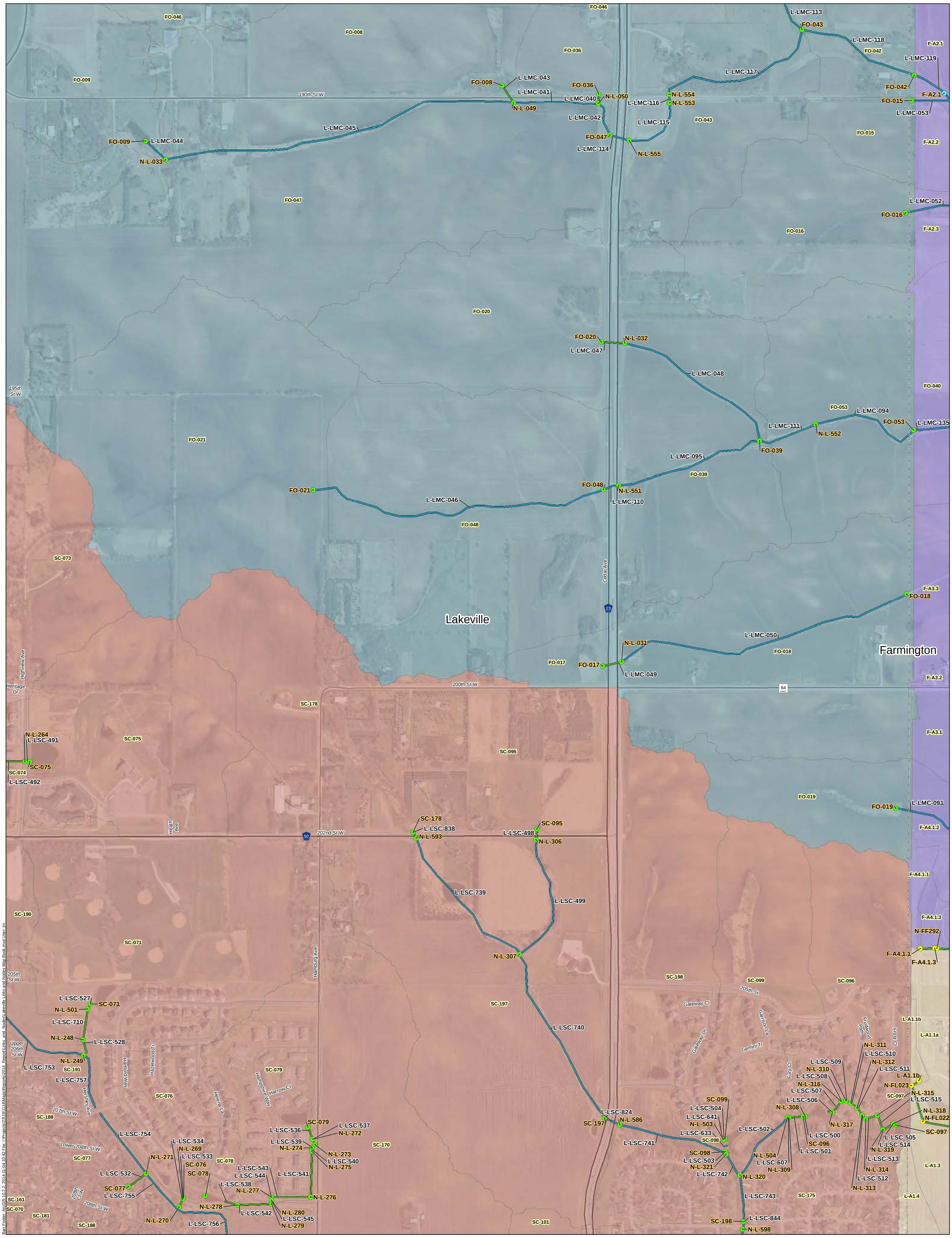
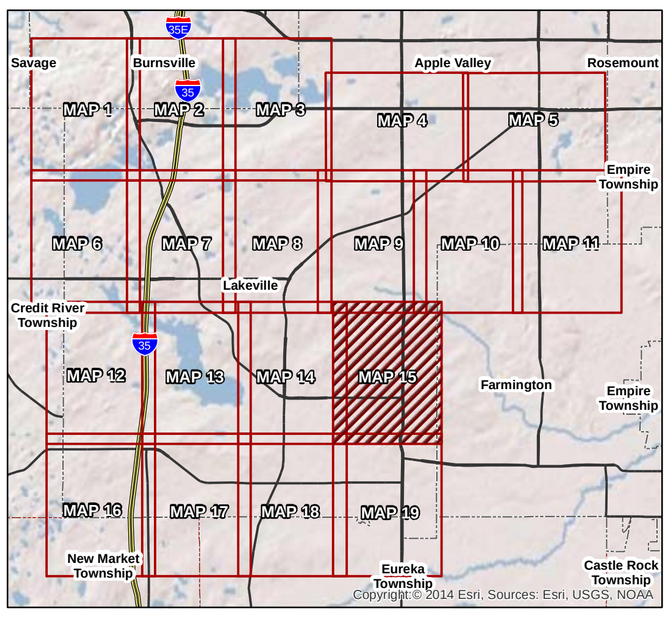




SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

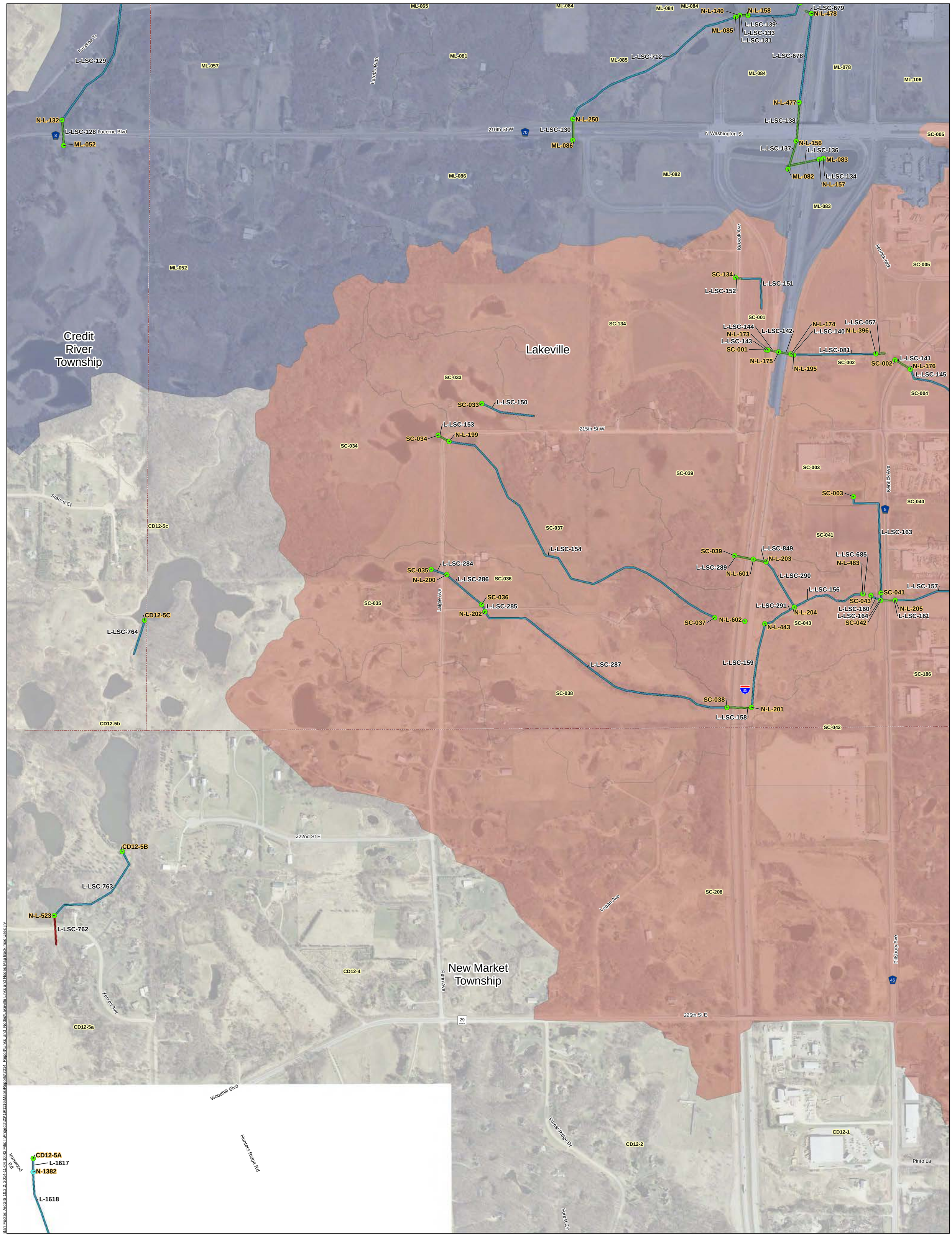
Subwatersheds
- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

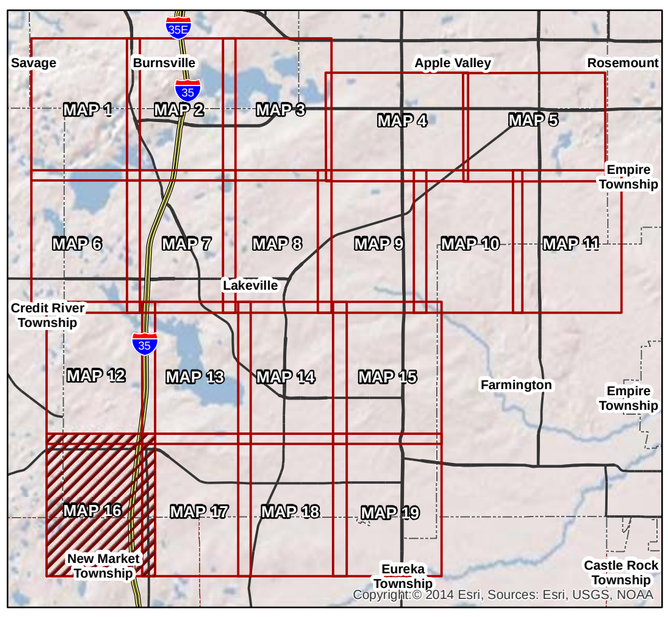
0 200 400 800
Feet

Figure B-15

XP-SWMM NODES & LINKS
City of Lakeville

Map 15 of 19





SWMM Node Data Source
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- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

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- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800
Feet

Figure B-16

XP-SWMM NODES & LINKS
City of Lakeville

Map 16 of 19

Barr Footer: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\19\1116\Maps\Reports\2014_ReportLinks_and_Nodes\Lakeville Links and Nodes Map Book.mxd User: jrv

