



Final Report

City of Millersburg Stormwater Master Plan

January 2019



Prepared For
City of Millersburg, Oregon

January 2019





EXPIRES:06/30/2019

Executive Summary

In 2018, The City of Millersburg initiated development of a Stormwater Master Plan to provide a clear understanding of existing stormwater infrastructure, to provide an outline of stormwater projects to address both existing and future system capacity needs, and to identify improvements to protect and improve water quality. This Master Plan project includes the development of stormwater system mapping, modeling of the system to develop an understanding of the existing system and the potential impacts of future development, a list of Capital Improvement Projects (CIPs) to address existing problem areas, and a strategy for expanding the system to safely accommodate future development.

Master Plan Analysis

Development of the Master Plan involved four primary analyses to evaluate the City's existing stormwater infrastructure and programs.

Stormwater System Capacity Evaluation

Section 4 documents the development of a hydrologic and hydraulic model (H/H) model to simulate rainfall and runoff characteristics within Millersburg. The model simulates stormwater flows through pipe networks, drainage ditches, creeks, and culverts to identify areas that are over capacity. The model considers both current conditions and the impacts of future development on the stormwater flows. Stormwater infrastructure capacity concerns are presented in Table 4-8.

Reported Issue Areas

Discussion with City staff, compilation of public concerns, and comments from a public open house were used to identify problem areas within the stormwater infrastructure. The aim was to identify problems that would not be identified through hydraulic modeling, such as deteriorating pipes, frequent maintenance concerns, inadequate maintenance access, or underserved areas resulting in flooding. Problem areas are documented in Section 2.7 and in Table 4-8.

Visual Inspection

Field visits were conducted on March 13 and April 12, 2018 to evaluate and assess the existing conditions of City's stormwater infrastructure. Roughly 10% of the City's infrastructure was visually inspected at random. The City of Millersburg's stormwater infrastructure was generally observed to be in good condition, structurally sound, and with little evidence of sediment deposit in the built-out and established areas. Section 5 includes maintenance and other programmatic recommendations to help protect existing and future infrastructure.

Maintenance and Program Evaluation

The City's stormwater management program was formed around Oregon drainage law and interests of public safety. Millersburg is currently identified as a political jurisdiction in the Upper Willamette Subbasin in Chapter 10 of the Willamette River TMDL Study and has been identified in the Proposed Oregon DEQ General Permit for the National Pollutant discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) Discharge Permit for Phase II Communities. Sections 5 and 6.5 provide an evaluation of the City's current stormwater program, recommendations for enhancements to the current program, and recommendations for the City on how to meet TMDL requirements and the NPDES MS4 permit requirements.

Recommendations

The programmatic recommendation in Section 5, and CIP recommendations in Section 6 present an integrated strategy to address stormwater management concerns identified as part of the Master Plan Analysis. Recommendations include a regime of preventative maintenance activities, a list of updates and additions to the City’s stormwater design standards, and a list of recommended CIPs to address existing and future conditions flooding problems. The recommended CIP plan includes 11 specific projects, including 2 projects intended to guide City discussion with Linn County regarding capacity issues in Old Salem Road. Detailed cost estimates and conceptual designs are provided in Appendix C.

Project	Priority	Total Cost
North Tributary of Crooks Creek Improvements	High	\$ 186,000
Morningstar Estates Outfall Modification	Medium	\$ 203,725
Becker Ridge Detention Ponds Modification	Medium	\$ 17,980
Transportation System Plan Stormwater Improvements	Low	\$ 2,082,500
Woods Road Drainage Capacity Increase	Low	\$ 559,004
Old Salem Road (Linn County) Build-Out Capacity Improvements	Low	\$ 707,491
Old Salem Road (Linn County) Existing Capacity Improvements	Low	\$ 370,801
Kathryn St & Knox Butte Ave Storm Improvements	Low	\$ 217,500
Hoffman Estates Capacity Increase	Low	\$ 156,890
Umpqua Lane Detention Pipes Modification	Low	\$ 109,910
Crooks Creek Sedimentation Concerns	Low	\$ 70,000

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Acronyms and Abbreviations

CIP	Capital Improvement Project
City	The City of Millersburg
cfs	Cubic feet per second
DEQ	Oregon Department of Environmental Quality
DSL	Oregon Department of State Lands
EPA	United States Environmental Protection Agency
GIS	Geographic Information System
HDPE	High density polyethylene
H/H	Hydrologic/Hydraulic
LID	Low Impact Design
Master Plan	Stormwater master plan
MS4	Municipal Separate Storm Sewer System
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NRCS	National Resource Conservation Service
ORN	Oregon State Plane North
RCP	Reinforced concrete pipe
SWMM	Storm Water Management Model
TMDL	Total Maximum Daily Load
USGS	United States Geological Survey
WQ	Water Quality

1 Introduction

1.1 Plan Purpose

The purpose of this plan is to evaluate the current condition of the City of Millersburg's stormwater infrastructure, and develop a program to address the City's current and future stormwater needs. This plan addresses stormwater infrastructure, operation and maintenance, future growth, design standards, state permits, and long-term funding.

The City of Millersburg has experienced a great deal of growth in the past five years. Upcoming projects from statewide transportation funding mean that the City will likely continue to experience significant growth. It is critical the City plan for such growth in a way that maintains the integrity of the community. Stormwater master planning offers a mechanism to anticipate and address infrastructure and programmatic needs that coincide with the added development that accompanies growth.

The City will use this Master Plan as a tool to proactively address stormwater management with prioritized stormwater capital improvement projects (CIPs) that work in conjunction with the City's ongoing stormwater program. These projects provide an opportunity for the City to incorporate solutions to stormwater system capacity, water quality, and public safety into current planning approaches.

Programmatic recommendations included as part of this plan will also address long-term strategies to help the City maintain its stormwater system and meet the requirements of its Total Maximum Daily Load program with the Oregon Department of Environmental Quality (DEQ).

1.2 Plan Objectives

This Master Plan evaluates and addresses issues present in the City's current stormwater system in regard to conveyance capacity. Additionally, recommendations to address water quality and stream stabilization are included alongside the development of capital improvement projects. The primary goals of this Master Plan are as follows:

- > Inventory and map the City's current stormwater infrastructure
- > Develop a hydrologic and hydraulic model of the City's current stormwater system
- > Evaluate the City's current stormwater system for deficiencies at existing flow rates and future capacity issues at build out flow rates
- > Develop a set of CIPs to address current issues and guide strategy for the expansion of the City's stormwater system
- > Develop planning level cost estimates for the recommended CIPs
- > Recommend prioritization and develop a plan for implementation of the recommended CIPs
- > Provide recommendations for an ongoing maintenance and inspection program

1.3 Approach

The Master Plan approach was developed to meet the City's stormwater management objectives and increase the understanding of current stormwater infrastructure. The data collection, evaluation, and CIP strategies were conducted as follows:

1. The City's stormwater infrastructure was mapped and compiled into a geographic information system (GIS) through a combination of georeferenced as-built drawings, field survey, and field verification.

2. Collected data was used to develop the stormwater hydrologic and hydraulic model and associated model attributes such as sub-catchment drainage areas, land uses, soils, and topography.
3. City staff were interviewed to identify known drainage issue areas.
4. A public open house was held on issue areas and community input was collected.
5. Alternative projects were developed to be included in a stormwater Capital Improvement Program (CIP).
6. Working with City Staff recommended projects were selected from the alternatives and a list of CIP projects was developed for improvements to the City's stormwater system.
7. Planning level project cost estimates were prepared for each project including capital expense, engineering design, and administrative costs.
8. Projects were categorized as short-term, medium-term, or long-term targets based on priority and design considerations.
9. The Master Plan was presented at a City Council work session and adopted at a subsequent City Council meeting.

The City of Millersburg is located in close proximity to the City of Albany and has adopted many of Albany's design and construction standards. The City of Millersburg does not maintain its own GIS system, instead it utilizes City of Albany and Linn County GIS through intergovernmental agreements. In addition, the City of Albany is currently completing a stormwater master plan. Therefore, throughout this report, City of Albany and Linn County data and City of Albany standards are referenced.

1.4 Plan Organization

This Master Plan is organized as follows:

- > Section 1 serves as the Master Plan introduction and describes the plan purpose, objectives, and overall approach.
- > Section 2 describes the study area characteristics, including reported issue areas.
- > Section 3 includes a description of the GIS mapping effort of the City's current stormwater infrastructure.
- > Section 4 describes the methods, variables, and parameters used to develop the hydrologic/hydraulic model of the City's stormwater system.
- > Section 5 describes the City's current stormwater program and provides recommended programmatic changes to meet the City's goals/values.
- > Section 6 provides a summary of the CIP recommended projects and program recommendations to help the City meet its NPDES and TMDL program requirements.

2 Study Area Characteristics

2.1 Location

The City of Millersburg is located 18 miles south of Salem, Oregon, along Interstate 5. Millersburg is located in Linn County and is bounded by the Willamette River to the southwest, Interstate 5 to the east, and the City of Albany to the south.

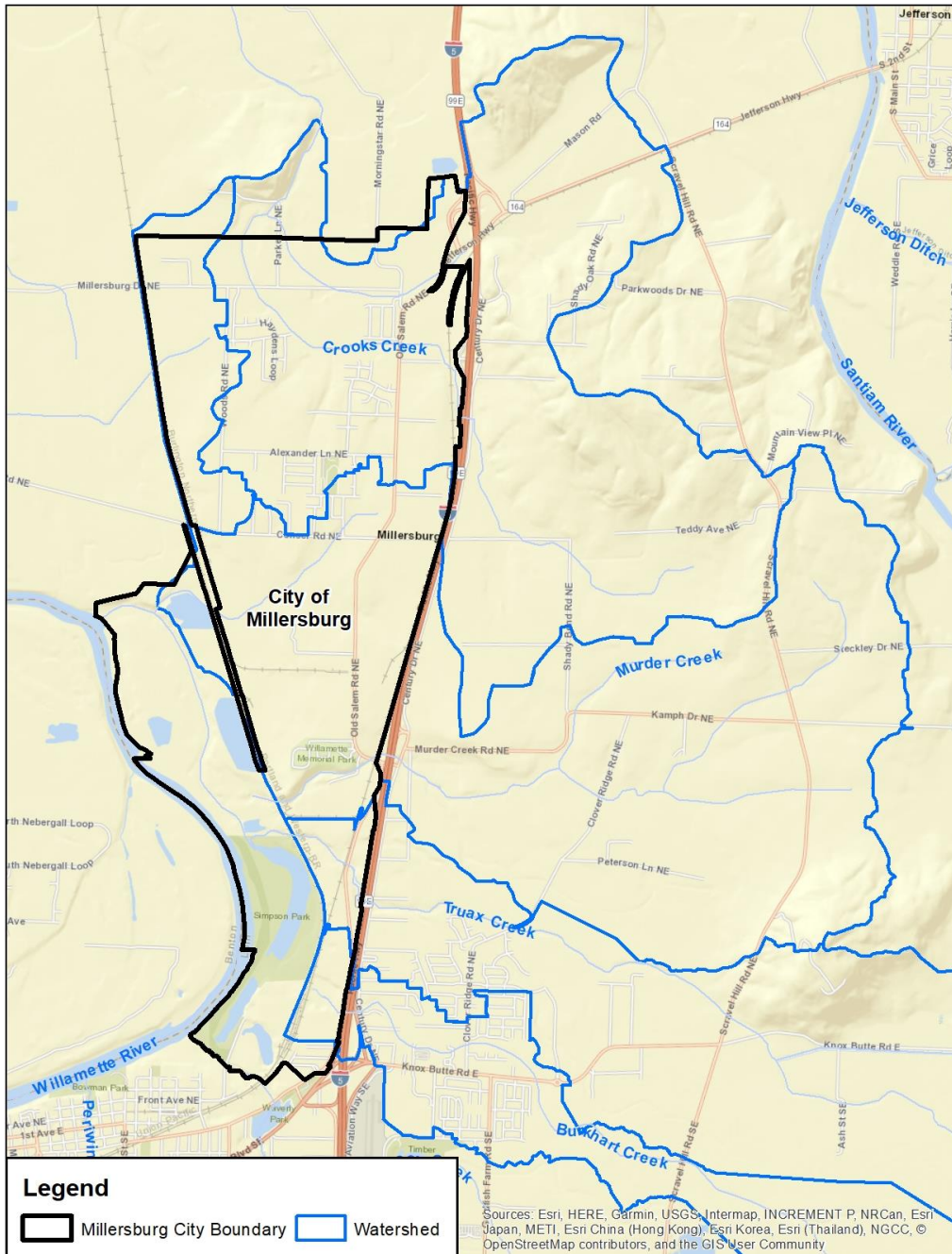


Figure 2-1 City of Millersburg Map with Watersheds

The city is approximately 4.5 square miles and is drained by Crooks Creek, Murder Creek, Burkhart Creek, Truax Creek, and Cox Creek. Burkhart and Truax Creek converge with Murder Creek within the city limits. All these creeks drain to the Willamette River at River Miles 111 for Crooks Creek, 114.5 for Murder Creek, and 117.7 for Cox Creek.

The City's drainage system is defined by three watershed regions: the Crooks Creek watershed, Murder Creek watershed, and the Wilson Lake watershed. All of these watersheds flow into the Willamette River, which is one of the Columbia River's primary tributaries.

The Crooks Creek watershed covers roughly a quarter of the City's area. This area covers a majority of the City north of Conser Road NE, and incorporates much of the City's existing residential area. The majority of the City's existing stormwater infrastructure lies within the Crooks Creek watershed.

The Wilson Lake watershed includes roughly a quarter of the City north of Conser Road NE and west of Woods Road NE. This watershed is largely undeveloped and consists of open fields draining to culverts under the Portland & Western Railway along the western City boundary. This watershed is zoned residential and has a large potential for development.

The Murder Creek watershed is the largest watershed in the City. Much of this watershed is zoned industrial, with some residential areas north and west of Conser Road NE and south of Kathryn Avenue NE. This watershed is largely developed south of Murder Creek and largely undeveloped north of Murder Creek. This watershed also includes the watersheds for Burkhart and Truax Creeks which combine with Murder Creek before discharging to the Willamette River.

2.2 Topography

Topographic information was compiled using 2016 aerial imagery, and 2010 LiDAR data on the North American Vertical Datum of 1988 (NAVD88). This was then converted to the National Geodetic Vertical Datum of 1929 (NGVD29) to align it with City and County vertical benchmarks and as-built data. This conversion was done by subtracting 3.33 feet from the NAVD88 data.

Millersburg is located within the Willamette River Valley and gently slopes from the east to the west. The highest point within the city is located at elevation 271.9 (NGVD29) and the lowest is near the Willamette River at elevation 168.6 (NGVD29). The Crooks Creek, Murder Creek (including Burkhart and Truax Creeks), and Cox Creek watersheds extend to just west of the Santiam River, with the entire Murder Creek watershed extending as far southeast as Lebanon. Outside the city, the watershed for Murder Creek extends up to an elevation of 639.9, and the watersheds for Burkhart, Truax, and Cox Creek extend up to an elevation of around 350 feet near Lebanon. The creeks within the city generally flow east to west, with the exception of Crooks Creek which flows east to north.

Within the city, slopes are gentle with slopes ranging from 0 to 25.6 percent. The average slope of Crooks Creek passing through the city from east to north is approximately 0.2 percent. Slopes upstream and outside of the city are generally steeper with maximum slopes exceeding 300%. Figure 2-2 illustrates the city and watershed topography.

2.3 Soils

Soil classification is an important characteristic to consider when evaluating runoff flow rates and volumes. Soil types within the study area were identified using data from the National Resource Conservation Service (NRCS) Soil Survey. Soil information is based upon data obtained from the NRCS Web Soil Survey which publishes information from the 1974 publication from the U.S. Department of Agriculture Soil Conservation Service titles *Soil Survey of Linn County Area, Oregon*.

Table 2-1 shows soil types, soil characteristics and distribution within the city limits.

Table 2-1 Soil Characteristics

NRCS Map Unit Name	NRCS Map Unit Symbol	Infiltration (in/hr)	Percent Coverage in City
Amity silt loam	3	0.20 - 0.57	13.6%
Awbrig silty clay loam	7	0.00 - 0.06	1.7%
Bashaw silty clay	8	0.00 - 0.06	8.0%
Clackamas gravelly silt loam	23	0.20 - 0.57	2.7%
Cloquato silt loam	25	0.57 - 1.98	0.9%
Coburg silty clay loam	26	0.20 - 0.57	6.1%
Concord silt loam	27	0.06 - 0.20	1.4%
Conser silty clay loam	28	0.06 - 0.20	0.3%
Dayton silt loam	33	0.00 - 0.06	9.1%
Fluvents-Fluvaquents complex, nearly level	39	-	3.8%
Holcomb silt loam	46	0.00 - 0.06	4.6%
Malabon silty clay loam	63	0.20 - 0.57	4.1%
Newberg fine sandy loam	73	1.98 - 5.95	5.2%
Ochrepts, very steep	74H	-	0.8%
Riverwash	85	-	6.9%
Santiam silt loam, 3 to 6 percent slopes	89B	0.06 - 0.20	2.3%
Steiwer silt loam, 3 to 12 percent slopes	95C	0.20 - 0.57	0.6%
Willamette silt loam	102	0.57 - 1.98	4.1%
Woodburn silt loam, 0 to 3 percent slopes	106A	0.06 - 0.20	16.2%
Woodburn silt loam, 3 to 12 percent slopes	106C	0.06 - 0.20	2.9%
Water	W	-	4.6%

The soils listed in Table 2-1 are illustrated within the study area in Figure 2-3.

2.4 Climate and Rainfall

The Mid-Willamette Valley experiences relatively warm, dry summers and mild wet winters. The Coast Range provides some shielding from Pacific Ocean storms. The following climate data is based on the Western Regional Climate Center historic record from 1893 to 2016 for Corvallis, Oregon (station 351862). The normal daily high temperatures range from approximately 81°F in July to 46°F in January. The normal daily low temperatures range from approximately 51°F in July to 33°F in January.

The average annual precipitation is approximately 41.1 inches with 5.9 inches of snowfall. Most of the precipitation in this area falls between the months of October and May; however, short, intense summertime storms contribute to the annual rainfalls as well.

Reference: <http://www.wrcc.dri.edu/summary/climsmor.html>

2.5 Land Use

Millersburg's 2017 population was reported by the U.S. Census Bureau to be 2,315. The city experienced a growth of 255.6% since 2010, with a growth rate of 26.2% between 2016 and 2017. Growth is likely to continue as much of the city is yet undeveloped, with an estimated build-out population of 5,147 in the year 2038 within the current urban growth boundary. Currently, land use includes a mix of residential, commercial, and industrial zones with the residential zones dominating the northern half of the city. Table 2-2 and Figure 2-5 outline the City's current land use classifications, and the coverage of each over the city.

Table 2-2 Land Use Coverage

Land Use Classification	Percent Coverage	Area Coverage, acres
Industrial	48%	1,292
Residential	36%	965
Other	10%	284
Commercial	6%	155

2.5.1 Impervious Area

In support of the City of Millersburg, the City of Albany’s GIS department measured and mapped existing (2010) impervious areas within the City of Millersburg. These include residential homes (roofs), building footprints, and paved surfaces. The mapped pavement areas include parking lots, sidewalks, and paved paths. Compacted gravel surfaces in industrial areas were also included.

Figure 2-4 shows the 2010 impervious areas.

The City of Millersburg’s land use map was used to estimate and assign impervious area percentages applicable to future development conditions for hydrologic modeling. Table 2-3 shows the future impervious percentages assigned to each zone, and Table 2-4 shows the expected increase in impervious area by basin. All vacant lands were assumed to be developed in the future condition land use scenario for modeling purposes. Areas zoned Public and Community Commercial were assumed to remain at 2010 impervious percentages into the future condition.

Table 2-3 Future Impervious Area by Land Use

Land Use Classification	Impervious Percentage
Industrial	75%
Residential	50%
Other	Site Specific
Commercial	60%

For the purposes of modeling, future built-out residential areas were assumed to have an impervious coverage of 40%. This percentage represents an average coverage based on exiting built-out lots of the same zoning, rather than 50% which is the maximum coverage allowed by City code.

Table 2-4 Impervious Increase by Study Area Basin

Study Area Basin	Existing Impervious Percentage	Future Impervious Percentage	Increase
Crooks Creek	21%	49%	27%
Murder Creek	18%	67%	49%

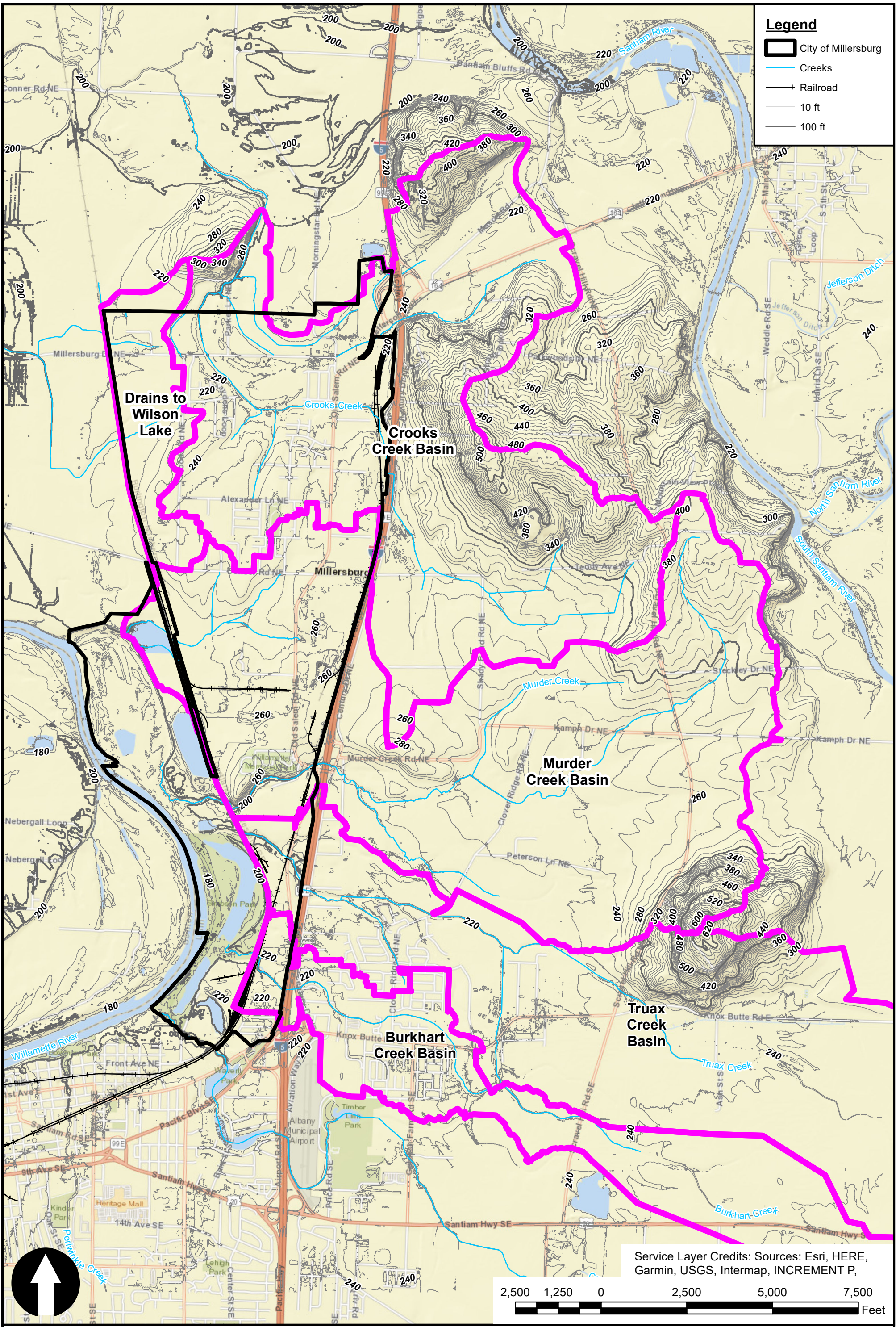
2.6 Drainage System

The City maintains approximately 9 miles of mainline pipe, 1 mile of lateral pipe, and 10 miles of open channel including creeks, natural drainage ways, and roadside ditches.

For the purpose of the modeling effort of this plan, subcatchments were delineated to capture drainage to City-owned piping and major open channel conveyance. Catch basin, roof laterals and other minor drainage structures were not included as part of this effort.

The drainage areas for Murder Creek and Crooks Creek were also delineated to capture the extent of their respective watersheds, which extend well beyond the City's limits. The Crooks Creek watershed extends east of Interstate 5 until just west of the Santiam River. The Murder Creek watershed in its entirety extends as far as Lebanon to the southeast and comingles with the Cox Creek watershed. However, the main branch of Murder Creek, as well as its tributaries Burkhart Creek and Truax Creek, were not analyzed as part of this modeling effort as no City maintained stormwater infrastructure is present in those areas. A minor tributary to Murder Creek that drains through the City just south of Conser Road NE was analyzed, and its watershed extends east of Interstate 5 and also extends to just west of the Santiam River.

Figure 2-6 illustrates the mapped pipe system on a citywide scale. More detailed mapping associated with system modeling is presented in Section 2.7 and in Appendix A.



Legend

- City of Millersburg
- Creeks
- Railroad
- 10 ft
- 100 ft

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P,
 2,500 1,250 0 2,500 5,000 7,500
 Feet