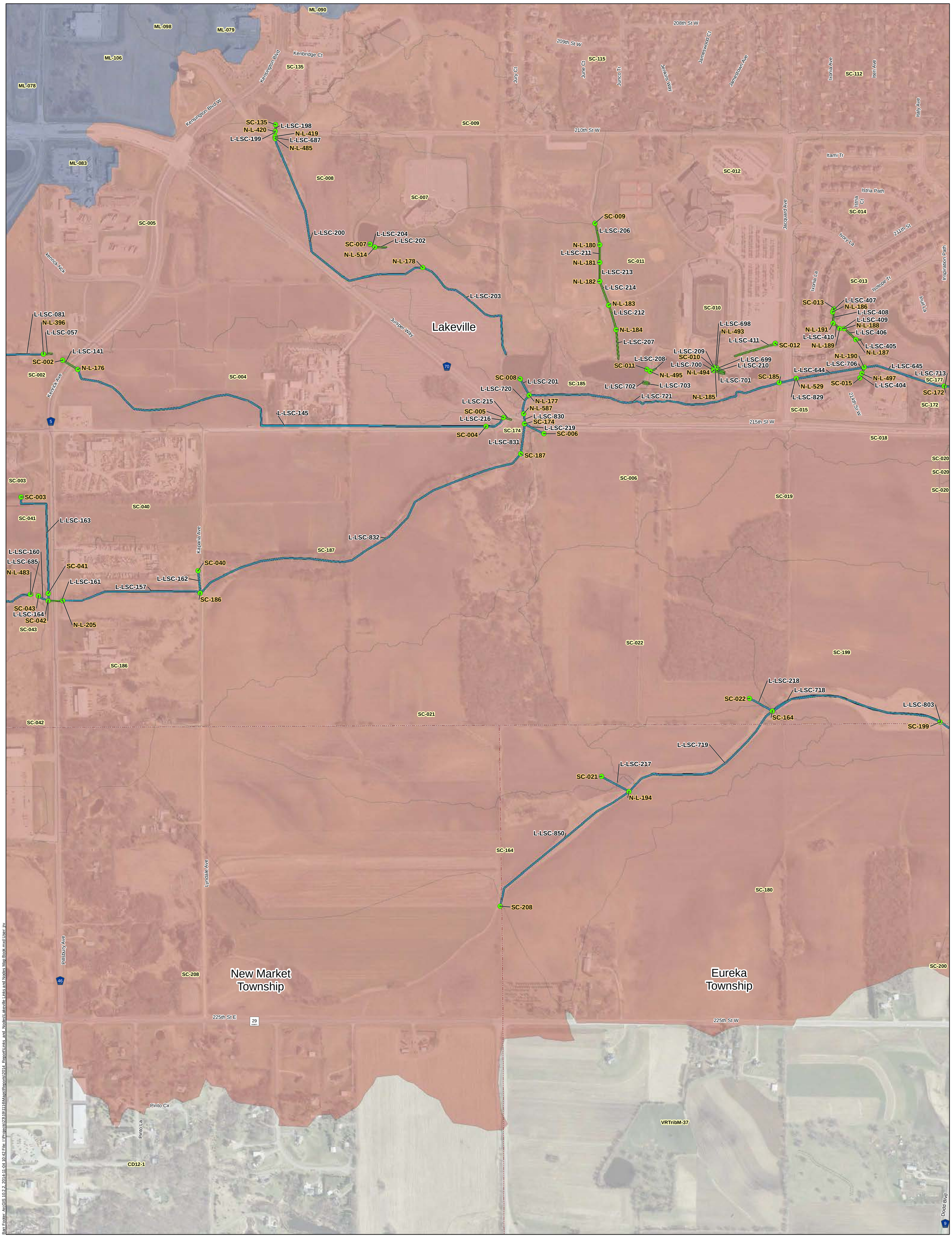
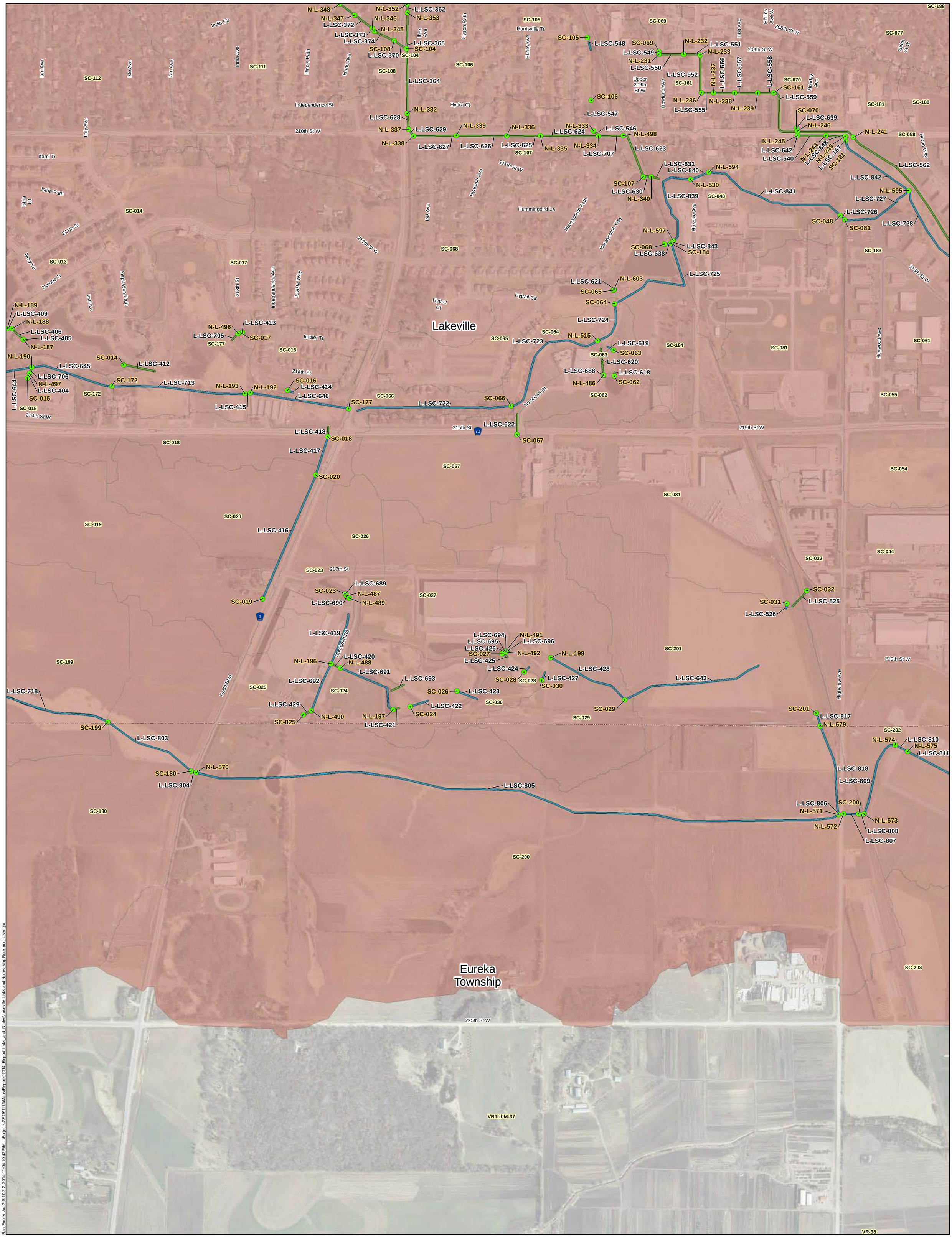


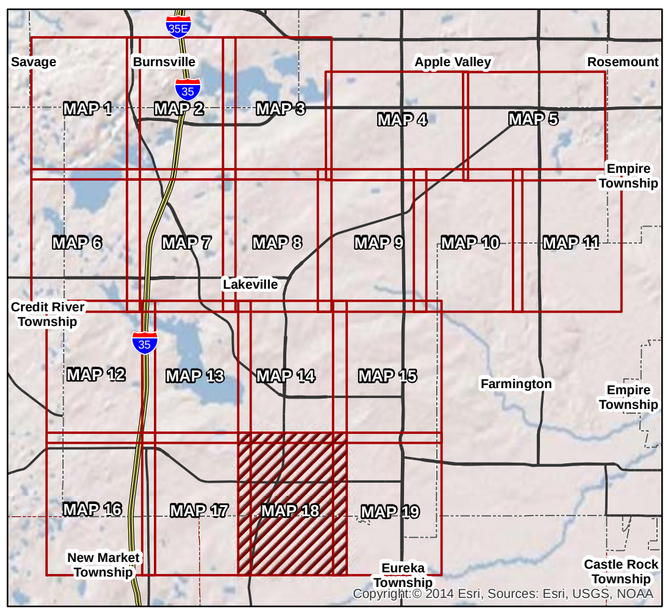
Figure B-17

XP-SWMM NODES & LINKS
City of Lakeville

Map 17 of 19

Barr Footer: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\19\111\6\Maps\Reports\2014 ReportLinks and Nodes\Lakeville Links and Nodes Map Book.mxd User: jrv





SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
- Civil Townships

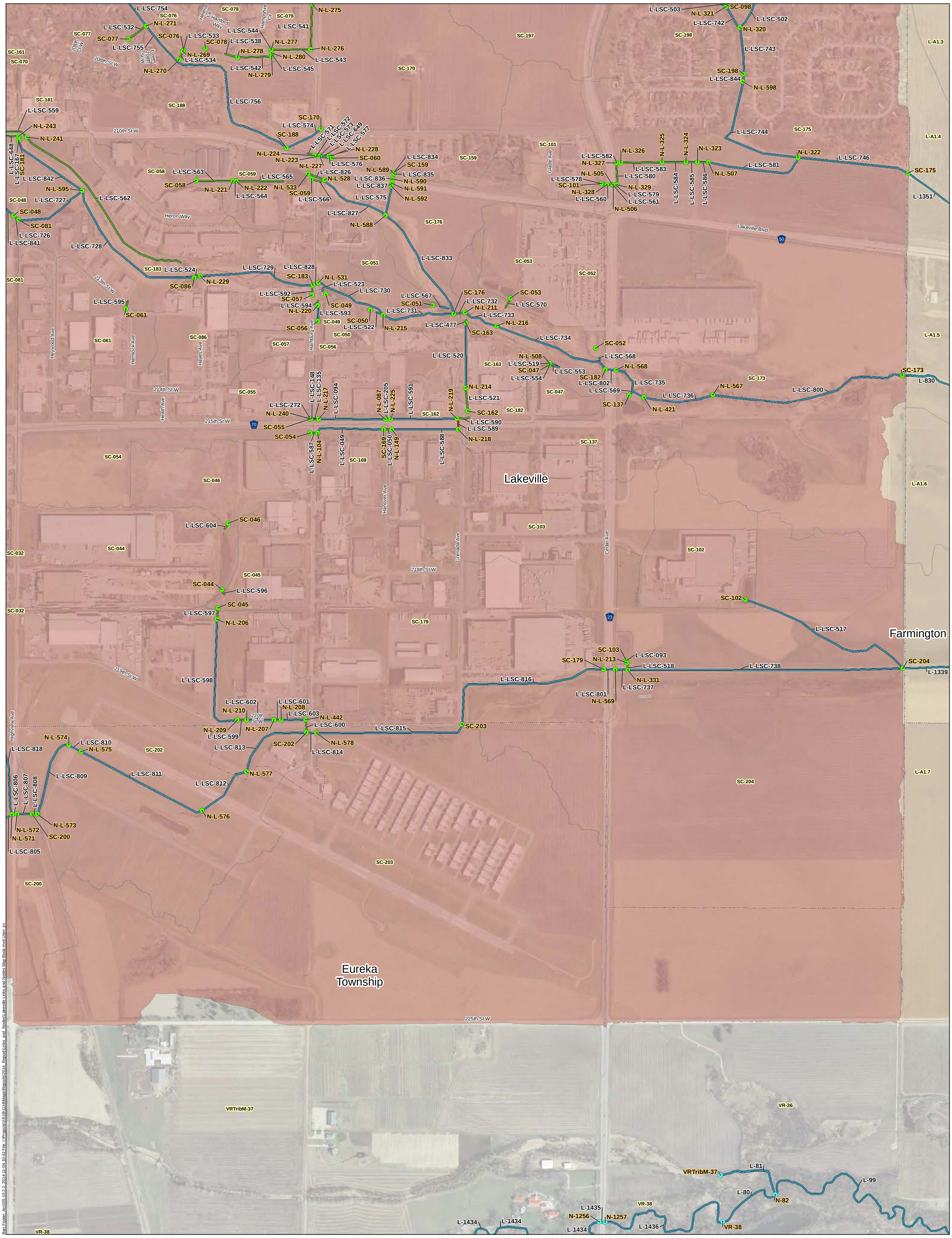
Subwatersheds
- Crystal Lake
- Marion Lake
- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

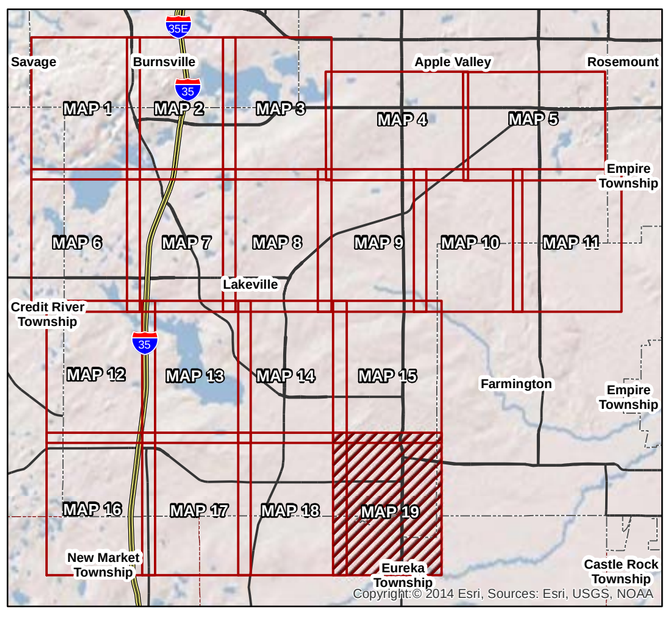
0 200 400 800
Feet

Figure B-18

XP-SWMM NODES & LINKS
City of Lakeville

Map 18 of 19





SWMM Node Data Source
- Farmington
- Lakeville
- VRWJPO
- Assumed Data

SWMM Link Data Source
- Pipe
- Natural Channel
- Assumed Pipe

- Municipal Boundaries
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- Orchard Lake
- Lakeville Middle Creek
- Lakeville North Creek
- Lakeville South Creek
- Farmington Middle Creek
- Farmington North Creek
- Farmington Other Areas
- Farmington South Creek

0 200 400 800
Feet

Figure B-19

XP-SWMM NODES & LINKS
City of Lakeville

Map 19 of 19

Barr Foster: ArcGIS 10.2.2, 2014-11-04 10:42 File: I:\Projects\23\19\11116\Maps\Reports\2014 Report\Links and Nodes\Lakeville Links and Nodes Map Book.mxd User: jrv

Appendix C

Community Flow and Volume Standards – Existing Conditions (Atlas 14)

Table C-1 Existing Conditions Standard Locations Peak Flow Rate Change

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Upstream Tributary Area (sq mi)	100 Year Peak Flow Change (cfs)[1,2]	50 Year Peak Flow Change (cfs)[1,2]	10 Year Peak Flow Change (cfs)[1,2]	2 Year Peak Flow Change (cfs)[1,2]	1 Year Peak Flow Change (cfs)[1,2]
N-1261	L-1442	County Ditch 12	New Market Twp.	Eureka Twp	12.1	156 (50%)	131 (46%)	39 (17%)	14 (9%)	20 (18%)
CD12-8	L-1448	County Ditch 12	New Market	New Market Twp.	2.4	66 (29%)	53 (25%)	20 (11%)	19 (17%)	27 (39%)
E SCreek-2[3]	L-1351	East Branch South Creek	Lakeville	Farmington	0.9	364 (104%)	285 (93%)	87 (43%)	27 (25%)	4 (5%)
MCreek-20[3]	L-1595	Middle Creek	Lakeville	Farmington	2.4	801 (111%)	596 (105%)	100 (26%)	71 (36%)	77 (59%)
MCreek-1a	L-201	Middle Creek	Farmington	Empire Twp.	11.5	897 (93%)	772 (97%)	198 (37%)	264 (140%)	199 (174%)
NBranch-2	L-1233	North Branch Vermillion River	Empire Twp.	Vermillion Twp.	6.2	796 (160%)	525 (134%)	103 (46%)	22 (25%)	22 (51%)
NCreek-2	L-1580	North Creek	Farmington	Empire Twp.	20.5	1,012 (71%)	886 (75%)	171 (22%)	202 (64%)	207 (108%)
NCreek-9[3]	L-1584	North Creek	Lakeville	Farmington	16.9	790 (66%)	743 (75%)	95 (14%)	93 (26%)	85 (32%)
SBranch-26	L-1121	South Branch Vermillion River	Eureka Twp.	Castle Rock Twp.	1.9	345 (105%)	220 (83%)	7 (4%)	-5 (-8%)	4 (10%)
SBranch-9	L-1599	South Branch Vermillion River	Castle Rock Twp.	Empire Twp.	27.1	706 (100%)	392 (62%)	174 (42%)	104 (91%)	64 (182%)
SBranch-8	L-305	South Branch Vermillion River	Empire Twp.	Vermillion Twp.	27.5	695 (98%)	405 (64%)	174 (42%)	96 (88%)	59 (168%)
SCreek-2[3]	L-830	South Creek	Lakeville	Farmington	15.5	1,451 (129%)	875 (91%)	3 (0%)	74 (19%)	19 (6%)
Trib1-20	L-1022	Tributary 1	Hampton Twp.	Vermillion Twp.	1.5	408 (99%)	272 (82%)	28 (16%)	1 (2%)	8 (15%)
Trib1-13	L-992	Tributary 1	Vermillion Twp.	Marshan Twp.	8.7	607 (163%)	391 (136%)	84 (56%)	17 (24%)	11 (23%)
Trib1-3	L-979	Tributary 1	Marshan Twp.	Hastings	19.2	787 (146%)	393 (87%)	68 (23%)	20 (14%)	33 (35%)
MCreek-3	L-202	Tributary 1 to Middle Creek	Farmington	Empire Twp.	0.8	-12 (-12%)	-32 (-36%)	-33 (-52%)	-18 (-54%)	-10 (-44%)
NCreek-25[4]	Link19	Tributary 1 to North Creek	Apple Valley	Lakeville	7.6	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
SBranch-5	L-1078	Tributary 1 to South Branch Vermillion River	Hampton	Hampton Twp.	0.5	91 (26%)	42 (14%)	-39 (-21%)	-8 (-7%)	-11 (-10%)
SBranch-3	L-1072	Tributary 1 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	2.0	447 (111%)	315 (93%)	72 (33%)	41 (41%)	43 (73%)
SCreek-11[3]	L-131	Tributary 1 to South Creek	New Market Twp.	Eureka Twp.	0.6	105 (27%)	48 (14%)	-41 (-17%)	-23 (-14%)	-17 (-14%)
SCreek-10[3]	L-1345	Tributary 1 to South Creek	Lakeville	Eureka Twp.	1.2	566 (168%)	365 (126%)	80 (43%)	41 (42%)	43 (71%)
SCreek-8[3]	L-1344	Tributary 1 to South Creek	Eureka Twp.	Lakeville	2.8	297 (153%)	242 (155%)	86 (90%)	56 (138%)	51 (252%)
SCreek-6[3]	L-1339	Tributary 1 to South Creek	Lakeville	Farmington	3.9	424 (95%)	399 (117%)	173 (82%)	132 (165%)	111 (212%)
NCreek-24[4]	L-1167	Tributary 1A to North Creek	Apple Valley	Lakeville	5.8	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Trib1-12	L-392	Tributary 1C	Vermillion Twp.	Marshan Twp.	0.5	77 (126%)	48 (99%)	3 (10%)	0 (0%)	1 (21%)
Trib1-2	L-1220	Tributary 1D	Marshan Twp.	Hastings	4.7	210 (112%)	141 (94%)	24 (27%)	2 (7%)	6 (36%)
Trib1-18	L-378	Tributary 1E	Hampton Twp.	Vermillion Twp.	0.8	199 (95%)	128 (74%)	9 (10%)	0 (-1%)	5 (24%)
CD12-12	L-1623	Tributary 2 to County Ditch 12	New Market	New Market Twp.	1.6	86 (37%)	65 (32%)	-8 (-6%)	-4 (-5%)	1 (1%)
SBranch-10	L-301	Tributary 2 to South Branch Vermillion River	Empire Twp.	Castle Rock Twp.	2.0	273 (108%)	130 (55%)	-9 (-5%)	-7 (-6%)	-5 (-4%)
N-990	L-1103	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Hampton	0.3	112 (90%)	73 (72%)	1 (2%)	0 (-1%)	1 (5%)
SBranch-14	L-294	Tributary 3 to South Branch Vermillion River	Hampton	Hampton Twp.	2.6	592 (106%)	370 (81%)	10 (3%)	-1 (-1%)	12 (13%)
SBranch-13	L-1532	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Castle Rock Twp.	4.7	1,162 (178%)	684 (121%)	104 (28%)	41 (27%)	38 (43%)
SBranch-6	L-295	Tributary 3C to South Branch Vermillion River	Hampton	Hampton Twp.	0.5	86 (36%)	49 (23%)	-22 (-15%)	-9 (-11%)	-6 (-10%)
NCreek-7[3]	L-215	Tributary 4 to North Creek	Empire Twp.	Farmington	0.8	190 (68%)	149 (70%)	20 (15%)	16 (30%)	18 (63%)
Trib6-6	L-1547	Tributary 6	Castle Rock Twp.	Empire Twp.	0.4	333 (822%)	234 (794%)	48 (191%)	9 (47%)	9 (63%)
MCreek-18[3]	L-1200	Tributary 6 to Middle Creek	Lakeville	Farmington	1.2	284 (65%)	211 (57%)	52 (21%)	35 (31%)	36 (54%)
SBranch-4	L-310	Tributary 6 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	0.3	79 (88%)	51 (69%)	2 (4%)	0 (-3%)	1 (6%)
Trib6-3	L-1675	Tributary 6A	Farmington	Empire Twp.	0.2	48 (59%)	25 (38%)	-10 (-25%)	1 (4%)	5 (42%)
MCreek-15[3]	L-1589	Tributary 6A to Middle Creek	Lakeville	Farmington	0.8	475 (134%)	409 (144%)	128 (72%)	61 (80%)	53 (119%)

Table C-1 Existing Conditions Standard Locations Peak Flow Rate Change

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Upstream Tributary Area (sq mi)	100 Year Peak Flow Change (cfs)[1,2]	50 Year Peak Flow Change (cfs)[1,2]	10 Year Peak Flow Change (cfs)[1,2]	2 Year Peak Flow Change (cfs)[1,2]	1 Year Peak Flow Change (cfs)[1,2]
TribC-10	L-340	Tributary C2	Coates	Vermillion Twp.	2.5	279 (65%)	154 (42%)	-22 (-9%)	-9 (-7%)	2 (2%)
TribC-8	L-346	Tributary C2	Rosemount	Vermillion Twp.	4.6	977 (337%)	662 (300%)	145 (106%)	58 (93%)	53 (147%)
TribC-5	L-352	Tributary C2	Vermillion Twp.	Nininger Twp.	6.3	441 (189%)	265 (136%)	103 (81%)	4 (7%)	11 (28%)
VRTribF-14	L-322	Tributary F	Vermillion Twp.	Vermillion	1.0	144 (95%)	87 (69%)	2 (3%)	-1 (-3%)	3 (19%)
VRTribG-16	L-320	Tributary G	Vermillion Twp.	Vermillion	1.9	166 (54%)	78 (29%)	-30 (-16%)	-16 (-14%)	-11 (-12%)
VRTribH-22	L-257	Tributary H	Empire Twp.	Vermillion Twp.	2.5	310 (163%)	194 (132%)	27 (29%)	10 (17%)	11 (34%)
VRTribR-47	L-1500	Tributary R	Elko	New Market Twp.	0.5	189 (720%)	104 (648%)	18 (122%)	15 (120%)	14 (126%)
VR-45	L-1495	Vermillion River	Elko	New Market Twp.	3.0	678 (202%)	295 (95%)	90 (39%)	81 (70%)	79 (104%)
VR-31	L-179	Vermillion River	Farmington	Empire Twp.	62.0	2,499 (117%)	1,800 (101%)	420 (37%)	262 (48%)	230 (68%)
N-1288	L-1473	Vermillion River	New Market Twp.	Eureka Twp	4.6	878 (195%)	350 (89%)	188 (79%)	100 (103%)	79 (132%)
VR-34	L-1413	Vermillion River	Eureka Twp.	Farmington	37.9	1,568 (164%)	1,134 (167%)	243 (77%)	46 (35%)	41 (50%)
VR-32	L-1317	Vermillion River	Farmington	Empire Twp.	61.7	2,499 (114%)	1,801 (98%)	417 (35%)	292 (52%)	243 (70%)
VR-30	L-225	Vermillion River	Empire Twp.	Farmington	95.7	3,457 (100%)	2,647 (94%)	1,048 (60%)	544 (71%)	480 (102%)
VR-29	L-1302	Vermillion River	Farmington	Empire Twp.	97.9	3,452 (99%)	2,655 (94%)	1,058 (60%)	553 (71%)	493 (103%)
VR-24	L-581	Vermillion River	Empire Twp.	Vermillion Twp.	116.4	3,517 (98%)	2,604 (90%)	938 (53%)	449 (65%)	338 (77%)
VR-17	L-319	Vermillion River	Vermillion Twp.	Vermillion	163.9	3,819 (95%)	2,846 (88%)	985 (54%)	272 (38%)	319 (70%)
VR-15	L-324	Vermillion River	Vermillion	Vermillion Twp.	166.5	3,804 (95%)	2,831 (88%)	964 (53%)	277 (39%)	287 (63%)
VR-8	L-1039	Vermillion River	Vermillion Twp.	Marshan Twp.	178.3	3,732 (98%)	2,715 (89%)	947 (58%)	257 (41%)	288 (68%)
VR-7	L-1034	Vermillion River	Marshan Twp.	Nininger Twp.	179.6	3,708 (98%)	2,708 (89%)	920 (57%)	257 (40%)	288 (68%)
VR-6	L-1031	Vermillion River	Nininger Twp.	Hastings	197.5	3,720 (97%)	2,688 (87%)	911 (56%)	256 (40%)	289 (68%)
VR-5	L-1029	Vermillion River	Nininger Twp.	Hastings	197.9	3,714 (96%)	2,688 (87%)	912 (56%)	256 (40%)	288 (68%)
VR-1	WOMP	Vermillion River	Hastings	NA	225.3	3,967 (103%)	2,366 (75%)	930 (57%)	250 (40%)	266 (61%)

[1] Calibrated flow rates are from the 4-day duration design event. Design events of smaller duration are nested within the 4-day distribution used to calculate peak flow rates.

[2] Change in flow rate calculated as (2014 Updated Atlas 14 Model - 2010 TP40 Model). Percent change calculated as (2014 Updated Atlas 14 Model - 2010 TP40 Model)/(2010 TP40 Model).

[3] Flow standard location at Lakeville municipal boundary.

[4] Apple Valley flow rates are agreed on by Apple Valley, Lakeville, and the VRWJPO. Inflows were not adjusted as part of the update.

Table C-2 Existing Conditions Standard Locations Peak Flow Rate

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Upstream Tributary Area (sq mi)	100 Year Peak Flow (cfs)[1]	50 Year Peak Flow (cfs)[1]	10 Year Peak Flow (cfs)[1]	2 Year Peak Flow (cfs)[1]	1 Year Peak Flow (cfs)[1]
N-1261	L-1442	County Ditch 12	New Market Twp.	Eureka Twp	12.1	472	416	265	161	131
CD12-8	L-1448	County Ditch 12	New Market	New Market Twp.	2.4	292	267	203	132	97
E SCreek-2 [2]	L-1351	East Branch South Creek	Lakeville	Farmington	0.9	714	590	291	138	92
MCreek-20 [2]	L-1595	Middle Creek	Lakeville	Farmington	2.4	1,522	1,166	483	270	207
MCreek-1a	L-201	Middle Creek	Farmington	Empire Twp.	11.5	1,863	1,565	733	453	314
NBranch-2	L-1233	North Branch Vermillion River	Empire Twp.	Vermillion Twp.	6.2	1,292	917	328	111	66
NCreek-2	L-1580	North Creek	Farmington	Empire Twp.	20.5	2,432	2,064	937	521	400
NCreek-9 [2]	L-1584	North Creek	Lakeville	Farmington	16.9	1,993	1,729	756	457	354
SBranch-26	L-1121	South Branch Vermillion River	Eureka Twp.	Castle Rock Twp.	1.9	673	486	168	61	39
SBranch-9	L-1599	South Branch Vermillion River	Castle Rock Twp.	Empire Twp.	27.1	1,412	1,027	585	218	100
SBranch-8	L-305	South Branch Vermillion River	Empire Twp.	Vermillion Twp.	27.5	1,402	1,040	584	206	95
SCreek-2 [2]	L-830	South Creek	Lakeville	Farmington	15.5	2,575	1,835	675	461	333
Trib1-20	L-1022	Tributary 1	Hampton Twp.	Vermillion Twp.	1.5	819	603	204	88	58
Trib1-13	L-992	Tributary 1	Vermillion Twp.	Marshan Twp.	8.7	979	678	233	87	58
Trib1-3	L-979	Tributary 1	Marshan Twp.	Hastings	19.2	1,327	845	358	164	129
MCreek-3	L-202	Tributary 1 to Middle Creek	Farmington	Empire Twp.	0.8	93	57	31	15	13
NCreek-25 [3]	Link19	Tributary 1 to North Creek	Apple Valley	Lakeville	7.6	80	80	77	55	45
SBranch-5	L-1078	Tributary 1 to South Branch Vermillion River	Hampton	Hampton Twp.	0.5	438	352	148	109	91
SBranch-3	L-1072	Tributary 1 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	2.0	850	654	289	142	102
SCreek-11 [2]	L-131	Tributary 1 to South Creek	New Market Twp.	Eureka Twp.	0.6	495	397	205	135	108
SCreek-10 [2]	L-1345	Tributary 1 to South Creek	Lakeville	Eureka Twp.	1.2	904	655	265	140	103
SCreek-8 [2]	L-1344	Tributary 1 to South Creek	Eureka Twp.	Lakeville	2.8	491	398	182	96	72
SCreek-6 [2]	L-1339	Tributary 1 to South Creek	Lakeville	Farmington	3.9	871	742	383	212	163
NCreek-24 [3]	L-1167	Tributary 1A to North Creek	Apple Valley	Lakeville	5.8	27	27	27	27	27
Trib1-12	L-392	Tributary 1C	Vermillion Twp.	Marshan Twp.	0.5	138	97	31	12	7
Trib1-2	L-1220	Tributary 1D	Marshan Twp.	Hastings	4.7	397	290	109	36	23
Trib1-18	L-378	Tributary 1E	Hampton Twp.	Vermillion Twp.	0.8	410	299	105	42	26
CD12-12	L-1623	Tributary 2 to County Ditch 12	New Market	New Market Twp.	1.6	318	267	131	85	71
SBranch-10	L-301	Tributary 2 to South Branch Vermillion River	Empire Twp.	Castle Rock Twp.	2.0	526	368	169	117	98
N-990	L-1103	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Hampton	0.3	236	174	65	27	18
SBranch-14	L-294	Tributary 3 to South Branch Vermillion River	Hampton	Hampton Twp.	2.6	1,148	825	313	144	107
SBranch-13	L-1532	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Castle Rock Twp.	4.7	1,813	1,248	471	193	127
SBranch-6	L-295	Tributary 3C to South Branch Vermillion River	Hampton	Hampton Twp.	0.5	328	259	121	74	57
NCreek-7 [2]	L-215	Tributary 4 to North Creek	Empire Twp.	Farmington	0.8	471	362	150	68	46
Trib6-6	L-1547	Tributary 6	Castle Rock Twp.	Empire Twp.	0.4	374	264	74	27	24
MCreek-18 [2]	L-1200	Tributary 6 to Middle Creek	Lakeville	Farmington	1.2	720	582	294	145	102
SBranch-4	L-310	Tributary 6 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	0.3	170	125	45	18	12
Trib6-3	L-1675	Tributary 6A	Farmington	Empire Twp.	0.2	128	91	29	20	16
MCreek-15 [2]	L-1589	Tributary 6A to Middle Creek	Lakeville	Farmington	0.8	828	693	306	138	97
TribC-10	L-340	Tributary C2	Coates	Vermillion Twp.	2.5	709	519	220	128	100
TribC-8	L-346	Tributary C2	Rosemount	Vermillion Twp.	4.6	1,266	883	282	120	90