FIGURE 2-2 TOPOGRAPHIC MAP
 CITY OF MILLERSBURG STORMWATER MASTER PLAN
 MILLERSBURG, OREGON



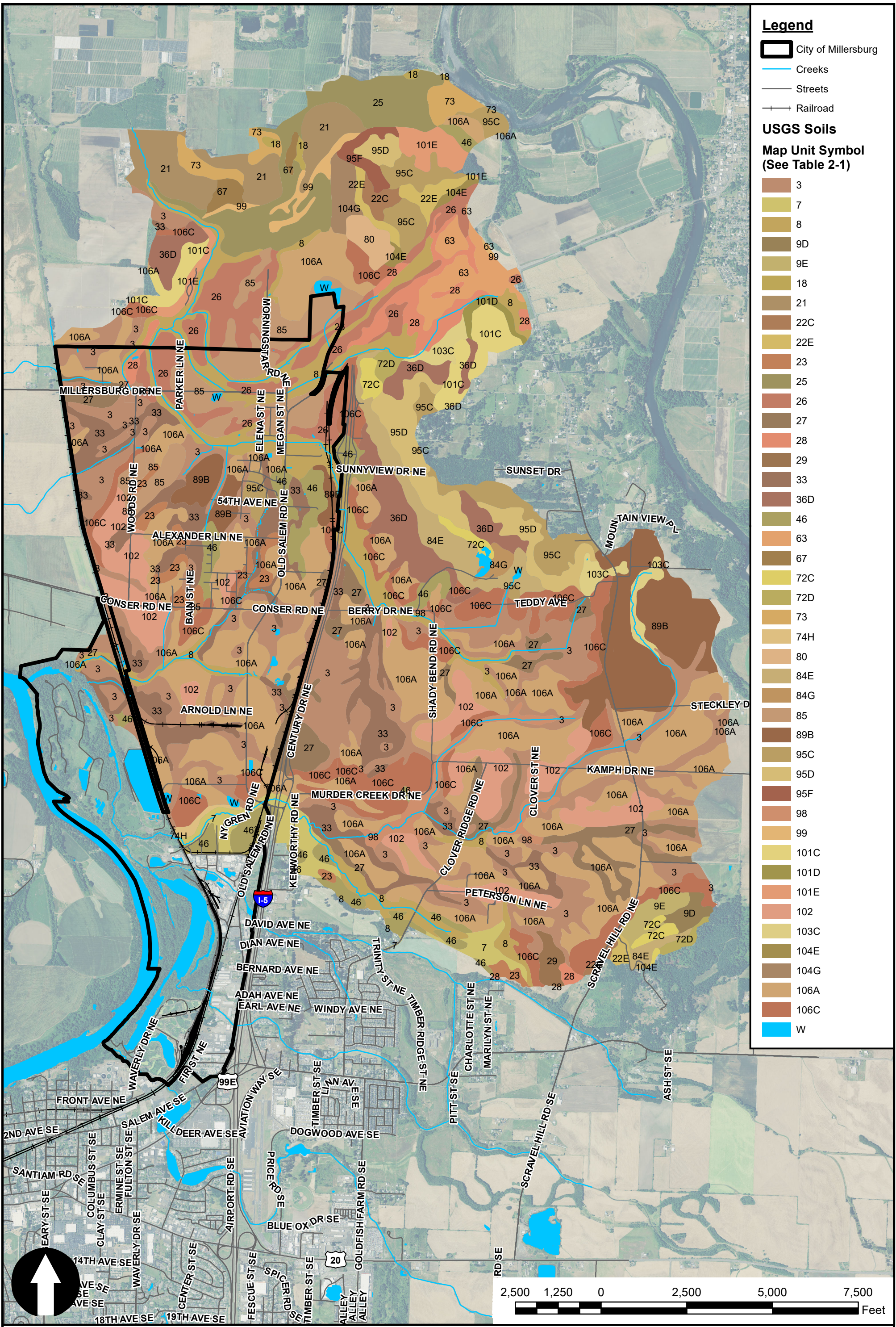


FIGURE 2-3 SOILS MAP

CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON



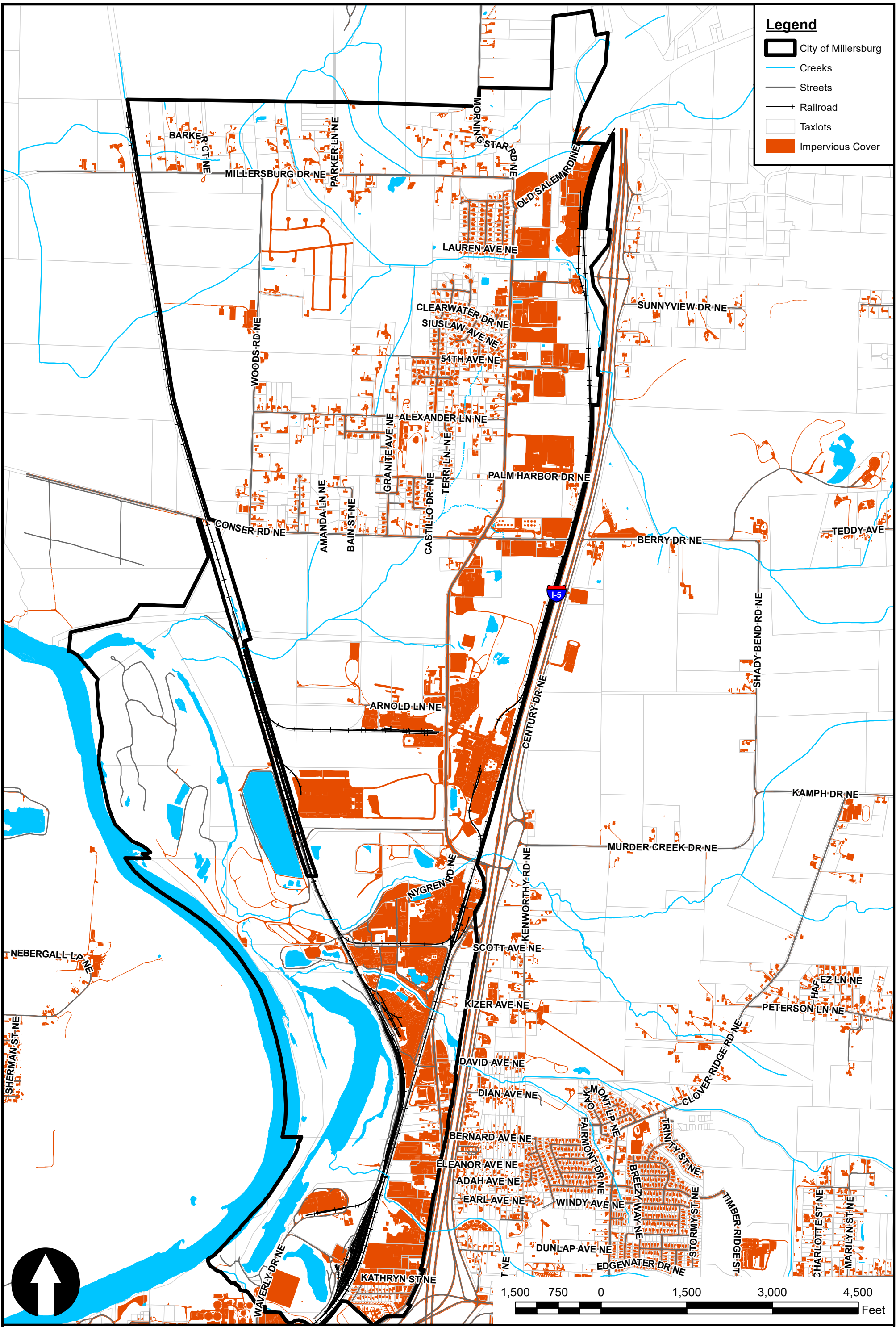


FIGURE 2-4 2010 IMPERVIOUS AREAS
 CITY OF MILLERSBURG STORMWATER MASTER PLAN
 MILLERSBURG, OREGON



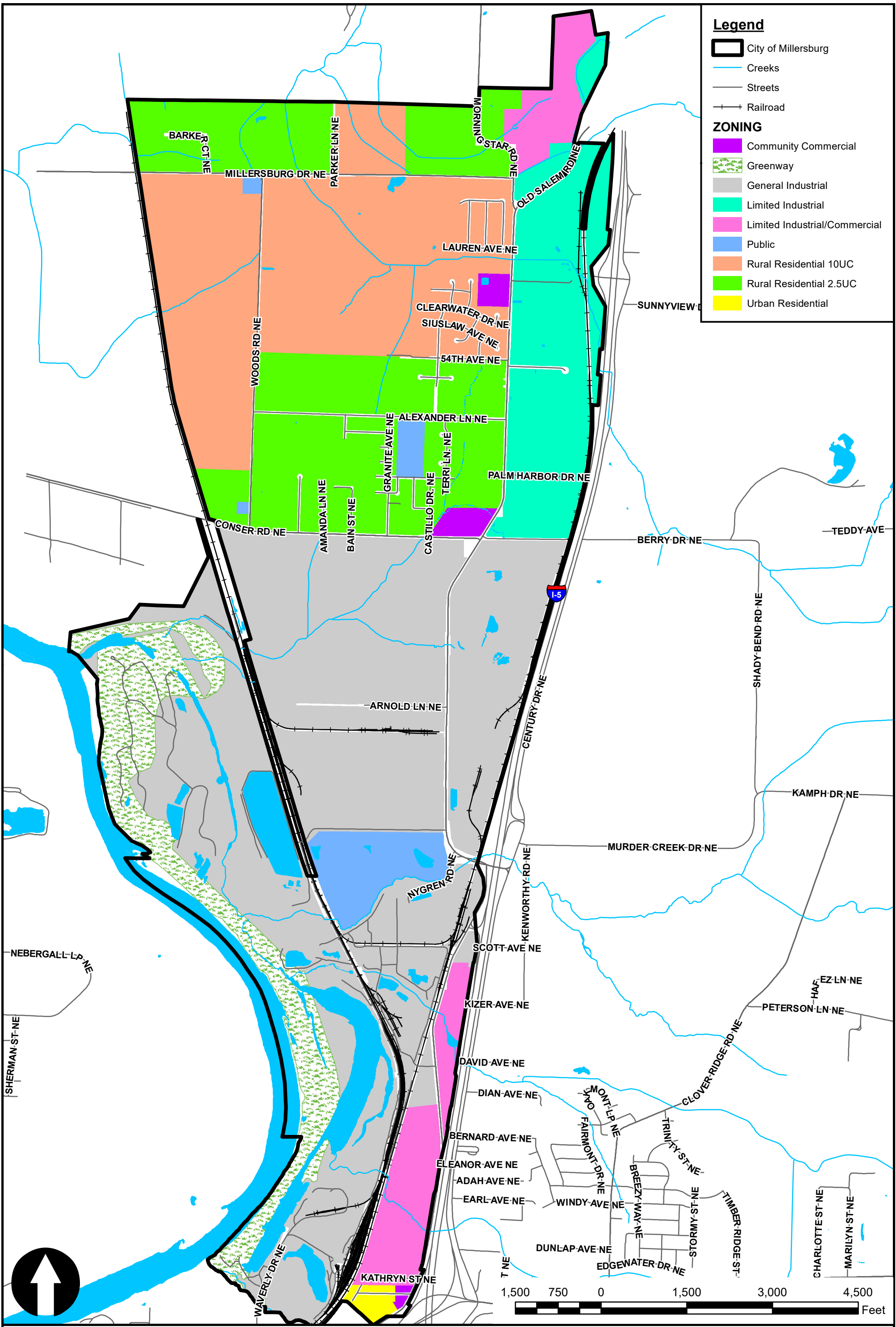


FIGURE 2-5 LAND USE

CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON



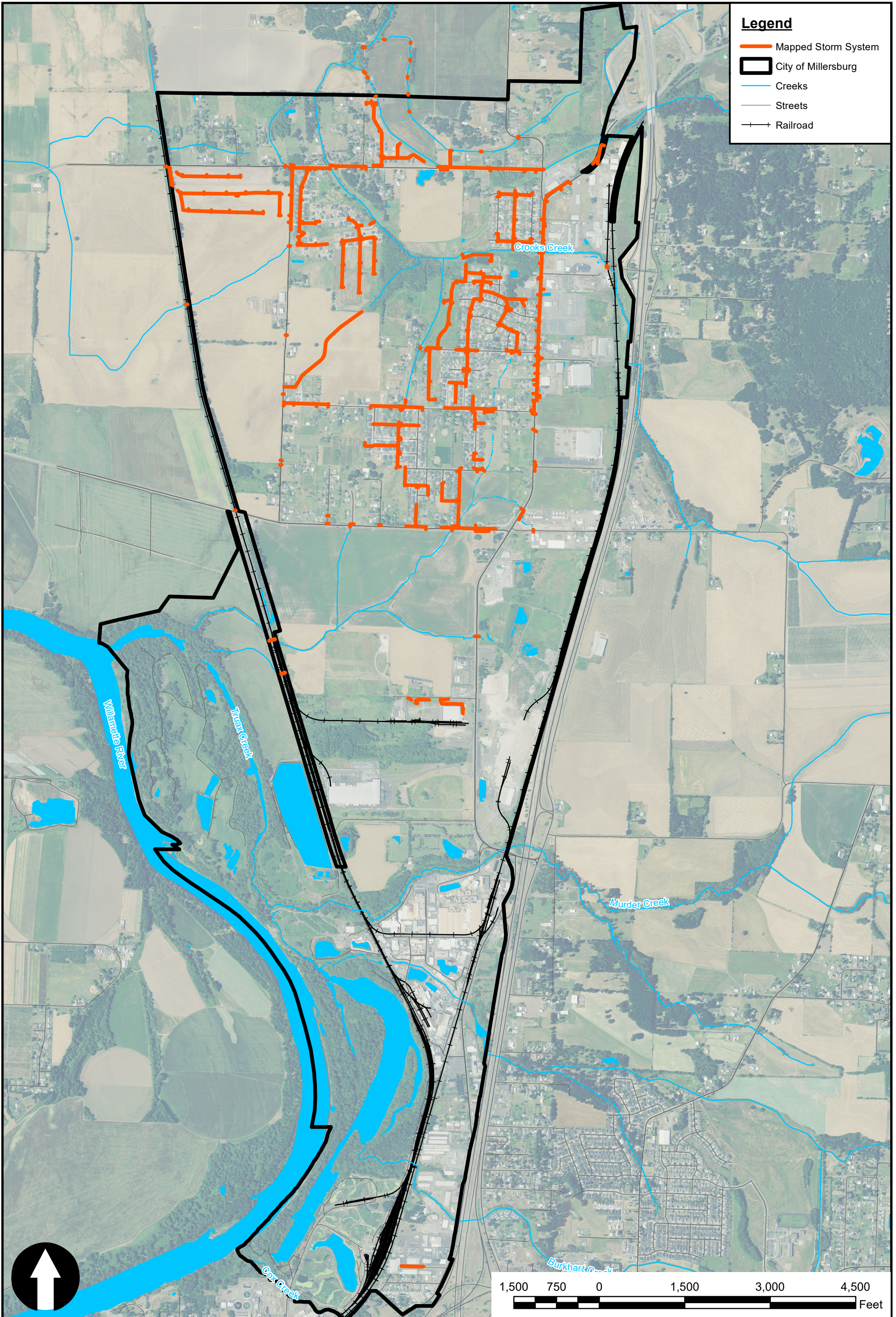


FIGURE 2-6 MAPPED DRAINAGE SYSTEM

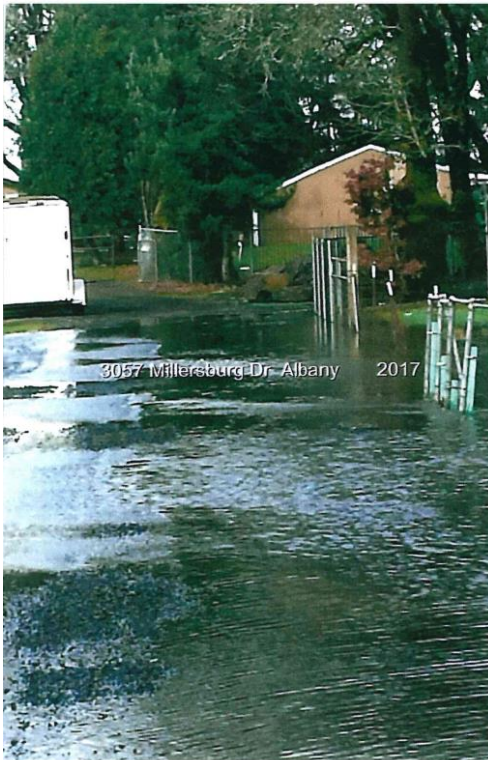
CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON

2.7 Reported Issue Areas

In addition to reviewing issue areas identified through hydrologic/hydraulic modeling, other locations of concern were identified through public comment. Reported issues were limited to a drainage way north of Millersburg Drive between Crooks Creek and Morningstar Road, and in the south end of the City along Kathryn Street and Knox Butte Avenue.

2.7.1 North Millersburg

Issues include flooding and ponding of storm water on private property along the drainage way. The photographs below show the flooding extent documented by landowners adjacent to this drainage way during a storm that occurred in February 2017. The storm in question approximated a 25-year intensity based on regional rain gauge data.



Landowners adjacent to this drainage way have expressed concern for the flooding that occurs in the area and the potential for exacerbated conditions as the City continues to grow and develop. This area was subject to extra detail and scrutiny in the analysis.

2.7.2 South Millersburg

Issues include a lack of stormwater infrastructure in Knox Butte Avenue, and stormwater infrastructure in Kathryn Street which connects to a privately owned system. There have not been many documented reports of flooding issues at those locations, and local knowledge of the underlying gravelly soils in the area may mean that stormwater is simply infiltrating rather than being discharged directly to a known waterway.

3 Mapping

3.1 Limits of Work

The GIS mapping of stormwater infrastructure was developed using as-built drawings augmented with survey data. The mapping extents were within the City right of way (ROW) with the exception of a few privately maintained culverts identified as items of interest which lie within unincorporated Linn County.

3.2 Approach

The mapping of the majority of the City of Millersburg's stormwater infrastructure was based on as-built information. Gaps in available data were identified and ground survey was conducted to supplement where needed.

Ground survey work was completed in March of 2018, and was limited to:

1. Culverts not identified on as-built documents.
2. Creek cross-sections at key locations for data verification.
3. Sanitary and Stormwater manhole rims at key location for as-built accuracy.

3.2.1 Horizontal Data

The collected data was georeferenced to the North American Datum of 1983 (NAD83) - Oregon State Plane North (ORN). As-built data was aligned and georeferenced by matching published property corners with Linn County's GIS tax lot information. When available, identified "found" property corners were used as the base points of reference for georeferenced scale, location, and rotation of the as-built data. In cases of conflict, a best fit was found and resolved between as-built property lines, GIS tax lot lines, and orthorectified aerial imagery.

3.2.2 Vertical Data

Invert, rim, and other relevant elevation data for the City of Millersburg's mapped stormwater system was based on the National Geodetic Vertical Datum of 1929 (NGVD29). This is consistent with Linn County, and City survey benchmarks available within and around the City, and all provided as-built information was based off this datum. This information was recorded in the tabular data of the ESRI shapefiles. Vertical accuracy of the as-built drawings was evaluated by comparing published rim elevations of select structures with measured, surveyed field data of the same structures. The difference between the as-built data and survey data ranged between 0 and 4 inches. As such, the provided as-built data was deemed within an acceptable range for use without correction.

3.2.3 Naming Convention

Mapped structures and pipes were named based on an arbitrary numbering of provided as-built drawings formatted such that the name is the as-built number hyphenated with an arbitrary unique 5-digit number (e.g. 05-02500 being the 250th mapped structure constructed as part of as-built development 5).

4 Stormwater System Capacity Evaluation

To identify flooding problems, two primary methods of system evaluation were utilized. First, the City's public stormwater pipe and channel system was evaluated using a hydrologic and hydraulic model to simulate the rainfall to runoff characteristics and route estimated flows through the City's conduits and channels. The stormwater system was evaluated in both the existing land use condition and full built-out development scenarios. This section provides a description of the modeling methods used for the system capacity evaluation and provides a summary of results.

The second method of system evaluation was to identify drainage capacity and other infrastructure issues through discussions with City staff, visual inspection, and public outreach. The compilation of additional problem areas is documented in Section 2.7.

4.1 Model Development

XPSWMM 2018.1 was the software chosen to model the City's storm system. XPSWMM is based on the EPA SWMM model developed in the 1970's as a comprehensive urban runoff model for continuous and event based simulation. XPSWMM was selected for its user friendly model development, report generation, and data management tools. XPSWMM's ability to import and export GIS shapefiles aided significantly in the model development.

The model of the City's storm drainage system includes City-owned stormwater pipes and major open-channel conveyances. Catch basin, roof laterals and other minor drainage structures were not included as part of this effort. System mapping completed for the model development is shown in Appendix A, which contains a key map, and 10 system maps at 1" = 250' scale.

The stormwater system model also includes channel modeling for Crooks Creek and Murder Creek as shown on Figure 2-6. Current channel information was developed from aerial Light Detection and Ranging (LiDAR) topographic information and verified with ground survey at key locations. Culvert and bridge data were incorporated from as-built data and ground survey.

Model development requires input of meteorological data, subcatchment hydrology, and surface water system hydraulic input parameters. Precipitation data, as design storms, were used to evaluate system capacity. Input parameters associated with subcatchment hydrology and surface water system hydraulics were developed through available GIS data.

4.1.1 Horizontal and Vertical Datum

The horizontal datum and vertical datum for the project are NAD83 and NGVD29 respectively. See Section 3.2.1 and Section 3.2.2 for more information.

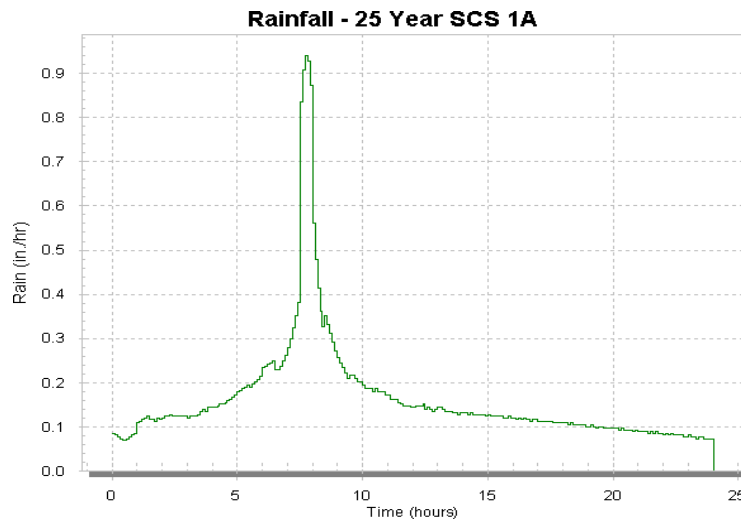
LiDAR data acquired from the State of Oregon Department of Geology and Mineral Industries (DOGAMI) was on the North American Vertical Datum of 1988 (NAVD88) and was converted to NGVD29. The conversion from NAVD88 to NGVD29 is a subtraction of 3.33 feet.

4.1.2 Design Storms

Traditional design storms are synthetic rainfall events used to evaluate the capacity of storm drainage systems and design capital improvement projects for the desired level of capacity and flood protection.

Design storms evaluated for this study included the 2-year, 10-year, 25-year, 50-year, and 100-year 24-hour duration design storms. A typical NRCS 24-hour rainfall distribution for a 25-year storm event is shown in Figure 4-1.

Figure 4-1 25 Year NRCS Type 1A Rainfall Distribution



The rainfall depths for these design storms were based on a rainfall data analysis conducted for the City of Albany’s Stormwater Master Plan in November 2011. This analysis was based on GIS data compiled for the Oregon Department of Transportation and the Federal Highway Administration. Table 4-1 lists the precipitation depths for each design storm used in the model.

Table 4-1 Design Storm Depths

24-Hour Storm Return Period <i>years</i>	Rainfall Depth <i>inches</i>
2	2.47
10	3.37
25	3.94
50	4.38
100	4.83

4.1.3 Hydrologic Data

This section includes a summary of subcatchment delineations and model input parameters used to define the hydrologic characteristics of the subcatchments. Table 4-2 identifies and describes model attributes associated with the subcatchments.

Table 4-2 Subcatchment Model Attributes

Attribute	Description
Name	The storm drain element identified as the inlet node
Area	Area of the subcatchment in acres
Width	Characteristic width of the overland flow path for sheet flow in feet
Slope	Average slope of the subcatchment in feet per foot
% Impervious	Average percent of land area that is directly connected impervious area
% Grass	Average percent of land area that is open space or grass cover
% Trees	Average percent of land area that is tree cover
Grass Infil.	Infiltration reference for grass cover
Tree Infil.	Infiltration reference for tree cover

Green-Ampt infiltration methodology was used to model runoff characteristics. XPSWMM uses an infiltration reference to calculate the infiltration for each subcatchment. This method is documented in the *EPA Storm Water Management Model Reference Manual Volume I – Hydrology (Revised)*.

The infiltration references are based on the underlying soil type and land cover type. Table 4-3 shows the reference files used in this analysis and their associated hydrology parameters. References are named based on hydrologic soil group, relative value of saturated hydraulic conductivity, and cover type. Underlying soils for the study areas are illustrated in Figure 2-3.

Table 4-3 Infiltration Reference Files

Infiltration Reference Name	Manning's 'n'		Depression Storage, inches		% Zero Detention	Saturated Hydraulic Conductivity (Ksat), in/hr	Initial Moisture Deficit	Average Capillary Suction, inches
	Impervious Area	Pervious Area	Impervious Area	Pervious Area				
B_High_Grass	0.014	0.09	0.03	0.4	50	0.55	0.33	4.27
B_Low_Grass	0.014	0.09	0.03	0.4	50	0.35	0.31	5.25
B_Low_Trees	0.014	0.12	0.03	0.4	50	0.35	0.31	5.25
C_High_Grass	0.014	0.09	0.03	0.4	50	0.3	0.31	5.58
C_High_Trees	0.014	0.12	0.03	0.4	50	0.3	0.31	5.58
C_Mid_Grass	0.014	0.09	0.03	0.4	50	0.25	0.3	5.98
C_Mid_Trees	0.014	0.12	0.03	0.4	50	0.25	0.3	5.98
C_Low_Grass	0.014	0.09	0.03	0.4	50	0.2	0.29	6.46
C_Low_Trees	0.014	0.12	0.03	0.4	50	0.2	0.29	6.46
D_High_Grass	0.014	0.09	0.03	0.4	50	0.15	0.29	7.08
D_High_Trees	0.014	0.12	0.03	0.4	50	0.15	0.29	7.08
D_Mid_Grass	0.014	0.09	0.03	0.4	50	0.05	0.25	9.47
D_Mid_Trees	0.014	0.12	0.03	0.4	50	0.05	0.25	9.47
D_Low_Grass	0.014	0.09	0.03	0.4	50	0.01	0.2	12.96
D_Low_Trees	0.014	0.12	0.03	0.4	50	0.01	0.2	12.96

For the existing conditions model, the percentage of impervious surface was estimated using the City of Millersburg's 2010 impervious surface shapefiles from City of Albany's GIS system and Millersburg's tax lot shapefiles from Linn County's GIS system. Tax lots that had been developed since 2010 were given an impervious percentage based on the average impervious percentage for similar development types. For the future conditions model, the percent impervious was assigned based on the assumed impervious percentages for each land use type from the City's zoning map (See Table 2-3).

Appendix B, Table B-1, provides model parameters and peak flows for each subcatchment and modeled design storm. Table B-2 provides model parameters and runoff volumes for each subcatchment and modeled design storm.

4.1.4 Hydraulic Data

This section describes the model input parameters used to characterize the hydraulic characteristics of the system.

System hydraulics were based on as-built data provided by the survey, LiDAR data from DOGAMI, and ground survey conducted as part of this project. Part of the ground survey effort went to validating invert and rim elevations and system geometry. Hydraulic components developed from this data included conduits and junctions. A description of the hydraulic components is provided in the following sections.

4.1.4.1 **Model Nodes**

Model nodes include stormwater manholes, catch basins, ditch inlets, and other relevant connection points or locations where a conduit change occurs. Model nodes have the attributes as listed in Table 4-4.

Table 4-4 Model Node Attributes

Attribute	Description
ID	Unique identifier
Invert Elevation	Invert elevation of the node in feet
Rim Elevation	Rim elevation of the node in feet

Appendix B, Table B-1, provides model parameters and peak flows for each modeled node.

4.1.4.2 Model Conduits

Model conduits include pipes, culverts, bridges, and open channels. Model conduits have the model attributes as shown in Table 4-5.

Table 4-5 Model Conduit Attributes

Attribute	Description
ID	GIS Unique ID (when applicable)
Length	Length between upstream and downstream nodes in feet
Roughness	Manning's Roughness Coefficient dependant on conduit material
Cross-Section	Circular, trapezoidal, rectangular, or natural
Upstream IE	Upstream invert elevation in feet
Downstream IE	Downstream invert elevation in feet
Diameter/Height	Diameter (if circular) or height of conduit section in feet
Width	Width (if rectangular) or bottom width (if rectangular) of conduit section in feet

Modeled hydraulic results for each conduit are outlined in Table B-2 in Appendix B.

4.1.4.3 Model Storage

Several in-line detention facilities were modeled as part of the Master Plan effort. These facilities were modeled based on as-built information and include a storage volume and control structure. Three types of detention facilities were modeled:

1. Detention Ponds
2. Detention Swales
3. Detention Pipes

Detention ponds are above-ground structures with flat (zero slope) bottoms. These facilities were modeled using stage-storage curves at nodes. Detention swales are above-ground structures like ponds, but have a sloped profile. These facilities were modeled using trapezoidal conduits. Detention pipes are underground facilities which include a large pipe or other structure. These facilities were modeled using a conduit of equivalent dimensions. Table 4-6 lists the modeled detention facilities and their modeled storage volume. This volume was determined for stages below the facility's overflow.

Table 4-6 Model Storage Summary

ID	Facility Type	Storage Volume, cubic feet
22-00010	Pipe	1,237
22-00050	Pipe	1,262
22-00070	Pipe	2,300
02-00070	Pipe	2,356
05-00380	Pond	38,059
03-00070	Pond	22,311
03-00200	Pond	52,171
03-00490	Pond	31,471
07-00170	Pond	34,510
10-01260	Pond	674,975
13-00180	Pond	89,769
12-00080	Pond	7,802
15-00080	Pond	54,784
Swale 1-B	Swale	436
Swale 1-A-2	Swale	37
Swale 1-A-1	Swale	340

4.1.4.4 Model Outfalls

The study area includes 3 channel model outfalls and 1 pipe model outfall. Model outfalls represent the ends of the model network and act as downstream boundary conditions. Model outfalls have the same attributes as model nodes but stage is calculated by the normal depth of flow in the upstream conduit.

4.2 Model Results

XPSWMM 2018.1 (version 19.1.57.12673) was used to simulate the 2-year, 10-year, 25-year, 50-year, and 100-year design storms for the current and future conditions.

Results of the hydrologic/hydraulic (H/H) model simulations are tabulated in Appendix B (Table B-1 for hydrologic peak flow results and Table B-2 for hydraulic results). For reporting purposes, the hydrologic results reflect all simulated design storms, and the hydraulic results tables reflect the 10-year flows, which were used to identify capacity deficiencies in most areas of the City. Hydraulic results for other storm events are available in the electronic project files.

The hydrologic results table (Table B-1) is sorted by basin and subcatchment, and includes the subcatchments name, subcatchment area, average slope, width, infiltration reference name, impervious area, and associated design flow. The hydraulics results table (Table B-2) is sorted by system basin and conduit, and includes the conduit name, upstream and downstream node ID, length, size, invert and rim elevations, capacity, and existing and future 10-year peak flows and water surface elevations.

4.2.1 Evaluation Criteria

The future and existing storm drainage network was evaluated for capacity based on flood risk. Flooding was defined as any surcharge over the rim elevation of a manhole or above the bank elevation of open channels. Areas with modeled flooding for 10-year and 25-year events were identified for CIP evaluation.

4.2.2 Model Validation

Preliminary modeling results were reviewed with City staff during a project meeting and compared to known flooding problems reported by the City's maintenance crews. Anecdotal accounts of flooding were generally consistent with the locations where flooding occurs in the modeled system. In some cases, flooding was reported due to sediment/debris build-up or other field conditions (e.g. a grading problem that prevents adequate collection of site runoff into the stormwater system) that are not reflected in the hydraulic model.

These problems were documented for CIP development, but did not require a change in the hydraulic model.

Discussions with City staff led to several minor adjustments to the modeled drainage system. Most notably, flooding issues reported north of Millersburg Drive between Morningstar Road and Crooks Creek resulted in additional ground survey being conducted. This additional data was used to better model that area.

Due to the size of the upstream hydrology, modeled flows were compared to USGS regression equations for equivalent storm events. These equations were developed by the USGS in cooperation with the Oregon Water Resources Department to estimate peak flows for rural, unregulated streams in western Oregon. The study details for these equations can be found in the USGS *Scientific Investigations Report 2005-5116* by Richard M. Cooper. Table 4-7 outlines the modeled peak flow rates of the two largest upstream basins for the design storm events and compares them to the USGS regression equations.

Table 4-7 USGS Regression Flow Comparison

Design Storm	Modeled Peak Flow, cfs	Estimated Peak Flow, cfs	Delta
Basin CC-N-00-035			
10-Year	33.30	33.11	0.6%
25-Year	40.02	42.18	-5.1%
50-Year	45.28	49.23	-8.0%
100-Year	51.05	56.46	-9.6%
Basin CC-N-02-009			
10-Year	14.64	13.90	5.3%
25-Year	17.63	17.81	-1.0%
50-Year	20.45	20.88	-2.1%
100-Year	23.99	24.06	-0.3%

Peak flows remain within 10 percent of the regression flows with a minimum of 0.3 percent difference depending on design storm. According to USGS Scientific Investigations Report 2005-5116 *Estimation of Peak Discharges for Rural, Unregulated Streams in Western Oregon*, this places the modeled hydrology within a reasonable range for the purposes of this analysis.

4.2.3 Flooding Issues Identified in Modeling

Based on the hydraulic model results summarized in Table B-2, conduits experiencing backwater conditions that resulted in flooding of the upstream structure were identified. Figure 4-2 and Figure 4-3 illustrate predicted flooding for existing and future land use conditions.

4.3 Identified Capacity Issues

The model results were reviewed with City staff and presented at a public open house on June 23, 2018. City staff provided comment and discussion about each identified modeled flooding area. Comment and discussion was also provided by residents during the open house. Table 4-8 summarizes the identified existing and future deficiencies, including reported issues identified in Section 2.7 and flooding issues identified as part of the modeling effort.

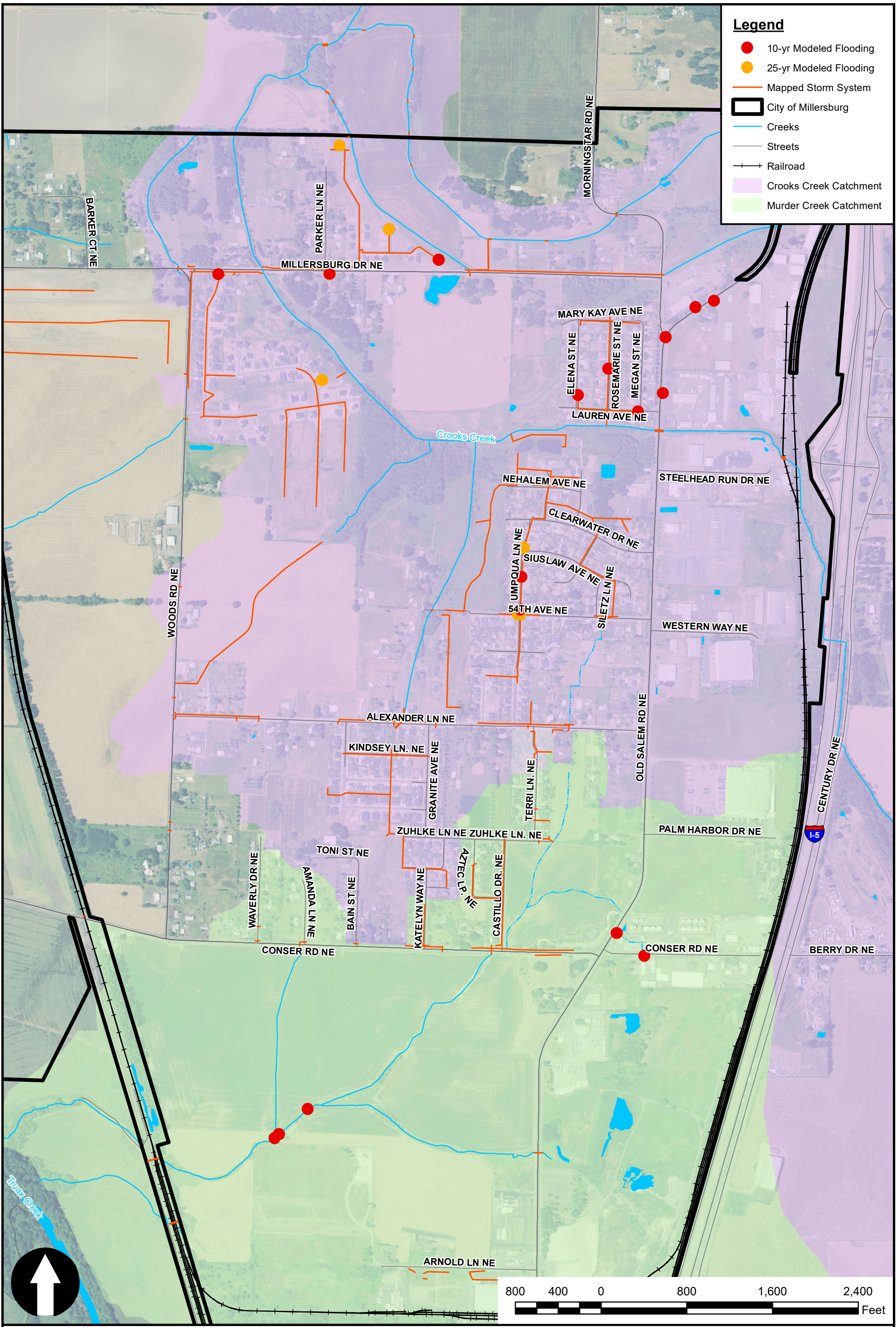
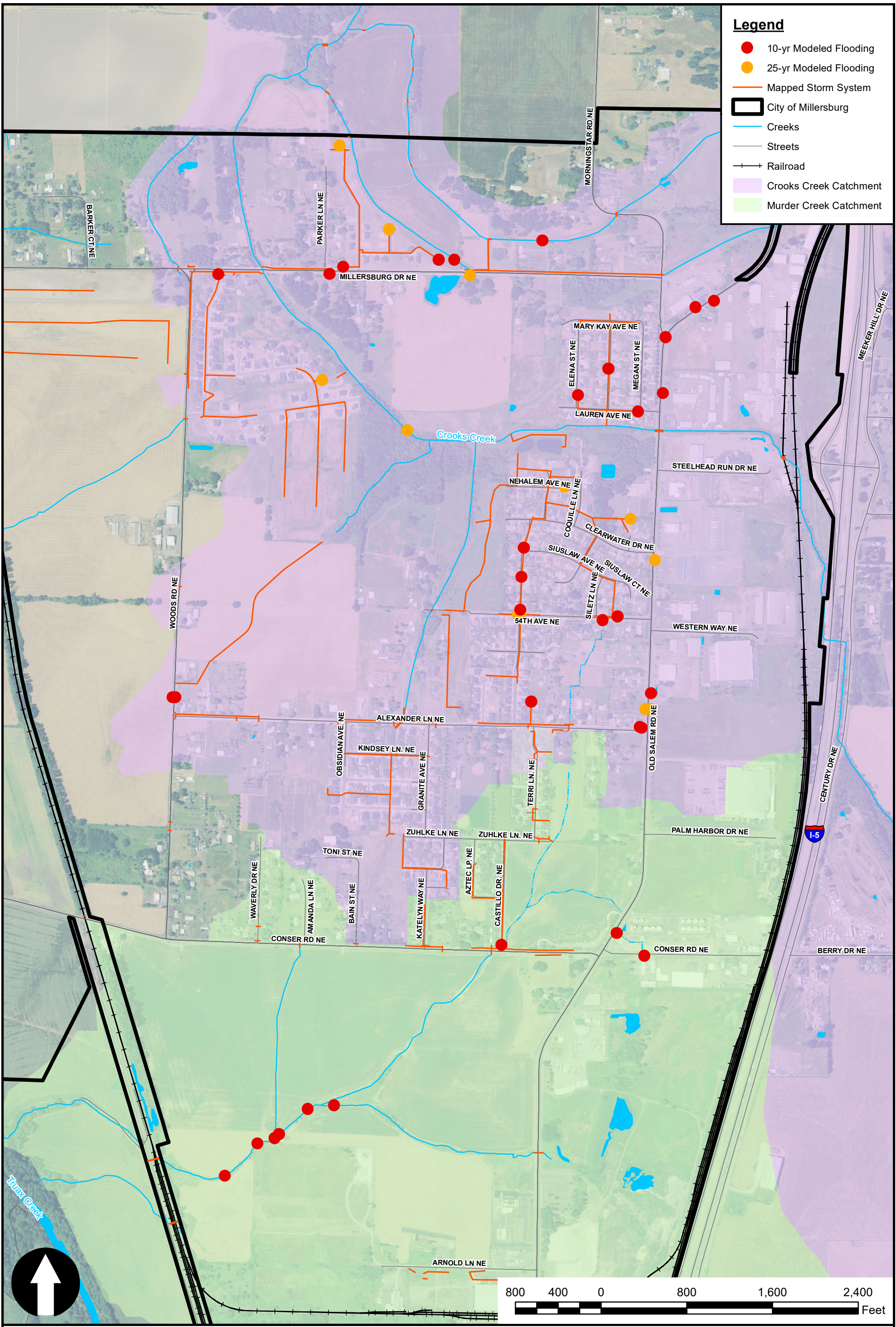


FIGURE 4-2 PREDICTED FLOODING: EXISTING LAND USE
10-YR & 25-YR DESIGN STORMS

CITY OF MILLERSBURG STORMWATER MASTER PLAN
 MILLERSBURG, OREGON





- Legend**
- 10-yr Modeled Flooding
 - 25-yr Modeled Flooding
 - Mapped Storm System
 - City of Millersburg
 - Creeks
 - Streets
 - +— Railroad
 - Crooks Creek Catchment
 - Murder Creek Catchment

FIGURE 4-3 PREDICTED FLOODING: FUTURE LAND USE
10-YR & 25-YR DESIGN STORMS
 CITY OF MILLERSBURG STORMWATER MASTER PLAN
 MILLERSBURG, OREGON



**Table 4-8 - Existing and Future Deficiencies
MODELED DEFICIENCIES**

Location	Problem Description	Contributing Drainage Area, acres
Crooks Creek		
Hoffman Estates Development	Currently a reach of 12" stormwater pipe that runs through Noel Lane. Modeled flooding occurs during the existing and future 10-year events due to undersized pipes and backwater from the downstream detention facility.	10.8
Becker Ridge Development	Pond overflow structures are either lower than upstream manhole rim elevations or inadequately sized for peak flow, causing flooding during the existing and future 10-year events.	54.8
Millersburg Drive between Crooks Creek and Parker Lane	Currently a reach of 12" stormwater pipe that runs through Millersburg Drive. Modeled flooding occurs during the existing and future 10-year events due to the pipe being undersized.	14.2
Morningstar Estates Development	Currently an 8" pipe acts as a control for stormwater discharge. Modeled flooding occurs during the existing and future 10-year events in the streets as there is no emergency overflow for the system.	22.6
Umpqua Lane between Clearwater Drive and 54th Avenue	Currently an underground pipe detention system controls flows discharging to the downstream storm system with an overflow discharging to the same system. The downstream system has insufficient capacity to convey the detained flows and flooding occurs in the street during the existing and future 10-year events.	17.9
Old Salem Road North of Lauren Avenue	Currently a 15" stormwater pipe that runs through Old Salem Road. Modeled flooding occurs during the existing and future 10-year events due to undersized pipes.	32.5
Woods Road north of Alexander Lane	Currently a 12" stormwater pipe that runs from Woods Road to a drainageway to Crooks Creek. The existing pipe is not sufficient to convey future flows and causes flooding along Woods Road during the future 10-year event.	25.3
Old Salem Road at Alexander Lane and Clearwater Drive	Currently, 1,560 linear feet of pipe in Old Salem Road is not adequately sized to convey future flows and causes flooding at these locations during the future 10-year event.	108.2
Murder Creek		
Conser Road east of Old Salem Road	Currently a 12" stormwater pipe that runs through Old Salem Road. Modeled flooding occurs during the existing and future 10-year events due to an undersized pipe.	27.3
REPORTED DEFICIENCIES		
Location	Problem Description	Contributing Drainage Area, acres
Knox Butte Avenue	Lack of public stormwater infrastructure.	7
Kathryn Street	Public stormwater infrastructure discharges to a private storm sewer.	5

5 Programmatic Recommendations

This section provides a summary of recommendations to address existing storm system capacity deficiencies, future storm system needs, future regulatory objectives and water quality objectives.