Table C-2 Existing Conditions Standard Locations Peak Flow Rate

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Upstream Tributary Area (sq mi)	100 Year Peak Flow (cfs)[1]	50 Year Peak Flow (cfs)[1]	10 Year Peak Flow (cfs)[1]	2 Year Peak Flow (cfs)[1]	1 Year Peak Flow (cfs)[1]
TribC-5	L-352	Tributary C2	Vermillion Twp.	Nininger Twp.	6.3	674	460	232	66	50
VRTribF-14	L-322	Tributary F	Vermillion Twp.	Vermillion	1.0	297	213	74	28	17
VRTribG-16	L-320	Tributary G	Vermillion Twp.	Vermillion	1.9	472	350	161	100	77
VRTribH-22	L-257	Tributary H	Empire Twp.	Vermillion Twp.	2.5	501	341	121	66	45
VRTribR-47	L-1500	Tributary R	Elko	New Market Twp.	0.5	215	120	32	27	25
VR-45	L-1495	Vermillion River	Elko	New Market Twp.	3.0	1,014	605	325	197	155
VR-31	L-179	Vermillion River	Farmington	Empire Twp.	62.0	4,638	3,589	1,565	807	571
N-1288	L-1473	Vermillion River	New Market Twp.	Eureka Twp	4.6	1,329	745	426	197	138
VR-34	L-1413	Vermillion River	Eureka Twp.	Farmington	37.9	2,524	1,811	557	175	122
VR-32	L-1317	Vermillion River	Farmington	Empire Twp.	61.7	4,685	3,633	1,592	852	592
VR-30	L-225	Vermillion River	Empire Twp.	Farmington	95.7	6,910	5,453	2,795	1,308	950
VR-29	L-1302	Vermillion River	Farmington	Empire Twp.	97.9	6,946	5,494	2,826	1,329	972
VR-24	L-581	Vermillion River	Empire Twp.	Vermillion Twp.	116.4	7,095	5,496	2,709	1,139	779
VR-17	L-319	Vermillion River	Vermillion Twp.	Vermillion	163.9	7,826	6,069	2,819	984	776
VR-15	L-324	Vermillion River	Vermillion	Vermillion Twp.	166.5	7,802	6,041	2,780	979	741
VR-8	L-1039	Vermillion River	Vermillion Twp.	Marshan Twp.	178.3	7,529	5,768	2,588	892	711
VR-7	L-1034	Vermillion River	Marshan Twp.	Nininger Twp.	179.6	7,497	5,749	2,533	891	711
VR-6	L-1031	Vermillion River	Nininger Twp.	Hastings	197.5	7,575	5,785	2,539	893	715
VR-5	L-1029	Vermillion River	Nininger Twp.	Hastings	197.9	7,567	5,781	2,538	893	713
VR-1	WOMP	Vermillion River	Hastings	NA	225.3	7,834	5,540	2,563	884	703

[1] Calibrated flow rates are from the 4-day duration design event. Design events of smaller duration are nested within the 4-day distribution used to calculate peak flow rates.

2 Flow standard location at Lakeville municipal boundary.

[3] Apple Valley flow rates are agreed on by Apple Valley, Lakeville, and the VRWJPO. Inflows were not adjusted as part of the update.

Table C-3 Existing Conditions Standard Locations Volume Change

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Includes Apple Valley Inflows	Upstream Tributary Area (sq mi)	Baseflow (cfs)	100 Year Volume Change (ac-ft)[1,2]	50 Year Volume Change (ac-ft)[1,2]	10 Year Volume Change (ac-ft)[1,2]	2 Year Volume Change (ac-ft)[1,2]	1 Year Volume Change (ac-ft)[1,2]
N-1261	L-1442	County Ditch 12	New Market Twp.	Eureka Twp	No	12	0	904 (70%)	610 (58%)	88 (14%)	-4 (-1%)	28 (16%)
CD12-8	L-1448	County Ditch 12	New Market	New Market Twp.	No	2	0	209 (52%)	141 (42%)	18 (8%)	-3 (-2%)	11 (17%)
E SCreek-2[3]	L-1351	East Branch South Creek	Lakeville	Farmington	No	1	0	114 (76%)	83 (66%)	24 (29%)	7 (18%)	9 (38%)
MCreek-20[3]	L-1595	Middle Creek	Lakeville	Farmington	No	2	0	248 (53%)	185 (47%)	50 (19%)	22 (18%)	30 (38%)
MCreek-1a	L-201	Middle Creek	Farmington	Empire Twp.	No	11	0	1,114 (52%)	830 (47%)	252 (22%)	134 (25%)	163 (48%)
NBranch-2	L-1233	North Branch Vermillion River	Empire Twp.	Vermillion Twp.	No	6	0	469 (97%)	296 (80%)	41 (21%)	1 (1%)	7 (27%)
NCreek-2	L-1580	North Creek	Farmington	Empire Twp.	Yes	21	0	954 (10%)	730 (8%)	264 (3%)	149 (2%)	183 (3%)
NCreek-9[3]	L-1584	North Creek	Lakeville	Farmington	Yes	17	0	704 (8%)	540 (6%)	197 (2%)	68 (1%)	93 (2%)
SBranch-26	L-1121	South Branch Vermillion River	Eureka Twp.	Castle Rock Twp.	No	2	0	157 (87%)	105 (75%)	16 (21%)	0 (1%)	3 (32%)
SBranch-9	L-1599	South Branch Vermillion River	Castle Rock Twp.	Empire Twp.	No	27	0	1,995 (85%)	1,288 (71%)	172 (18%)	28 (10%)	66 (56%)
SBranch-8	L-305	South Branch Vermillion River	Empire Twp.	Vermillion Twp.	No	28	0	2,034 (85%)	1,316 (71%)	175 (18%)	28 (10%)	67 (55%)
SCreek-2[3]	L-830	South Creek	Lakeville	Farmington	No	15	0	1,298 (64%)	913 (53%)	234 (21%)	23 (4%)	62 (14%)
Trib1-20	L-1022	Tributary 1	Hampton Twp.	Vermillion Twp.	No	1	0	130 (82%)	87 (69%)	14 (19%)	0 (1%)	3 (23%)
Trib1-13	L-992	Tributary 1	Vermillion Twp.	Marshan Twp.	No	9	0	731 (89%)	475 (74%)	67 (19%)	0 (0%)	15 (24%)
Trib1-3	L-979	Tributary 1	Marshan Twp.	Hastings	No	19	0	1,241 (101%)	775 (82%)	96 (19%)	-1 (-1%)	19 (22%)
MCreek-3	L-202	Tributary 1 to Middle Creek	Farmington	Empire Twp.	No	1	0	96 (52%)	71 (45%)	26 (25%)	17 (31%)	20 (58%)
NCreek-25[4]	Link19	Tributary 1 to North Creek	Apple Valley	Empire Twp.	No	8	0	NA	NA	NA	NA	NA
SBranch-5	L-1078	Tributary 1 to South Branch Vermillion River	Hampton	Hampton Twp.	No	1	0	44 (63%)	29 (50%)	4 (11%)	0 (-3%)	2 (14%)
SBranch-3	L-1072	Tributary 1 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	No	2	0	168 (82%)	109 (67%)	17 (18%)	0 (0%)	4 (18%)
SCreek-11[3]	L-131	Tributary 1 to South Creek	New Market Twp.	Eureka Twp.	No	1	0	50 (55%)	30 (40%)	0 (-1%)	-3 (-14%)	0 (3%)
SCreek-10[3]	L-1345	Tributary 1 to South Creek	Lakeville	Eureka Twp.	No	1	0	116 (74%)	79 (61%)	15 (19%)	1 (3%)	5 (25%)
SCreek-8[3]	L-1344	Tributary 1 to South Creek	Eureka Twp.	Lakeville	No	3	0	369 (97%)	264 (86%)	78 (42%)	31 (41%)	36 (92%)
SCreek-6[3]	L-1339	Tributary 1 to South Creek	Lakeville	Farmington	No	4	0	364 (63%)	248 (52%)	43 (14%)	5 (4%)	21 (23%)
NCreek-24[4]	L-1167	Tributary 1A to North Creek	Apple Valley	Lakeville	No	6	0	NA	NA	NA	NA	NA
Trib1-12	L-392	Tributary 1C	Vermillion Twp.	Marshan Twp.	No	0	0	34 (110%)	21 (92%)	3 (26%)	0 (4%)	0 (36%)
Trib1-2	L-1220	Tributary 1D	Marshan Twp.	Hastings	No	5	0	281 (121%)	171 (100%)	22 (27%)	1 (4%)	3 (32%)
Trib1-18	L-378	Tributary 1E	Hampton Twp.	Vermillion Twp.	No	1	0	70 (85%)	47 (72%)	8 (23%)	0 (2%)	1 (28%)
CD12-12	L-1623	Tributary 2 to County Ditch 12	New Market	New Market Twp.	No	2	0	131 (47%)	89 (38%)	12 (8%)	-1 (-2%)	9 (17%)
SBranch-10	L-301	Tributary 2 to South Branch Vermillion River	Empire Twp.	Castle Rock Twp.	No	2	0	135 (95%)	83 (75%)	10 (16%)	-1 (-2%)	2 (13%)
N-990	L-1103	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Hampton	No	0	0	31 (80%)	21 (69%)	4 (20%)	0 (2%)	1 (26%)
SBranch-14	L-294	Tributary 3 to South Branch Vermillion River	Hampton	Hampton Twp.	No	3	0	220 (86%)	144 (71%)	21 (19%)	0 (0%)	5 (21%)
SBranch-13	L-1532	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Castle Rock Twp.	No	5	0	401 (87%)	263 (72%)	39 (19%)	0 (1%)	9 (22%)
SBranch-6	L-295	Tributary 3C to South Branch Vermillion River	Hampton	Hampton Twp.	No	1	0	44 (69%)	30 (57%)	4 (14%)	0 (-2%)	1 (16%)
NCreek-7[3]	L-215	Tributary 4 to North Creek	Empire Twp.	Farmington	No	1	0	2 (1%)	-2 (-2%)	-15 (-23%)	-6 (-24%)	0 (-3%)
Trib6-6	L-1547	Tributary 6	Castle Rock Twp.	Empire Twp.	No	0	0	100 (173%)	74 (156%)	26 (88%)	10 (82%)	9 (126%)
MCreek-18[3]	L-1200	Tributary 6 to Middle Creek	Lakeville	Farmington	No	1	0	109 (52%)	77 (45%)	12 (10%)	2 (5%)	7 (24%)
SBranch-4	L-310	Tributary 6 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	No	0	0	25 (82%)	16 (68%)	3 (18%)	0 (0%)	1 (22%)
Trib6-3	L-1675	Tributary 6A	Farmington	Empire Twp.	No	0	0	60 (93%)	29 (54%)	-1 (-2%)	2 (23%)	3 (55%)
MCreek-15[3]	L-1589	Tributary 6A to Middle Creek	Lakeville	Farmington	No	1	0	87 (67%)	66 (62%)	21 (30%)	10 (34%)	11 (66%)
TribC-10	L-340	Tributary C2	Coates	Vermillion Twp.	No	3	0	160 (73%)	95 (54%)	7 (7%)	-3 (-6%)	2 (7%)
TribC-8	L-346	Tributary C2	Rosemount	Vermillion Twp.	No	5	0	337 (94%)	211 (75%)	23 (14%)	-2 (-4%)	5 (11%)
TribC-5	L-352	Tributary C2	Vermillion Twp.	Nininger Twp.	No	6	0	469 (98%)	295 (79%)	43 (20%)	3 (3%)	10 (19%)
VRTribF-14	L-322	Tributary F	Vermillion Twp.	Vermillion	No	1	0	75 (103%)	48 (88%)	7 (24%)	0 (2%)	1 (29%)
VRTribG-16	L-320	Tributary G	Vermillion Twp.	Vermillion	No	2	0	128 (96%)	80 (78%)	9 (17%)	0 (-2%)	2 (15%)
VRTribH-22	L-257	Tributary H	Empire Twp.	Vermillion Twp.	No	3	0	196 (88%)	128 (74%)	20 (22%)	1 (2%)	4 (30%)
VRTribR-47	L-1500	Tributary R	Elko	New Market Twp.	No	0	0	42 (61%)	28 (49%)	4 (11%)	-1 (-3%)	1 (13%)
VR-45	L-1495	Vermillion River	Elko	New Market Twp.	No	3	0	269 (64%)	181 (52%)	24 (11%)	-4 (-4%)	8 (13%)
VR-31	L-179	Vermillion River	Farmington	Empire Twp.	No	62	10	5,305 (74%)	3,606 (62%)	397 (10%)	81 (5%)	225 (21%)

Table C-3 Existing Conditions Standard Locations Volume Change

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Includes Apple Valley Inflows	Upstream Tributary Area (sq mi)	Baseflow (cfs)	100 Year Volume Change (ac-ft)[1,2]	50 Year Volume Change (ac-ft)[1,2]	10 Year Volume Change (ac-ft)[1,2]	2 Year Volume Change (ac-ft)[1,2]	1 Year Volume Change (ac-ft)[1,2]
N-1288	L-1473	Vermillion River	New Market Twp.	Eureka Twp	No	5	0	408 (64%)	272 (52%)	34 (11%)	-5 (-4%)	12 (14%)
VR-34	L-1413	Vermillion River	Eureka Twp.	Farmington	No	38	1	2,963 (76%)	1,933 (62%)	241 (13%)	-22 (-3%)	68 (15%)
VR-32	L-1317	Vermillion River	Farmington	Empire Twp.	No	62	10	5,275 (74%)	3,584 (62%)	704 (20%)	80 (5%)	221 (21%)
VR-30	L-225	Vermillion River	Empire Twp.	Farmington	Yes	96	16	6,826 (38%)	4,765 (30%)	1,111 (9%)	322 (4%)	481 (7%)
VR-29	L-1302	Vermillion River	Farmington	Empire Twp.	Yes	98	16	6,832 (37%)	4,783 (29%)	1,109 (9%)	328 (4%)	500 (7%)
VR-24	L-581	Vermillion River	Empire Twp.	Vermillion Twp.	Yes	116	30	8,431 (40%)	5,872 (32%)	1,378 (10%)	348 (4%)	698 (10%)
VR-17	L-319	Vermillion River	Vermillion Twp.	Vermillion	Yes	164	39	11,551 (48%)	7,859 (38%)	1,657 (11%)	397 (4%)	780 (11%)
VR-15	L-324	Vermillion River	Vermillion	Vermillion Twp.	Yes	166	39	11,720 (48%)	7,966 (38%)	1,672 (11%)	400 (4%)	785 (11%)
VR-8	L-1039	Vermillion River	Vermillion Twp.	Marshan Twp.	Yes	178	58	12,086 (50%)	8,164 (39%)	1,685 (11%)	402 (4%)	755 (11%)
VR-7	L-1034	Vermillion River	Marshan Twp.	Nininger Twp.	Yes	180	58	12,154 (50%)	8,208 (40%)	1,694 (11%)	404 (4%)	757 (11%)
VR-6	L-1031	Vermillion River	Nininger Twp.	Hastings	Yes	197	58	13,154 (53%)	8,809 (41%)	1,772 (12%)	404 (4%)	770 (11%)
VR-5	L-1029	Vermillion River	Nininger Twp.	Hastings	Yes	198	58	13,186 (53%)	8,830 (41%)	1,775 (12%)	404 (4%)	771 (11%)
VR-1	WOMP	Vermillion River	Hastings	NA	Yes	225	50	15,081 (57%)	9,955 (44%)	1,872 (12%)	396 (4%)	795 (11%)

[1] Calibrated flow rates are from the 4-day duration design event. Design events of smaller duration are nested within the 4-day distribution used to calculate peak flow rates.

[2] Change in volume calculated as (2014 Updated Atlas 14 Model - 2010 TP40 Model). Percent change calculated as (2014 Updated Atlas 14 Model - 2010 TP40 Model)/(2010 TP40 Model).

[3] Flow standard location at Lakeville municipal boundary.

[4] Apple Valley flow rates are agreed on by Apple Valley, Lakeville, and the VRWJPO. Inflows were not adjusted as part of the 2011 North Creek update.

Table C-4 Existing Conditions Standard Locations Volume

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Upstream Tributary Area (sq mi)	Baseflow (cfs)	100 Year Volume (ac-ft)[1]	50 Year Volume (ac-ft)[1]	10 Year Volume (ac-ft)[1]	2 Year Volume (ac-ft)[1]	1 Year Volume (ac-ft)[1]
N-1261	L-1442	County Ditch 12	New Market Twp.	Eureka Twp	12.1	0	2,196	1,659	728	282	202
CD12-8	L-1448	County Ditch 12	New Market	New Market Twp.	2.4	0	610	476	233	103	76
E SCreek-2 [2]	L-1351	East Branch South Creek	Lakeville	Farmington	0.9	0	264	208	106	47	34
MCreek-20 [2]	L-1595	Middle Creek	Lakeville	Farmington	2.4	0	715	575	309	146	109
MCreek-1a	L-201	Middle Creek	Farmington	Empire Twp.	11.5	0	3,253	2,613	1,414	675	504
NBranch-2	L-1233	North Branch Vermillion River	Empire Twp.	Vermillion Twp.	6.2	0	949	666	236	59	33
NCreek-2	L-1580	North Creek	Farmington	Empire Twp.	20.5	0	10,777	10,144	8,928	6,644	5,756
NCreek-9 [2]	L-1584	North Creek	Lakeville	Farmington	16.9	0	9,822	9,367	8,488	6,415	5,576
SBranch-26	L-1121	South Branch Vermillion River	Eureka Twp.	Castle Rock Twp.	1.9	0	337	245	92	25	14
SBranch-9	L-1599	South Branch Vermillion River	Castle Rock Twp.	Empire Twp.	27.1	0	4,334	3,099	1,120	309	184
SBranch-8	L-305	South Branch Vermillion River	Empire Twp.	Vermillion Twp.	27.5	0	4,421	3,164	1,146	316	188
SCreek-2 [2]	L-830	South Creek	Lakeville	Farmington	15.5	0	3,337	2,630	1,349	640	493
Trib1-20	L-1022	Tributary 1	Hampton Twp.	Vermillion Twp.	1.5	0	289	213	86	27	17
Trib1-13	L-992	Tributary 1	Vermillion Twp.	Marshan Twp.	8.7	0	1,550	1,119	427	125	78
Trib1-3	L-979	Tributary 1	Marshan Twp.	Hastings	19.2	0	2,466	1,717	600	171	109
MCreek-3	L-202	Tributary 1 to Middle Creek	Farmington	Empire Twp.	0.8	0	280	228	131	70	56
NCreek-25 [3]	Link19	Tributary 1 to North Creek	Apple Valley	Empire Twp.	7.6	0	NA	NA	NA	NA	NA
SBranch-5	L-1078	Tributary 1 to South Branch Vermillion River	Hampton	Hampton Twp.	0.5	0	115	87	40	17	13
SBranch-3	L-1072	Tributary 1 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	2.0	0	372	271	110	36	23
SCreek-11 [2]	L-131	Tributary 1 to South Creek	New Market Twp.	Eureka Twp.	0.6	0	142	106	48	20	15
SCreek-10 [2]	L-1345	Tributary 1 to South Creek	Lakeville	Eureka Twp.	1.2	0	274	208	94	36	25
SCreek-8 [2]	L-1344	Tributary 1 to South Creek	Eureka Twp.	Lakeville	2.8	0	750	572	261	104	76
SCreek-6 [2]	L-1339	Tributary 1 to South Creek	Lakeville	Farmington	3.9	0	941	726	344	149	113
NCreek-24 [3]	L-1167	Tributary 1A to North Creek	Apple Valley	Lakeville	5.8	0	NA	NA	NA	NA	NA
Trib1-12	L-392	Tributary 1C	Vermillion Twp.	Marshan Twp.	0.5	0	64	44	15	3	2
Trib1-2	L-1220	Tributary 1D	Marshan Twp.	Hastings	4.7	0	515	343	103	21	11
Trib1-18	L-378	Tributary 1E	Hampton Twp.	Vermillion Twp.	0.8	0	153	111	43	11	6
CD12-12	L-1623	Tributary 2 to County Ditch 12	New Market	New Market Twp.	1.6	0	410	323	164	78	60
SBranch-10	L-301	Tributary 2 to South Branch Vermillion River	Empire Twp.	Castle Rock Twp.	2.0	0	277	193	70	23	16
N-990	L-1103	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Hampton	0.3	0	71	53	22	7	4
SBranch-14	L-294	Tributary 3 to South Branch Vermillion River	Hampton	Hampton Twp.	2.6	0	475	345	135	42	27
SBranch-13	L-1532	Tributary 3 to South Branch Vermillion River	Hampton Twp.	Castle Rock Twp.	4.7	0	866	629	245	75	47
SBranch-6	L-295	Tributary 3C to South Branch Vermillion River	Hampton	Hampton Twp.	0.5	0	109	82	36	14	9
NCreek-7 [2]	L-215	Tributary 4 to North Creek	Empire Twp.	Farmington	0.8	0	127	100	49	20	13
Trib6-6	L-1547	Tributary 6	Castle Rock Twp.	Empire Twp.	0.4	0	159	121	56	22	15
MCreek-18 [2]	L-1200	Tributary 6 to Middle Creek	Lakeville	Farmington	1.2	0	321	251	124	49	34
SBranch-4	L-310	Tributary 6 to South Branch Vermillion River	Hampton Twp.	Vermillion Twp.	0.3	0	55	41	17	5	3
Trib6-3	L-1675	Tributary 6A	Farmington	Empire Twp.	0.2	0	125	83	29	13	9
MCreek-15 [2]	L-1589	Tributary 6A to Middle Creek	Lakeville	Farmington	0.8	0	216	172	89	38	27
TribC-10	L-340	Tributary C2	Coates	Vermillion Twp.	2.5	0	379	271	111	46	36
TribC-8	L-346	Tributary C2	Rosemount	Vermillion Twp.	4.6	0	697	493	181	62	45
TribC-5	L-352	Tributary C2	Vermillion Twp.	Nininger Twp.	6.3	0	948	669	251	87	62
VRTribF-14	L-322	Tributary F	Vermillion Twp.	Vermillion	1.0	0	147	103	35	8	5
VRTribG-16	L-320	Tributary G	Vermillion Twp.	Vermillion	1.9	0	261	183	66	21	14

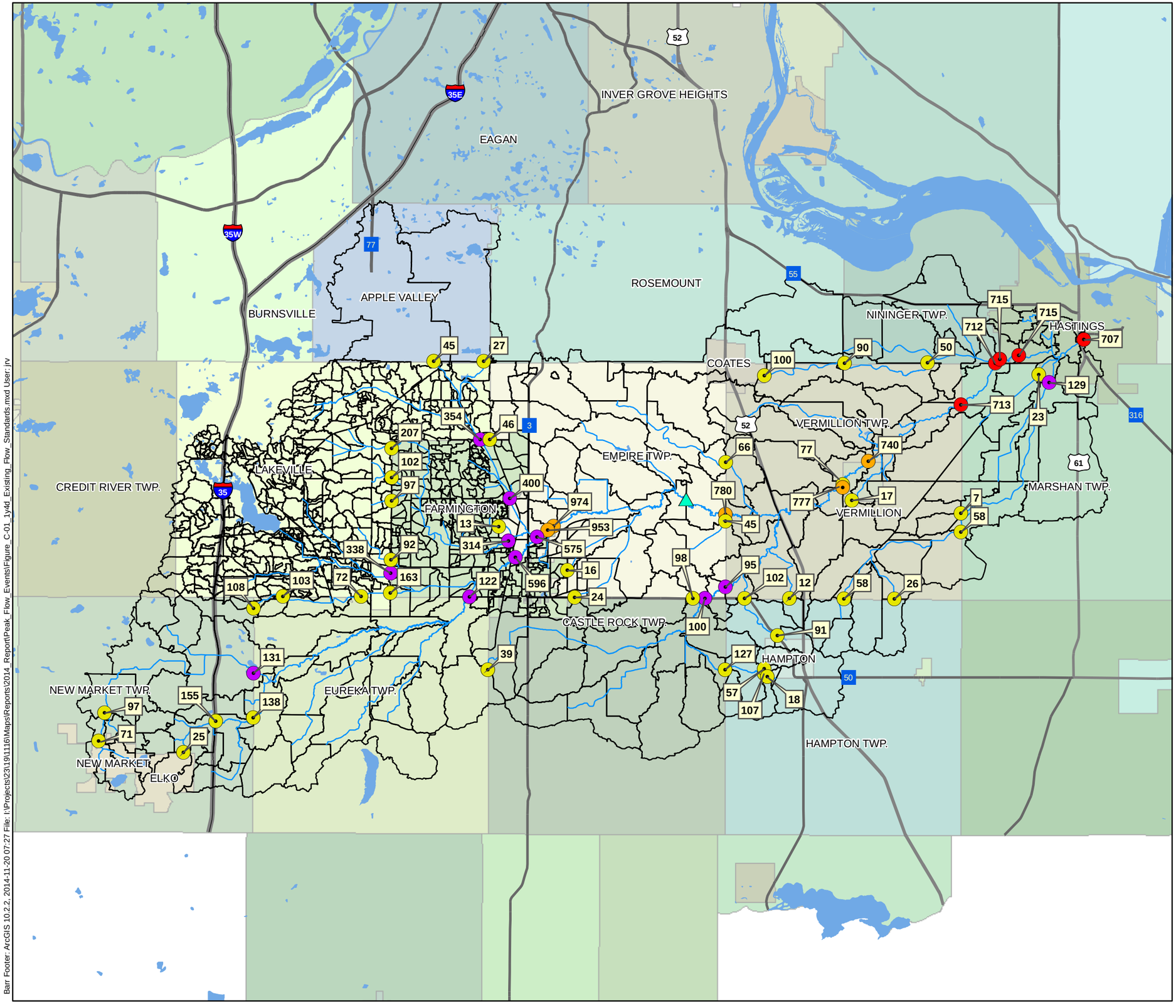
Table C-4 Existing Conditions Standard Locations Volume