This section includes programmatic recommendations for maintenance activities, as well as revisions to stormwater management standards and city code to protect natural conveyance system. The programmatic recommendations also include one-time projects that are needed to implement the stormwater management program.

Section 5.1 evaluates the City current maintenance program and system condition, and provides a recommended maintenance schedule to meet the City's goals. Section 5.2 evaluated the City's current stormwater related requirements and provides a list of programmatic recommendations. Section 5.3 provides a summary of the programmatic recommendations made in Sections 5.1 and 5.2.

Most of the City's storm system is relatively new, therefore this report did not investigate the age of the system or the systematic process of replacing old infrastructure.

5.1 Maintenance Recommendations

The City of Millersburg has never implemented a proactive, regular maintenance program for its stormwater system. The current program is reactionary; maintenance issues are addressed when they become known. The following covers maintenance recommendations for stormwater infrastructure, creeks, and drainage ways. Recommended inspection and maintenance frequencies are summarized in Table 5-1.

5.1.1 Stormwater Infrastructure

During this project, a sampling of locations was visually inspected and assessed for sediment build up and potential damage. Roughly 10% of the City's infrastructure was visually inspected at random. The City of Millersburg's stormwater infrastructure was generally observed to be in good condition, structurally sound, and with little evidence of sediment deposit in the built-out and established areas. The City is encouraged to move toward a proactive, preventative maintenance approach to protect the existing system and minimize long-term costs. Over time, as repairs and maintenance occur as needed when identified through routine inspections, the potential for emergency maintenance responses will be reduced. With a fully functional preventative maintenance program, the long-term costs associated with future repairs, rehabilitation, and replacement will be minimized.

In addition to identifying maintenance needs, routine inspections can be used to meet illicit discharge screening requirements of the City's TMDL Implementation Plan. The recommended inspection plan is shown in Table 5-1.

5.1.2 Creeks and Drainage Ways

The creeks and drainage ways in the City of Millersburg are largely natural with dense riparian vegetation that are prone to collecting sediment, debris, and other blockages that restrict channel flow. Additionally, there are no active controls for invasive species or habitat management. A programmatic agreement with the Oregon Department of State Lands (DSL) for riparian vegetation and sediment management would allow the City to provide the maintenance needed to reduce flood risk due to creek blockages and manage the health of the riparian habitat. It's recommended that visual inspection be conducted annually, with debris, sediment, and vegetation clearing as needed.

Table 5-1 Inspection and Maintenance Frequencies

Structure	Quantity	Percent Inspected (per year)	Inspection Type	Inspection Frequency (per year)	Percent Requiring Maintenance (per year)
Catch Basins	330	20%	Visual	1	5%
Manholes	169	20%	Visual	1	20%
Pipe	8.9 miles	20%	Video	1	20%
Surface Detention	11	100%	Visual	2	100%
Underground Detention	4	100%	Visual	2	As Required
Water Quality Facilities	2	100%	Visual	2	100%
Creek	7.7 miles	100%	Visual	1	As Required
Drainage Ways	2.6 miles	100%	Visual	1	As Required

5.2 Program Recommendations

5.2.1 Stormwater Design Manual

Current City Land Use Development Code allows the City to review, approve and inspect proposed drainage systems for new development at its discretion. Although the City code allows this, the code itself is not comprehensive and it is recommended that a stormwater design manual be developed to help guide future development design to accomplish the City's goals.

Issues to include in the stormwater design manual:

- Emergency overflows need to be identified and adequately designed for all new development. We recommend that these overflows be designed for the 100-year flows discharge to a location downstream that could accommodate the overflow.
- Sufficient freeboard in detention ponds to pass larger storms without causing flooding upstream of the structure or overtopping the detention/retention facility
- Conveyance analysis must take into account backwater effects from downstream facilities/channels/infrastructure.
- Require new development to mitigate increased runoff. Jurisdictions have different approaches to addressing this issue and a further discussion is included under section 5.1.2.2 below. In order to be consistent with local practices and adopted construction standards it is recommended that Millersburg adopt requirements similar to the City of Albany's requirements:
 - City of Albany: detain post-developed runoff from the 2-year, 5-year, 10-year, and 25-year, 24-hour storm to pre-developed quantities. For project areas greater than 100 acres or covers multiple drainage sub-basins then the 50-year, 24-hour storm is also to be detained to pre-developed peak volumes.
- Require water quality treatment for the first 1-inch of rainfall. This volume is required by many communities in Oregon and corresponds to capturing and treating 80% of annual runoff.
- Erosion control permitting and inspection for Single Family Residential Projects.

- The size of buffers around creeks and wetlands is usually covered under the City Code, however this should be addressed as part of changes to the stormwater standards. Buffers along with examples are discussed below under Section 5.1.2.3.

The City currently requires new development to accommodate potential run-off upstream of the site. This design must accommodate run-off assuming conditions of maximum potential watershed development permitted by the Comprehensive Plan. It also must consider run-off from areas outside the UGB. This, in combination with flow mitigation requirements, will ensure existing infrastructure will remain adequate to accommodate stormwater flows as the City continues to grow. Modeled flow rates entering the City have been included in Table 5-2.

Table 5-2 Upstream Boundary Flows

Location	Model Node	Modeled Flows (cfs)			
		10-year	25-year	50-year	100-year
Drainage north of Morningstar Rd	CC-N-01-023	16.54	20.21	23.76	27.87
Crooks Creek tributary at Morningstar Rd and Millersburg Dr	CC-N-02-017	31.18	37.57	43.55	51.02
Crooks Creek main channel at I-5	CC-N-00-035	36.17	43.53	49.3	55.59

5.2.2 Water Quality

The City currently does not have a stormwater quality requirement for new development. Stormwater quality projects were not identified as part of this Master Plan, however stormwater treatment requirements for new development are recommended and will improve water quality and help the City meet its TMDL requirements. This master plan recommends implementing requirements for new development and redevelopment but has not recommended a retrofit program of existing conditions.

Low Impact Design (LID) approaches have been shown to meet many of these requirements for heavy metals, bacteria, phosphorous, nitrates, and other pollutants. Additionally, LID facilities are often publicly visible and help with public outreach and education about water quality. LID approaches include stormwater planters, bio-swales, and rain gardens which treat collected stormwater through media filtration and biological uptake from planted vegetation. LID approaches should be encouraged for private development and some public facilities.

Because of the limited maintenance staff at the City we encourage stormwater facilities for all non-residential developments be kept in private ownership and maintained by the property owners. For residential development we recommend regional facilities that fall under the maintenance of a home owners association (HOA). A development condition should include the ability of the City to inspect the facilities and hire a private firm to provide maintenance and charge the HOA if required. It is recommended that the City of Millersburg take a similar approach to that of the City of Albany which is outlined below.

City of Albany - The City of Albany requires that a post-construction water quality permit be obtained for all new development and/or redevelopment on parcels equal to or greater than one acre, including all phases of development. Albany exempts some development from this requirement including: development constructing less than 3 single-family or duplex dwelling on an existing lot or lots of record, development that creates and/or replaces less than 8,100 sq-ft of impervious surface, the development is being constructed under a valid land use approval submitted prior to January 1, 2015, and at the discretion of the Director due to impracticality of construction in which case a fee-in-lieu is paid by the developer. Construction and design requirements for the permit are outlined in the City of Albany’s engineering standards. Albany’s engineering standards require vegetated stormwater quality facilities that provide filtration of stormwater through soil and plant material, with manufactured options approved on a case-by-case basis when vegetated facilities are not feasible. These vegetated facilities are sized based on the amount of impervious surface in the contributed drainage area using sizing factors based on facility type.

These factors were developed by the City of Albany using the 1-inch 24-hour rain event which corresponds to 80% of the average annual runoff volume. Albany also allows for impervious area reduction credits for pervious pavements, green roofs, and tree protection.

5.2.3 Riparian Buffers

The City currently requires a minimum setback of 50 feet from the top of bank for all fish-bearing streams and year-round flowing streams. All other intermittent drainage ways and watercourses have a required minimum setback that includes the vegetative fringe, top of bank, or a minimum of 15 feet from the centerline of the drainage way whichever is greater. Additional setbacks are required per floodplain requirements and significant wetland/riparian area requirements.

Riparian buffers serve to protect channels and waterways from encroaching development, and also give space for tree canopy cover to develop. Riparian tree canopies act in shading waterways which reduces ambient stream heating and contributes to meeting the temperature TMDL for the Upper Willamette sub-basin. Additionally, buffers allow for city access to maintain drainage ways to ensure adequate function and health.

The following is a summary of riparian buffer requirements for the cities of Albany, Corvallis, Eugene, and Salem:

City of Albany - No relevant code was found upon initial research. Albany's planning commission has designated areas around their major channels as zone OS – Open Space and have set restrictions in that capacity.

City of Corvallis - The City of Corvallis requires riparian areas to be protected with a buffer measured from the top of bank that restricts development. These buffers are determined based on the drainage basin of each stream and range in width from 50 feet for basins draining less than 20 acres to 120 feet for the Willamette River, Mary's River, and their channels. In addition to these buffers, Corvallis requires that an easement be placed offset from the channel in a width depending on the buffer protection level. These easement offsets range from the drainage channel width plus 25 feet to the drainage channel width plus 75 feet. In cases where the 0.2 foot Floodway is larger than the measured requirements, the Floodway is used instead.

City of Eugene - The City of Eugene requires a conservation setback measured from the top of bank based on given category outlined in their Goal 5 Water Resources Conservation Plan. These categories are labeled A through E and have setback widths ranging from 100 feet to 20 feet with Category E streams having no setback requirement. Eugene also requires setbacks for wetlands in categorized at A, B, or C with A needing 50 feet, B needing 25 feet, and C not requiring a setback.

City of Salem - No relevant code was found upon initial research. Salem's city code requires the identification of significant wetlands but defers to Oregon Division of State Lands for direction on what is allowable.

It's recommended that the City of Millersburg adopt a 50-foot buffer measured from the top of bank for all fish-bearing streams, and a 20-foot buffer from top of bank for all other streams and drainage ways.

5.2.4 Erosion Control

The City of Millersburg currently requires erosion control measures to be in place as part of the City's grading permit, and through Oregon DEQ's 1200-C permits. Although there are few issues with sediment in the stormwater system in established parts of the City, the City has experienced issues with sediment and debris build-up during and following single-family residential construction. Existing mechanisms for erosion control requirements currently do not cover this type of construction.

City of Portland - The City of Portland's Bureau of Development Services handles single-family residential erosion control requirements within the building permit review. Developers who are applying for a Single

Family Residential (SFR) building permit and meet the following conditions may fill out the Simple Site Erosion Control Requirements Form in lieu of a full erosion control plan. This requires basic erosion control measures and allows the City to enforce erosion control with a rigid permit process.

It is recommended that the City of Millersburg adopt a similar approach to Single Family Residential erosion control plans as the City of Portland by including erosion control requirements as part of a building permit for these projects, but allow developers applying for the permit to sign an understanding acknowledging that they will be required to implement erosion control BMPs as part of the permit approval.

5.2.5 Stormwater System Inspections

The City of Millersburg currently requires developers to TV newly constructed storm lines prior to paving. Routine inspection of the stormwater system helps to detect any issues that may occur including infrastructure failure or illicit discharge. Inspection also helps inform maintenance decisions and development of a cost-effective maintenance plan.

It's recommended that the City conduct TV investigations of all stormwater pipes at the end of a developer's 1-year maintenance period, requiring a bond from the developer for any cleaning required of the infrastructure including pipes and detention structures.

5.3 Recommended Program Change Summary

Maintenance and Inspection

We recommend that the City develop proactive and preventative inspection to ensure continued function of the City's existing stormwater infrastructure.

Inspection Schedule is per Table 5-1 of this report.

We recommend that the City develop a programmatic agreement with DSL for riparian vegetation and sediment maintenance for all streams and drainage ways within the City.

We recommend starting an inspection program and tracking the inspection to meet NPDES program requirements.

As part of the Erosion Control Program increased inspection will be required on projects under construction.

Update Stormwater Design Standards

It's recommended that the City update the current stormwater design standards to guide future development. The updated standards should address the following items which were discuss in Section 5 of this report:

- Emergency overflow design.
- Design for backwater effects.
- Mitigation of increased runoff so that new development and redevelopment detain post-development flow to keep a natural flow condition.
- Stream buffers
 - We recommend retaining the 50 foot buffer measured from the top of bank for all fish-bearing streams as well as requiring a 20 foot buffer measured from the top of bank for all other streams and drainage ways.
- Easements
 - We recommend requiring a minimum of the channel width plus 12 feet for maintenance and access easements along streams and other drainage ways.

- Water quality requirements.
 - We recommend requiring the treatment of the 1-inch which corresponds to 80% of the annual rainfall volume.
 - We recommend dictating design by engineering standards that give preference for LID approaches with mechanical options approved at the City's discretion.

6 Capital Improvement Projects

This section identifies the projects designed to address the drainage issue areas identified in Table 4-8 and Section 2.7. Issue areas include flooding issues identified through the XPSWMM modeling effort (See Section 4), as well as the reported issues discussed in Section 2.7. To the maximum extent feasible, CIPs were developed as integrated solutions to address multiple objectives, or to address multiple flooding issues with a single, comprehensive project.

6.1 Project Identification

CIP locations were identified by reviewing the model results presented in Table 4-8 and the reported problem areas discussed in Section 2.7. Field visits to reported and modeled issue areas were also used to evaluate surrounding conditions, potential solutions, and to identify issue areas that could be consolidated into a single project approach.

The XPSWMM model was utilized to evaluate potential solutions for identified flooding issues. Potential solutions included upsizing of existing pipes, expansion of stormwater infrastructure, and/or re-evaluation of existing detention systems. In some cases, flooding issues are related to insufficient overflow mechanisms in existing detention systems. The construction of additional overflow structures is a cost-effective means of addressing these issues in cases where downstream flow constrictions are not present. In cases where the downstream system is not sufficient to convey the overflow, an upsizing of the downstream system or re-routing the overflow is required.

6.2 Unit Cost Estimates

Unit cost information for construction elements of the CIPs were compiled using bid tabulations from recent local construction projects. Preliminary CIP cost estimate are based on the unit cost information for construction elements plus 25 percent contingency, and 25 percent engineering and administration. Land acquisition costs are not included in the estimates.

Project unit costs and detailed cost estimates for each CIP are located in Appendix C. CIPs with multiple components contain a detailed cost estimate for each project component.

6.3 CIP Sizing and Conceptual Design

This section includes a summary of the CIP sizing and conceptual design criteria based on the type of system improvement proposed. System improvements include piping improvements and channel improvements.

Pipe Conveyance - New conveyance pipes were sized to convey the 25-year future conditions flow rate.

Channel Conveyance - New open channel improvements were designed to maintain a minimum of 1 foot of freeboard for the 25-year future conditions flow rate. The flooding impacts were evaluated for the 100-year future conditions flow rate to determine if out-of-channel ponding presented a risk to structures or travel lanes. If no risk was found the ponding was considered acceptable.

6.4 CIP Project Summary

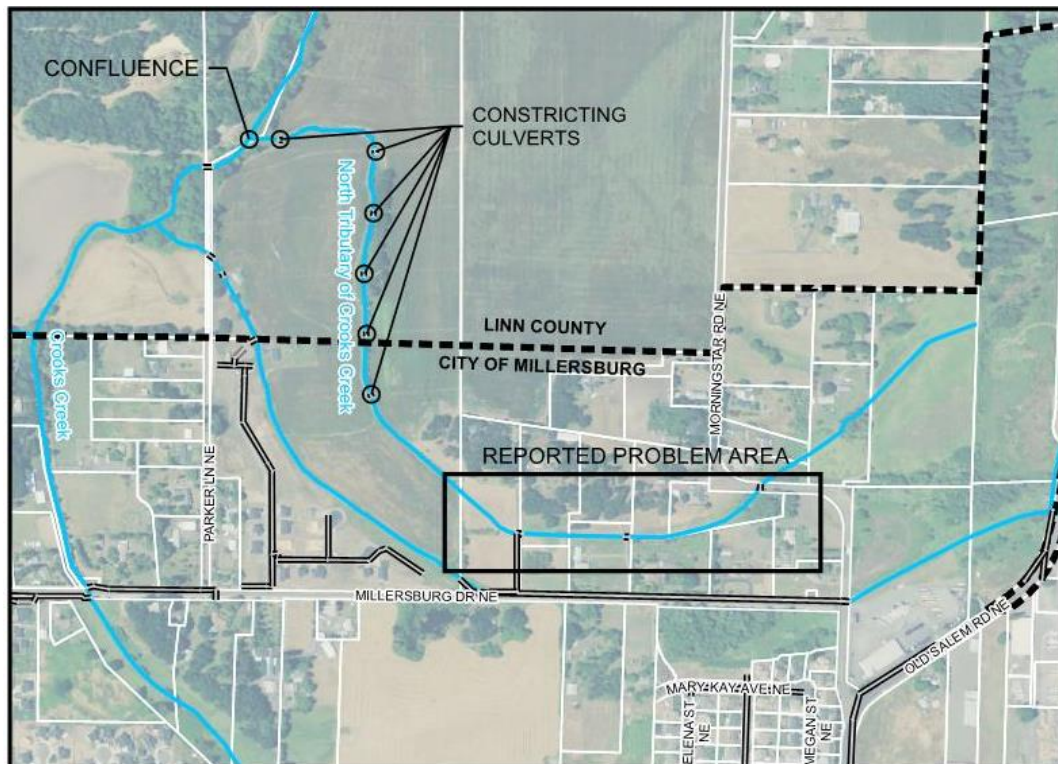
This section describes each recommended CIP and includes a problem description, cost summary, and project description for each CIP. The CIPs are presented by location. The key map provided in Appendix C shows the location of each of the proposed CIPs. Detailed CIP cost sheets are also provided in Appendix C and include an additional conceptual design map detailing the project extents.

North Tributary of Crooks Creek Improvements

Description

The City has received multiple reports of issues occurring along a drainage way tributary to Crooks Creek. This drainage way is located north of Millersburg Drive and runs west from Morningstar Road through private property and eventually discharges to Crooks Creek roughly a half-mile north of Millersburg Drive. Several private culverts exist along the drainage way between Morningstar Road and the confluence with Crooks Creek. Additionally, two 24-inch diameter pipes connect this drainage way to another drainage way to the south that conveys stormwater discharging from the box culvert that runs under Millersburg Drive and also discharges to the main channel of Crooks Creek. Figure 6-1 highlights the reported problem area.

Figure 6-1 North Tributary of Crooks Creek



Survey conducted as part of the Master Plan process showed that the drainage way through this area does not keep a consistent grade and, on average, only has a positive grade of roughly 0.1%. The drainage way in general does not exhibit significant fall and maintains an average slope of 0.13% between Morningstar Road and Crooks Creek. These conditions are less than ideal for drainage and can lead to prolonged periods of inundation that can last several hours to several days after a significant event.

Recommendation

Two alternatives were explored to solve the issues at this location. Both alternatives consist of regrading the existing channel to provide as much positive drainage as possible to the system as well as removing the existing hydraulic connection – by way of two 24-inch pipe culverts – between the adjacent drainage ways. The recommended alternative maintains the existing channel alignment and requires that roughly 3,050 linear feet of channel be regraded to provide a 0.2% channel slope.

The project would require permitting through Oregon DSL. The project could be considered exempt by administrative rule depending on whether the channel is considered a drainage/irrigation ditch or an

intermittent/perennial stream. The project would be exempt in the case of the channel being a ditch as the project would be restoring serviceability and would be classified as maintenance. Otherwise, an Individual Removal-Fill Permit would be required.

The other alternative was eliminated due to potential impacts to surrounding properties which would require further study. The estimate includes costs for required private culvert improvements.

Project Estimated Cost \$186,000

Hoffman Estates Stormwater Capacity Increase

Description

The existing stormwater system in the Hoffman Estates development consists of stormwater lines in Shayla Drive, Noel Lane, Kamila Drive, and Dixie Court that drain to an onsite stormwater pond north of Shayla Drive. The stormwater pond controls flows discharging to an adjacent drainage way that runs along the east side of the development. The model shows that the existing system surcharges and floods at the upstream peripheral structures during storm events up to and including the 2-year event. This is due to a combination of inadequate freeboard and backwater effects at the detention pond, as well as inadequate pipe sizing and adverse pipe slopes.

The likelihood of reported issues in this area are low as the flooding locations are in areas that are not publically accessible. Potential property damage associated with this flooding is likely minimal. This project has been included to present a solution if a flooding issue arises at this location.

Recommendation

It's recommended that an additional overflow be constructed in the existing detention pond as the existing overflow lacks capacity to bypass flows in excess of the 10-year storm without overtopping the pond. Additionally, it's recommended that two 15-inch pipes in Noel Lane be upsized to 18-inch pipes to eliminate the constriction that those pipes create.

Project Estimated Cost \$156,890

Becker Ridge Detention Ponds Modification

Description

The model analysis shows that the as-built emergency overflow designs for two of the three detention ponds present in the Becker Ridge development do not adequately prevent flooding in the adjacent or upstream roadways.

This is due to either the overflow elevation being higher than the rim elevations of upstream structures, or a lack of adequate capacity to maintain flood stages below upstream rim elevations.

Recommendation

The installation of secondary emergency overflow structures in the ponds will ensure the system has the capacity to pass design flows up to the 25-year storm without flooding the roadway.

Project Estimated Cost \$17,980

Morningstar Estates Outfall Modification

Description

The existing storm system in the Morningstar Estates development is designed with a singular outlet pipe that acts as a flow restriction with collected stormwater backing up into the pipe system and an onsite detention pond. No emergency overflow currently exists. The model analysis shows flooding in Rosemarie Street and Lauren Ave during a 10-yr 24-hr storm event.

As stated previously, no emergency overflow for the storm system currently exists, and in the event of the system exceeding capacity the excess stormwater has no escape route and ponds in the roadways with the possibility of causing damage to adjacent property. Additionally, backwater in Crooks Creek downstream of the outlet pipe reduces the allowable flow out of the system which further restricts the flow.

Recommendation

The system needs an emergency overflow that allows the conveyance of large storms while reducing the risk to life and property. Replacing the existing outlet pipe with one that can pass large storms in exceedance to the 10-year storm and installing a control structure upstream with an emergency overflow will maintain the designed detention capacity while allowing an escape route for high flows. However, the existing pipe is currently located in a 15-foot storm easement and aerial photos show that houses built in the adjacent lots are located very close to the easement lines. Therefore, it is recommended that an overflow pipe be routed to the west in Lauren Avenue and south along the west end of the Morningstar Estates subdivision to discharge to Crooks Creek. This route would require a new easement and would result in approximately 375 additional feet of pipe.

Project Estimated Cost \$203,725

Umpqua Lane Detention Pipes Modification

Description

As part of the North Park Estates development, the stormwater system in Umpqua Lane was connected to the existing system at 54th Avenue. To limit flow rates in the downstream system, three detention pipes and a control structure were built as part of the development prior to the connection. The control structure includes a 60-inch weir as the emergency overflow, which discharges to the same existing pipe as the main flow. The model analysis shows that during a 10-yr 24-hr storm, the downstream system surcharges with the existing emergency overflow discharging to a stormwater system that cannot handle the additional flow. This may cause flooding in Umpqua Lane and negates the function of the emergency overflow.

Recommendation

Disconnect the emergency overflow from its current discharge point and construct a new overflow route. The new route will discharge west of Umpqua Lane along 54th Avenue to a drainage way tributary to Crooks Creek. This alternative would allow for a safe escape route while allowing low flows to continue north along Umpqua Lane.

Project Estimated Cost \$109,910

Woods Road Drainage Capacity Increase

Description

The model analysis shows potential flooding issues at Woods Road north of Alexander Lane in the Build-Out condition. This is caused by capacity issues in the existing stormwater pipe that was constructed to convey flow from Woods Road and Alexander Lane to Crooks Creek. This system was designed to convey existing flows, and the added flow from potential future development exceeds the pipe capacity.

Recommendation

Increase capacity in this stormwater pipe by replacing the existing 12-inch pipe with an 18-inch pipe to eliminate the potential future flooding issues.

Project Estimated Cost \$559,004

Crooks Creek Sedimentation Concerns

Description

The City and residents have expressed concern with sediment build-up in Crooks Creek between Old Salem Road and Millersburg Drive. Concerns have been centered on the potential increase of flood risk if sediment build-up decreases the channel cross section as the City continues to develop. Programmatic recommendations have been included to address removal of sediment from the creek channel as needed to maintain its conveyance function. A way to reduce the amount of sediment that can accumulate in the channel is to construct a sediment collection facility.

Crooks Creek has a tributary area upstream of the City of Millersburg of roughly 2 square miles dominated by agricultural use. Additionally, soils throughout the watershed are dominantly silt loams which have a reasonable erosion potential (roughly 4 tons/acre/year based on the USGS Soil Survey). A profile of Crooks Creek shows grades ranging from 0.5% to 0.05% between Berry Drive and Millersburg Drive. The reaches with the shallowest slope lie between I-5 and the Union Pacific Railroad, and between Old Salem Road and Millersburg Drive. Areas of shallow slope generally have greater potential for sediment accumulation.

Recommendation

Constructing a facility to trap and collect sediment prior to Old Salem Road may be an option to handle sediment concerns. An effective way to accomplish this would be to construct a pond or settling pool to slow down the water entering the facility long enough for sediment to fall out of suspension and settle at the bottom with maintenance being periodic dredging. A facility of this nature would require a detailed study identifying the nature of the transported sediment entering the City as well as collection of other site-specific data crucial to the design of such a facility. Studies of this nature range in cost depending on the scope of work.

Study Estimated Cost Range \$30,000 - \$70,000 (*Scope Dependent*)

Transportation System Plan Stormwater Improvements

Description

The City of Millersburg currently has plans to expand its current transportation system to accommodate a future build-out condition. This CIP gives a total cost estimate for the stormwater component of each proposed expansion or improvement. See Appendix C for further details.

Total Estimated Cost \$2,082,500

and general permit relate to the City's Stormwater program and how the recommendations from this master Plan will help the City meet the conditions of the permit.

The six control measures of the Phase II permit are:

- **Education and Outreach:** the June 23, 2018 Public Open House and the October 23, 2018 Council work session both provide input for meeting this measure. Other items that help meet this are flyers that can be handed out about water quality and how to improve it.
- **Public Involvement and Participation:** Once again the master plan effort counts towards this measure. The City should work with other communities like Albany to provide outreach brochures, provide water quality stormwater talks to local schools and teach contractors and home owners the importance of water quality in their daily activities.
- **Illicit Discharge Detection and Elimination:** The City currently meets many of the items required by this minimum measure. The master plan provided a map of the storm system. The city has an active program to require contractors to video installed pipe to determine if illicit cross connections were made during construction. With the increased inspection recommended as part of the storm maintenance program in Table 5-1 of this report the city should meet many of the requirements of this measure.
- **Construction Site Runoff:** This plan is recommending more robust erosion and sediment control requirements. This is accomplished through permitting, inspection and the ability to shut down construction sites if erosion controls are not being implemented correctly. This will not only help protect streams, it will also reduce the amount of sediment being deposited in the storm system and therefore reduce long-term maintenance costs.
- **Post-Construction Site Runoff:** The permit requires adopting a retention standard and alternative compliance which includes water quality treatment. The stormwater master plan is recommending an update of the stormwater standards to address water quality treatment of the first 1-inch of runoff and to provide detention of and flow control to existing conditions. The permit also emphasizes a prioritization of Low Impact Development (LID) techniques. LID strategies should be included in the stormwater design standards
- **Pollution Prevention and Good Housekeeping for Municipal Operations:** This measure includes an O&M program for the stormwater system including inspection, maintenance, cleaning and tracking of the activities. This report is recommending inspection of 20% of catch basins annually and cleaning as necessary.

The permit includes a robust tracking of all the City's stormwater activities and the reporting of this information to the Oregon DEQ on an annual basis. For many communities this tracking of daily activities can be demanding and a shift from current practices. It is recommended that the City develop spreadsheets to track these activities and keep them updated to aid in the annual reporting effort.

6.6 Recommended Capital Project Summary

Table 6-1 outlines the recommended Capital Improvement Projects with a total cost summary and project priority. Project identification sheets for each of these projects are shown in Appendix C.