XP-SWMM Node	XP-SWMM Link	Reach	Upstream Municipality	Downstream Municipality	Upstream Tributary Area (sq mi)	Baseflow (cfs)	100 Year Volume (ac-ft)[1]	50 Year Volume (ac-ft)[1]	10 Year Volume (ac-ft)[1]	2 Year Volume (ac-ft)[1]	1 Year Volume (ac-ft)[1]
VRTribH-22	L-257	Tributary H	Empire Twp.	Vermillion Twp.	2.5	0	420	301	113	30	17
VRTribR-47	L-1500	Tributary R	Elko	New Market Twp.	0.5	0	111	85	40	16	12
VR-45	L-1495	Vermillion River	Elko	New Market Twp.	3.0	0	692	530	243	98	71
VR-31	L-179	Vermillion River	Farmington	Empire Twp.	62.0	10	12,480	9,463	4,311	1,785	1,316
N-1288	L-1473	Vermillion River	New Market Twp.	Eureka Twp	4.6	0	1,044	793	358	142	102
VR-34	L-1413	Vermillion River	Eureka Twp.	Farmington	37.9	1	6,837	5,028	2,060	742	523
VR-32	L-1317	Vermillion River	Farmington	Empire Twp.	61.7	10	12,383	9,383	4,266	1,764	1,299
VR-30	L-225	Vermillion River	Empire Twp.	Farmington	95.7	16	24,754	20,740	13,751	8,640	7,231
VR-29	L-1302	Vermillion River	Farmington	Empire Twp.	97.9	16	25,293	21,215	14,035	8,793	7,356
VR-24	L-581	Vermillion River	Empire Twp.	Vermillion Twp.	116.4	30	29,356	24,267	15,400	9,276	7,655
VR-17	L-319	Vermillion River	Vermillion Twp.	Vermillion	163.9	39	35,670	28,647	16,862	9,643	7,872
VR-15	L-324	Vermillion River	Vermillion	Vermillion Twp.	166.5	39	36,001	28,879	16,944	9,669	7,890
VR-8	L-1039	Vermillion River	Vermillion Twp.	Marshan Twp.	178.3	58	36,222	28,872	16,727	9,536	7,782
VR-7	L-1034	Vermillion River	Marshan Twp.	Nininger Twp.	179.6	58	36,347	28,957	16,754	9,542	7,785
VR-6	L-1031	Vermillion River	Nininger Twp.	Hastings	197.5	58	38,200	30,195	17,153	9,664	7,875
VR-5	L-1029	Vermillion River	Nininger Twp.	Hastings	197.9	58	38,272	30,247	17,174	9,672	7,881
VR-1	WOMP	Vermillion River	Hastings	NA	225.3	50	41,745	32,592	17,939	9,945	8,088

[1] Total volume is the runoff volume generated by the design event only; base flow is not included in the total volume calculation. See the 2010 VRWJPO report (Appendix G) for further discussion of volume calculations.

2 Flow standard location at Lakeville municipal boundary.

[4] Apple Valley flow rates are agreed on by Apple Valley, Lakeville, and the VRWJPO. Inflows were not adjusted as part of the update.



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Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (784 cfs)
- SWMM Links
- Watersheds
- Lakes

Peak flow rates listed in units of cfs.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

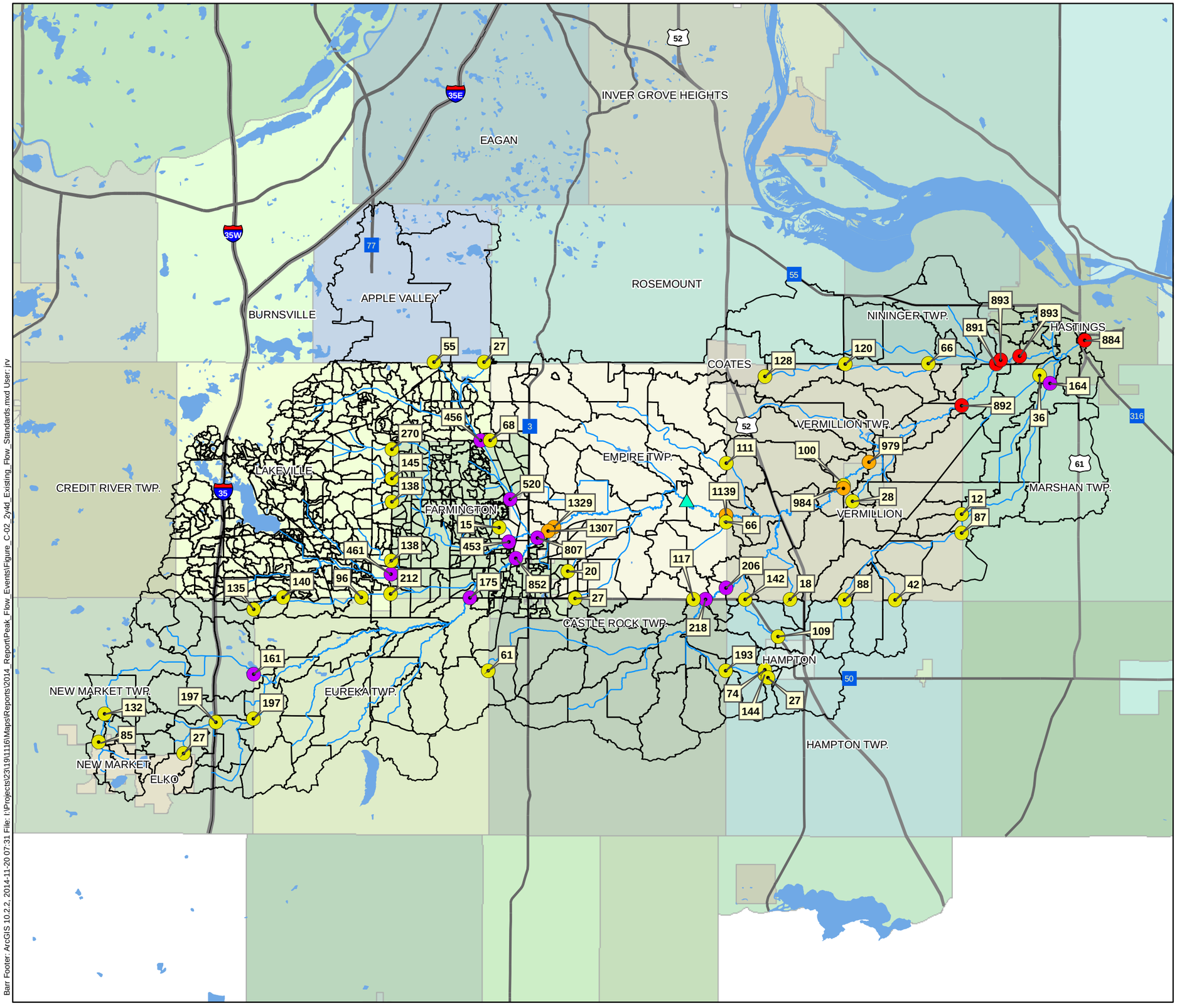
N

Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-1

COMMUNITY FLOW STANDARDS
Existing Conditions (Atlas 14)
1 Year 4 Day Peak Flow
Vermillion River Watershed



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (1,156 cfs)
- SWMM Links
- Watersheds
- Lakes

Peak flow rates listed in units of cfs.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

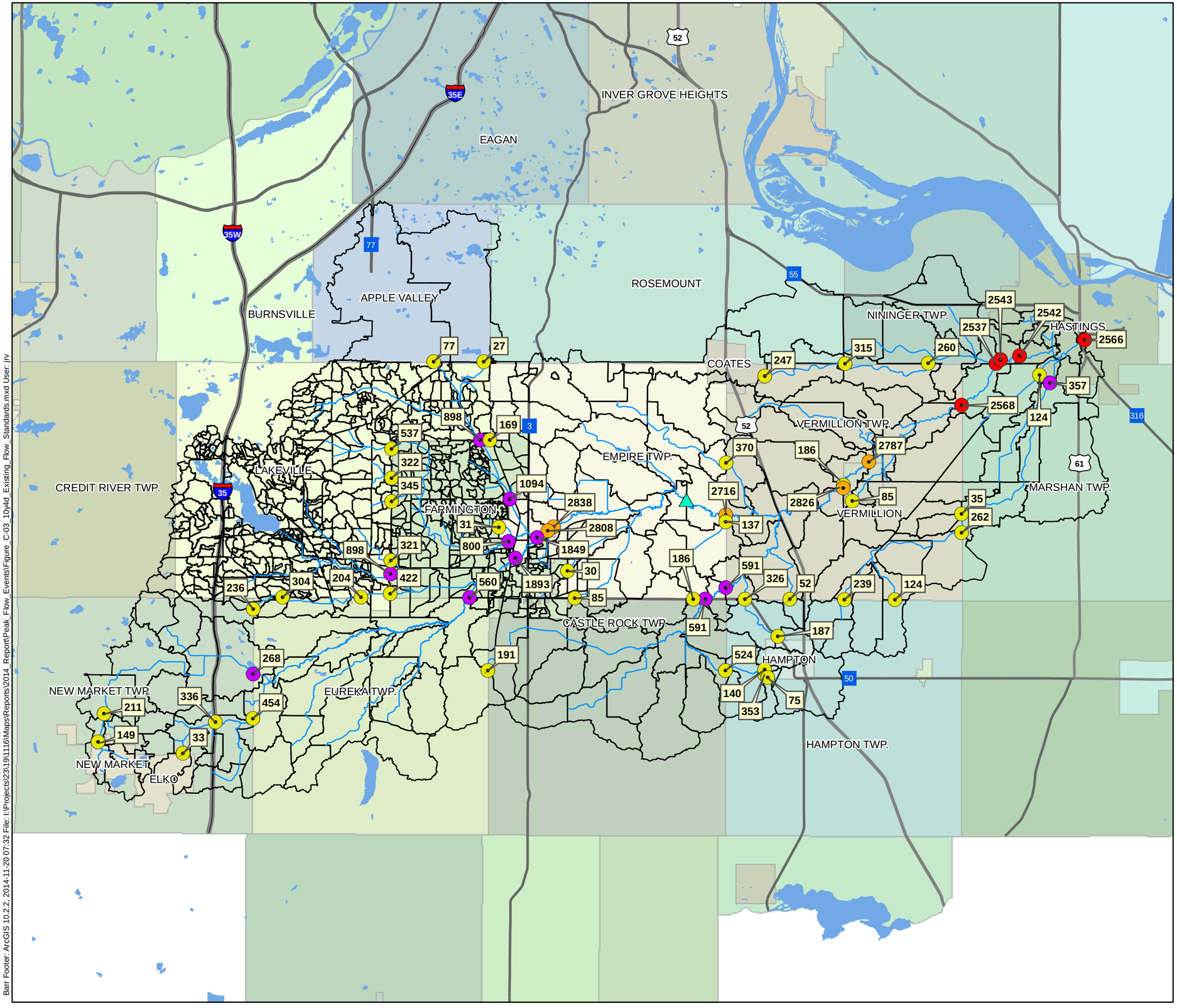
Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-2

COMMUNITY FLOW STANDARDS
Existing Conditions (Atlas 14)
2 Year 4 Day Peak Flow
Vermillion River Watershed

Barr Footer: ArcGIS 10.2.2, 2014-11-20 07:31 File: I:\Projects\23\19\116\Maps\Reports\2014_Report\Peak_Flow_Events\Figure_C-02_2yr4d_Existing_Flow_Standards.mxd User: jrv



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (2,732 cfs)
- SWMM Links
- Watersheds
- Lakes

Peak flow rates listed in units of cfs.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

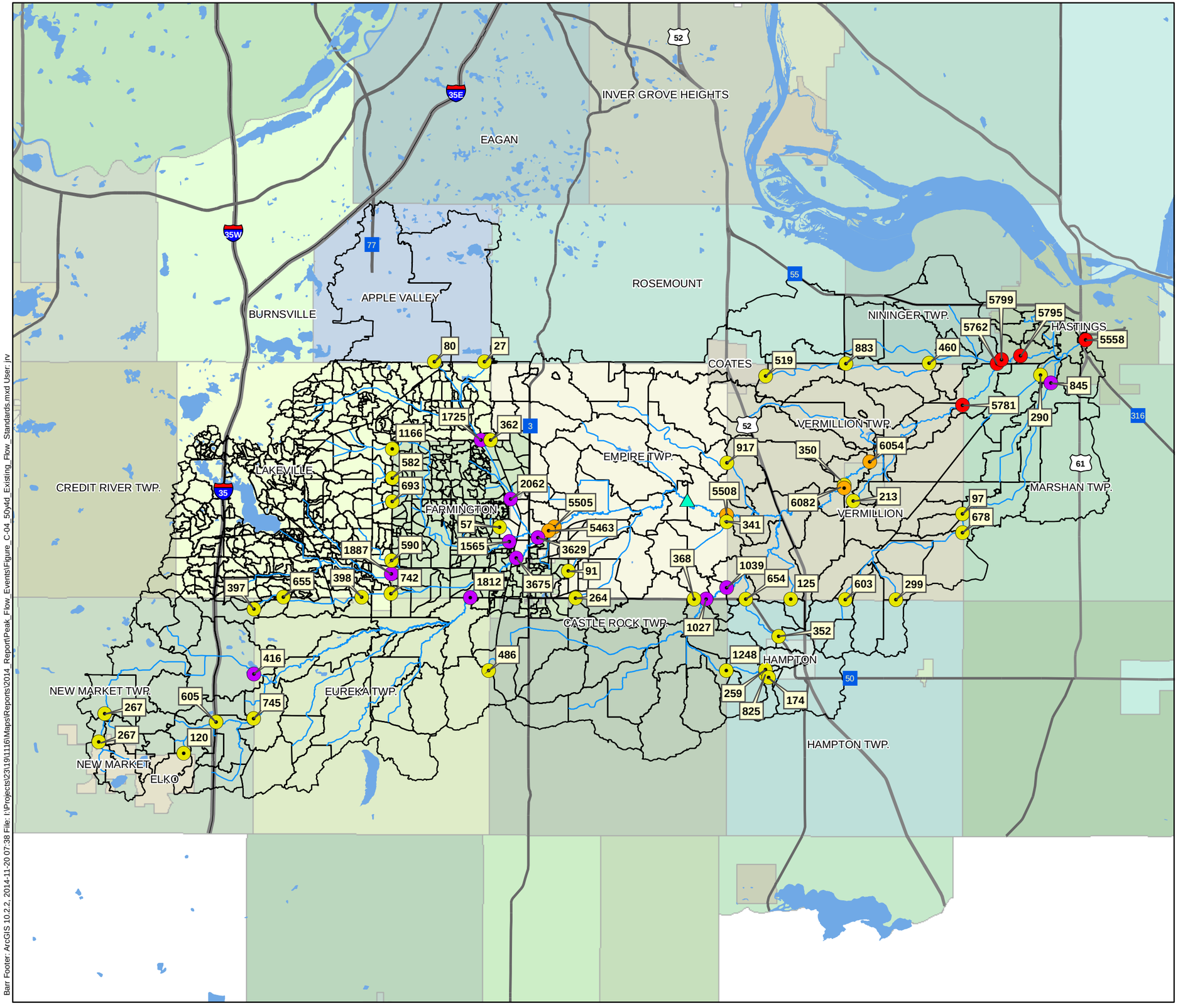
Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-3