Table 6-1 CIP Recommendation Summary

Project	Priority	Total Cost
North Tributary of Crooks Creek Improvements	High	\$ 186,000
Morningstar Estates Outfall Modification	Medium	\$ 203,725
Becker Ridge Detention Ponds Modification	Medium	\$ 17,980
Transportation System Plan Stormwater Improvements	Low	\$ 2,082,500
Woods Road Drainage Capacity Increase	Low	\$ 559,004
Old Salem Road (Linn County) Build-Out Capacity Improvements	Low	\$ 707,491
Old Salem Road (Linn County) Existing Capacity Improvements	Low	\$ 370,801
Kathryn St & Knox Butte Ave Storm Improvements	Low	\$ 217,500
Hoffman Estates Capacity Increase	Low	\$ 156,890
Umpqua Lane Detention Pipes Modification	Low	\$ 109,910
Crooks Creek Sedimentation Concerns	Low	\$ 70,000

City of Millersburg
Stormwater Master Plan

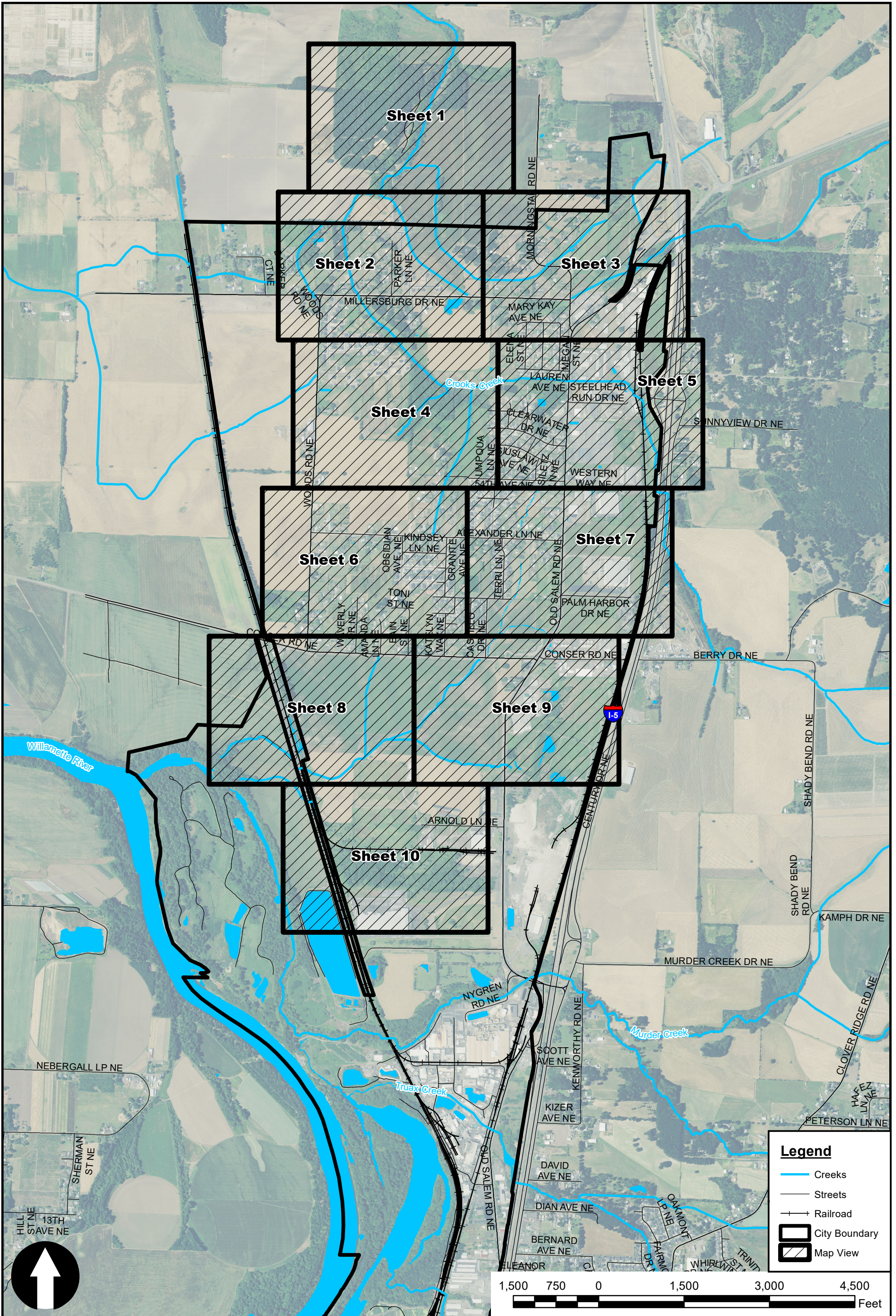
APPENDIX

A

MODELED DRAINAGE SYSTEM MAPS

Appendix A Modeled Drainage System Maps

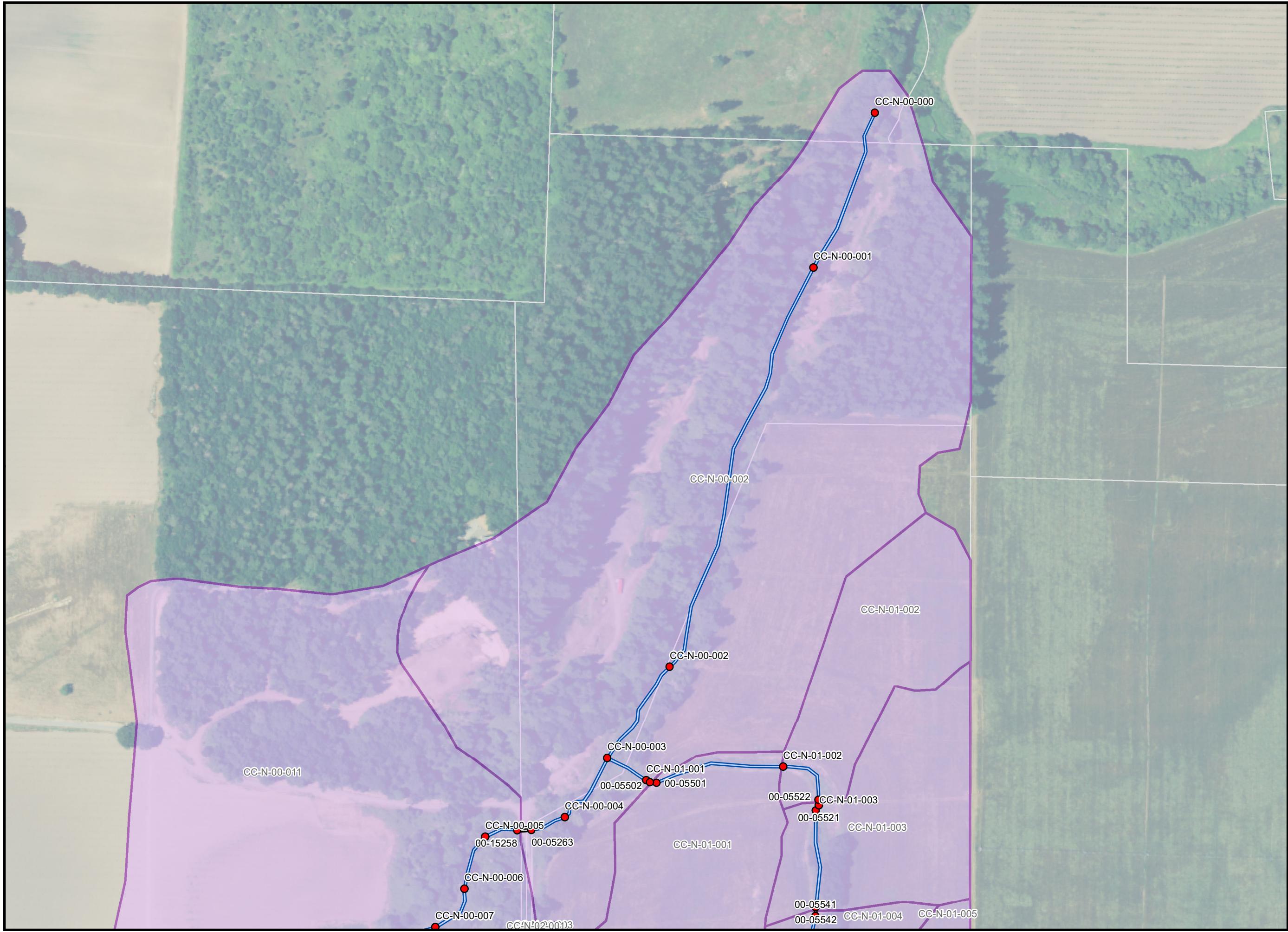
- > Key Map
- > XPSWMM Model Map Sheets
 - Sheet 1
 - Sheet 2
 - Sheet 3
 - Sheet 4
 - Sheet 5
 - Sheet 6
 - Sheet 7
 - Sheet 8
 - Sheet 9
 - Sheet 10



**XPSWMM MODEL SYSTEM MAP
KEY MAP**

CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON

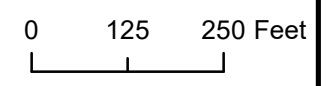
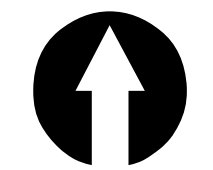


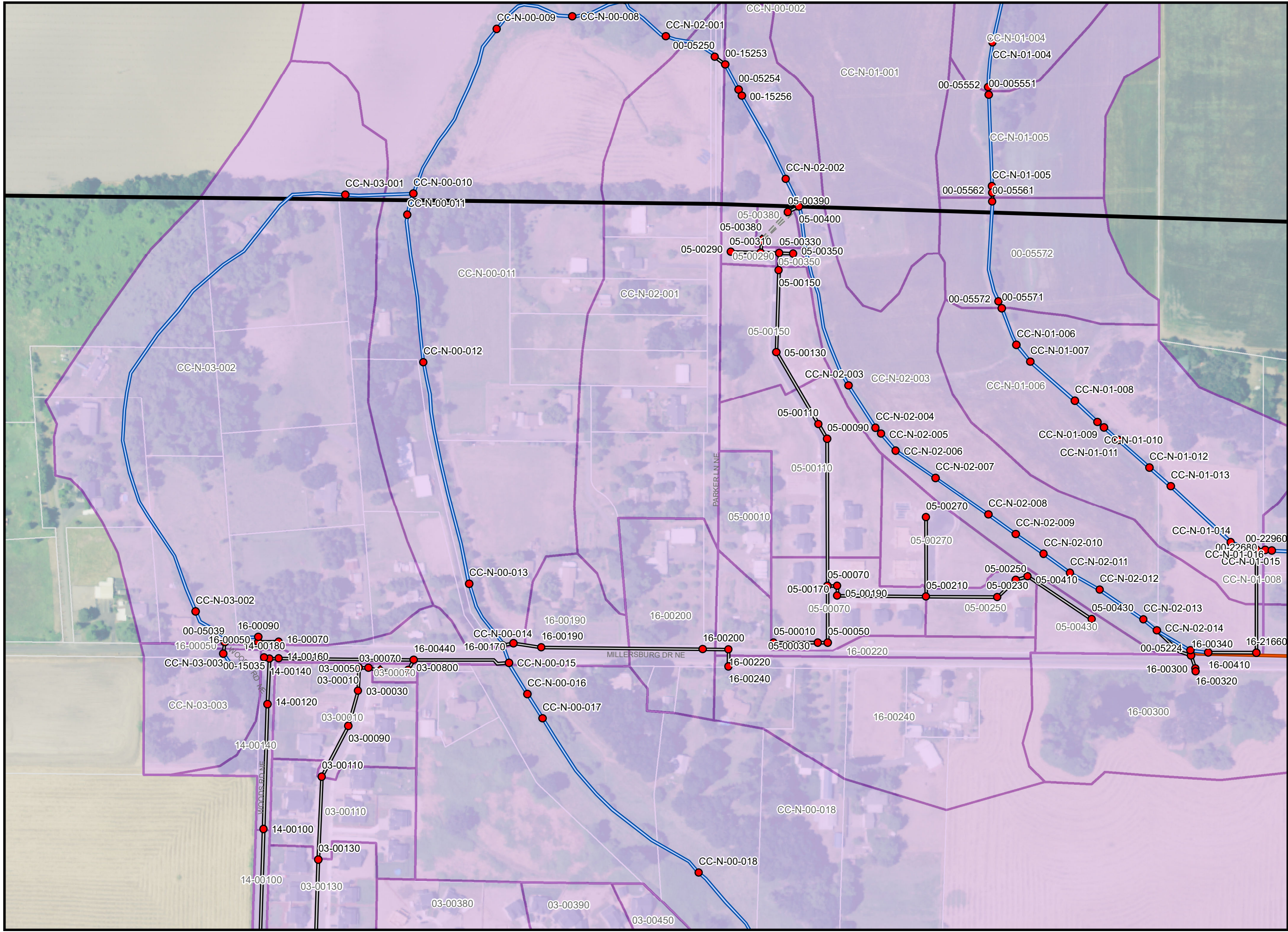


- Legend**
- Modeled Node
 - ◆ Modeled Storage Node
 - Modeled Box Conduit
 - Modeled Channel
 - Modeled Pipe Conduit
 - Modeled Control Structure
 - Taxlot
 - ▭ City Boundary
 - Crooks Creek Catchment
 - Murder Creek Catchment

**XPSWMM MODEL
SYSTEM MAP**

SHEET 1



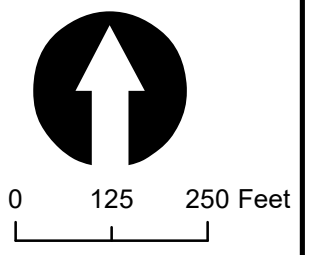


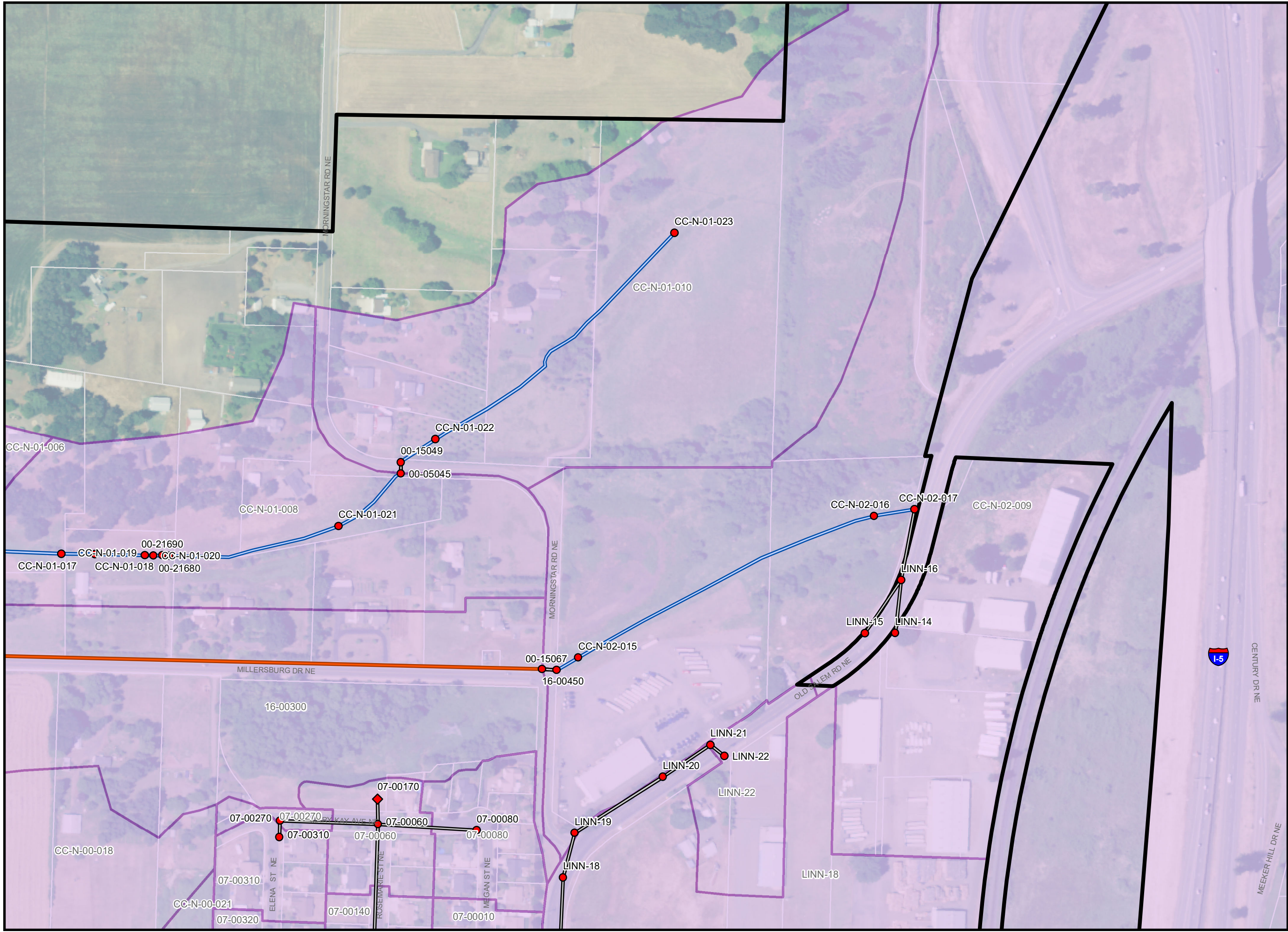
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- Modeled Pipe Conduit
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- Taxlot
- City Boundary
- Crooks Creek Catchment
- Murder Creek Catchment

XPSWMM MODEL SYSTEM MAP

SHEET 2



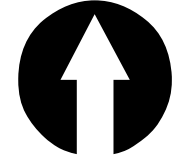



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- - - Modeled Control Structure
- Taxlot
- City Boundary
- Crooks Creek Catchment
- Murder Creek Catchment

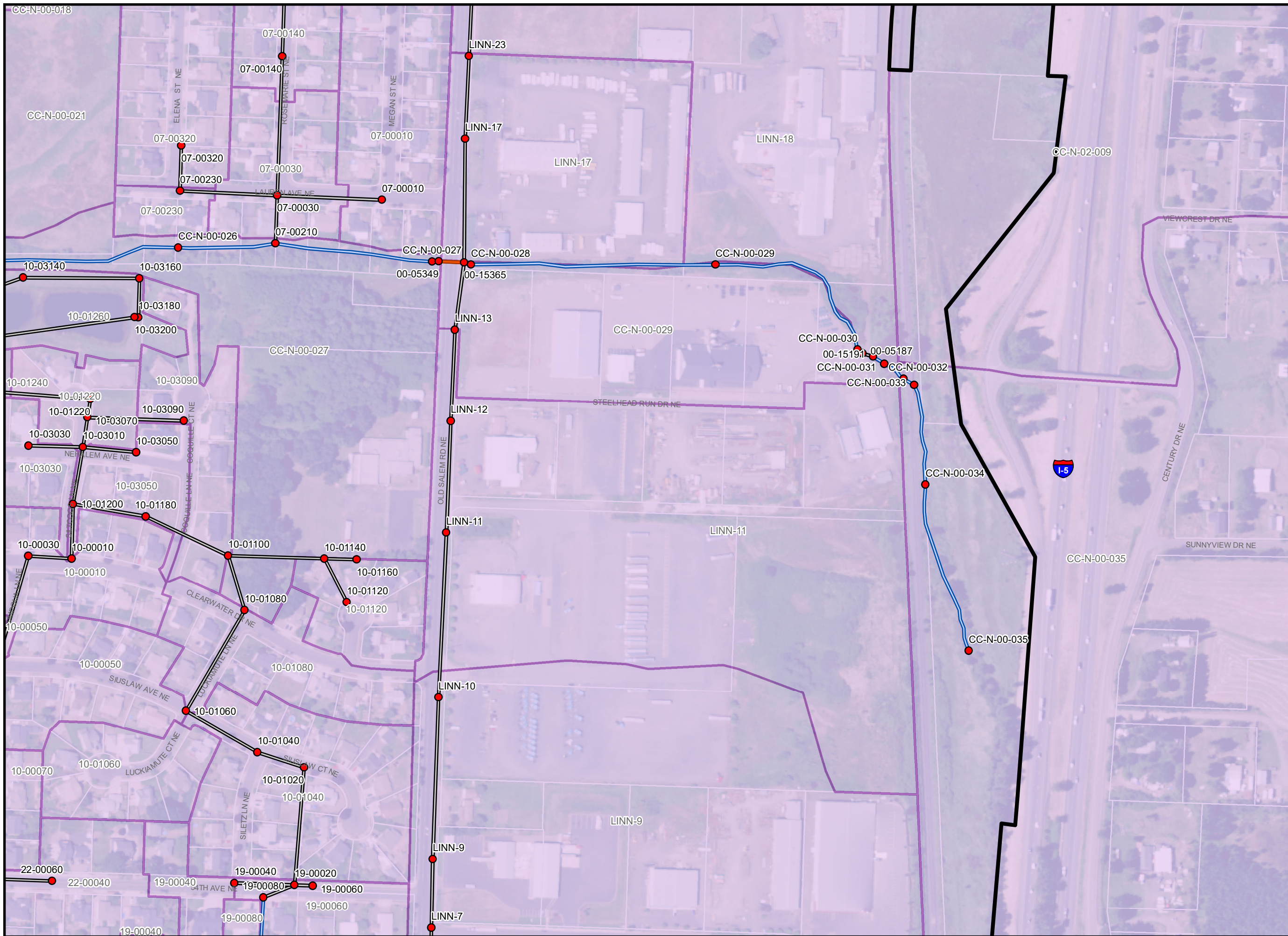
**XPSWMM MODEL
SYSTEM MAP**

SHEET 3


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**CITY OF
Millersburg**
A COMMUNITY LINKING
AGRICULTURE AND INDUSTRY

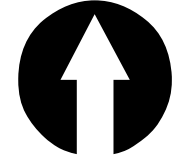
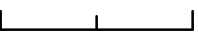


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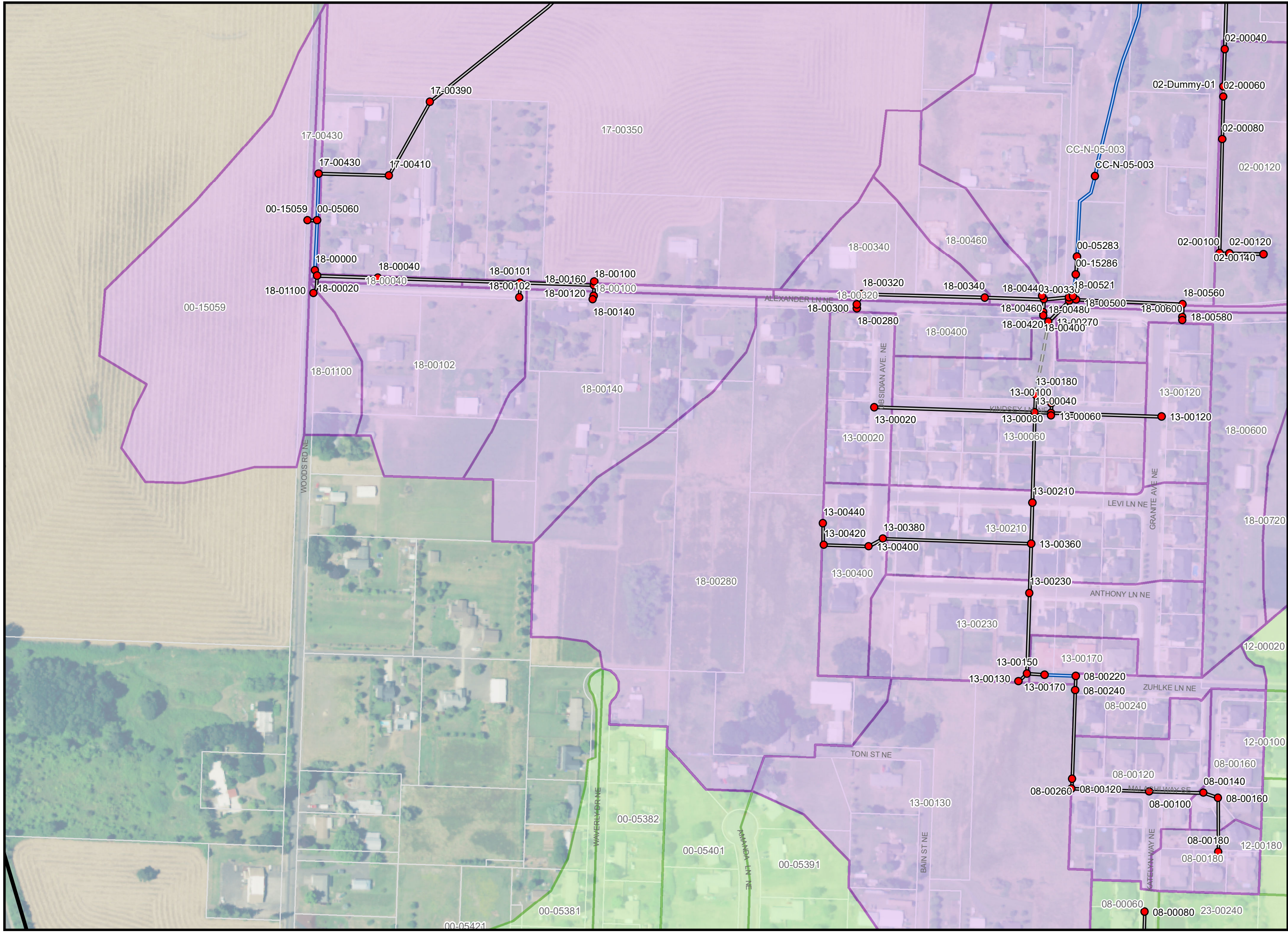
XPSWMM MODEL SYSTEM MAP

SHEET 5


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City of Millersburg
A COMMUNITY LINKING AGRICULTURE AND INDUSTRY

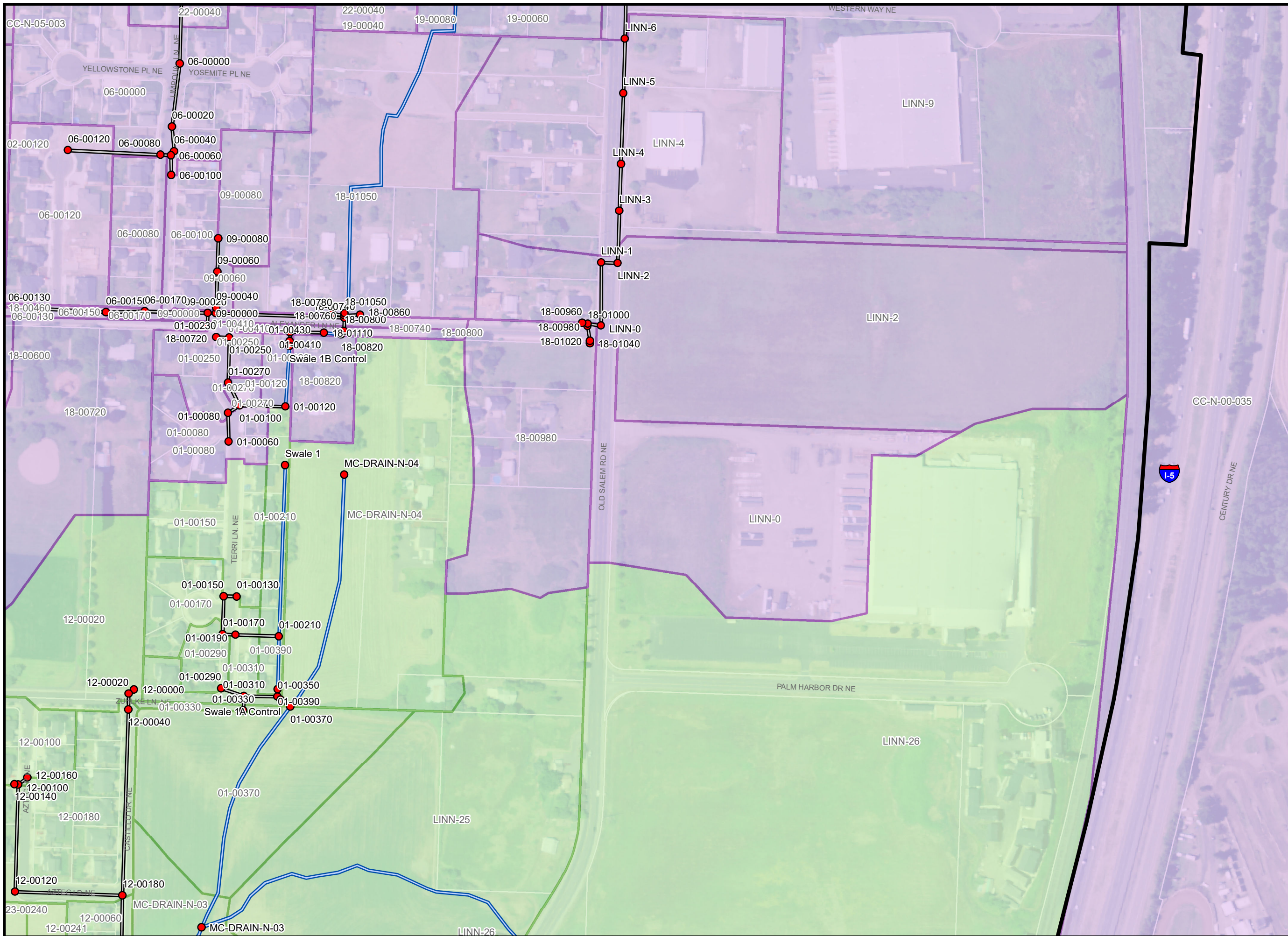


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- Taxlot
- ▭ City Boundary
- ▭ Crooks Creek Catchment
- ▭ Murder Creek Catchment

XPSWMM MODEL SYSTEM MAP

SHEET 6

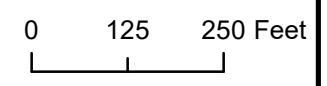
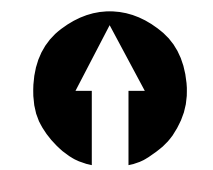


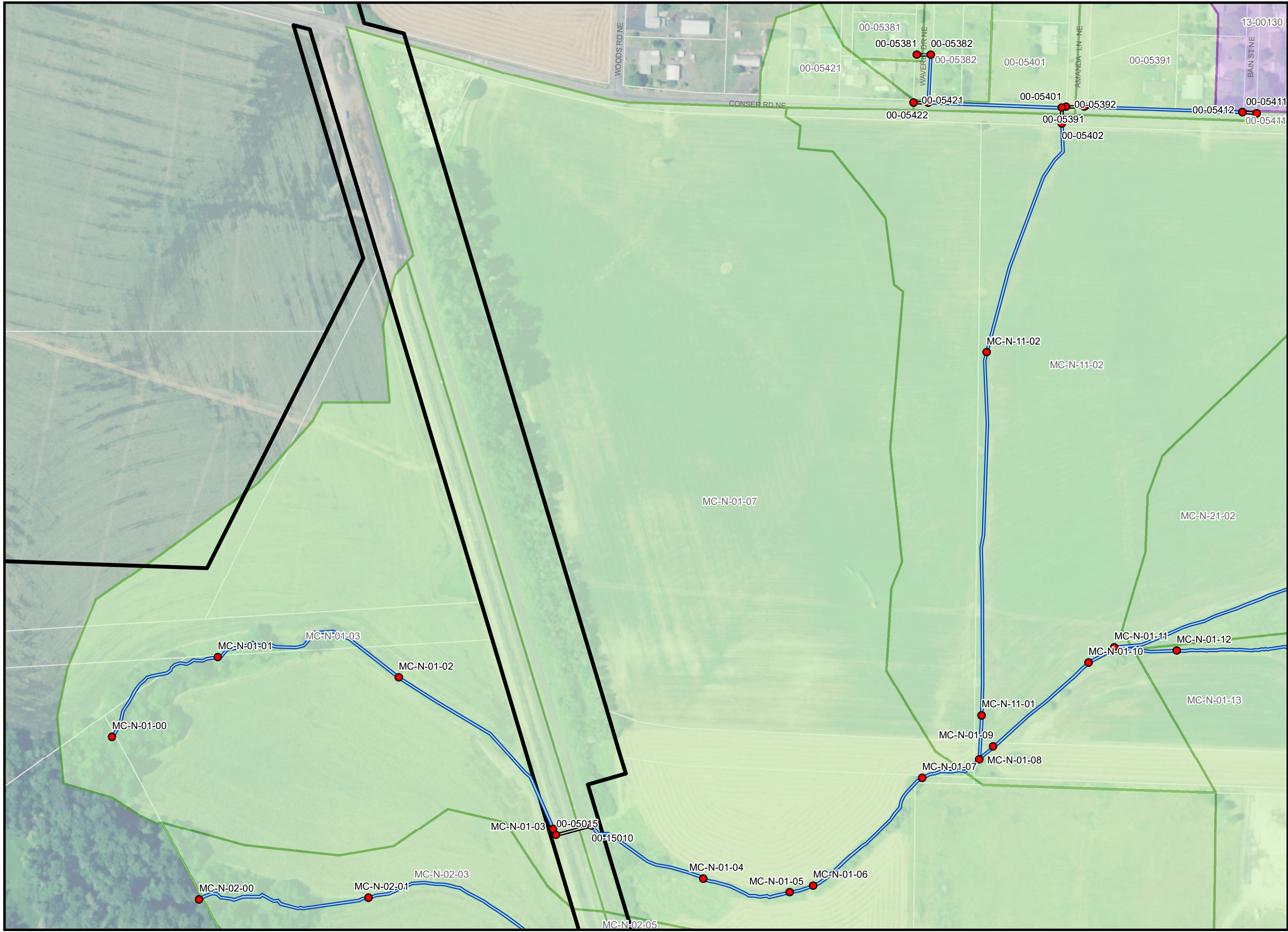
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- Murder Creek Catchment

XPSWMM MODEL SYSTEM MAP

SHEET 7



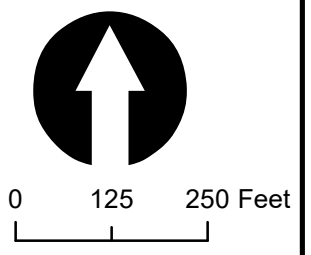


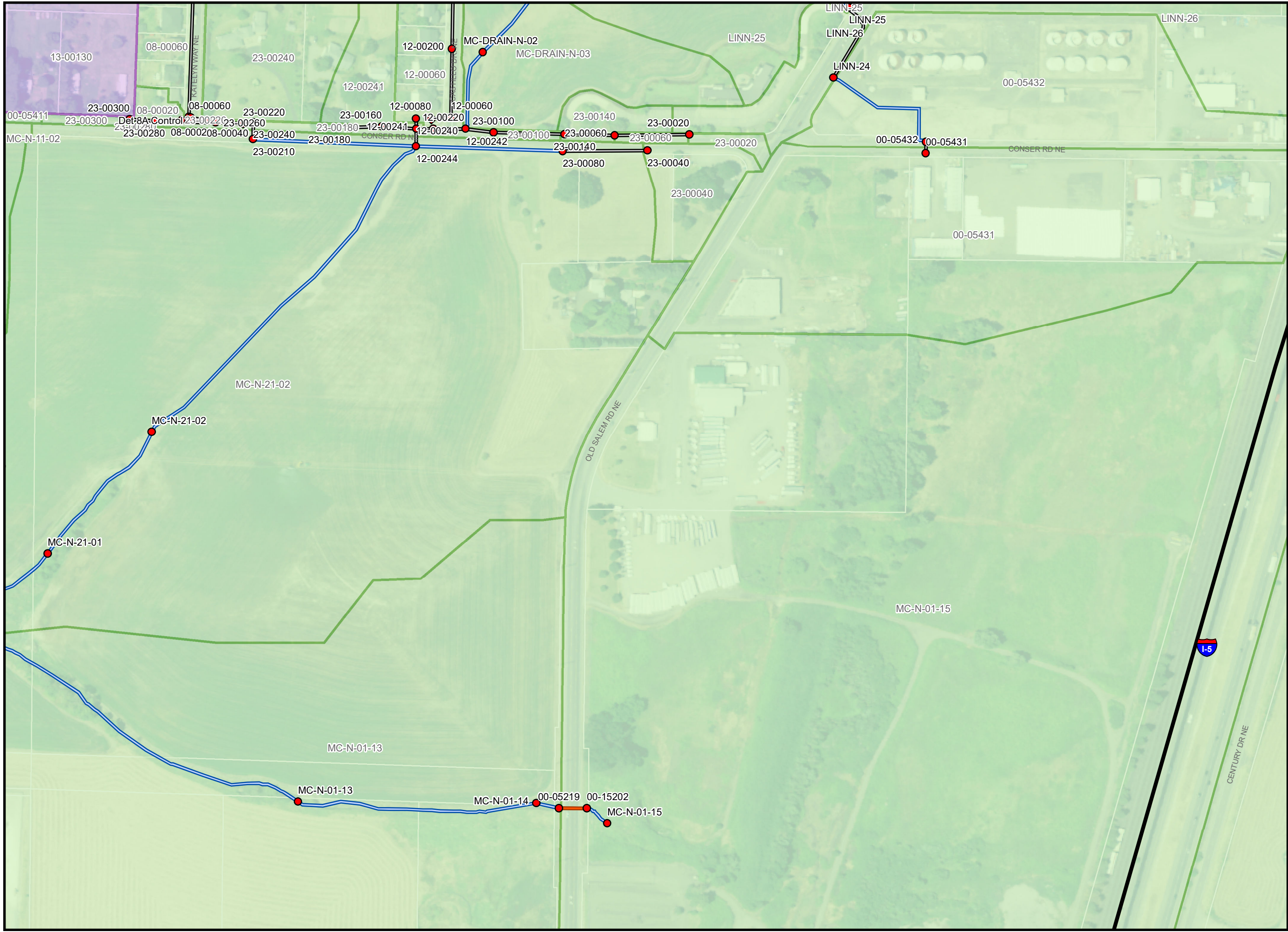
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- Taxlot
- City Boundary
- Crooks Creek Catchment
- Murder Creek Catchment