COMMUNITY FLOW STANDARDS
Existing Conditions (Atlas 14)
10 Year 4 Day Peak Flow
Vermillion River Watershed

Barr Footer: ArcGIS 10.2.2, 2014-11-20 07:32 File: I:\Projects\23\19111\6\Maps\Reports\2014_Report\Peak_Flow_Events\Figure_C-03_10y4d_Existing_Flow_Standards.mxd User: jrv



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (5,533 cfs)
- SWMM Links
- Watersheds
- Lakes

Peak flow rates listed in units of cfs.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

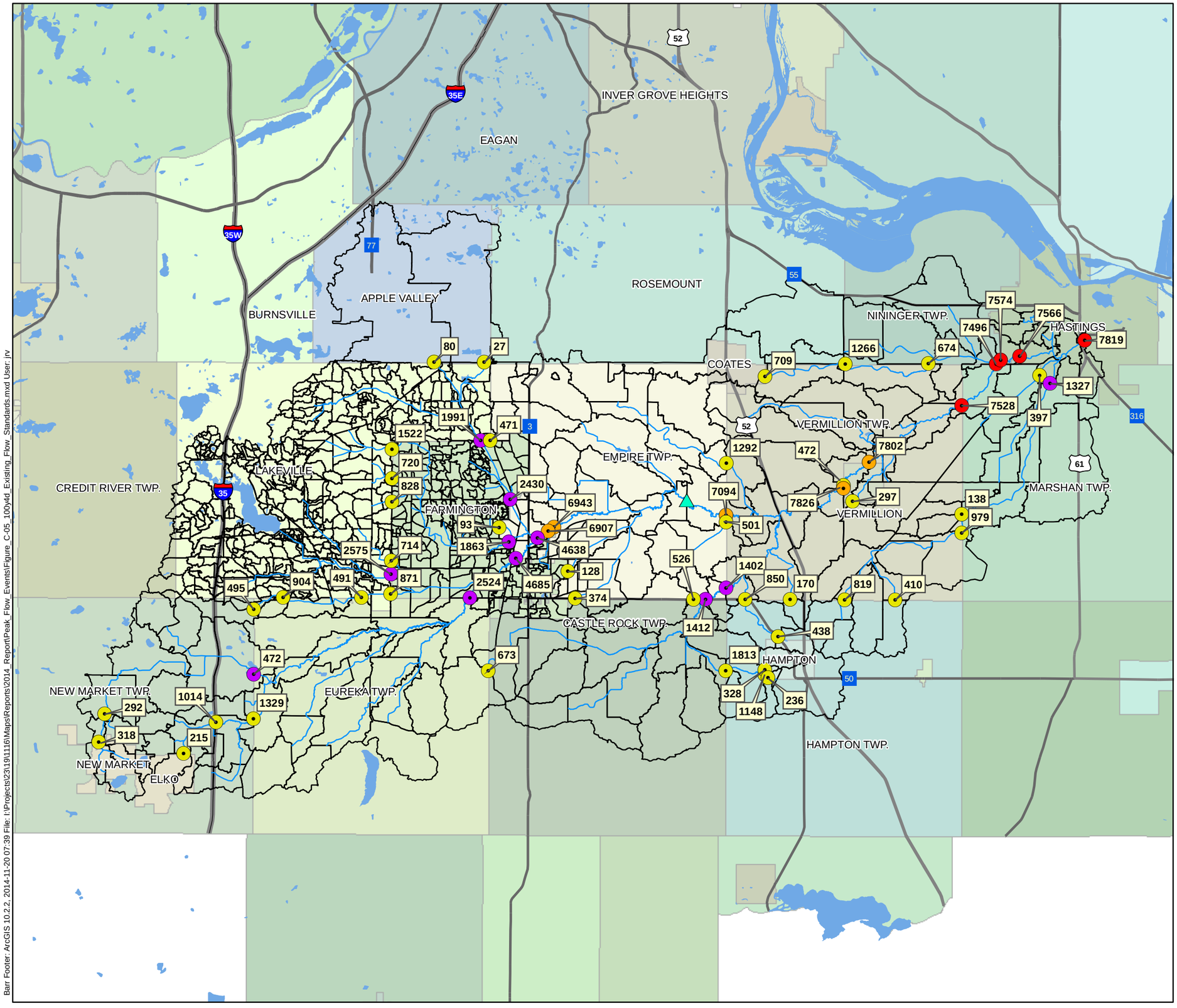
Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-4

COMMUNITY FLOW STANDARDS
Existing Conditions (Atlas 14)
50 Year 4 Day Peak Flow
Vermillion River Watershed

Barr Footer: ArcGIS 10.2.2, 2014-11-20 07:38 File: I:\Projects\23\19111\6\Maps\Reports\2014_Report\Peak_Flow_Events\Figure_C-04_50y4d_Existing_Flow_Standards.mxd User: jrv



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (7,124 cfs)
- SWMM Links
- Watersheds
- Lakes

Peak flow rates listed in units of cfs.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

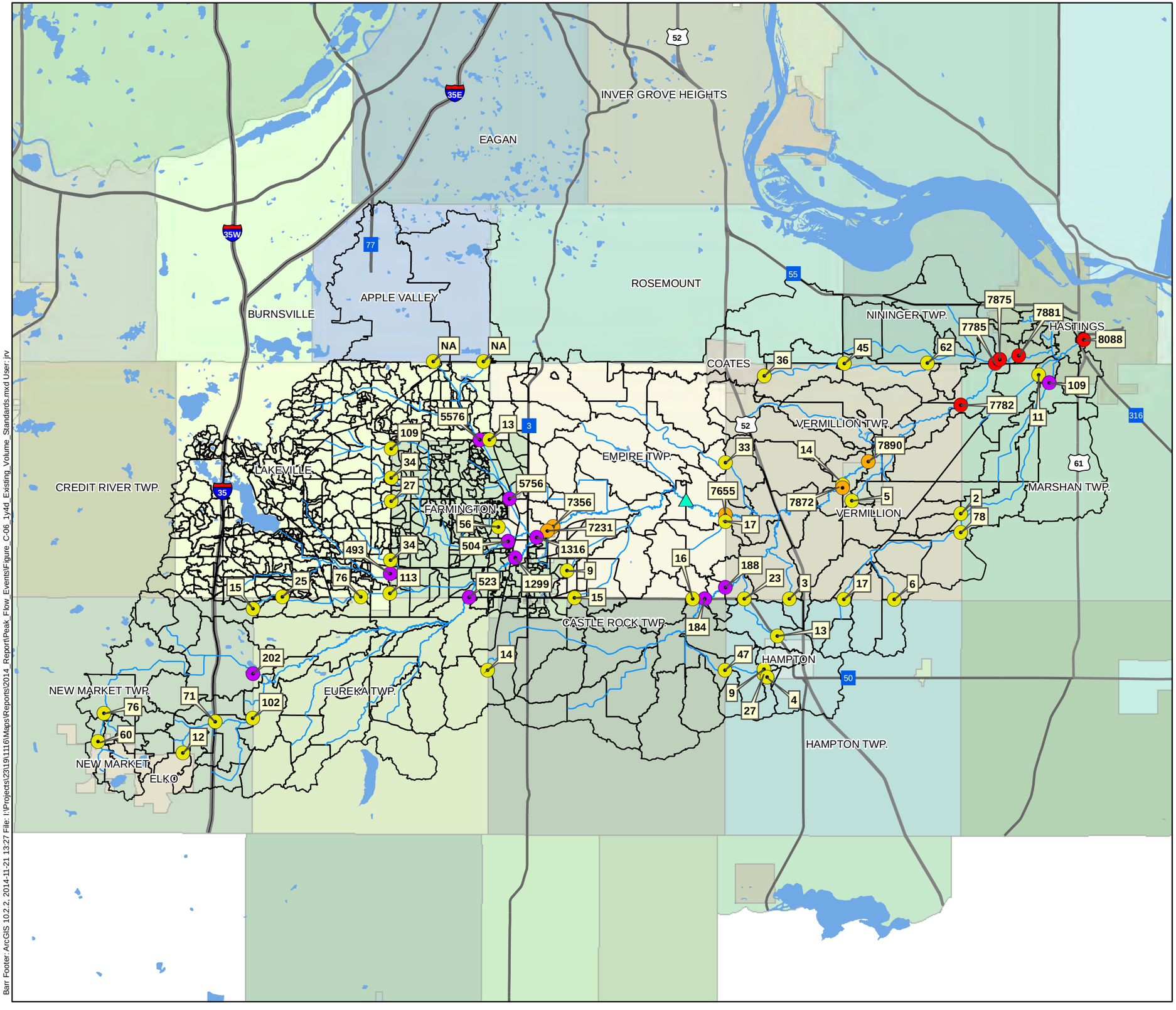
Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-5

COMMUNITY FLOW STANDARDS
Existing Conditions (Atlas 14)
100 Year 4 Day Peak Flow
Vermillion River Watershed

Barr Footer: ArcGIS 10.2.2, 2014-11-20 07:39 File: I:\Projects\23\19\116\Maps\Reports\2014_Report\Peak_Flow_Events\Figure_C-05_100y4d_Existing_Flow_Standards.mxd User: jrv



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Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (7,651 ac-ft)
- SWMM Links
- Watersheds
- Lakes

Runoff volumes listed in units of ac-ft.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

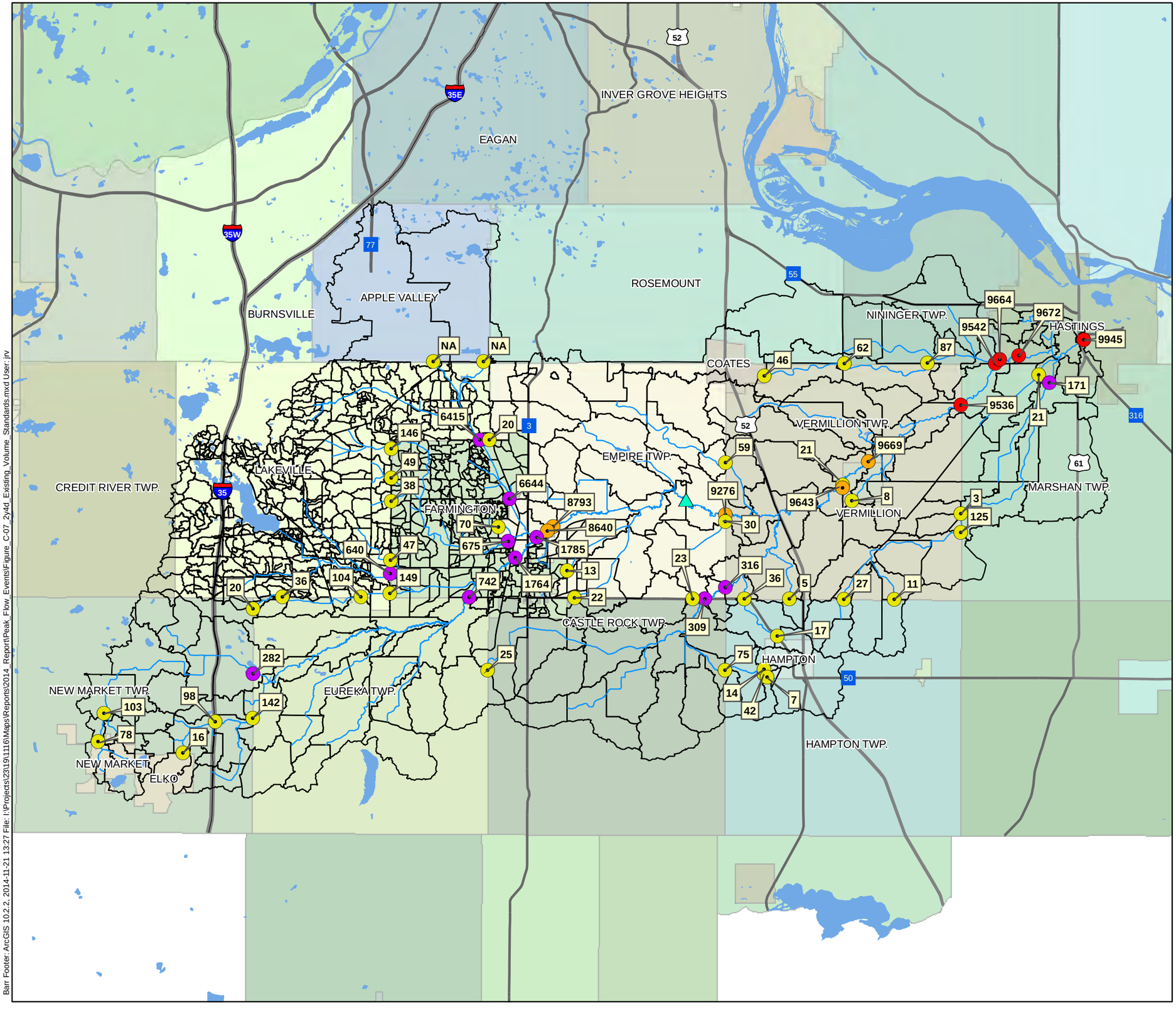
N

Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-6

COMMUNITY VOLUME STANDARDS
Existing Conditions (Atlas 14)
1 Year 4 Day Runoff Volume
Vermillion River Watershed