**XPSWMM MODEL
SYSTEM MAP**

SHEET 8



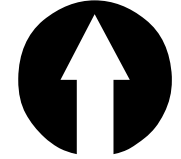
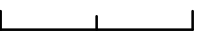


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- Modeled Box Conduit
- Modeled Channel
- Modeled Pipe Conduit
- - - Modeled Control Structure
- Taxlot
- City Boundary
- Crooks Creek Catchment
- Murder Creek Catchment

**XPSWMM MODEL
SYSTEM MAP**

SHEET 9


 0 125 250 Feet




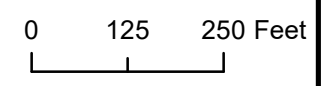
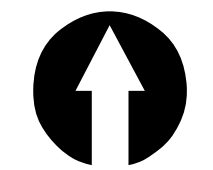
**CITY OF
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- Legend**
- Modeled Node
 - ◆ Modeled Storage Node
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 - Murder Creek Catchment

**XPSWMM MODEL
SYSTEM MAP**

SHEET 10



City of Millersburg
Stormwater Master Plan

APPENDIX

B

HYDROLOGIC AND HYDRAULIC
INPUTS/RESULTS TABLES

Appendix B

Hydrologic and Hydraulic Inputs/Results Tables

- > Table B-1 Hydrologic Input Data and Peak Flow Results
- > Table B-2 Hydraulic Model Parameters and Results
- > Table B-2 Hydraulic Model Parameters and Results Sorted by Upstream Node

Table B-1 - Hydrologic Input and Peak Flow Results

Subcatchment Name	Area (acres)	Average Slope (%)	Width (feet)	Infiltration Reference	Tree Cover (%)	Impervious Area (%)			Subcatchment Peak Flow (cfs)											
						Existing Land Use	Future Land Use	Increase	Existing Land Use				Future Land Use				Increase			
									2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm
CROOKS CREEK																				
00-05060	15.80	0.2	53	D_High	0.00	4.33	40.31	35.98	0.34	0.48	0.61	0.69	1.67	2.48	3.07	3.50	1.33	2.00	2.46	2.81
00-05572	3.86	0.2	477	C_Low	0.00	0.00	0.00	0.00	0.00	0.03	0.28	0.54	0.00	0.03	0.28	0.54	0.00	0.00	0.00	0.00
00-15054	3.12	0	82	D_Mid	4.59	6.48	40.01	33.52	0.11	0.15	0.19	0.24	0.49	0.71	0.87	1.01	0.38	0.56	0.67	0.77
00-15059	10.44	0	32	C_High	0.00	2.19	61.46	59.27	0.11	0.15	0.18	0.21	0.93	1.42	1.76	2.03	0.82	1.27	1.58	1.83
01-00080	1.50	0.3	81.27	C_High	0.00	50.67	54.73	4.06	0.41	0.57	0.67	0.74	0.43	0.60	0.71	0.80	0.03	0.04	0.05	0.05
01-00120	0.40	2.4	105.19	B_Low	0.00	25.00	50.00	25.00	0.06	0.08	0.10	0.11	0.12	0.16	0.19	0.21	0.06	0.08	0.10	0.11
01-00250	1.23	1	231.21	B_Low	0.00	50.41	55.08	4.67	0.37	0.50	0.59	0.65	0.40	0.55	0.64	0.71	0.03	0.05	0.05	0.06
01-00270	0.17	0.9	37.73	B_Low	0.00	70.59	70.59	0.00	0.07	0.10	0.11	0.13	0.07	0.10	0.11	0.13	0.00	0.00	0.00	0.00
01-00410	0.11	1.8	45.16	B_Low	0.00	63.64	63.64	0.00	0.04	0.06	0.07	0.07	0.04	0.06	0.07	0.07	0.00	0.00	0.00	0.00
02-00020	0.74	0.7	179	B_Low	0.00	45.32	57.39	12.08	0.20	0.27	0.32	0.35	0.25	0.34	0.40	0.44	0.05	0.07	0.08	0.09
02-00120	3.56	1.4	329	B_Low	0.00	45.23	45.23	0.00	0.94	1.29	1.51	1.68	0.94	1.29	1.51	1.68	0.00	0.00	0.00	0.00
03-00010	2.53	0.6	332	B_Low	0.00	45.23	45.23	0.00	0.67	0.92	1.07	1.19	0.67	0.92	1.07	1.19	0.00	0.00	0.00	0.00
03-00070	0.15	0.4	81	B_Low	0.00	0.00	40.00	40.00	0.00	0.00	0.00	0.00	0.04	0.05	0.06	0.06	0.04	0.05	0.06	0.06
03-00110	2.33	1.1	319	B_Low	0.00	45.26	45.26	0.00	0.62	0.85	0.99	1.11	0.62	0.85	0.99	1.11	0.00	0.00	0.00	0.00
03-00130	2.84	0.9	352	B_Low	0.00	45.22	45.22	0.00	0.75	1.03	1.21	1.34	0.75	1.03	1.21	1.34	0.00	0.00	0.00	0.00
03-00150	1.76	0.9	277	B_Low	0.00	45.25	45.25	0.00	0.47	0.64	0.75	0.84	0.47	0.64	0.75	0.84	0.00	0.00	0.00	0.00
03-00170	0.34	1.2	121	B_Low	0.00	45.24	45.24	0.00	0.09	0.12	0.15	0.16	0.09	0.12	0.15	0.16	0.00	0.00	0.00	0.00
03-00200	0.59	2.1	160	B_Low	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
03-00230	0.43	1.5	136	B_Low	0.00	0.00	40.14	40.14	0.00	0.00	0.00	0.00	0.10	0.14	0.16	0.18	0.10	0.14	0.16	0.18
03-00250	4.24	0.7	179	B_Low	0.00	45.24	45.24	0.00	1.05	1.45	1.72	1.92	1.05	1.45	1.72	1.92	0.00	0.00	0.00	0.00
03-00280	1.28	0.3	236	B_Low	0.00	45.23	45.23	0.00	0.34	0.46	0.54	0.61	0.34	0.46	0.54	0.61	0.00	0.00	0.00	0.00
03-00320	3.46	0.5	115	C_High	0.00	45.23	45.23	0.00	0.83	1.15	1.36	1.52	0.83	1.15	1.36	1.52	0.00	0.00	0.00	0.00
03-00340	6.49	0.6	50	C_Low	0.48	45.23	45.23	0.00	1.16	1.69	2.05	2.36	1.16	1.69	2.05	2.36	0.00	0.00	0.00	0.00
03-00360	0.96	0.3	18	C_High	0.42	45.25	45.25	0.00	0.20	0.29	0.34	0.39	0.20	0.29	0.34	0.39	0.00	0.00	0.00	0.00
03-00380	4.60	0.4	83	B_Low	0.00	45.24	45.24	0.00	0.98	1.39	1.66	1.87	0.98	1.39	1.66	1.87	0.00	0.00	0.00	0.00
03-00390	2.77	0.5	347	B_Low	0.00	45.21	45.21	0.00	0.73	1.00	1.17	1.31	0.73	1.00	1.17	1.31	0.00	0.00	0.00	0.00
03-00450	2.16	0.4	306	C_High	0.00	45.20	45.20	0.00	0.57	0.78	0.91	1.02	0.57	0.78	0.91	1.02	0.00	0.00	0.00	0.00
03-00490	0.81	1.1	188	C_Mid	0.00	45.26	45.26	0.00	0.22	0.30	0.35	0.40	0.22	0.30	0.35	0.40	0.00	0.00	0.00	0.00
03-00550	0.19	0.9	91	B_Low	0.00	54.45	54.45	0.00	0.06	0.09	0.10	0.11	0.06	0.09	0.10	0.11	0.00	0.00	0.00	0.00
03-00660	4.47	1.2	137	D_Low	0.00	45.23	45.23	0.00	1.13	2.15	2.88	3.40	1.13	2.15	2.88	3.40	0.00	0.00	0.00	0.00
03-00700	2.96	1.7	359	D_Mid	0.00	45.24	45.24	0.00	0.79	1.08	1.46	2.05	0.79	1.08	1.46	2.05	0.00	0.00	0.00	0.00
03-00720	2.58	0.6	335	D_Low	0.00	45.25	45.25	0.00	0.71	1.61	2.06	2.35	0.71	1.61	2.06	2.35	0.00	0.00	0.00	0.00
03-00740	0.90	0.9	198	C_High	0.00	45.27	45.27	0.00	0.24	0.33	0.39	0.43	0.24	0.33	0.39	0.43	0.00	0.00	0.00	0.00
03-00760	1.37	0.5	245	D_Mid	0.00	45.27	45.27	0.00	0.37	0.50	0.66	0.91	0.37	0.50	0.66	0.91	0.00	0.00	0.00	0.00
03-00780	1.47	1	253	D_High	0.00	45.23	45.23	0.00	0.39	0.54	0.90	1.02	0.39	0.54	0.90	1.02	0.00	0.00	0.00	0.00
05-00010	1.18	0.2	226	D_Low	0.00	46.98	46.98	0.00	0.33	0.71	0.92	1.05	0.33	0.71	0.92	1.05	0.00	0.00	0.00	0.00
05-00070	2.14	0.2	305	D_Low	0.00	45.24	45.24	0.00	0.58	1.24	1.62	1.87	0.58	1.24	1.62	1.87	0.00	0.00	0.00	0.00
05-00110	3.67	0.9	202	D_Low	0.00	45.22	45.22	0.00	0.97	1.98	2.63	3.06	0.97	1.98	2.63	3.06	0.00	0.00	0.00	0.00
05-00150	2.19	1.2	309	D_Low	0.00	45.25	45.25	0.00	0.63	1.47	1.84	2.08	0.63	1.47	1.84	2.08	0.00	0.00	0.00	0.00
05-00250	1.12	0.6	221	D_Low	0.00	45.24	45.24	0.00	0.32	0.76	0.94	1.07	0.32	0.76	0.94	1.07	0.00	0.00	0.00	0.00
05-00270	1.84	1.2	283	D_Low	0.00	45.24	45.24	0.00	0.53	1.25	1.56	1.77	0.53	1.25	1.56	1.77	0.00	0.00	0.00	0.00
05-00290	0.45	0.2	140	D_Low	0.00	45.13	45.13	0.00	0.13	0.30	0.38	0.43	0.13	0.30	0.38	0.43	0.00	0.00	0.00	0.00
05-00350	0.09	0.8	64	D_Low	0.00	44.68	44.68	0.00	0.03	0.07	0.09	0.10	0.03	0.07	0.09	0.10	0.00	0.00	0.00	0.00
05-00380	0.31	0.3	115	D_Low	0.00	0.00	0.00	0.00	0.05	0.17	0.23	0.27	0.05	0.17	0.23	0.27	0.00	0.00	0.00	0.00
05-00430	0.86	1	194	D_Low	0.00	45.19	45.19	0.00	0.26	0.61	0.75	0.85	0.26	0.61	0.75	0.85	0.00	0.00	0.00	0.00
06-00000	6.86	0.5	117	B_Low	0.00	55.70	55.70	0.00	1.69	2.43	2.91	3.28	1.69	2.43	2.91	3.28	0.00	0.00	0.00	0.00
06-00080	1.49	1.1	255	B_Low	0.00	45.20	46.21	1.01	0.40	0.54	0.64	0.71	0.41	0.56	0.65	0.73	0.01	0.01	0.01	0.02
06-00100	1.42	0.7	248	B_Low	0.00	45.20	50.00	4.80	0.38	0.52	0.60	0.67	0.42	0.57	0.67	0.74	0.04	0.05	0.06	0.07
06-00120	3.34	0.3	58	B_Low	0.00	45.24	50.00	4.76	0.67	0.96	1.14	1.29	0.72	1.03	1.24	1.40	0.05	0.08	0.09	0.11
06-00130	0.07	0.1	54	B_Low	0.00	30.30	30.30	0.00	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.00	0.00	0.00	0.00
06-00150	0.15	2.1	80	B_Low	0.00	21.77	36.73	14.97	0.02	0.03	0.03	0.03	0.03	0.04	0.05	0.06	0.01	0.02	0.02	0.02
06-00170	0.08	1.3	59	B_Low	0.00	36.25	47.50	11.25	0.02	0.02	0.03	0.03	0.02	0.03	0.04	0.04	0.01	0.01	0.01	0.01
07-00010	5.19	0.5	165	D_Low	0.00	45.22	48.02	2.79	1.25	2.23	2.98	3.55	1.31	2.32	3.08	3.65	0.06	0.09	0.10	0.10
07-00030	3.06	0.5	133	D_Low	0.00	54.70	62.65	7.95	0.91	1.63	2.13	2.48	1.02	1.77	2.26	2.61	0.11	0.14	0.14	0.13
07-00060	2.18	0.2	308	D_Mid	0.00	39.72	39.99	0.27	0.50	0.69	0.87	1.15	0.50	0.69	0.87	1.15	0.00	0.01	0.01	0.01
07-00080	2.74	0.2	49	D_Low	1.10	45.43	50.31	4.88	0.55	0.92	1.20	1.43	0.59	0.98	1.27	1.50	0.04	0.06	0.07	0.08

Table B-1 - Hydrologic Input and Peak Flow Results

Subcatchment Name	Area (acres)	Average Slope (%)	Width (feet)	Infiltration Reference	Tree Cover (%)	Impervious Area (%)			Subcatchment Peak Flow (cfs)											
						Existing Land Use	Future Land Use	Increase	Existing Land Use				Future Land Use				Increase			
									2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm
07-00140	2.38	0.4	322	D_Low	0.00	46.69	51.75	5.05	0.67	1.47	1.89	2.15	0.74	1.53	1.93	2.20	0.07	0.06	0.05	0.04
07-00230	0.83	1	190	D_Low	0.00	65.38	65.38	0.00	0.34	0.63	0.76	0.85	0.34	0.63	0.76	0.85	0.00	0.00	0.00	0.00
07-00270	0.43	0.1	137	D_Low	0.00	64.58	64.58	0.00	0.17	0.31	0.38	0.42	0.17	0.31	0.38	0.42	0.00	0.00	0.00	0.00
07-00310	1.83	0.2	282	D_Mid	0.00	46.89	51.37	4.48	0.49	0.68	0.84	1.07	0.53	0.74	0.91	1.15	0.04	0.06	0.07	0.08
07-00320	3.94	0.3	66	D_High	0.00	43.66	48.86	5.20	0.77	1.10	1.38	1.56	0.83	1.20	1.50	1.70	0.07	0.10	0.12	0.14
08-00120	3.21	1	164	B_Low	0.00	45.24	50.22	4.98	0.82	1.14	1.34	1.49	0.90	1.25	1.47	1.65	0.08	0.12	0.14	0.16
08-00160	1.46	0.1	252	B_Low	0.00	45.26	53.78	8.52	0.36	0.50	0.60	0.67	0.43	0.59	0.70	0.78	0.06	0.09	0.10	0.11
08-00180	1.23	0.1	231	B_Low	0.00	45.19	50.82	5.63	0.31	0.43	0.50	0.56	0.34	0.48	0.56	0.63	0.04	0.05	0.06	0.06
08-00240	1.54	0.1	259	B_Low	0.00	45.25	51.76	6.50	0.40	0.55	0.65	0.72	0.45	0.62	0.73	0.82	0.05	0.07	0.09	0.10
09-00000	0.08	2.6	60	B_Low	0.00	48.19	60.24	12.05	0.02	0.03	0.04	0.04	0.03	0.04	0.05	0.05	0.01	0.01	0.01	0.01
09-00060	0.15	0.7	80	B_Low	0.00	27.89	54.42	26.53	0.02	0.03	0.04	0.04	0.05	0.07	0.08	0.09	0.02	0.03	0.04	0.04
09-00080	1.26	0.9	234	B_Low	0.00	14.89	55.10	40.21	0.11	0.15	0.18	0.20	0.41	0.56	0.65	0.73	0.30	0.41	0.47	0.53
10-00010	4.56	0.6	88	B_Low	0.00	50.61	50.61	0.00	1.11	1.58	1.88	2.11	1.11	1.58	1.88	2.11	0.00	0.00	0.00	0.00
10-00050	4.90	1.6	192	B_Low	0.00	47.78	47.78	0.00	1.31	1.82	2.14	2.39	1.31	1.82	2.14	2.39	0.00	0.00	0.00	0.00
10-00070	2.32	2.2	318	B_Low	0.00	47.04	49.89	2.85	0.64	0.88	1.03	1.15	0.68	0.93	1.09	1.22	0.04	0.05	0.06	0.07
10-01040	6.51	1.4	233	B_Low	0.00	43.83	48.22	4.40	1.58	2.20	2.60	2.90	1.73	2.41	2.84	3.17	0.15	0.20	0.24	0.27
10-01060	2.69	1.8	342	B_Low	0.00	40.48	48.94	8.45	0.64	0.88	1.03	1.15	0.77	1.06	1.24	1.38	0.13	0.18	0.21	0.24
10-01080	3.71	1.5	45	B_Low	0.65	49.14	53.89	4.75	0.88	1.25	1.48	1.67	0.94	1.34	1.60	1.80	0.07	0.10	0.12	0.14
10-01120	2.21	0.8	70	B_Low	3.17	38.01	49.73	11.72	0.46	0.64	0.75	0.84	0.58	0.82	0.96	1.07	0.13	0.18	0.21	0.24
10-01220	1.86	0.2	284	C_High	0.00	45.23	48.84	3.61	0.48	0.67	0.78	0.87	0.52	0.72	0.84	0.94	0.04	0.05	0.06	0.07
10-01240	0.52	1.6	43	D_Low	8.08	0.00	40.00	40.00	0.06	0.22	0.33	0.39	0.14	0.32	0.42	0.47	0.07	0.11	0.09	0.08
10-01260	2.94	0.5	4	D_Low	0.00	0.37	0.37	0.00	0.04	0.10	0.15	0.19	0.04	0.10	0.15	0.19	0.00	0.00	0.00	0.00
10-03030	2.56	0.6	74	C_High	2.69	45.24	45.24	0.00	0.61	0.85	1.00	1.12	0.61	0.85	1.00	1.12	0.00	0.00	0.00	0.00
10-03050	1.87	1.3	285	B_Low	0.00	45.23	45.23	0.00	0.50	0.68	0.80	0.89	0.50	0.68	0.80	0.89	0.00	0.00	0.00	0.00
10-03090	2.99	0.8	76	C_Mid	2.44	45.22	45.22	0.00	0.71	0.99	1.17	1.33	0.71	0.99	1.17	1.33	0.00	0.00	0.00	0.00
11-00010	0.15	2.6	81	B_Low	0.00	33.77	39.74	5.96	0.03	0.04	0.05	0.05	0.04	0.05	0.06	0.06	0.01	0.01	0.01	0.01
11-00030	0.16	0.9	83	B_Low	0.00	53.16	53.16	0.00	0.05	0.07	0.08	0.09	0.05	0.07	0.08	0.09	0.00	0.00	0.00	0.00
11-00110	4.85	0.5	79	B_Low	0.00	0.00	51.19	51.19	0.00	0.00	0.00	0.00	1.14	1.62	1.94	2.18	1.14	1.62	1.94	2.18
11-00150	2.60	0.6	336	B_Low	0.00	0.00	39.98	39.98	0.00	0.00	0.00	0.00	0.61	0.83	0.98	1.09	0.61	0.83	0.98	1.08
11-00230	1.87	0.6	17	B_Low	0.37	0.00	54.71	54.71	0.00	0.00	0.00	0.00	0.40	0.58	0.70	0.79	0.40	0.58	0.70	0.79
11-00270	0.18	1.5	90	B_Low	0.00	0.00	45.65	45.65	0.00	0.00	0.00	0.00	0.05	0.07	0.08	0.09	0.05	0.07	0.08	0.09
13-00020	2.02	0.9	297	B_Low	0.00	45.26	56.18	10.92	0.54	0.74	0.86	0.96	0.67	0.91	1.07	1.19	0.13	0.18	0.21	0.23
13-00060	6.17	0.6	159	B_Low	0.00	45.24	53.66	8.42	1.44	2.02	2.39	2.68	1.66	2.35	2.79	3.12	0.22	0.33	0.39	0.44
13-00120	1.87	1.3	286	B_Low	0.00	45.25	57.20	11.95	0.50	0.68	0.80	0.89	0.63	0.86	1.01	1.12	0.13	0.18	0.21	0.23
13-00130	14.97	0.1	50	C_High	0.00	11.29	50.44	39.15	0.62	0.90	1.08	1.23	1.62	2.44	2.98	3.41	1.00	1.54	1.90	2.19
13-00170	0.80	1.6	187	B_Low	0.00	45.31	45.31	0.00	0.22	0.29	0.34	0.38	0.22	0.29	0.34	0.38	0.00	0.00	0.00	0.00
13-00210	5.27	0.6	180	B_Low	0.00	45.24	52.39	7.15	1.27	1.77	2.09	2.33	1.69	2.37	2.81	3.15	0.42	0.60	0.72	0.82
13-00230	5.12	0.9	166	B_Low	0.00	45.23	45.23	0.00	1.25	1.74	2.05	2.30	1.25	1.74	2.05	2.30	0.00	0.00	0.00	0.00
13-00400	2.03	0.8	233	B_Low	0.00	45.23	45.23	0.00	0.53	0.73	0.86	0.96	0.53	0.73	0.86	0.96	0.00	0.00	0.00	0.00
14-00040	0.22	0	98	B_Low	0.00	51.14	51.14	0.00	0.06	0.09	0.10	0.12	0.06	0.09	0.10	0.12	0.00	0.00	0.00	0.00
14-00080	0.23	0	99	B_Low	0.00	50.22	50.22	0.00	0.07	0.09	0.11	0.12	0.07	0.09	0.11	0.12	0.00	0.00	0.00	0.00
14-00100	0.33	0.1	120	B_Low	0.00	49.85	50.15	0.30	0.10	0.13	0.15	0.17	0.10	0.13	0.15	0.17	0.00	0.00	0.00	0.00
14-00140	0.75	0.2	181	B_Low	0.00	37.58	39.97	2.39	0.17	0.23	0.27	0.30	0.18	0.24	0.28	0.32	0.01	0.01	0.02	0.02
14-00200	1.50	0.5	256	B_Low	0.00	0.00	51.17	51.17	0.00	0.00	0.00	0.00	0.45	0.62	0.72	0.80	0.45	0.62	0.72	0.80
16-00050	0.07	0.8	53	B_Low	0.00	86.15	86.15	0.00	0.03	0.05	0.05	0.06	0.03	0.05	0.05	0.06	0.00	0.00	0.00	0.00
16-00190	2.89	0.8	39	C_Mid	0.62	49.50	49.50	0.00	0.66	0.94	1.13	1.28	0.66	0.94	1.13	1.28	0.00	0.00	0.00	0.00
16-00200	3.04	0.4	108	D_Low	6.58	25.19	53.67	28.48	0.44	0.90	1.29	1.59	0.85	1.46	1.91	2.24	0.41	0.56	0.62	0.65
16-00220	1.63	0.4	267	D_Low	0.00	38.76	55.05	16.29	0.39	0.98	1.28	1.46	0.54	1.10	1.37	1.56	0.15	0.13	0.10	0.10
16-00240	6.66	0.5	34	D_Low	0.30	23.36	86.91	63.55	0.65	1.07	1.40	1.68	1.62	2.50	3.11	3.59	0.97	1.44	1.71	1.91
16-00300	23.80	0.4	66	D_High	29.90	17.01	47.29	30.28	1.46	2.29	2.97	3.50	2.89	4.49	5.69	6.60	1.44	2.20	2.72	3.11
17-00350	50.53	0.1	665	C_Mid	0.00	3.14	47.46	44.32	0.91	1.26	1.48	1.65	8.77	12.78	15.41	17.53	7.86	11.52	13.94	15.88
17-00430	0.36	0.8	125	C_Low	0.00	61.45	71.51	10.06	0.13	0.18	0.22	0.29	0.15	0.21	0.25	0.32	0.02	0.03	0.03	0.02
18-00040	0.21	1.4	96	B_Low	0.00	59.72	59.72	0.00	0.08	0.10	0.12	0.13	0.08	0.10	0.12	0.13	0.00	0.00	0.00	0.00
18-00100	0.45	0.2	141	B_Low	0.00	49.78	49.78	0.00	0.13	0.18	0.21	0.24	0.13	0.18	0.21	0.24	0.00	0.00	0.00	0.00
18-00102	5.29	0.5	19	B_Low	0.00	13.83	35.62	21.79	0.31	0.45	0.54	0.61	0.62	0.90	1.08	1.23	0.30	0.45	0.54	0.62
18-00140	7.39	0.1	26	B_Low	0.00	18.95	50.96	32.01	0.38	0.56	0.68	0.78	0.68	1.03	1.26	1.44	0.30	0.46	0.58	0.67
18-00280	17.39	0.1	59	B_Low	0.00	6.60	50.13	43.53	0.46	0.66	0.79	0.90	1.68	2.53	3.10	3.56	1.23	1.87	2.31	2.66

Table B-1 - Hydrologic Input and Peak Flow Results

Subcatchment Name	Area (acres)	Average Slope (%)	Width (feet)	Infiltration Reference	Tree Cover (%)	Impervious Area (%)			Subcatchment Peak Flow (cfs)											
						Existing Land Use	Future Land Use	Increase	Existing Land Use				Future Land Use				Increase			
									2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm
18-00320	0.13	0.4	76	B_Low	0.00	56.82	56.82	0.00	0.04	0.06	0.07	0.08	0.04	0.06	0.07	0.08	0.00	0.00	0.00	0.00
18-00340	2.32	0.9	318	B_Low	0.00	17.97	49.55	31.58	0.25	0.34	0.40	0.44	0.67	0.92	1.08	1.20	0.43	0.58	0.68	0.76
18-00400	2.42	0.9	325	B_Low	0.00	45.23	52.66	7.43	0.64	0.88	1.03	1.15	0.75	1.02	1.20	1.33	0.10	0.14	0.17	0.19
18-00460	2.37	1.4	321	B_Low	0.00	15.63	30.49	14.86	0.22	0.30	0.35	0.39	0.43	0.59	0.69	0.76	0.21	0.28	0.33	0.37
18-00600	4.19	0.2	22	B_Low	0.00	43.16	51.24	8.08	0.52	0.77	0.93	1.06	0.58	0.86	1.04	1.19	0.06	0.09	0.11	0.13
18-00720	6.51	0.1	31	B_Low	0.00	17.50	33.21	15.71	0.40	0.59	0.71	0.81	0.63	0.92	1.12	1.27	0.22	0.33	0.41	0.46
18-00740	0.52	0.1	150	B_Low	0.00	49.61	50.00	0.39	0.15	0.20	0.24	0.27	0.15	0.21	0.24	0.27	0.00	0.00	0.00	0.00
18-00800	0.31	0.1	116	B_Low	0.00	60.13	60.13	0.00	0.11	0.15	0.18	0.20	0.11	0.15	0.18	0.20	0.00	0.00	0.00	0.00
18-00820	1.20	0.6	229	B_Low	0.00	16.07	49.96	33.89	0.12	0.16	0.18	0.20	0.35	0.48	0.57	0.63	0.24	0.33	0.38	0.43
18-00980	6.10	0.1	27	B_Low	0.00	12.35	49.96	37.61	0.29	0.43	0.51	0.58	0.75	1.12	1.36	1.55	0.46	0.69	0.85	0.97
18-01050	9.71	1	267	B_Low	0.00	18.02	52.22	34.20	1.01	1.39	1.63	1.82	2.67	3.73	4.41	4.93	1.66	2.34	2.78	3.11
18-01100	1.18	0.5	226	B_Low	0.00	19.37	52.00	32.63	0.14	0.19	0.22	0.24	0.36	0.49	0.58	0.64	0.22	0.31	0.36	0.40
19-00040	1.57	1.8	261	B_Low	0.00	54.28	56.90	2.62	0.50	0.69	0.80	0.90	0.52	0.72	0.84	0.94	0.02	0.03	0.04	0.04
19-00060	2.42	1.2	325	B_Low	0.00	43.42	47.67	4.25	0.62	0.85	0.99	1.11	0.68	0.93	1.09	1.21	0.06	0.08	0.10	0.11
19-00080	0.44	1	138	B_Low	0.00	35.99	54.90	18.91	0.09	0.13	0.15	0.17	0.14	0.20	0.23	0.26	0.05	0.07	0.08	0.09
22-00040	4.80	0.5	88	B_Low	0.00	53.03	53.03	0.00	1.19	1.69	2.02	2.27	1.19	1.69	2.02	2.27	0.00	0.00	0.00	0.00
CC-N-00-002	41.24	4.6	106	C_High	77.15	0.53	4.86	4.33	0.13	0.26	1.01	1.76	1.13	1.57	1.91	2.40	1.00	1.30	0.90	0.64
CC-N-00-011	46.40	2.2	118	C_Mid	42.18	2.29	40.00	37.71	0.61	0.85	1.04	1.70	6.58	9.61	11.68	13.50	5.96	8.76	10.64	11.80
CC-N-00-018	44.21	0.7	70	D_Mid	14.82	3.42	40.00	36.58	0.76	1.07	1.32	1.62	4.40	6.54	8.08	9.40	3.64	5.47	6.76	7.79
CC-N-00-021	27.65	1.2	134	D_Mid	29.80	0.00	68.59	68.59	0.00	0.19	0.91	1.70	6.34	9.23	11.31	13.21	6.34	9.04	10.40	11.51
CC-N-00-027	14.96	0.6	105	D_Mid	50.53	9.73	30.24	20.51	0.77	1.09	1.44	1.75	1.94	2.81	3.52	4.11	1.17	1.72	2.08	2.36
CC-N-00-029	9.76	0.6	158	D_Low	0.00	15.55	71.04	55.49	0.86	1.79	2.64	3.36	3.01	4.85	6.17	7.17	2.15	3.06	3.53	3.81
CC-N-00-035	1235.47	1	820	C_High	24.36	4.61	5.16	0.55	23.01	33.30	40.02	45.28	24.94	36.17	43.53	49.30	1.93	2.88	3.51	4.02
CC-N-01-001	11.60	0.4	500	C_High	1.16	0.45	35.20	34.75	0.07	0.14	0.17	0.21	2.27	3.18	3.75	4.20	2.21	3.03	3.58	3.99
CC-N-01-002	5.24	0.3	179	C_High	0.00	0.00	50.05	50.05	0.00	0.00	0.00	0.05	1.32	1.86	2.21	2.48	1.32	1.86	2.21	2.43
CC-N-01-003	5.87	0.2	378	C_High	6.44	0.00	0.00	0.00	0.06	0.23	0.30	0.34	0.06	0.23	0.30	0.34	0.00	0.00	0.00	0.00
CC-N-01-004	2.38	0.2	512	C_Mid	18.02	0.00	0.00	0.00	0.08	0.28	0.35	0.44	0.08	0.28	0.35	0.44	0.00	0.00	0.00	0.00
CC-N-01-005	4.78	0.2	525	C_Low	3.91	0.00	0.00	0.00	0.04	0.13	0.36	0.67	0.04	0.13	0.36	0.67	0.00	0.00	0.00	0.00
CC-N-01-009	10.63	0.5	1970	D_Mid	16.72	4.81	5.00	0.20	0.51	1.61	2.75	4.65	0.51	1.63	2.77	4.67	0.01	0.01	0.02	0.02
CC-N-01-021	16.43	0.4	2400	D_Mid	24.64	12.86	49.31	36.45	1.43	4.05	6.04	8.69	4.80	8.02	10.15	12.83	3.37	3.96	4.11	4.14
CC-N-01-023	39.22	0.4	1064	D_Mid	8.98	3.16	57.79	54.63	0.81	2.55	3.93	5.74	11.08	16.54	20.21	23.76	10.27	13.99	16.28	18.02
CC-N-02-001	11.14	0.4	156	C_Low	4.51	10.59	40.31	29.72	0.65	0.90	1.12	1.44	2.02	2.89	3.52	4.15	1.37	1.99	2.40	2.71
CC-N-02-007	12.45	0.3	2170	D_Low	0.24	1.25	32.47	31.22	1.41	4.70	7.27	8.89	2.55	6.92	9.28	10.73	1.15	2.22	2.01	1.84
CC-N-02-017	769.41	0.4	720	C_Low	32.06	3.03	6.54	3.51	10.19	14.64	17.63	20.45	21.67	31.18	37.57	43.55	11.48	16.55	19.94	23.10
CC-N-03-002	25.65	0.4	79	C_High	34.27	5.67	15.83	10.16	0.71	1.01	1.20	1.35	1.54	2.24	2.70	3.06	0.83	1.23	1.50	1.71
CC-N-03-003	2.44	0.2	326	B_Low	0.00	5.08	44.02	38.94	0.07	0.10	0.12	0.13	0.61	0.85	1.00	1.11	0.54	0.75	0.88	0.98
CC-N-04-002	23.91	1	114	B_Low	37.04	1.36	40.00	38.64	0.19	0.26	0.31	0.34	3.64	5.29	6.38	7.23	3.45	5.03	6.07	6.88
CC-N-05-001	10.31	1.5	65	C_High	35.53	1.19	40.01	38.81	0.07	0.10	0.15	0.32	1.80	2.58	3.10	3.57	1.72	2.48	2.96	3.25
CC-N-05-002	8.08	1.7	161	B_Low	6.84	6.94	40.00	33.06	0.33	0.45	0.53	0.59	1.74	2.42	2.85	3.19	1.41	1.97	2.32	2.60
CC-N-05-003	17.71	1.2	447	B_Low	0.00	12.64	49.00	36.36	1.31	1.79	2.10	2.34	4.60	6.42	7.58	8.47	3.30	4.63	5.48	6.14
LINN-0	9.24	0.1	34	B_Low	0.00	63.23	63.23	0.00	1.09	1.64	2.01	2.30	1.09	1.64	2.01	2.30	0.00	0.00	0.00	0.00
LINN-11	25.49	1.1	334	D_High	0.00	50.31	70.75	20.45	6.06	8.68	10.91	12.32	7.88	11.37	14.16	16.03	1.82	2.70	3.26	3.71
LINN-17	8.99	0.6	258	D_Mid	0.00	86.11	86.11	0.00	3.64	5.19	6.31	7.33	3.64	5.19	6.31	7.33	0.00	0.00	0.00	0.00
LINN-18	20.63	0.4	221	D_Mid	0.00	39.91	72.44	32.54	3.44	4.97	6.05	7.05	5.25	7.67	9.34	10.82	1.81	2.70	3.29	3.77
LINN-2	18.13	0.6	282	B_Low	0.00	4.52	59.89	55.37	0.48	0.66	0.77	0.86	4.78	6.86	8.21	9.26	4.30	6.20	7.44	8.41
LINN-22	2.85	0.1	352	D_Low	0.00	66.26	66.26	0.00	1.05	1.83	2.29	2.61	1.05	1.83	2.29	2.61	0.00	0.00	0.00	0.00
LINN-4	12.50	0.7	184	B_Low	0.00	42.04	70.85	28.80	2.50	3.56	4.24	4.77	3.72	5.37	6.44	7.28	1.23	1.82	2.21	2.52
LINN-9	36.76	0.9	435	B_Low	0.00	54.00	70.48	16.48	8.75	12.57	15.04	16.97	10.66	15.41	18.50	20.92	1.91	2.84	3.46	3.96

Table B-1 - Hydrologic Input and Peak Flow Results

Subcatchment Name	Area (acres)	Average Slope (%)	Width (feet)	Infiltration Reference	Tree Cover (%)	Impervious Area (%)			Subcatchment Peak Flow (cfs)											
						Existing Land Use	Future Land Use	Increase	Existing Land Use				Future Land Use				Increase			
									2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm	2-yr, 24-hr Design Storm	10-yr, 24-hr Design Storm	25-yr, 24-hr Design Storm	50-yr, 24-hr Design Storm
MURDER CREEK																				
00-05381	2.02	0.8	256.26	C_High	0.00	27.72	51.34	23.62	0.33	0.45	0.53	0.59	0.60	0.83	0.97	1.08	0.28	0.38	0.44	0.49
00-05382	4.06	0.6	176.11	C_Mid	0.00	21.67	50.14	28.46	0.51	0.70	0.82	0.91	1.10	1.53	1.80	2.03	0.59	0.83	0.98	1.12
00-05391	5.13	1.4	489.32	D_High	0.00	19.49	49.92	30.43	0.59	0.84	1.76	2.03	1.50	2.05	3.09	3.49	0.90	1.21	1.33	1.46
00-05401	4.17	1.6	344.29	C_High	0.00	17.27	49.99	32.72	0.43	0.58	0.68	0.76	1.22	1.67	1.96	2.18	0.79	1.09	1.27	1.42
00-05411	0.13	0.7	37.5	D_Low	0.00	50.00	50.00	0.00	0.04	0.09	0.11	0.12	0.04	0.09	0.11	0.12	0.00	0.00	0.00	0.00
00-05421	1.77	0.4	178.38	B_Low	0.00	35.03	51.78	16.75	0.36	0.49	0.58	0.65	0.52	0.72	0.85	0.94	0.16	0.22	0.27	0.30
00-05431	17.87	0.4	724.28	B_Low	0.00	52.15	75.41	23.26	4.86	6.81	8.05	9.01	6.60	9.36	11.12	12.49	1.74	2.54	3.07	3.48
00-05432	9.38	0.7	470.6	B_Low	0.00	45.20	68.12	22.92	2.34	3.26	3.85	4.30	3.42	4.76	5.61	6.27	1.07	1.50	1.76	1.97
01-00150	2.03	0.7	154.2	C_Low	0.00	50.74	54.08	3.35	0.58	0.81	0.95	1.18	0.62	0.86	1.02	1.25	0.04	0.05	0.06	0.07
01-00170	1.37	2.3	291.96	C_High	0.00	50.36	55.97	5.60	0.41	0.56	0.66	0.73	0.46	0.62	0.73	0.81	0.05	0.06	0.07	0.08
01-00210	0.96	0.5	61.4	D_Mid	0.00	11.46	50.00	38.54	0.07	0.09	0.14	0.21	0.27	0.37	0.46	0.57	0.20	0.28	0.32	0.36
01-00290	0.55	1.6	123.57	D_High	0.00	50.91	54.56	3.65	0.17	0.23	0.39	0.44	0.18	0.25	0.40	0.45	0.01	0.01	0.01	0.01
01-00310	0.81	2.9	178.07	C_Low	0.00	54.32	63.41	9.09	0.26	0.36	0.45	0.64	0.30	0.42	0.51	0.69	0.04	0.06	0.06	0.05
01-00330	0.18	3	53.11	C_Low	0.00	0.00	50.00	50.00	0.00	0.01	0.04	0.08	0.05	0.07	0.10	0.14	0.05	0.06	0.06	0.06
01-00370	5.82	1.2	579.09	C_Mid	0.00	0.00	49.99	49.99	0.00	0.00	0.19	0.60	1.70	2.33	2.73	3.04	1.70	2.33	2.54	2.44
01-00390	0.25	4.2	92.71	D_Mid	0.00	24.00	50.00	26.00	0.04	0.05	0.13	0.20	0.08	0.10	0.18	0.23	0.04	0.05	0.05	0.03
08-00020	0.25	1.6	85.47	B_Low	0.00	24.00	44.90	20.90	0.04	0.05	0.06	0.06	0.07	0.09	0.11	0.12	0.03	0.04	0.05	0.05
08-00060	1.77	0.4	75.75	B_Low	0.00	50.28	56.88	6.60	0.47	0.66	0.78	0.87	0.53	0.74	0.87	0.97	0.06	0.08	0.10	0.11
12-00020	4.60	0.3	154.72	B_Low	0.00	11.30	36.59	25.28	0.30	0.41	0.49	0.54	0.87	1.22	1.45	1.62	0.57	0.81	0.96	1.08
12-00060	2.03	1.9	262.88	C_High	0.00	47.29	56.74	9.44	0.57	0.77	0.91	1.01	0.68	0.93	1.09	1.21	0.11	0.15	0.18	0.20
12-00100	1.34	0.5	87.63	B_Low	0.00	52.99	59.67	6.69	0.39	0.54	0.64	0.72	0.44	0.61	0.72	0.81	0.05	0.06	0.08	0.09
12-00180	4.14	1.6	472.12	B_Low	0.00	50.48	58.65	8.16	1.23	1.68	1.97	2.19	1.42	1.95	2.28	2.54	0.19	0.27	0.32	0.35
12-00241	1.62	2.8	231.26	B_Low	0.00	14.81	51.29	36.48	0.14	0.20	0.23	0.25	0.49	0.67	0.79	0.88	0.35	0.48	0.56	0.63
15-00080	5.00	0.4	174.41	B_Low	0.00	70.80	75.01	4.21	1.71	2.43	2.90	3.25	1.77	2.52	3.01	3.38	0.06	0.09	0.11	0.13
15-00240	0.45	1.5	69.91	B_Low	0.00	51.11	51.11	0.00	0.14	0.19	0.22	0.24	0.14	0.19	0.22	0.24	0.00	0.00	0.00	0.00
23-00020	0.22	0.1	9.01	B_Low	0.00	81.82	83.18	1.36	0.07	0.11	0.13	0.15	0.08	0.11	0.14	0.15	0.00	0.01	0.01	0.01
23-00040	1.62	1.5	279.43	B_Low	0.00	27.78	45.72	17.94	0.27	0.37	0.43	0.48	0.44	0.60	0.70	0.78	0.17	0.23	0.28	0.31
23-00060	0.13	1.4	45.6	B_Low	0.00	92.31	92.31	0.00	0.07	0.10	0.11	0.13	0.07	0.10	0.11	0.13	0.00	0.00	0.00	0.00
23-00100	0.11	1.5	35.8	B_Low	0.00	90.91	90.91	0.00	0.06	0.08	0.10	0.11	0.06	0.08	0.10	0.11	0.00	0.00	0.00	0.00
23-00140	0.74	1.7	154.31	B_Low	0.00	44.59	44.59	0.00	0.20	0.27	0.31	0.35	0.20	0.27	0.31	0.35	0.00	0.00	0.00	0.00
23-00180	0.18	0.8	30.11	B_Low	0.00	77.78	77.78	0.00	0.08	0.11	0.13	0.15	0.08	0.11	0.13	0.15	0.00	0.00	0.00	0.00
23-00220	0.13	0.5	14.38	B_Low	0.00	84.62	84.62	0.00	0.06	0.09	0.10	0.11	0.06	0.09	0.10	0.11	0.00	0.00	0.00	0.00
23-00240	3.93	2	557.11	B_Low	0.00	11.70	50.00	38.30	0.27	0.38	0.44	0.49	1.16	1.58	1.86	2.07	0.88	1.21	1.42	1.58
23-00280	0.03	0.8	23.37	B_Low	0.00	100.00	100.00	0.00	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.00	0.00	-0.01	-0.01
23-00300	0.16	0.6	33.05	D_High	0.00	56.25	56.25	0.00	0.05	0.07	0.11	0.12	0.05	0.07	0.11	0.12	0.00	0.00	0.00	0.00
LINN-25	15.53	0.7	711.53	C_Mid	0.00	3.16	38.26	35.10	0.29	0.40	0.47	1.00	3.32	4.62	5.44	6.07	3.03	4.22	4.97	5.08
LINN-26	45.46	0.4	1359.18	C_High	0.00	34.56	66.62	32.06	8.30	11.60	13.70	15.31	14.28	20.34	24.25	27.28	5.97	8.74	10.55	11.97
MC-DRAIN-N-03	5.51	1.4	485.08	C_High	0.00	1.63	24.03	22.40	0.05	0.07	0.09	0.23	0.78	1.07	1.26	1.40	0.73	1.00	1.17	1.16
MC-DRAIN-N-04	10.31	0.5	481.74	C_Mid	0.00	7.37	50.00	42.63	0.45	0.61	0.72	0.82	2.78	3.87	4.55	5.15	2.33	3.25	3.83	4.33
MC-N-01-03	30.60	0.8	1162.07	C_Mid	0.00	1.31	48.43	47.12	0.24	0.33	0.51	1.65	8.04	11.16	13.15	14.85	7.80	10.84	12.64	13.20
MC-N-01-07	76.89	1.2	2547.08	C_High	9.17	0.90	66.27	65.38	0.41	0.56	0.66	1.89	26.94	37.65	44.44	49.69	26.53	37.09	43.79	47.80
MC-N-01-13	64.75	0.9	1839.81	C_High	0.00	9.67	74.45	64.79	3.67	5.03	5.89	6.55	24.01	33.94	40.29	45.21	20.34	28.91	34.40	38.66
MC-N-01-15	141.65	0.3	1063.83	C_High	2.17	36.03	71.48	35.45	19.22	27.95	33.68	38.18	31.50	46.13	55.72	63.28	12.29	18.18	22.04	25.09
MC-N-02-03	36.61	0.4	756.13	B_Low	0.00	3.06	54.78	51.72	0.66	0.91	1.06	1.18	9.04	12.95	15.48	17.45	8.38	12.05	14.42	16.27
MC-N-02-05	149.88	0.4	1057.14	B_Low	20.90	20.30	71.72	51.41	13.67	19.59	23.42	26.40	34.27	50.07	60.41	68.64	20.60	30.48	36.99	42.24
MC-N-11-02	39.33	1.3	1326.13	C_High	0.00	1.42	74.40	72.98	0.33	0.46	0.53	0.85	15.38	21.52	25.42	28.43	15.04	21.06	24.88	27.58
MC-N-21-02	57.95	1	1572.69	C_High	0.00	2.19	74.67	72.48	0.76	1.03	1.21	1.35	21.51	30.41	36.11	40.52	20.75	29.38	34.90	39.18

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
CROOKS CREEK																
00-05035	00-15035	00-05039	32.8	12" DIA	1.9	204.3	203.7	207.9	207.9	204.4	203.9	204.8	204.1	4.9	0.1	0.8
00-05047	00-15049	00-05045	31.87	30" DIA	0.3	203.3	203.3	208.6	208.6	204.3	204.3	204.9	204.8	20.6	0.5	3.8
00-05048	00-15049	00-05045	31.8	30" DIA	0.5	203.3	203.1	208.6	208.6	204.3	204.3	204.9	204.8	30.0	0.7	4.3
00-05049	00-15049	00-05045	32.14	30" DIA	0.1	203.2	203.2	208.6	208.6	204.3	204.3	204.9	204.8	10.2	0.6	4.1
00-05054	00-15054	00-05053	26.66	12" DIA	1.9	235.5	235.0	237.7	237.7	235.7	235.0	235.8	235.1	5.0	0.2	0.7
00-05059	00-15059	00-05060	26.66	12" DIA	0.5	233.5	233.3	235.9	235.9	233.6	233.6	235.9	235.9	2.6	0.2	1.4
00-05067	00-15067	16-00450	41.03	24" DIA	1	204.7	204.3	208.8	208.8	206.0	204.9	206.8	205.4	22.6	6.8	13.6
00-05068	00-15067	16-00450	41.13	24" DIA	1	204.7	204.3	208.8	208.8	206.0	204.9	206.8	205.4	22.3	6.9	13.7
00-05190	00-15191	00-05187	30.23	84" DIA	2.3	210.4	209.7	220.9	220.9	214.6	214.5	214.6	214.6	621.7	27.9	29.7
00-05191	00-15191	00-05187	31.46	84" DIA	1.5	210.1	209.6	220.9	220.9	214.6	214.5	214.6	214.6	435.9	-12.2	-12.4
00-05192	00-15191	00-05187	31.53	84" DIA	0.4	209.7	209.5	220.9	220.9	214.6	214.5	214.6	214.6	197.9	-12.1	-12.1
00-05252	00-15253	00-05250	35.64	36" DIA	0.1	196.6	196.6	201.6	201.7	198.3	198.0	198.8	198.4	25.0	11.1	18.1
00-05253	00-15253	00-05250	35.64	36" DIA	0.1	196.7	196.7	201.6	201.7	198.3	198.0	198.8	198.4	25.0	9.9	16.7
00-05256	00-15256	00-05254	19.72	51" H, 66" BOX	1.5	197.2	197.0	202.3	202.3	198.8	198.7	199.3	199.1	313.9	21.0	34.8
00-05257	00-15258	00-05263	39.94	48" DIA	0.3	191.1	191.0	196.7	196.7	194.5	194.4	195.4	195.2	71.9	24.4	40.6
00-05258	00-15258	00-05263	39.94	48" DIA	0.5	191.0	190.8	196.7	196.7	194.5	194.4	195.4	195.2	99.1	25.4	41.2
00-05260	00-15258	00-05263	39.92	48" DIA	0.6	191.3	191.1	196.7	196.7	194.5	194.4	195.4	195.2	113.7	23.8	40.0
00-05262	00-15258	00-05263	39.97	48" DIA	0.2	191.0	190.9	196.7	196.7	194.5	194.4	195.4	195.2	64.3	24.6	40.7
00-05286	00-15286	00-05283	50.42	24" DIA	2.4	231.9	230.7	234.5	234.5	232.7	231.6	233.0	231.8	34.8	4.6	5.9
00-05287	00-15286	00-05283	50.57	24" DIA	0.9	231.3	230.8	234.5	234.5	232.7	231.6	233.0	231.8	21.6	7.7	10.6
00-05308	00-15308	00-05309	21.41	24" DIA	1.4	223.9	223.6	226.9	226.9	225.7	224.7	226.3	224.9	27.2	11.3	18.3
00-05365	00-15365	00-05349	70.5	58" H, 120" BOX	1.2	205.2	204.3	213.5	213.5	207.8	207.8	208.3	208.2	851.5	31.3	39.6
00-05370	00-15365	00-05349	70.61	58" H, 120" BOX	1.23	205.2	204.3	213.5	213.5	207.8	207.8	208.3	208.2	850.8	31.3	39.6
00-05500	00-05501	00-05502	18.13	15" DIA	0.55	193.9	193.8	196.5	196.5	194.8	194.8	195.1	195.0	4.8	0.6	1.6
00-05510	00-05501	00-05502	17.35	12" DIA	1.15	194.0	193.8	196.5	196.5	194.8	194.8	195.1	195.0	3.8	0.4	1.0
00-05520	00-05521	00-05522	14.43	12" DIA	-1.39	199.1	199.3	201.7	201.7	199.4	199.2	199.6	199.4	4.2	0.0	0.4
00-05530	00-05521	00-05522	14.83	15" DIA	-0.67	198.8	198.9	201.7	201.7	199.4	199.2	199.6	199.4	5.3	1.0	1.8
00-05540	00-05541	00-05542	24.71	12" DIA	1.21	200.3	200.0	202.1	202.1	200.9	200.4	201.4	200.5	3.9	1.0	2.2
00-05550	00-005551	00-05552	21.45	12" DIA	-1.86	200.4	200.8	202.8	202.8	201.5	201.4	201.9	201.6	4.9	0.9	2.2
00-05560	00-05561	00-05562	24.96	12" DIA	0.4	201.5	201.4	203.3	203.3	202.3	202.2	202.6	202.4	2.3	0.9	2.1
00-05570	00-05571	00-05572	21.53	12" DIA	0.7	201.6	201.5	203.4	203.4	202.3	202.3	202.6	202.6	3.0	0.9	1.3
00-21671	00-21680	00-21690	20.11	24" DIA	0.5	203.6	203.5	206.0	206.0	204.2	203.7	204.7	204.1	16.0	1.6	4.4
00-21681	00-21680	00-21690	20.09	24" DIA	1.29	203.7	203.4	206.0	206.0	204.2	203.7	204.7	204.1	25.7	1.9	4.2
00-22661	00-22680	00-22960	23.83	12" DIA	0.8	202.2	202.0	204.6	204.6	202.2	202.2	203.0	203.0	3.0	0.0	1.1
00-22671	00-22680	00-22960	24.29	12" DIA	0.82	202.4	202.2	204.6	204.6	202.2	202.2	203.0	203.0	3.0	0.0	0.9
00-22681	00-22680	00-22960	24.32	30" DIA	-1.77	200.8	201.2	204.6	204.6	202.2	202.2	203.0	203.0	50.6	3.5	7.4
01-00070	01-00060	01-00080	81.6	10" DIA	0.5	238.5	238.1	242.6	242.2	238.6	238.6	238.6	238.6	1.6	0.0	0.0
01-00090	01-00080	01-00100	36.03	10" DIA	0.5	238.1	237.9	242.2	242.2	238.6	238.5	238.6	238.6	1.6	0.6	0.6
01-00110	01-00100	01-00120	134	12" DIA	0.5	237.9	237.3	242.2	242.2	238.5	238.3	238.6	238.4	2.5	1.1	1.2
01-00220	01-00230	01-00250	35.18	10" DIA	0.4	238.7	238.5	241.2	241.2	238.9	238.9	238.9	238.9	1.4	0.0	0.0
01-00240	01-00250	01-00270	126.08	10" DIA	0.3	238.5	238.2	241.2	241.8	238.9	238.6	238.9	238.7	1.2	0.5	0.5
01-00260	01-00270	01-00100	71.2	10" DIA	0.3	238.2	237.9	241.8	242.2	238.6	238.5	238.7	238.6	1.2	0.6	0.6
01-00380	01-00430	01-00410	22.15	12" DIA	0.5	236.4	236.3	239.0	239.0	236.8	236.7	236.9	236.7	2.5	1.1	1.2
02-00010	02-00020	00-15308	70	12" DIA	0.4	226.1	225.8	229.6	226.9	226.5	225.7	226.5	226.3	2.3	0.8	0.9
02-00030	02-00040	02-00020	285.92	12" DIA	0.8	228.5	226.2	235.9	229.6	228.8	226.5	228.8	226.5	3.2	0.6	0.6
02-00050	02-Dummy-01	02-00040	135.69	12" DIA	0.8	229.7	228.6	239.1	235.9	230.0	228.8	230.0	228.8	3.2	0.6	0.6
02-00070	02-00080	02-00060	120	60" DIA	0.3	230.1	229.8	238.7	239.1	233.5	233.5	233.5	233.5	142.7	0.9	0.9
02-00090	02-00100	02-00080	322	12" DIA	0.6	236.3	234.2	240.6	238.7	236.7	233.5	236.7	233.5	2.8	1.3	1.3
02-00110	02-00120	02-00100	27.5	12" DIA	0.1	237.6	237.3	240.9	240.6	238.0	236.7	238.0	236.7	3.5	1.3	1.3
02-00130	02-00140	02-00120	97.72	6" DIA	2.3	240.5	238.3	243.5	240.9	240.5	238.0	240.5	238.0	0.8	0.0	0.0
03-00020	03-00030	03-00010	65	21" DIA	0.3	204.0	203.8	208.3	207.9	207.9	207.9	207.9	207.9	8.3	4.2	4.3
03-00040	03-00010	03-00050	28	21" DIA	1.3	203.8	203.4	207.9	208.2	207.9	207.9	207.9	207.9	20.3	5.1	5.2

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
03-00060	03-00050	03-00070	37	21" DIA	0.4	203.4	203.2	208.2	208.2	207.9	207.9	207.9	207.9	10.4	5.1	5.2
03-00080	03-00090	03-00030	102.41	21" DIA	0.3	204.3	204.0	208.8	208.3	207.9	207.9	208.0	207.9	8.4	4.2	4.3
03-00100	03-00110	03-00090	160.09	18" DIA	0.3	204.8	204.3	209.2	208.8	208.0	207.9	208.0	208.0	5.6	4.2	4.3
03-00120	03-00130	03-00110	233.07	18" DIA	0.3	205.4	204.8	210.6	209.2	208.1	208.0	208.1	208.0	5.6	3.4	3.5
03-00140	03-00150	03-00130	400	18" DIA	0.3	206.6	205.4	212.6	210.6	208.1	208.1	208.2	208.1	5.8	2.6	2.7
03-00160	03-00170	03-00150	149.59	18" DIA	0.4	207.2	206.6	213.3	212.6	208.1	208.1	208.3	208.2	6.7	0.8	0.9
03-00180	03-00190	03-00170	85.97	18" DIA	0.4	208.0	207.2	215.0	213.3	208.3	208.1	208.3	208.3	10.1	0.7	0.8
03-00210	03-00230	03-00200	116.33	18" DIA	0.5	208.7	208.1	213.7	215.0	210.3	210.3	211.0	211.0	7.4	1.9	2.4
03-00240	03-00250	03-00230	135.93	15" DIA	0.3	209.4	208.9	214.0	213.7	210.3	210.3	211.1	211.0	3.7	2.0	2.3
03-00270	03-00260	03-00250	29.5	10" DIA	1	210.1	209.8	214.3	214.0	210.3	210.3	211.1	211.1	2.2	0.0	0.0
03-00290	03-00280	03-00250	246.79	12" DIA	0.4	210.8	209.6	215.3	214.0	211.1	210.3	211.2	211.1	2.4	0.5	0.9
03-00310	03-00300	03-00280	199.43	10" DIA	0.7	212.5	211.0	216.4	215.3	212.6	211.1	212.8	211.2	1.9	0.1	0.6
03-00330	03-00320	03-00340	311.17	18" DIA	0.4	209.9	208.7	215.7	214.2	212.0	212.0	212.0	212.0	6.7	3.5	3.5
03-00350	03-00360	03-00340	199.32	15" DIA	0.7	210.4	208.8	216.0	214.2	212.0	212.0	212.0	212.0	5.9	1.6	1.6
03-00370	03-00380	03-00150	230.97	12" DIA	0.3	208.4	207.6	213.3	212.6	209.0	208.1	209.0	208.2	2.1	1.4	1.4
03-00400	03-00390	03-00410	85.18	10" DIA	0.4	209.2	208.9	213.9	213.5	211.9	211.9	211.9	211.9	1.4	1.0	1.0
03-00420	03-00410	03-00430	55.89	10" DIA	0.4	208.8	208.6	213.5	213.3	211.9	211.9	211.9	211.9	1.4	1.0	1.0
03-00440	03-00430	03-00450	70.85	10" DIA	0.4	208.5	208.2	213.3	213.0	211.9	211.9	211.9	211.9	1.4	1.0	1.0
03-00460	03-00450	03-00470	27.7	24" DIA	2.1	208.1	207.5	213.0	213.3	211.9	211.8	211.9	211.8	32.7	10.1	10.1
03-00480	03-00470	03-00490	49.1	24" DIA	0.7	207.9	207.5	213.3	213.3	211.8	211.8	211.8	211.8	21.2	10.1	10.1
03-00520	03-00510	03-00530	86	24" DIA	0.5	206.5	206.0	213.3	212.0	207.2	203.0	207.2	203.6	17.3	5.0	5.0
03-00540	03-00550	03-00450	58.51	24" DIA	0.3	208.4	208.2	213.2	213.0	211.9	211.9	211.9	211.9	13.2	8.6	8.6
03-00560	03-00340	03-00550	169.6	24" DIA	0.2	208.8	208.4	214.2	213.2	212.0	211.9	212.0	211.9	11.1	8.5	8.5
03-00570	03-00580	03-00340	41.86	15" DIA	1.36	209.4	208.8	214.1	214.2	212.0	212.0	212.0	212.0	7.5	2.0	2.0
03-00590	03-00600	03-00580	375.14	15" DIA	0.3	210.5	209.4	215.9	214.1	212.1	212.0	212.1	212.0	3.5	2.0	2.0
03-00610	03-00620	03-00600	189.77	10" DIA	3.8	218.2	210.9	223.4	215.9	218.6	212.1	218.6	212.1	4.3	2.1	2.1
03-00630	03-00640	03-00620	160.23	10" DIA	3.7	224.1	218.2	229.5	223.4	224.5	218.6	224.5	218.6	4.2	2.1	2.1
03-00650	03-00660	03-00640	175.95	10" DIA	0.9	225.7	224.1	230.8	229.5	226.7	224.5	226.7	224.5	2.1	2.1	2.1
03-00670	03-00680	03-00320	82.22	15" DIA	0.5	210.5	210.0	216.1	215.7	212.1	212.0	212.1	212.0	4.6	2.5	2.5
03-00690	03-00700	03-00680	325.45	15" DIA	0.7	212.7	210.5	218.3	216.1	213.3	212.1	213.3	212.1	5.3	2.6	2.6
03-00710	03-00720	03-00700	400	10" DIA	3.5	227.2	213.1	231.1	218.3	227.6	213.3	227.6	213.3	4.1	1.6	1.6
03-00730	03-00740	03-00360	50.43	15" DIA	1.4	211.2	210.5	216.4	216.0	212.0	212.0	212.0	212.0	7.6	1.4	1.4
03-00750	03-00760	03-00740	335.79	12" DIA	0.4	212.8	211.4	217.9	216.4	213.3	212.0	213.3	212.0	2.3	1.0	1.0
03-00770	03-00780	03-00760	232.75	10" DIA	0.9	215.1	213.0	219.8	217.9	215.4	213.3	215.4	213.3	2.1	0.5	0.5
03-00810	03-00800	16-00440	35.19	21" DIA	0.3	203.0	202.9	208.2	207.8	203.5	200.4	203.5	201.0	8.5	1.6	1.6
05-00020	05-00010	05-00030	125	6" DIA	-0.32	205.1	205.5	206.0	207.9	206.3	206.2	206.3	206.2	0.3	0.3	0.3
05-00040	05-00030	05-00050	26.98	10" DIA	5.3	205.4	204.0	207.9	207.5	206.2	206.2	206.2	206.2	5.0	0.4	0.4
05-00060	05-00050	05-00070	158.9	12" DIA	0.2	203.3	203.0	207.5	208.4	206.2	206.2	206.2	206.2	1.7	0.4	0.4
05-00080	05-00070	05-00090	411.94	15" DIA	0.2	202.9	202.2	208.4	207.2	206.2	205.6	206.2	205.6	2.8	2.8	2.8
05-00100	05-00090	05-00110	47.68	15" DIA	0.2	202.2	202.2	207.2	207.1	205.6	205.5	205.6	205.5	1.6	2.8	2.8
05-00120	05-00110	05-00130	234.24	15" DIA	0.2	202.0	201.5	207.1	206.5	205.5	204.3	205.5	204.3	3.1	4.6	4.6
05-00140	05-00130	05-00150	229.8	15" DIA	0.2	201.4	201.0	206.5	204.7	204.3	203.7	204.3	203.7	2.8	4.6	4.6
05-00160	05-00150	05-00330	47.77	18" DIA	0.2	200.9	200.8	204.7	205.4	203.7	203.6	203.7	203.6	5.0	6.1	6.1
05-00180	05-00170	05-00070	27.54	12" DIA	0.2	203.1	203.1	207.9	208.4	206.3	206.2	206.3	206.2	1.5	1.8	1.7
05-00200	05-00210	05-00190	248.82	12" DIA	0.2	203.7	203.2	210.1	207.7	206.8	206.3	206.8	206.3	1.6	1.8	1.8
05-00220	05-00230	05-00210	199.98	12" DIA	0.2	204.1	203.8	208.8	210.1	206.8	206.8	206.8	206.8	1.6	1.0	1.0
05-00240	05-00250	05-00230	71.63	12" DIA	0.2	204.4	204.2	208.0	208.8	206.8	206.8	206.8	206.8	1.7	1.1	1.1
05-00260	05-00270	05-00210	222.43	12" DIA	0.2	204.1	203.8	207.8	210.1	207.1	206.8	207.1	206.8	1.4	1.2	1.2
05-00280	05-00290	05-00310	83.13	12" DIA	0.2	200.8	200.6	204.7	205.2	203.6	203.6	203.6	203.6	1.7	0.3	0.3
05-00300	05-00330	05-00310	52.75	18" DIA	0.23	200.7	200.6	205.4	205.2	203.6	203.6	203.6	203.6	5.0	6.1	6.1
05-00320	05-00350	05-00330	39.17	12" DIA	0.2	200.8	200.8	204.9	205.4	203.6	203.6	203.6	203.6	1.5	0.1	0.1
05-00340	05-00310	05-00380	36	18" DIA	0.1	200.6	200.6	205.2	204.4	203.6	203.6	203.6	203.6	2.5	6.4	6.4
05-00351	05-00390	05-00400	14	18" DIA	0.2	200.6	200.5	204.4	206.4	201.2	200.0	201.2	200.5	7.4	2.9	2.8