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (9,269 ac-ft)
- SWMM Links
- Watersheds
- Lakes

Runoff volumes listed in units of ac-ft.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

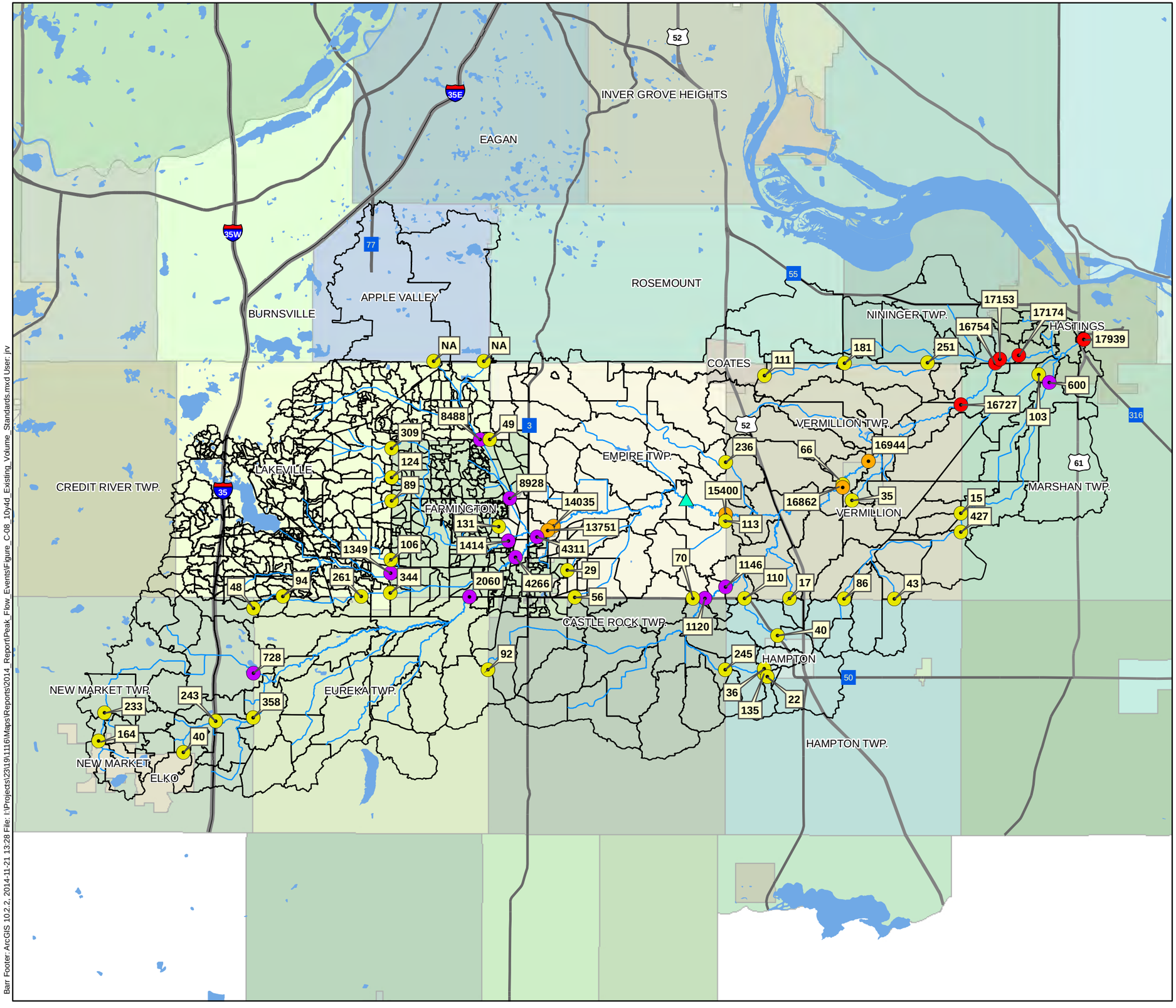
N

Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-7

COMMUNITY VOLUME STANDARDS
Existing Conditions (Atlas 14)
2 Year 4 Day Runoff Volume
Vermillion River Watershed



Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (15,370 ac-ft)
- SWMM Links
- Watersheds
- Lakes

Runoff volumes listed in units of ac-ft.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

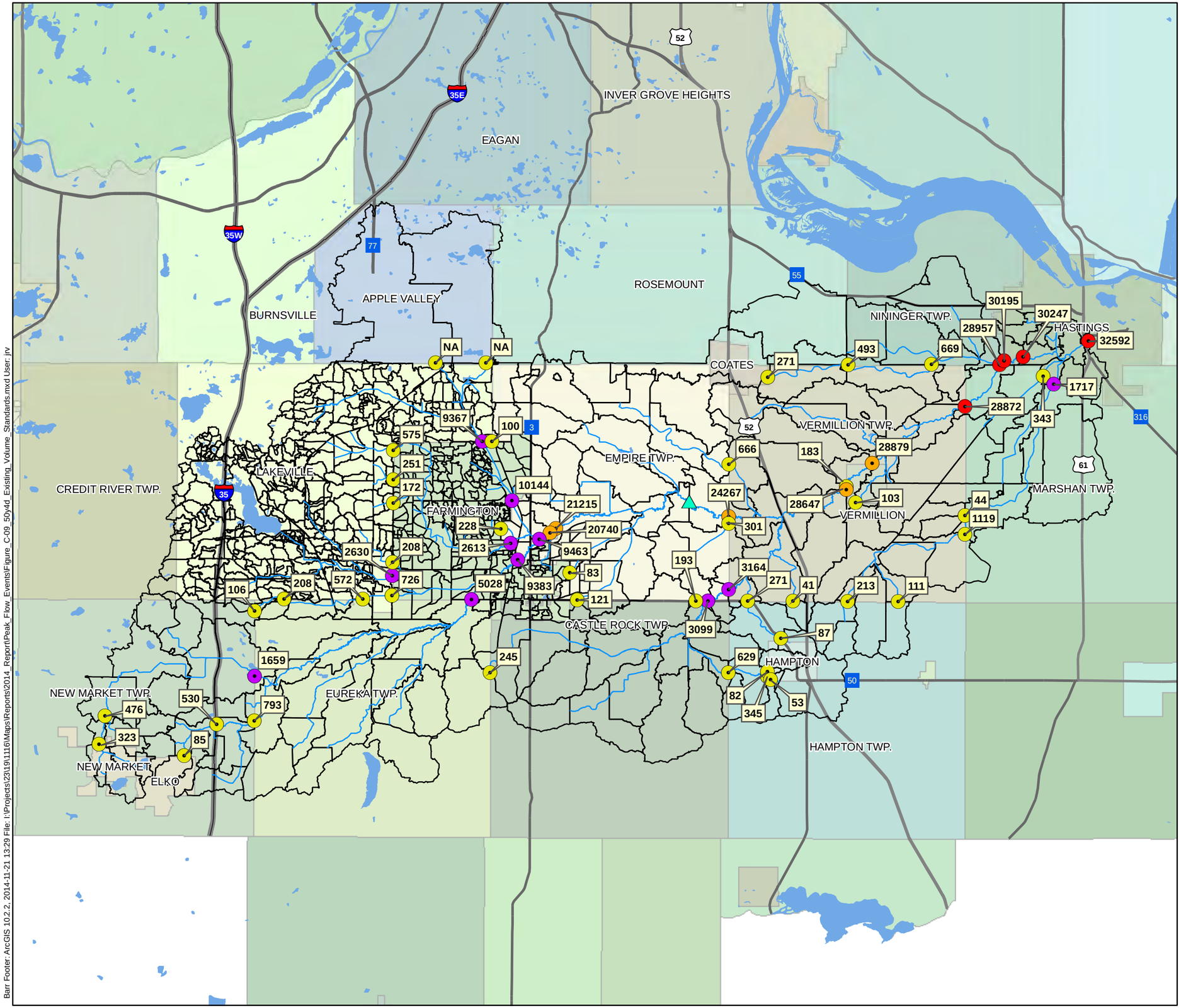
Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-8

COMMUNITY VOLUME STANDARDS
Existing Conditions (Atlas 14)
10 Year 4 Day Runoff Volume
Vermillion River Watershed

Barr Footer: ArcGIS 10.2.2, 2014-11-21 13:28 File: I:\Projects\23\19\1116\Maps\Reports\2014_Report\Peak_Flow_Events\Figure_C-08_10y4d_Existing_Volume_Standards.mxd User: jrv



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Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (24,162 ac-ft)
- SWMM Links
- Watersheds
- Lakes

Runoff volumes listed in units of ac-ft.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

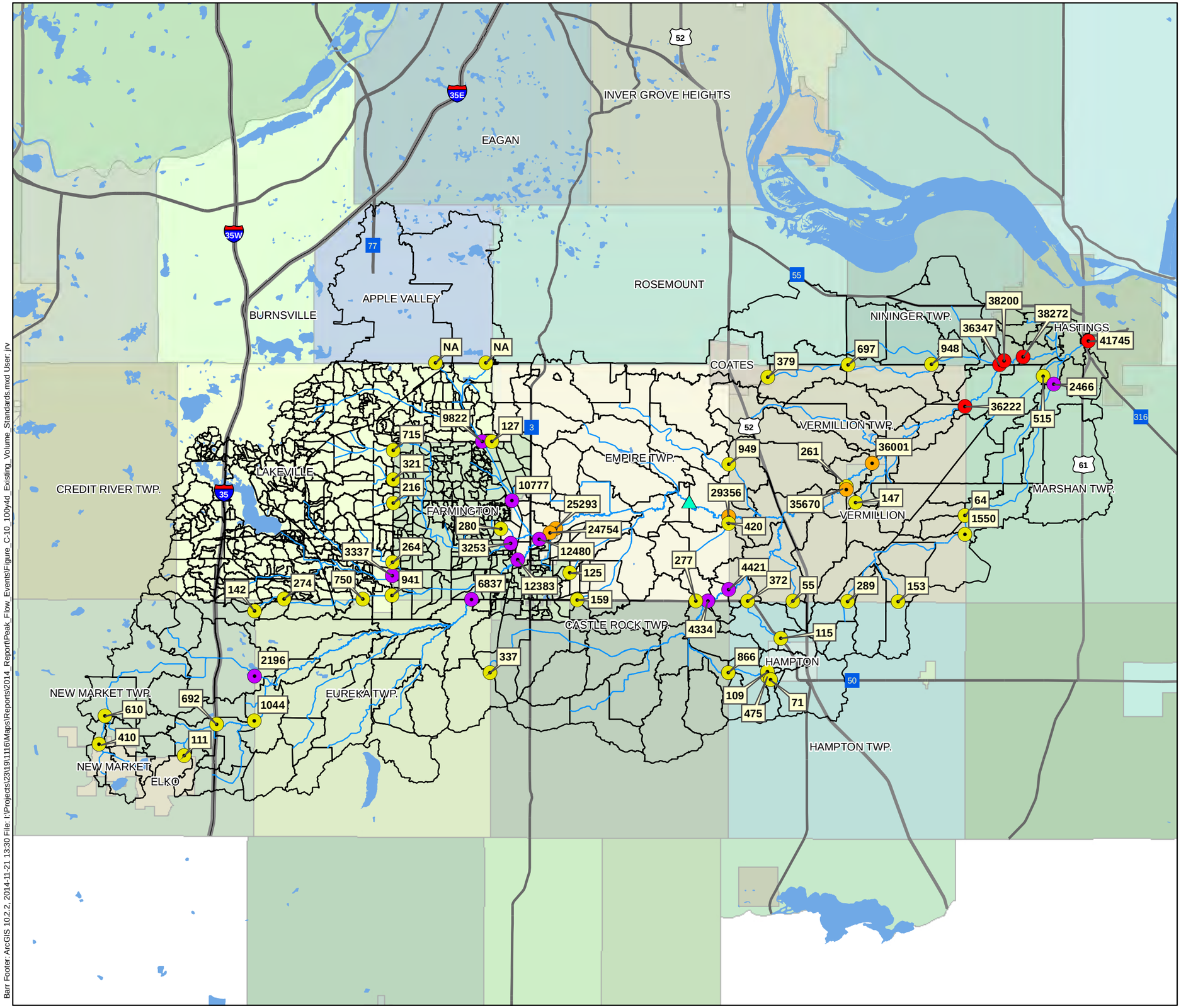
N

Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-9

COMMUNITY VOLUME STANDARDS
Existing Conditions (Atlas 14)
50 Year 4 Day Runoff Volume
Vermillion River Watershed



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Legend

Standard Locations

Tributary Drainage Area

- 0-10 square miles
- 10-67.5 square miles
- 67.5-170 square miles
- 170-225 square miles
- USGS Station (29,196 ac-ft)
- SWMM Links
- Watersheds
- Lakes

Runoff volumes listed in units of ac-ft.

Community Boundaries Source:
Metropolitan Council, Updated as of 10/17/2014.

N

Miles
1 0 1 2

Kilometers
1 0 1 2 3 4

Figure C-10

COMMUNITY VOLUME STANDARDS
Existing Conditions (Atlas 14)
100 Year 4 Day Runoff Volume
Vermillion River Watershed