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
05-00360	05-00410	05-00250	32.5	8" DIA	0.4	204.6	204.4	207.8	208.0	206.8	206.8	206.8	206.8	0.8	0.5	0.5
05-00420	05-00430	05-00410	214	8" DIA	0.4	205.3	204.6	206.5	207.8	206.5	206.8	206.5	206.8	0.7	0.5	0.5
05-00440	05-00190	05-00170	27.78	12" DIA	0.2	203.2	203.1	207.7	207.9	206.3	206.3	206.3	206.3	2.1	1.7	1.8
06-00010	06-00020	06-00000	176	12" DIA	1.1	232.3	230.6	237.5	236.3	234.3	234.0	234.5	234.1	3.5	1.9	2.1
06-00030	06-00040	06-00020	72	12" DIA	0.3	232.7	232.3	238.3	237.5	234.4	234.3	234.7	234.5	2.5	1.9	2.1
06-00050	06-00060	06-00040	14	12" DIA	0.3	235.0	235.0	238.2	238.3	235.7	234.4	235.7	234.7	0.1	2.0	2.1
06-00070	06-00100	06-00060	56	12" DIA	0.6	235.4	235.0	238.3	238.2	235.7	235.7	235.7	235.7	2.7	0.5	0.6
06-00090	06-00080	06-00060	31	12" DIA	0.7	235.2	235.0	237.8	238.2	235.8	235.7	235.8	235.7	2.9	1.5	1.6
06-00110	06-00120	06-00080	258.52	12" DIA	1.76	239.8	235.3	243.8	237.8	240.1	235.8	240.2	235.8	4.7	1.0	1.0
06-00140	06-00130	06-00150	185.05	12" DIA	1.2	243.6	241.4	247.6	244.9	243.6	241.5	243.6	241.5	3.9	0.0	0.0
06-00160	06-00150	06-00170	108.82	12" DIA	0.6	241.4	240.2	244.9	243.7	241.5	240.3	241.5	240.4	3.7	0.0	0.1
06-00180	06-00170	09-00000	175.65	12" DIA	0.6	240.2	239.4	243.7	242.4	240.3	238.5	240.4	238.6	2.4	0.1	0.1
07-00040	07-00010	07-00030	291.9	12" DIA	0.3	206.5	205.8	210.0	209.6	210.0	209.4	210.0	209.4	1.8	2.0	1.9
07-00070	07-00080	07-00060	277.48	12" DIA	0.3	207.5	206.8	210.9	210.6	209.6	209.4	209.6	209.4	1.8	0.9	1.0
07-00150	07-00060	07-00140	440	24" DIA	0.1	206.7	206.2	210.6	209.4	209.4	209.4	209.4	209.4	7.5	-4.8	-4.6
07-00160	07-00170	07-00060	70.22	24" DIA	0.1	206.8	206.7	210.6	210.6	209.4	209.4	209.4	209.4	7.1	-7.1	-6.9
07-00190	07-00140	07-00030	388.76	24" DIA	0.1	206.1	205.7	209.4	209.6	209.4	209.4	209.4	209.4	7.5	-3.4	-3.2
07-00200	07-00030	07-00210	135.5	8" DIA	0.4	205.7	205.1	209.6	211.0	209.4	207.3	209.4	207.9	0.8	2.0	1.9
07-00220	07-00230	07-00030	272.64	12" DIA	0.3	206.4	205.8	210.0	209.6	209.5	209.4	209.6	209.4	1.8	1.6	1.5
07-00260	07-00270	07-00060	274.31	12" DIA	0.3	207.5	206.8	210.6	210.6	209.5	209.4	209.6	209.4	1.8	1.0	1.0
07-00300	07-00310	07-00270	45.08	12" DIA	0.5	207.8	207.6	210.4	210.6	209.5	209.5	209.6	209.6	2.5	0.7	0.7
07-00330	07-00320	07-00230	126.57	12" DIA	0.3	206.9	206.5	209.6	210.0	209.6	209.5	209.6	209.6	2.0	1.0	0.9
08-00070	08-00100	08-00120	215	12" DIA	0.3	237.7	237.0	242.4	240.1	238.3	238.1	238.6	238.4	2.0	0.9	1.1
08-00090	08-00140	08-00100	155	12" DIA	0.3	238.2	237.8	244.6	242.4	238.7	238.3	238.8	238.6	1.9	0.9	1.1
08-00110	08-00160	08-00140	42	12" DIA	0.3	238.6	238.4	243.8	244.6	239.0	238.7	239.1	238.8	2.0	0.9	1.1
08-00130	08-00180	08-00160	155	12" DIA	0.3	239.1	238.7	242.6	243.8	239.4	239.0	239.5	239.1	1.9	0.4	0.5
08-00150	08-00240	08-00220	40	12" DIA	0.3	235.9	235.5	240.5	240.5	237.2	237.0	237.4	237.1	3.7	2.5	2.9
08-00170	08-00260	08-00240	248	12" DIA	0.3	236.6	235.9	239.9	240.5	238.0	237.2	238.3	237.4	2.0	2.0	2.2
08-00190	08-00120	08-00260	28	12" DIA	0.3	236.8	236.7	240.1	239.9	238.1	238.0	238.4	238.3	2.0	2.0	2.2
09-00010	09-00000	09-00020	22.64	12" DIA	1.1	238.2	238.0	242.4	242.4	238.5	238.0	238.6	238.2	3.7	0.7	1.0
09-00030	09-00040	09-00020	16.11	6" DIA	0.2	238.2	238.2	239.8	242.4	238.5	238.0	238.7	238.2	0.3	0.2	0.5
09-00050	09-00060	09-00040	100	6" DIA	0.2	238.5	238.2	239.7	239.8	238.8	238.5	239.3	238.7	0.3	0.2	0.5
09-00070	09-00080	09-00060	93.61	6" DIA	0.2	238.6	238.4	239.8	239.7	238.9	238.8	239.8	239.3	0.3	0.2	0.4
10-00020	10-00030	10-00010	120.58	12" DIA	1	211.6	210.4	219.3	217.3	215.9	212.5	216.5	213.3	3.6	6.1	6.0
10-00040	10-00050	10-00030	289.49	12" DIA	2.4	218.5	211.7	224.1	219.3	224.0	215.9	224.1	216.5	5.5	6.2	6.0
10-00060	10-00070	10-00050	273.67	12" DIA	1.4	222.5	218.6	227.8	224.1	227.8	224.0	227.8	224.1	4.2	5.1	5.0
10-00080	10-00090	10-00070	307.14	12" DIA	1.8	228.1	222.6	233.1	227.8	233.1	227.8	233.1	227.8	4.8	4.8	4.8
10-01010	19-00020	10-01020	316.03	12" DIA	1.3	224.3	220.1	227.4	225.2	225.1	221.1	226.8	223.3	4.1	4.1	4.5
10-01030	10-01020	10-01040	137.15	15" DIA	0.5	219.9	219.2	225.2	224.2	221.1	220.7	223.3	222.8	4.6	4.1	4.6
10-01050	10-01040	10-01060	229.98	15" DIA	0.9	219.1	216.9	224.2	228.3	220.7	218.7	222.8	220.8	6.3	6.2	6.5
10-01070	10-01060	10-01080	322.98	15" DIA	1.1	216.7	213.1	228.3	219.0	218.7	215.4	220.8	216.9	6.8	7.0	7.4
10-01090	10-01080	10-01100	161.38	18" DIA	0.5	212.8	212.0	219.0	217.4	215.4	214.6	216.9	215.9	7.7	8.1	8.5
10-01110	10-01120	10-01140	136.99	12" DIA	0.5	216.8	215.5	219.8	220.7	217.1	215.5	217.1	216.1	3.6	0.6	0.8
10-01130	10-01140	10-01100	269.17	12" DIA	1	215.3	212.5	220.7	217.4	215.5	214.6	216.1	215.9	3.6	0.6	0.9
10-01150	10-01160	10-01140	90	12" DIA	0.7	216.1	215.5	217.1	220.7	216.1	215.5	216.1	216.1	3.0	0.0	0.0
10-01170	10-01100	10-01180	253.4	18" DIA	0.6	211.9	210.2	217.4	218.4	214.6	213.0	215.9	214.0	8.5	8.6	9.2
10-01190	10-01180	10-01200	204.64	18" DIA	0.7	210.1	208.7	218.4	215.7	213.0	211.7	214.0	212.5	8.8	8.4	9.2
10-01210	10-00010	10-01200	154.84	18" DIA	1	210.2	208.7	217.3	215.7	212.5	211.7	213.3	212.5	10.5	7.7	7.5
10-01230	10-03010	10-03070	294.12	24" DIA	0.29	206.5	205.7	212.5	211.3	210.2	208.4	210.9	209.1	12.2	17.5	18.1
10-01250	10-01220	10-01240	316.23	30" DIA	0.2	204.7	204.0	211.2	212.5	207.7	207.7	208.7	208.7	18.3	19.0	19.8
10-01270	10-01240	10-01260	157.9	48" DIA	0.6	202.5	201.5	212.5	210.5	207.7	207.7	208.7	208.7	116.0	19.1	23.0
10-01290	10-03120	CC-N-00-024	124.58	18" DIA	0.3	203.0	202.8	208.5	208.4	206.8	206.7	207.4	207.3	4.7	5.6	6.3
10-01295	10-03240	10-01240	156.63	30" DIA	0.2	204.4	204.0	211.9	212.5	207.7	207.7	208.7	208.7	19.7	-0.1	3.0

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
10-03020	10-03030	10-03010	151.42	12" DIA	0.94	208.2	206.7	211.7	212.5	210.3	210.2	211.0	210.9	3.5	0.8	0.8
10-03040	10-03070	10-01220	149.25	24" DIA	0.4	205.7	205.2	211.3	211.2	208.4	207.7	209.1	208.7	13.5	18.4	19.1
10-03041	10-03050	10-03010	149.12	12" DIA	0.7	207.8	206.7	211.4	212.5	210.2	210.2	211.0	210.9	3.0	0.7	0.7
10-03060	10-03090	10-03070	269.74	12" DIA	0.5	208.0	206.7	211.7	211.3	208.7	208.4	209.3	209.1	2.5	1.0	1.0
10-03080	10-03140	10-03120	179	18" DIA	0.4	203.8	203.0	210.5	208.5	207.0	206.8	207.6	207.4	6.7	5.6	6.3
10-03170	10-03160	10-03140	324.69	18" DIA	0.4	205.1	203.9	210.0	210.5	207.4	207.0	208.2	207.6	6.6	5.6	6.3
10-03190	10-03180	10-03160	109.07	18" DIA	0.4	205.1	203.9	210.5	210.0	207.6	207.4	208.6	208.2	11.4	5.6	6.3
10-03250	10-01200	10-03010	294.12	24" DIA	0.55	208.2	206.5	215.7	212.5	211.7	210.2	212.5	210.9	16.8	16.1	16.7
11-00020	11-00010	11-00030	176.29	10" DIA	0.403	225.4	224.7	228.0	235.5	225.5	224.5	225.5	224.5	1.4	0.0	0.0
11-00040	11-00030	11-00050	168.75	12" DIA	0.5	224.4	223.6	235.5	232.6	224.5	223.6	224.5	223.6	2.4	0.1	0.1
11-00060	11-00050	11-00070	104.68	12" DIA	0.3	223.4	223.1	232.6	230.9	223.6	223.1	223.6	223.1	2.0	0.1	0.1
11-00080	11-00070	11-00090	111.76	12" DIA	0.3	222.9	222.5	230.9	229.1	223.1	222.5	223.1	222.5	2.0	0.1	0.1
11-00100	11-00090	11-00110	124.38	12" DIA	0.7	222.3	221.5	229.1	226.7	222.5	221.4	222.5	221.8	3.0	0.1	0.1
11-00120	11-00110	11-00130	158.35	12" DIA	0.8	221.3	220.0	226.7	225.0	221.4	219.9	221.8	220.2	3.1	0.1	1.7
11-00140	11-00130	11-00150	178.11	12" DIA	3	219.8	214.5	225.0	220.0	219.9	214.5	220.2	214.8	6.1	0.1	1.7
11-00160	11-00150	11-00170	59.21	12" DIA	10.47	214.4	208.2	220.0	220.5	214.5	207.7	214.8	208.7	11.5	0.1	2.5
11-00180	11-00170	11-00190	147.55	24" DIA	0.5	207.4	206.6	220.5	217.0	207.7	207.7	208.7	208.7	15.8	0.1	2.6
11-00200	11-00190	11-00210	133.78	24" DIA	0.5	206.4	205.7	217.0	213.7	207.7	207.7	208.7	208.7	16.4	0.1	2.5
11-00220	11-00210	11-00230	67.93	24" DIA	0.54	205.6	205.2	213.7	212.8	207.7	207.7	208.7	208.7	16.7	-0.1	2.5
11-00240	11-00230	11-00250	42.68	30" DIA	0.14	204.8	204.7	212.8	212.7	207.7	207.7	208.7	208.7	15.4	-0.1	3.0
11-00260	11-00270	11-00170	132.09	24" DIA	0.31	207.8	207.4	220.1	220.5	207.8	207.7	208.7	208.7	12.6	0.0	0.1
11-00280	11-00250	10-03240	115.92	30" DIA	0.22	204.7	204.4	212.7	211.9	207.7	207.7	208.7	208.7	19.4	-0.1	3.0
13-00030	13-00020	13-00040	452.85	15" DIA	0.2	235.0	234.0	239.0	237.0	235.4	233.6	235.5	233.9	2.9	0.7	0.9
13-00050	13-00060	13-00040	45.93	30" DIA	0.2	232.9	232.8	236.8	237.0	233.6	233.6	233.9	233.9	18.2	2.7	3.2
13-00070	13-00080	13-00060	7.37	12" DIA	0.2	234.4	234.4	237.1	236.8	234.4	233.6	234.4	233.9	1.9	0.0	0.0
13-00090	13-00100	13-00060	27.37	12" DIA	0.2	234.4	234.4	237.1	236.8	234.4	233.6	234.4	233.9	1.7	0.0	0.0
13-00110	13-00120	13-00060	310.84	12" DIA	0.4	235.6	234.4	239.0	236.8	236.0	233.6	236.1	233.9	2.3	0.7	0.9
13-00140	13-00130	13-00150	31.55	24" DIA	2.2	235.8	235.1	240.1	240.4	236.0	235.7	236.2	235.9	33.7	0.9	2.4
13-00160	13-00170	13-00150	49.38	12" DIA	0.2	236.1	236.0	240.1	240.4	237.0	235.7	237.1	235.9	1.6	2.8	3.1
13-00190	13-00040	13-00180	51	36" DIA	0.2	232.3	232.2	237.0	239.6	233.6	233.6	233.9	233.8	29.5	11.1	14.0
13-00200	13-00210	13-00040	254	30" DIA	0.2	233.3	232.8	238.0	237.0	234.4	233.6	234.6	233.9	18.4	7.8	10.0
13-00220	13-00360	13-00210	115.1	30" DIA	0.2	233.6	233.4	241.1	238.0	234.6	234.4	234.8	234.6	18.3	6.1	7.7
13-00240	13-00150	13-00230	226.36	24" DIA	0.2	234.9	234.4	240.4	239.0	235.7	234.9	235.9	235.0	10.1	3.7	5.4
13-00290	13-00270	13-00330	86	18" DIA	0.2	231.8	231.6	239.6	239.0	232.9	232.8	233.2	233.1	4.7	3.0	3.9
13-00300	13-00270	13-00330	86	18" DIA	0.2	231.8	231.6	239.6	239.0	232.9	232.8	233.2	233.1	4.7	3.0	3.9
13-00310	13-00270	13-00330	86	18" DIA	0.2	231.8	231.6	239.6	239.0	232.9	232.8	233.2	233.1	4.7	3.0	3.9
13-00331	13-00230	13-00360	137.99	30" DIA	0.2	233.9	233.6	239.0	241.1	234.9	234.6	235.0	234.8	18.5	5.4	7.0
13-00350	13-00380	13-00360	414.95	10" DIA	0.3	235.4	234.2	240.6	241.1	235.9	234.6	235.9	234.8	1.2	0.7	0.7
13-00370	13-00400	13-00380	44.98	10" DIA	0.3	235.6	235.5	240.6	240.6	236.1	235.9	236.1	235.9	1.2	0.7	0.7
13-00390	13-00420	13-00400	125.62	8" DIA	0.9	236.9	235.7	241.9	240.6	236.9	236.1	236.9	236.1	1.2	0.0	0.0
13-00410	13-00440	13-00420	63.45	8" DIA	0.9	237.5	236.9	240.5	241.9	237.5	236.9	237.5	236.9	1.2	0.0	0.0
14-00050	14-00040	14-00060	127	15" DIA	0.3	209.7	209.3	215.0	215.5	209.8	209.1	209.8	209.3	3.7	0.1	0.1
14-00070	14-00060	14-00080	117.39	15" DIA	0.4	209.0	208.5	215.5	214.9	209.1	208.5	209.3	208.7	4.4	0.1	0.7
14-00090	14-00080	14-00100	360.61	15" DIA	0.3	208.3	207.1	214.9	213.3	208.5	207.1	208.7	207.3	3.6	0.2	0.8
14-00110	14-00100	14-00120	351	15" DIA	0.6	206.9	204.7	213.3	208.8	207.1	204.9	207.3	205.1	5.1	0.3	0.9
14-00130	14-00120	14-00140	130	15" DIA	0.2	204.6	204.3	208.8	207.1	204.9	204.5	205.1	204.6	3.1	0.3	0.9
14-00150	14-00140	14-00160	25.82	15" DIA	0.2	204.2	204.1	207.1	207.8	204.5	204.3	204.6	204.4	3.1	0.5	1.2
14-00170	14-00180	14-00140	15.17	15" DIA	0.4	204.2	204.2	207.3	207.1	204.5	204.5	204.6	204.6	4.1	0.0	0.0
14-00210	14-00200	14-00060	38	12" DIA	1.8	209.8	209.2	214.0	215.5	209.8	209.1	210.1	209.3	4.8	0.0	0.6
16-00060	16-00070	16-00050	52.12	12" DIA	0.3	205.2	205.0	208.0	207.3	205.2	205.1	205.2	205.1	1.8	0.0	0.0
16-00100	16-00050	16-00090	12	12" DIA	0.3	205.0	205.0	207.3	207.3	205.1	205.0	205.1	205.0	2.0	0.0	0.0
16-00110	14-00160	16-00440	378.65	24" DIA	1.07	204.1	200.0	207.8	207.8	204.3	200.4	204.4	201.0	23.4	0.5	1.2
16-00160	16-00170	CC-N-00-014	10.69	12" DIA	2.81	199.3	199.0	206.7	206.0	200.4	200.4	201.1	201.0	6.0	3.8	3.8

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
16-00180	16-00190	16-00170	78.21	12" DIA	0.3	201.3	201.1	205.4	206.7	202.8	200.4	202.8	201.1	1.9	3.8	3.8
16-00190.1	16-00200	16-00190	449.5	12" DIA	0.3	202.7	201.3	206.4	205.4	205.6	202.8	205.7	202.8	2.0	2.8	2.9
16-00210	16-00220	16-00200	63.77	12" DIA	1.4	203.6	202.7	206.8	206.4	205.7	205.6	205.8	205.7	4.2	2.0	2.2
16-00230	16-00240	16-00220	44.77	12" DIA	0.6	203.9	203.6	205.8	206.8	205.8	205.7	205.8	205.8	2.9	1.1	1.9
16-00310	16-00300	16-00320	8.65	12" DIA	-1.39	201.0	201.1	203.8	203.8	202.2	202.2	203.5	203.3	4.2	2.3	4.5
16-00330	16-00320	16-00340	38.32	18" DIA	0	201.1	201.1	203.8	203.8	202.2	202.2	203.3	203.3	0.3	2.3	4.5
16-00350	16-00340	CC-N-02-014	36.67	12" DIA	0.3	201.1	201.0	203.8	203.5	202.2	202.1	203.3	202.7	2.0	2.3	4.5
16-00390	16-00450	00-05224	1761.52	24" H, 72" BOX	0.2	204.3	200.3	208.8	203.8	204.9	202.1	205.4	202.7	53.8	13.6	27.2
16-00400	16-21660	16-00410	118.01	24" DIA	-0.29	200.5	200.8	204.8	204.8	202.1	202.1	202.9	202.7	12.1	3.6	8.3
16-00430	16-00440	CC-N-00-015	260.72	24" DIA	0.93	200.0	197.6	207.8	208.2	200.4	200.4	201.0	201.0	21.8	1.9	2.6
17-00360	17-00370	17-00350	713.64	12" DIA	0.3	228.1	220.2	231.7	225.0	228.6	221.8	228.8	222.1	3.8	1.8	2.5
17-00380	17-00390	17-00370	876.45	12" DIA	0.3	229.9	228.1	234.0	231.7	231.9	228.6	233.8	228.8	1.6	1.8	2.5
17-00400	17-00410	17-00390	236.86	12" DIA	0.6	231.3	229.9	236.2	234.0	232.5	231.9	235.0	233.8	2.8	1.9	2.5
17-00420	17-00430	17-00410	197.47	12" DIA	0.2	232.0	231.4	236.5	236.2	233.0	232.5	235.9	235.0	2.0	2.0	2.5
18-00010	18-00020	18-00000	16.44	15" DIA	0.6	233.6	233.5	236.8	236.8	234.1	234.0	235.9	235.9	5.0	1.4	2.4
18-00030	18-00040	18-00020	172	12" DIA	0.5	234.6	233.7	239.0	236.8	235.1	234.1	236.4	235.9	2.5	1.2	2.0
18-00050	18-00101	18-00040	398.48	12" DIA	0.5	236.8	234.7	241.3	239.0	237.3	235.1	237.6	236.4	2.6	1.2	2.0
18-00051	18-00100	18-00101	207.74	12" DIA	0.4	237.7	236.8	240.7	241.3	238.1	237.3	238.2	237.6	2.3	0.7	1.1
18-00052	18-00102	18-00101	41.48	8" DIA	0.5	237.0	236.8	241.3	241.3	237.4	237.3	237.7	237.6	0.8	0.5	0.9
18-00070	18-01100	18-00020	67.4	12" DIA	1.3	234.3	233.4	236.8	236.8	234.4	234.1	235.9	235.9	4.0	0.2	0.5
18-00090	18-00120	18-00100	30	12" DIA	0.5	237.9	237.8	240.6	240.7	238.3	238.1	238.4	238.2	2.4	0.6	1.0
18-00110	18-00140	18-00120	10.25	12" DIA	0.7	238.2	238.1	240.6	240.6	238.5	238.3	238.6	238.4	2.9	0.6	1.0
18-00130	18-00160	18-00100	10	4" DIA	1	237.9	237.8	240.7	240.7	238.1	238.1	238.2	238.2	0.2	0.0	0.0
18-00150	18-00280	18-00300	10.29	12" DIA	0.6	238.8	238.7	241.2	241.2	239.1	237.1	239.5	237.4	2.7	0.7	2.5
18-00170	18-00300	18-00320	33.05	12" DIA	1.8	236.8	236.2	241.2	241.3	237.1	236.5	237.4	236.8	4.8	0.7	2.5
18-00190	18-00320	18-00340	345	15" DIA	0.5	236.1	234.3	241.3	239.3	236.5	234.7	236.8	235.0	4.7	0.7	2.6
18-00210	18-00340	18-00440	165	15" DIA	1	234.4	232.7	239.3	238.7	234.7	233.2	235.0	233.6	6.7	1.0	3.2
18-00230	18-00400	18-00420	10	12" DIA	0.7	236.3	236.2	238.7	238.7	236.6	233.6	236.7	233.7	3.0	0.9	1.0
18-00250	18-00420	18-00440	35.17	12" DIA	1.8	233.3	232.7	238.7	238.7	233.6	233.2	233.7	233.6	4.8	0.9	1.0
18-00270	18-00460	18-00440	11.27	12" DIA	0.9	236.3	236.2	238.7	238.7	236.5	233.2	236.6	233.6	3.4	0.3	0.6
18-00290	18-00440	18-00480	70.85	15" DIA	0.5	232.6	232.2	238.7	239.0	233.2	232.8	233.6	233.1	4.5	2.2	4.8
18-00310	18-00480	18-00521	6.67	15" DIA	1.5	232.1	232.0	239.0	239.0	232.8	232.8	233.1	233.1	7.9	2.2	4.8
18-00330	13-00330	18-00521	17.2	18" DIA	0.5	231.6	231.5	239.0	239.0	232.8	232.8	233.1	233.1	7.2	3.0	3.9
18-00350	13-00330	18-00521	17.2	18" DIA	0.5	231.6	231.5	239.0	239.0	232.8	232.8	233.1	233.1	7.2	3.0	3.9
18-00370	13-00330	18-00521	17.2	18" DIA	0.5	231.6	231.5	239.0	239.0	232.8	232.8	233.1	233.1	7.2	3.0	3.9
18-00390	18-00500	18-00521	10.03	12" DIA	3	232.3	232.0	239.0	239.0	233.0	232.8	233.1	233.1	6.2	1.3	1.8
18-00410	18-00560	18-00500	300	12" DIA	2	238.3	232.3	243.0	239.0	238.6	233.0	238.6	233.1	5.0	0.8	0.9
18-00430	18-00580	18-00560	35.14	12" DIA	1.8	239.0	238.4	243.0	243.0	239.3	238.6	239.3	238.6	4.8	0.8	0.9
18-00450	18-00600	18-00580	10	12" DIA	1	240.6	240.5	243.0	243.0	240.9	239.3	241.0	239.3	3.6	0.8	0.9
18-00470	18-00720	09-00000	37.02	12" DIA	0.9	238.0	237.7	242.3	242.4	238.5	238.5	238.6	238.6	3.3	0.6	0.9
18-00490	09-00020	18-00740	367	12" DIA	0.5	237.6	235.7	242.4	238.4	238.0	236.1	238.2	236.2	2.6	0.8	1.5
18-00510	18-00740	18-00760	6.8	18" DIA	0	235.4	235.4	238.4	238.6	236.1	236.0	236.2	236.2	0.3	2.4	3.5
18-00530	18-00780	18-00760	33.5	4" DIA	0.9	235.7	235.4	238.4	238.6	236.0	236.0	236.2	236.2	0.2	0.0	0.0
18-00550	18-00800	18-00740	37	18" DIA	0.43	235.6	235.5	238.4	238.4	236.1	236.1	236.3	236.2	6.9	1.3	1.8
18-00570	18-00820	18-00800	12.69	12" DIA	0.95	236.1	235.9	238.4	238.4	236.5	236.1	236.6	236.3	3.5	1.2	1.7
18-00590	18-00860	18-00760	43.7	4" DIA	0.9	235.8	235.4	238.4	238.6	236.0	236.0	236.2	236.2	0.2	0.0	0.0
18-00610	18-00960	18-00980	15.8	12" DIA	0.9	235.7	235.5	237.3	238.0	235.7	235.6	237.3	237.3	3.4	0.0	-0.7
18-00630	18-01000	18-00980	4.71	12" DIA	0.6	235.2	235.2	237.3	238.0	235.6	235.6	237.3	237.3	2.8	0.0	-1.2
18-00650	18-01020	18-01000	41.02	12" DIA	0.5	235.5	235.3	238.2	237.3	235.6	235.6	237.4	237.3	2.4	0.0	-0.3
18-00670	18-01040	18-01020	7.7	12" DIA	0.8	235.7	235.6	238.2	238.2	235.7	235.6	237.4	237.4	3.2	0.0	-0.1
18-01030	18-00760	18-01050	6.01	12" DIA	0	235.3	235.3	238.6	238.6	236.0	235.4	236.2	235.6	0.1	2.4	3.5
18-01040.1	01-00410	18-01110	94.83	12" DIA	1.58	236.3	234.8	239.0	238.5	236.7	236.5	236.7	236.6	4.5	1.1	1.3
19-00010	19-00040	19-00020	167.89	10" DIA	0.7	223.8	222.7	230.9	227.4	225.2	225.1	226.9	226.8	1.8	0.7	0.7

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
19-00030	19-00060	19-00020	50.99	10" DIA	0.784	223.1	222.7	226.8	227.4	225.2	225.1	226.8	226.8	1.9	0.8	0.9
19-00050	19-00080	19-00020	93.42	10" DIA	1.9	224.5	222.7	228.5	227.4	226.7	225.1	228.5	226.8	3.0	3.0	4.0
22-00010	22-00020	22-00120	175	36" DIA	0.2	229.5	229.1	237.7	234.2	234.0	234.0	234.1	234.1	29.8	-0.5	-0.5
22-00030	22-00120	22-00040	24.94	12" DIA	0.2	229.1	229.1	234.2	234.2	234.0	234.0	234.1	234.1	1.6	-0.9	-0.9
22-00050	22-00060	22-00040	178.5	36" DIA	0.2	229.4	229.1	236.2	234.2	234.0	234.0	234.1	234.1	29.5	-0.5	-0.5
22-00070	06-00000	22-00040	325.41	36" DIA	0.2	229.7	229.0	236.3	234.2	234.0	234.0	234.1	234.1	29.6	4.3	4.4
22-00100	22-Dummy-01	10-00090	43.39	12" DIA	0.9	228.5	228.2	234.2	233.1	234.0	233.1	234.1	233.1	3.1	5.1	5.4
24-00000	LINN-16	CC-N-02-017	199.72	15" DIA	0.3	207.4	206.8	211.9	209.4	207.4	207.4	208.2	208.2	3.5	0.0	-0.2
24-00010	LINN-14	LINN-16	149.03	15" DIA	0.5	208.5	207.7	211.9	211.9	208.5	207.4	208.5	208.2	4.6	0.0	0.0
24-00020	LINN-15	LINN-16	171.45	12" DIA	1	209.4	207.7	213.8	211.9	209.4	207.4	209.4	208.2	3.6	0.0	0.0
24-00070	LINN-0	LINN-1	175.02	12" DIA	0.8	235.0	233.7	238.2	237.4	235.6	234.0	237.4	237.3	3.1	2.0	2.8
24-00080	LINN-1	LINN-2	46.07	12" DIA	0.5	233.4	233.1	237.4	237.4	234.0	233.6	237.3	237.3	3.0	2.0	2.8
24-00120	LINN-2	LINN-3	146.48	15" DIA	0.6	233.0	232.0	237.4	235.4	233.6	232.6	237.3	235.4	5.2	2.5	7.5
24-00140	LINN-3	LINN-4	130.52	15" DIA	0.6	232.0	231.2	235.4	235.7	232.6	231.9	235.4	234.3	5.2	2.5	6.7
24-00160	LINN-4	LINN-5	115	18" DIA	0.3	230.7	230.4	235.7	235.2	231.9	231.3	234.3	233.0	5.6	6.0	11.2
24-00200	LINN-5	LINN-6	150	18" DIA	0.5	230.3	229.4	235.2	233.0	231.3	230.3	233.0	231.3	7.8	6.0	11.2
24-00240	LINN-6	LINN-7	120.78	18" DIA	0.5	229.3	228.7	233.0	234.7	230.3	229.0	231.3	229.4	7.8	6.0	11.2
24-00290	LINN-7	LINN-9	189.26	24" DIA	0.5	228.2	227.2	234.7	234.8	229.0	228.1	229.4	228.4	16.4	6.0	11.2
24-00350	LINN-9	LINN-10	225.02	24" DIA	2.53	227.1	221.4	234.8	227.3	228.1	222.5	228.4	223.5	36.0	18.5	26.6
24-00400	LINN-10	LINN-11	460.05	24" DIA	1.43	221.3	214.7	227.3	220.4	222.5	215.9	223.5	217.6	27.1	18.5	26.4
24-00470	LINN-11	LINN-12	209.03	24" DIA	1.5	214.6	209.8	220.4	216.5	215.9	211.2	217.6	211.9	34.4	27.1	37.5
24-00530	LINN-12	LINN-13	255.01	30" DIA	1.2	209.7	207.3	216.5	212.9	211.2	209.1	211.9	209.9	39.3	27.1	37.5
24-00560	LINN-13	00-15365	172	30" DIA	0.5	207.2	206.4	212.9	213.5	209.1	207.8	209.9	208.3	28.2	27.1	37.5
24-00590	LINN-17	00-15365	313	15" DIA	0.13	208.1	207.7	212.9	213.5	212.9	207.8	212.9	208.3	2.3	7.5	7.5
24-00630	LINN-23	LINN-17	161	15" DIA	0.1	208.5	208.2	213.6	212.9	213.2	212.9	213.2	212.9	2.7	3.5	3.8
24-00680	LINN-18	LINN-23	292.71	12" DIA	0.2	209.7	209.1	214.9	213.6	214.9	213.2	214.9	213.2	1.7	3.4	3.8
24-00700	LINN-19	LINN-18	42.98	12" DIA	0.2	210.1	209.8	215.9	214.9	214.8	214.9	214.8	214.9	3.1	-1.3	-1.3
24-00710	LINN-20	LINN-19	285.22	12" DIA	0.2	210.9	210.2	214.5	215.9	214.5	214.8	214.5	214.8	1.8	-1.3	-1.3
24-00730	LINN-21	LINN-20	175	12" DIA	0.3	211.5	211.0	214.8	214.5	214.7	214.5	214.7	214.5	1.8	1.4	1.4
24-00760	LINN-22	LINN-21	50.06	12" DIA	0.5	211.6	211.5	214.8	214.8	214.8	214.7	214.8	214.7	1.6	1.4	1.4
24-00790	18-00980	LINN-0	37.43	12" DIA	0.2	235.1	235.0	238.0	238.2	235.6	235.6	237.3	237.4	1.7	0.4	1.2
CC-Drainage-01	00-05053	03-00300	1855.38	Irregular Channel	1.22	235.0	212.5	237.7	216.4	235.0	212.6	235.1	212.8	41.1	0.1	0.6
CC-DRAINAGE-02	18-01050	19-00080	1167.69	Irregular Channel	0.9	235.0	224.5	238.6	228.5	235.4	226.7	235.6	228.5	347.7	3.5	7.0
CC-L-00-001	CC-N-00-001	CC-N-00-000	473.43	Irregular Channel	-0.017	188.2	188.3	224.3	205.3	192.1	192.0	193.0	192.9	6309.0	89.0	160.7
CC-L-00-002	CC-N-00-002	CC-N-00-001	1207.64	Irregular Channel	0.194	190.6	188.2	226.6	224.3	193.2	192.1	194.0	193.0	5978.5	93.4	161.8
CC-L-00-003	CC-N-00-003	CC-N-00-002	1207.64	Irregular Channel	0	190.6	190.6	226.6	226.6	193.9	193.2	194.7	194.0	429.5	96.2	163.3
CC-L-00-004	CC-N-00-004	CC-N-00-003	532.52	Irregular Channel	-0.1	190.0	190.6	213.4	226.6	194.4	193.9	195.2	194.7	2006.5	97.4	161.9
CC-L-00-005A	00-05263	CC-N-00-004	101.22	Irregular Channel	0.751	190.8	190.0	196.7	213.4	194.4	194.4	195.2	195.2	1753.0	98.1	162.4
CC-L-00-005B	CC-N-00-005	00-15258	95.52	Irregular Channel	1.07	192.0	191.0	215.4	196.7	194.5	194.5	195.4	195.4	1942.1	98.4	162.6
CC-L-00-006	CC-N-00-006	CC-N-00-005	160.91	Irregular Channel	-0.062	191.9	192.0	209.3	215.4	194.8	194.5	195.8	195.4	4837.2	98.6	162.9
CC-L-00-007	CC-N-00-007	CC-N-00-006	150.25	Irregular Channel	0.433	192.6	191.9	209.9	209.3	195.2	194.8	196.1	195.8	12782.1	98.8	163.2
CC-L-00-008	CC-N-00-008	CC-N-00-007	156.1	Irregular Channel	0.79	193.8	192.6	203.7	209.9	195.9	195.2	196.5	196.1	4028.4	78.9	129.7
CC-L-00-009	CC-N-00-009	CC-N-00-008	246.47	Irregular Channel	0.215	194.3	193.8	204.3	203.7	196.8	195.9	197.4	196.5	1352.5	78.9	129.8
CC-L-00-010	CC-N-00-010	CC-N-00-009	522.47	Irregular Channel	0.0085	194.4	194.3	204.3	204.3	197.5	196.8	198.3	197.4	291.4	79.0	129.9
CC-L-00-011	CC-N-00-011	CC-N-00-010	62.14	Irregular Channel	0.17	194.5	194.4	207.0	204.3	197.6	197.5	198.3	198.3	687.8	78.5	128.3
CC-L-00-012	CC-N-00-012	CC-N-00-011	416.74	Irregular Channel	0.329	195.8	194.5	208.4	207.0	198.6	197.6	199.2	198.3	571.0	78.3	123.3
CC-L-00-013	CC-N-00-013	CC-N-00-012	634.83	Irregular Channel	0.273	197.6	195.8	204.8	208.4	200.3	198.6	200.9	199.2	630.3	78.5	123.5
CC-L-00-014	CC-N-00-014	CC-N-00-013	199.38	Irregular Channel	0.085	197.7	197.6	206.0	204.8	200.4	200.3	201.0	200.9	786.1	78.6	123.6
CC-L-00-016	CC-N-00-016	CC-N-00-015	102.29	Irregular Channel	0.137	197.7	197.6	208.4	208.2	200.6	200.4	201.2	201.0	4221.7	74.9	118.7
CC-L-00-017	CC-N-00-017	CC-N-00-016	80.55	Irregular Channel	0.161	197.9	197.7	208.1	208.4	200.6	200.6	201.2	201.2	4836.0	75.1	118.8
CC-L-00-018	CC-N-00-018	CC-N-00-017	624.93	Irregular Channel	0.165	198.9	197.9	207.2	208.1	201.8	200.6	202.1	201.2	812.4	75.7	120.9
CC-L-00-019A	03-00530	CC-N-00-018	487	Irregular Channel	0.4168	200.9	198.9	212.0	207.2	203.0	201.8	203.6	202.1	1012.8	75.4	116.7
CC-L-00-019B	CC-N-00-019	03-00530	208.76	Irregular Channel	0.4168	201.8	200.9	208.2	212.0	203.8	203.0	204.5	203.6	1012.7	70.5	111.9

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
CC-L-00-020	CC-N-00-020	CC-N-00-019	503.96	Irregular Channel	0.135	202.5	201.8	206.4	208.2	205.6	203.8	206.3	204.5	92.5	70.6	111.9
CC-L-00-021	CC-N-00-021	CC-N-00-020	228.76	Irregular Channel	-0.162	202.1	202.5	208.3	206.4	205.9	205.6	206.5	206.3	101.2	70.6	112.0
CC-L-00-022	CC-N-00-022	CC-N-00-021	451.77	Irregular Channel	-0.1	201.7	202.1	207.7	208.3	206.2	205.9	206.8	206.5	18.4	68.3	89.9
CC-L-00-023	CC-N-00-023	CC-N-00-022	451.77	Irregular Channel	0.242	202.8	201.7	216.1	207.7	206.5	206.2	207.2	206.8	155.9	68.6	89.8
CC-L-00-024	CC-N-00-024	CC-N-00-023	479.44	Irregular Channel	-0.10637	202.3	202.8	208.4	216.1	206.7	206.5	207.3	207.2	125.2	59.2	70.2
CC-L-00-025	CC-N-00-025	CC-N-00-024	98.71	Irregular Channel	-0.01	202.2	202.3	212.1	208.4	206.7	206.7	207.4	207.3	62.7	58.4	70.7
CC-L-00-026	CC-N-00-026	CC-N-00-025	620.56	Irregular Channel	0.14	203.1	202.2	213.0	212.1	207.1	206.7	207.8	207.4	1173.9	60.5	75.8
CC-L-00-027A	07-00210	CC-N-00-026	273.39	Irregular Channel	0.172	203.6	203.1	211.0	213.0	207.3	207.1	207.9	207.8	382.6	62.4	80.0
CC-L-00-027B	CC-N-00-027	07-00210	437.91	Irregular Channel	0.171	204.3	203.6	213.5	211.0	207.7	207.3	208.2	207.9	381.9	62.6	80.5
CC-L-00-028A	00-05349	CC-N-00-027	18.5	Irregular Channel	0	204.3	204.3	213.5	213.5	207.8	207.7	208.2	208.2	6.3	62.4	79.0
CC-L-00-028B	CC-N-00-028	00-15365	20.2	Irregular Channel	0	205.2	205.2	219.7	213.5	207.8	207.8	208.3	208.3	30.9	32.7	37.6
CC-L-00-029	CC-N-00-029	CC-N-00-028	682.78	Irregular Channel	0.18	206.4	205.2	220.7	219.7	209.0	207.8	209.2	208.3	1205.9	32.8	37.8
CC-L-00-030	CC-N-00-030	CC-N-00-029	541.06	Irregular Channel	0.573	213.0	206.4	222.2	220.7	214.4	209.0	214.4	209.2	1142.8	31.6	33.9
CC-L-00-031A	00-05187	CC-N-00-030	18.5	Irregular Channel	0	213.0	213.0	220.9	222.2	214.5	214.4	214.6	214.4	54.1	31.6	33.9
CC-L-00-031B	CC-N-00-031	00-15191	37.05	Irregular Channel	0	212.6	212.6	221.8	220.9	214.6	214.6	214.7	214.6	55.7	31.6	33.9
CC-L-00-032	CC-N-00-032	CC-N-00-031	69.8	Irregular Channel	1.6	213.7	212.6	223.6	221.8	215.0	214.6	215.1	214.7	390.7	31.7	33.9
CC-L-00-034	CC-N-00-034	CC-N-00-033	282.75	Irregular Channel	0.877	215.9	213.4	224.7	222.4	217.7	216.2	217.8	216.4	4015.4	31.9	34.4
CC-L-00-035	CC-N-00-035	CC-N-00-034	486.15	Irregular Channel	0.187	216.8	215.9	225.6	224.7	218.6	217.7	218.6	217.8	1744.9	32.6	35.4
CC-L-01-001	CC-N-01-001	CC-N-00-003	125.98	Irregular Channel	3.26	194.7	190.6	204.4	226.6	194.8	193.9	195.0	194.7	10195.6	1.1	5.2
CC-L-01-002	00-05502	CC-N-01-001	12.7	Irregular Channel	-7.09	193.8	194.7	196.5	204.4	194.8	194.8	195.0	195.0	830.5	1.0	2.7
CC-L-01-003	CC-N-01-002	00-05501	365.66	Irregular Channel	1.28	198.5	193.9	204.9	196.5	198.7	194.8	198.9	195.1	208.8	1.0	2.7
CC-L-01-004	00-05522	CC-N-01-002	164.89	Irregular Channel	0.073	198.7	198.5	201.7	204.9	199.2	198.7	199.4	198.9	51.5	1.0	2.2
CC-L-01-005	CC-N-01-003	00-05521	17.48	Irregular Channel	5.15	199.7	198.8	204.1	201.7	199.9	199.4	200.0	199.6	126.5	1.0	2.2
CC-L-01-006	00-05542	CC-N-01-003	272.6	Irregular Channel	0.11	200.0	199.7	202.1	204.1	200.4	199.9	200.5	200.0	37.8	1.0	2.2
CC-L-01-007	CC-N-01-004	00-05541	154.08	Irregular Channel	0.37	200.8	200.3	205.2	202.1	201.2	200.9	201.4	201.4	49.2	1.0	2.2
CC-L-01-008	00-05552	CC-N-01-004	127.01	Irregular Channel	-0.02	200.8	200.8	202.8	205.2	201.4	201.2	201.6	201.4	9.4	0.9	2.1
CC-L-01-009	CC-N-01-005	00-005551	252.91	Irregular Channel	0.55	201.8	200.4	204.7	202.8	202.2	201.5	202.4	201.9	408.9	0.9	2.2
CC-L-01-010	00-05562	CC-N-01-005	18.42	Irregular Channel	-2.5	201.4	201.8	203.3	204.7	202.2	202.2	202.4	202.4	647.9	0.9	2.1
CC-L-01-011	00-05572	00-05561	283.4	Irregular Channel	0.007	201.5	201.5	203.4	203.3	202.3	202.3	202.6	202.6	26.5	0.9	2.3
CC-L-01-012	CC-N-01-006	00-05571	101.42	Irregular Channel	-0.09	201.5	201.6	203.0	203.4	202.3	202.3	202.6	202.6	10.7	1.0	2.7
CC-L-01-013	CC-N-01-007	CC-N-01-006	61.73	Irregular Channel	-0.28	201.4	201.5	202.8	203.0	202.3	202.3	202.6	202.6	54.1	1.0	2.8
CC-L-01-014	CC-N-01-008	CC-N-01-007	166.65	Irregular Channel	0.5	202.2	201.4	203.6	202.8	202.5	202.3	202.7	202.6	73.3	1.3	3.0
CC-L-01-015	CC-N-01-009	CC-N-01-008	86.82	Irregular Channel	-0.68	201.6	202.2	203.0	203.6	202.5	202.5	202.7	202.7	85.1	1.3	3.1
CC-L-01-016	CC-N-01-010	CC-N-01-009	24.02	Irregular Channel	1.92	202.1	201.6	203.5	203.0	202.5	202.5	202.7	202.7	142.8	-0.3	2.0
CC-L-01-017	CC-N-01-011	CC-N-01-010	52.77	Irregular Channel	-0.42	201.9	202.1	203.3	203.5	202.5	202.5	202.7	202.7	66.6	-0.3	2.0
CC-L-01-018	CC-N-01-012	CC-N-01-011	117.23	Irregular Channel	0.4	202.3	201.9	204.6	203.3	202.5	202.5	202.8	202.7	65.3	-0.2	2.1
CC-L-01-019	CC-N-01-013	CC-N-01-012	79.82	Irregular Channel	-0.31	202.1	202.3	204.6	204.6	202.5	202.5	202.8	202.8	57.7	-0.2	2.1
CC-L-01-020	CC-N-01-014	CC-N-01-013	229.18	Irregular Channel	0.17	202.5	202.1	204.6	204.6	202.5	202.5	202.9	202.8	42.6	0.0	2.1
CC-L-01-021	CC-N-01-015	CC-N-01-014	59.39	Irregular Channel	-0.94	201.9	202.5	204.6	204.6	202.2	202.5	203.0	202.9	20.0	0.0	2.2
CC-L-01-022	00-22960	CC-N-01-015	15.57	Irregular Channel	-8.09	200.6	201.9	204.6	204.6	202.2	202.2	203.0	203.0	58.6	0.0	2.3
CC-L-01-023	CC-N-01-016	00-22680	18.29	Irregular Channel	6.4	202.0	200.8	203.5	204.6	202.3	202.2	203.0	203.0	117.8	3.5	9.3
CC-L-01-024	CC-N-01-017	CC-N-01-016	204.26	Irregular Channel	0.39	202.8	202.0	204.8	203.5	203.4	202.3	203.7	203.0	29.1	3.5	9.2
CC-L-01-025	CC-N-01-018	CC-N-01-017	94.22	Irregular Channel	-0.53	202.3	202.8	204.3	204.8	203.4	203.4	203.7	203.7	53.2	3.5	9.2
CC-L-01-026	CC-N-01-019	CC-N-01-018	140.03	Irregular Channel	0.4	202.8	202.3	204.9	204.3	203.6	203.4	204.0	203.7	46.2	3.5	9.3
CC-L-01-027	CC-N-01-020	CC-N-01-019	23.98	Irregular Channel	-0.71	202.7	202.8	204.0	204.9	203.6	203.6	204.0	204.0	32.5	3.5	9.4
CC-L-01-028	00-21690	CC-N-01-020	24.91	Irregular Channel	3.01	203.4	202.7	206.0	204.0	203.7	203.6	204.1	204.0	67.1	3.5	15.3
CC-L-01-029	CC-N-01-021	00-21680	487.1	Irregular Channel	-0.04	203.4	203.6	208.1	206.0	204.3	204.2	204.8	204.7	146.7	3.5	15.3
CC-L-01-030	00-05045	CC-N-01-021	231.3	Irregular Channel	-0.13	203.1	203.4	208.6	208.1	204.3	204.3	204.8	204.8	709.9	1.7	12.0
CC-L-01-031	CC-N-01-022	00-15049	116.68	Irregular Channel	1.05	204.4	203.2	209.1	208.6	204.7	204.3	205.1	204.9	1990.8	2.1	12.4
CC-L-01-032	CC-N-01-023	CC-N-01-022	899.78	Irregular Channel	0.102	205.3	204.4	208.3	209.1	205.8	204.7	206.1	205.1	713.0	2.1	14.8
CC-L-02-001	CC-N-02-001	CC-N-00-007	156.98	Irregular Channel	1.99	195.7	192.6	206.1	209.9	196.8	195.2	197.2	196.1	9238.9	21.1	36.6
CC-L-02-002	00-05250	CC-N-02-001	154.51	Irregular Channel	0.429	196.3	195.7	201.7	206.1	198.0	196.8	198.4	197.2	388.7	21.0	34.8
CC-L-02-003	00-05254	00-15253	79.54	Irregular Channel	0.429	197.0	196.6	202.3	201.6	198.7	198.3	199.1	198.8	289.6	21.0	34.8

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
CC-L-02-004	CC-N-02-002	00-15256	264.34	Irregular Channel	0.429	198.0	196.9	205.1	202.3	199.8	198.8	200.2	199.3	409.8	21.0	34.8
CC-L-02-005	05-00400	CC-N-02-002	84.86	Irregular Channel	0.121	198.1	198.0	206.4	205.1	200.0	199.8	200.5	200.2	114.1	21.0	34.8
CC-L-02-006	CC-N-02-003	05-00400	525.37	Irregular Channel	0.02	198.3	198.1	202.7	206.4	200.6	200.0	201.2	200.5	50.2	18.5	32.6
CC-L-02-007	CC-N-02-004	CC-N-02-003	139.92	Irregular Channel	0.24	198.6	198.3	202.7	202.7	200.8	200.6	201.4	201.2	77.6	18.6	32.8
CC-L-02-008	CC-N-02-005	CC-N-02-004	23.01	Irregular Channel	4.09	199.5	198.6	203.6	202.7	200.9	200.8	201.4	201.4	323.1	18.6	32.9
CC-L-02-009	CC-N-02-006	CC-N-02-005	62.89	Irregular Channel	-1.48	198.6	199.5	202.7	203.6	201.0	200.9	201.6	201.4	194.4	18.6	33.0
CC-L-02-010	CC-N-02-007	CC-N-02-006	135.48	Irregular Channel	0.49	199.3	198.6	203.4	202.7	201.3	201.0	201.9	201.6	112.4	18.6	33.1
CC-L-02-011	CC-N-02-008	CC-N-02-007	180.55	Irregular Channel	-0.13	199.0	199.3	203.1	203.4	201.5	201.3	202.1	201.9	58.3	15.0	28.5
CC-L-02-012	CC-N-02-009	CC-N-02-008	94.07	Irregular Channel	0.7	199.7	199.0	203.8	203.1	201.6	201.5	202.2	202.1	133.9	15.0	28.5
CC-L-02-013	CC-N-02-010	CC-N-02-009	95.4	Irregular Channel	-0.016	199.5	199.7	203.6	203.8	201.8	201.6	202.4	202.2	63.4	15.0	28.4
CC-L-02-014	CC-N-02-011	CC-N-02-010	91.87	Irregular Channel	0.56	200.1	199.5	204.1	203.6	201.9	201.8	202.6	202.4	119.1	15.0	28.7
CC-L-02-015	CC-N-02-012	CC-N-02-011	95.9	Irregular Channel	-0.35	199.7	200.1	203.8	204.1	202.1	201.9	202.7	202.6	95.2	15.0	28.7
CC-L-02-016	CC-N-02-013	CC-N-02-012	147.94	Irregular Channel	0.39	200.3	199.7	202.7	203.8	202.1	202.1	202.7	202.7	249.3	15.3	31.1
CC-L-02-017	CC-N-02-014	CC-N-02-013	48.49	Irregular Channel	-0.47	200.1	200.3	203.5	202.7	202.1	202.1	202.7	202.7	276.6	16.0	38.5
CC-L-02-018	00-05224	CC-N-02-014	109.85	Irregular Channel	0.25	200.3	200.1	203.8	203.5	202.1	202.1	202.7	202.7	5.8	14.5	34.0
CC-L-02-019	CC-N-02-015	00-15067	69.5	Irregular Channel	2	206.1	204.7	210.2	208.8	206.6	206.0	206.9	206.8	1060.0	13.8	27.6
CC-L-02-020	CC-N-02-016	CC-N-02-015	923.13	Irregular Channel	-0.089	205.3	206.1	209.4	210.2	207.4	206.6	208.1	206.9	16.7	13.8	28.2
CC-L-02-021	CC-N-02-017	CC-N-02-016	115	Irregular Channel	0	205.3	205.3	209.4	209.4	207.4	207.4	208.2	208.1	1.8	14.4	30.3
CC-L-03-001	CC-N-03-001	CC-N-00-010	191.08	Irregular Channel	3.79	201.6	194.4	205.8	204.3	201.8	197.5	201.9	198.3	644.4	0.7	2.4
CC-L-03-002	CC-N-03-002	CC-N-03-001	1546.61	Irregular Channel	0.131	203.6	201.6	209.9	205.8	203.9	201.8	204.1	201.9	13.7	0.7	2.4
CC-L-03-003A	00-05039	CC-N-03-002	126.36	Irregular Channel	0.07	203.7	203.6	207.9	209.9	203.9	203.9	204.1	204.1	102.5	0.1	0.8
CC-L-03-003B	CC-N-03-003	00-15035	39.74	Irregular Channel	1.53	205.0	204.3	211.2	207.9	205.0	204.4	205.1	204.8	475.7	0.1	0.8
CC-L-04-001	CC-N-04-001	CC-N-00-021	272.64	Irregular Channel	2.59	209.2	202.1	218.5	208.3	209.5	205.9	210.1	206.5	3912.8	2.6	19.2
CC-L-04-002	CC-N-04-002	CC-N-04-001	1016.17	Irregular Channel	1.229	221.7	209.2	226.1	218.5	221.8	209.5	222.1	210.1	3657.0	2.6	19.2
CC-L-04-003	17-00350	CC-N-04-002	215.12	Irregular Channel	-0.67	220.2	221.7	225.0	226.1	221.8	221.8	222.1	222.1	2717.5	2.6	14.6
CC-L-05-001	CC-N-05-001	CC-N-00-023	460.46	Irregular Channel	1.14	208.0	202.8	218.8	216.1	208.9	206.5	209.2	207.2	4776.9	11.4	20.8
CC-L-05-002	CC-N-05-002	CC-N-05-001	1028.07	Irregular Channel	1.42	222.6	208.0	232.2	218.8	223.2	208.9	223.4	209.2	12934.1	11.4	19.3
CC-L-05-003A	00-05309	CC-N-05-002	162.66	Irregular Channel	0.61	223.6	222.6	226.9	232.2	224.7	223.2	224.9	223.4	116.9	11.3	18.3
CC-L-05-003B	CC-N-05-003	00-15308	730.47	Irregular Channel	0.768	229.5	223.9	232.5	226.9	230.5	225.7	230.8	226.3	131.4	11.6	20.4
CC-L-05-004	00-05283	CC-N-05-003	158.82	Irregular Channel	0.743	230.7	229.5	234.5	232.5	231.6	230.5	231.8	230.8	163.2	11.1	16.5
CC-L-05-005	18-00521	00-15286	61.02	Irregular Channel	-0.77	231.5	232.0	239.0	234.5	232.8	232.7	233.1	233.0	361.3	11.2	16.5
CC-NORTHDITCH-01	16-00410	00-05224	49.97	Irregular Channel	0.7	200.8	200.5	204.8	203.8	202.1	202.1	202.7	202.7	416.1	3.7	8.4
D-ALEXANDER-01	18-01110	18-00820	47.98	Irregular Channel	-2.71	234.8	236.1	238.5	238.4	236.5	236.5	236.6	236.6	17.2	1.1	1.3
D-MILLERSBURG-01	16-00090	00-05039	95.18	Irregular Channel	1.33	205.0	203.7	207.3	207.9	205.0	203.9	205.0	204.1	1190.8	0.0	0.0
D-WOODS-1	00-05060	17-00430	131.56	Irregular Channel	1	233.3	232.0	235.9	236.5	233.6	233.0	235.9	235.9	65.7	2.0	3.6
D-WOODS-2	18-00000	00-05060	139.89	Irregular Channel	0.14	233.5	233.3	236.8	235.9	234.0	233.6	235.9	235.9	15.3	1.4	2.4
D-ZUHLKE-01	08-00220	13-00170	87.65	Irregular Channel	-0.67	235.5	236.1	240.5	240.1	237.0	237.0	237.1	237.1	353.2	2.5	2.8
Swale 1-B	01-00120	Swale 1B Control	183.2	Irregular Channel	0.49	237.3	236.4	242.2	239.0	238.3	238.2	238.4	238.3	2.7	1.1	1.3

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
MURDER CREEK																
00-05005	00-15005	00-05001	72.22	48" DIA	0.7	208.9	208.4	215.8	215.8	210.2	210.4	210.9	211.0	120.7	-21.1	-26.4
00-05006	00-15005	00-05001	72.05	48" DIA	3.2	208.5	206.3	215.8	215.8	210.2	210.4	210.9	211.0	255.0	40.4	69.8
00-05009	00-15010	00-05015	104.01	36" DIA	0.4	208.1	207.6	215.6	215.6	208.9	208.9	209.7	209.7	43.4	4.0	8.6
00-05010	00-15010	00-05015	102.97	36" DIA	0.5	208.1	207.5	215.6	215.6	208.9	208.9	209.7	209.7	48.8	5.3	11.7
00-05202	00-15202	00-05219	78.33	48" H, 36" BOX	0.3	221.1	220.9	229.0	229.0	223.0	222.8	223.4	223.0	64.1	27.8	46.0
00-05380	00-05381	00-05382	32.58	12" DIA	1.5	236.3	235.8	238.3	238.3	236.5	236.1	236.6	236.3	4.4	0.5	0.8
00-05390	00-05391	00-05392	37.78	18" DIA	0.2	230.7	230.6	234.7	234.7	231.5	231.5	231.7	231.7	4.2	0.9	2.1
00-05400	00-05401	00-05402	40.7	15" DIA	3.1	231.0	229.8	235.2	235.2	231.5	226.7	231.7	226.8	11.4	3.1	6.7
00-05410	00-05411	00-05412	30.64	10" DIA	0.8	239.3	239.0	241.0	241.0	239.4	239.1	239.4	239.1	2.0	0.1	0.1
00-05420	00-05421	00-05422	40.65	12" DIA	3.91	236.3	234.7	237.7	237.7	236.4	234.9	236.5	235.0	7.1	0.5	0.7
00-05430	00-05431	00-05432	31.91	10" DIA	4.11	238.4	237.1	239.4	239.4	239.4	238.9	239.4	238.9	4.4	4.1	3.4
01-00140	01-00130	01-00150	35.18	10" DIA	0.5	234.7	234.5	238.7	238.7	235.3	235.3	235.7	235.7	1.6	0.0	0.0
01-00160	01-00150	01-00170	107	10" DIA	0.3	234.5	234.2	238.7	238.1	235.3	235.2	235.7	235.5	1.2	0.8	0.9
01-00180	01-00170	01-00190	35.18	10" DIA	0.5	234.2	234.0	238.1	238.1	235.2	235.1	235.5	235.4	1.6	1.3	1.5
01-00200	01-00190	01-00210	124.6	10" DIA	0.5	234.0	233.5	238.1	238.1	235.1	234.7	235.4	234.9	1.4	1.3	1.5
01-00280	01-00290	01-00310	68.15	10" DIA	0.5	233.0	232.6	236.3	235.3	234.7	234.7	234.9	234.9	1.6	0.2	0.2
01-00300	01-00310	01-00350	95.94	10" DIA	0.5	232.6	232.1	235.3	235.5	234.7	234.7	234.9	234.8	1.6	0.6	0.7
01-00320	Swale 1A Control	01-00370	37.28	12" DIA	0.3	232.1	232.0	235.5	234.5	232.6	232.2	232.8	232.3	1.9	1.6	2.3
01-00340	01-00330	01-00310	39.18	10" DIA	0.3	232.7	232.6	235.3	235.3	234.7	234.7	234.9	234.9	1.2	0.0	0.1
01-00360	01-00390	01-00350	16.53	12" DIA	1.7	232.5	232.1	235.5	235.5	234.7	234.7	234.9	234.8	5.2	1.4	1.7
08-00010	08-00020	08-00040	70	12" DIA	0.3	234.8	234.6	237.0	238.1	235.0	235.0	235.0	235.0	2.0	0.0	0.1
08-00030	Det 8A Control	08-00040	51	12" DIA	0.3	234.7	234.6	238.2	238.1	235.1	235.0	235.2	235.0	1.9	0.7	0.7
08-00050	08-00080	08-00060	372	18" DIA	0.1	235.3	234.9	243.2	238.2	237.2	237.2	237.2	237.2	3.3	-0.2	-0.1
12-00010	12-00000	12-00020	21.72	10" DIA	3.1	237.7	237.0	242.7	242.7	237.7	237.2	237.7	237.3	3.9	0.0	0.0
12-00030	12-00020	12-00040	41.54	10" DIA	3.7	237.0	235.5	242.7	241.4	237.2	235.6	237.3	235.8	4.2	0.4	1.2
12-00050	12-00060	12-00080	55.8	15" DIA	0.7	225.7	225.3	229.2	230.0	228.9	228.8	229.2	229.0	5.5	3.4	4.5
12-00070	12-00100	12-00120	299.58	10" DIA	1	236.8	233.8	244.0	242.0	237.1	234.0	237.1	234.0	2.2	0.5	0.6
12-00090	12-00140	12-00100	8	10" DIA	0.12	238.0	237.9	243.8	244.0	238.0	237.1	238.0	237.1	1.9	0.0	0.0
12-00110	12-00160	12-00100	30.54	10" DIA	1	238.3	237.9	243.9	244.0	238.3	237.1	238.3	237.1	2.2	0.0	0.0
12-00130	12-00120	12-00180	258.88	12" DIA	1.2	233.7	230.1	242.0	235.0	234.0	230.6	234.0	230.9	4.2	0.5	0.6
12-00150	12-00180	12-00200	244.48	15" DIA	1.1	230.0	227.3	235.0	230.5	230.6	229.2	230.9	229.8	6.8	2.6	3.7
12-00170	12-00200	12-00060	191.99	15" DIA	0.7	227.2	225.8	230.5	229.2	229.2	228.9	229.8	229.2	5.6	2.6	3.7
12-00190	12-00040	12-00180	523.19	12" DIA	1	235.4	230.1	241.4	235.0	235.6	230.6	235.8	230.9	3.6	0.4	1.2
12-00210	12-00242	12-00220	80.7	18" DIA	0.66	225.0	224.5	230.7	230.6	227.5	226.2	229.1	226.9	8.5	13.6	17.4
12-00211	12-00220	12-00241	58	18" DIA	0.4	224.5	224.2	230.6	230.6	226.2	225.3	226.9	225.4	7.8	13.6	17.4
12-00230	12-00240	12-00241	23.6	15" DIA	1.9	224.8	224.3	230.0	230.6	225.4	225.3	225.5	225.4	9.4	2.6	4.1
12-00243	12-00241	12-00244	48.73	36" DIA	1.8	224.2	223.1	230.6	230.7	225.3	225.0	225.4	225.0	98.8	15.6	20.3
15-00010	15-00040	15-00020	74.26	18" DIA	0.7	232.0	231.5	235.3	235.3	232.4	231.9	232.5	232.0	9.0	1.8	2.2
15-00030	15-00100	15-00080	41.23	18" DIA	0.2	232.5	232.4	236.0	238.0	233.8	233.8	234.5	234.4	4.6	1.8	2.9
15-00050	15-00120	15-00100	200.97	18" DIA	0.2	232.9	232.5	236.0	236.0	233.8	233.8	234.5	234.5	4.6	1.9	3.0
15-00090	15-00260	15-00220	34.85	10" DIA	0.63	236.4	236.2	239.6	239.6	236.6	236.6	236.8	236.8	1.7	0.2	0.2
15-00110	15-00240	15-00260	106.95	10" DIA	0.9	237.4	236.4	239.6	239.6	237.6	236.6	237.6	236.8	2.1	0.2	0.2
23-00010	23-00020	23-00060	235	12" DIA	2	237.1	232.4	241.0	237.3	237.2	232.4	237.2	232.4	5.0	0.1	0.1
23-00030	23-00040	23-00080	255	12" DIA	2.2	237.1	231.9	239.4	234.4	237.3	232.0	237.4	232.0	5.1	0.4	0.6
23-00050	23-00060	23-00140	135	12" DIA	2	232.3	229.6	237.3	234.4	232.4	229.7	232.4	229.7	5.0	0.2	0.2
23-00070	23-00140	23-00100	191	12" DIA	1.5	229.5	226.7	234.4	231.4	229.7	227.8	229.7	229.1	4.4	0.5	0.5
23-00090	23-00100	12-00242	77	18" DIA	1.5	226.6	225.3	231.4	230.7	227.8	227.5	229.1	229.1	13.3	1.7	1.5
23-00130	08-00040	23-00260	27	12" DIA	0.3	234.6	234.5	238.1	237.7	235.0	233.3	235.0	233.4	1.9	0.7	0.8
23-00150	23-00160	12-00241	77	18" DIA	1.5	228.0	226.9	231.6	230.6	228.1	225.3	228.1	225.4	12.6	0.1	0.1
23-00170	23-00180	23-00160	88	18" DIA	2	229.8	228.0	233.3	231.6	229.8	228.1	229.8	228.1	14.8	0.1	0.1
23-00190	23-00220	23-00240	28	12" DIA	1.96	231.4	230.8	236.8	236.6	231.7	231.1	231.7	231.3	5.0	1.1	1.2
23-00200	23-00240	23-00210	47.89	24" DIA	0.65	230.7	230.4	236.6	236.6	231.1	230.6	231.3	230.6	18.2	1.4	2.7

Table B-2 - Hydraulic Model Parameters and Results

Conduit ID	Upstream Node	Downstream Node	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
23-00230	23-00260	23-00220	79	12" DIA	1.5	233.0	231.5	237.7	236.8	233.3	231.7	233.4	231.7	5.0	1.0	1.1
23-00250	23-00280	23-00260	79	12" DIA	1.5	233.0	231.5	240.4	237.7	233.4	233.3	233.4	233.4	5.0	0.3	0.3
23-00270	23-00300	23-00280	68	8" DIA	3.4	238.1	235.8	241.0	240.4	238.2	233.4	238.2	233.4	2.2	0.1	0.1
24-00800	LINN-26	LINN-25	55.95	30" DIA	0.374	234.6	234.4	238.4	238.1	235.9	234.6	236.3	234.7	25.1	15.2	24.1
24-00801	LINN-24	LINN-26	184.55	12" DIA	0.374	236.8	236.1	238.9	238.4	238.9	235.9	238.9	236.3	2.2	3.7	3.7
D-CONSER-01	23-00080	12-00244	412.5	Irregular Channel	2.14	231.9	223.1	234.4	230.7	232.0	225.0	232.0	225.0	151.4	0.3	0.5
D-CONSER-02	23-00210	12-00244	457.47	Irregular Channel	1.6	230.4	223.1	236.6	230.7	230.6	225.0	230.6	225.0	131.0	0.9	2.3
D-CONSER-03	00-05412	00-05391	443.89	Irregular Channel	1.88	239.0	230.7	241.0	234.7	239.1	231.5	239.1	231.7	186.7	0.1	0.1
D-CONSER-04.1	00-05392	00-05401	12.81	Irregular Channel	-3.36	230.6	231.0	234.7	235.2	231.5	231.5	231.7	231.7	111.7	0.9	2.1
D-CONSER-05	00-05422	00-05401	375.05	Irregular Channel	0.97	234.7	231.0	237.7	235.2	234.9	231.5	235.0	231.7	60.0	1.6	3.0
D-WAVERLY-01	00-05382	00-05422	134.55	Irregular Channel	0.85	235.8	234.7	238.3	237.7	236.1	234.9	236.3	235.0	21.0	1.1	2.3
MC-DRAINAGE-01	MC-DRAIN-N-02	12-00242	217	Irregular Channel	0.75	227.0	225.4	232.1	230.7	227.7	227.5	229.1	229.1	680.4	15.6	21.7
MC-DRAINAGE-02	MC-DRAIN-N-03	MC-DRAIN-N-02	218.15	Irregular Channel	0	228.3	227.0	233.4	232.1	228.7	227.7	229.1	229.1	6296.5	16.3	33.8
MC-DRAINAGE-03	01-00370	MC-DRAIN-N-03	676.2	Irregular Channel	0.54	232.0	228.3	234.5	233.4	232.2	228.7	232.3	229.1	1183.3	1.9	7.5
MC-DRAINAGE-04	MC-DRAIN-N-04	01-00370	681.28	Irregular Channel	0.62	236.3	232.0	237.6	234.5	236.4	232.2	236.5	232.3	320.3	0.5	3.6
MC-DRAINAGE-11	LINN-25	MC-DRAIN-N-03	1006.4	Irregular Channel	0.58	234.2	228.3	238.1	233.4	234.6	228.7	234.7	229.1	942.7	14.8	27.2
MC-DRAINAGE-12	00-05432	LINN-24	380.8	Irregular Channel	0.07	237.1	236.8	239.4	238.9	238.9	238.9	238.9	238.9	9.3	5.2	7.4
MC-L-01-01	MC-N-01-01	MC-N-01-00	414.11	Irregular Channel	2.3	188.1	178.6	208.9	207.0	189.0	179.6	189.4	179.8	15498.4	9.5	28.0
MC-L-01-02	MC-N-01-02	MC-N-01-01	583.33	Irregular Channel	2.88859	205.0	188.1	209.3	208.9	206.0	189.0	206.6	189.4	1146.4	9.5	28.0
MC-L-01-03	MC-N-01-03	MC-N-01-02	625.59	Irregular Channel	0.48115	208.0	205.0	211.4	209.3	208.9	206.0	209.7	206.6	112.2	9.5	28.1
MC-L-01-04	00-05015	MC-N-01-03	19.09	Irregular Channel	-2.25	207.5	208.0	215.6	211.4	208.9	208.9	209.7	209.7	242.7	9.3	20.5
MC-L-01-05	MC-N-01-04	00-15010	359.2	Irregular Channel	0.44	209.7	208.1	211.3	215.6	210.7	208.9	210.8	209.7	3.8	9.2	19.1
MC-L-01-06	MC-N-01-05	MC-N-01-04	255.21	Irregular Channel	0.13714	210.0	209.7	211.7	211.3	211.2	210.7	211.6	210.8	9.9	9.2	19.0
MC-L-01-07	MC-N-01-06	MC-N-01-05	68.72	Irregular Channel	0.37835	210.3	210.0	211.7	211.7	211.4	211.2	211.7	211.6	15.2	9.3	19.1
MC-L-01-08	MC-N-01-07	MC-N-01-06	437.54	Irregular Channel	0.45482	212.3	210.3	213.5	211.7	213.3	211.4	213.5	211.7	21.4	9.6	28.2
MC-L-01-09	MC-N-01-08	MC-N-01-07	437.54	Irregular Channel	0.03	212.4	212.3	213.6	213.5	213.6	213.3	213.6	213.5	5.7	8.8	8.7
MC-L-01-10	MC-N-01-09	MC-N-01-08	230.12	Irregular Channel	0.03	212.5	212.4	213.7	213.6	213.7	213.6	213.7	213.6	12.0	10.2	10.2
MC-L-01-11	MC-N-01-10	MC-N-01-09	356.12	Irregular Channel	0.19375	213.2	212.5	214.2	213.7	214.2	213.7	214.2	213.7	8.5	31.0	31.0
MC-L-01-12	MC-N-01-11	MC-N-01-10	356.12	Irregular Channel	0.36	214.4	213.2	219.3	214.2	215.4	214.2	215.7	214.2	11.7	38.1	86.7
MC-L-01-13	MC-N-01-12	MC-N-01-11	259.67	Irregular Channel	-0.15	214.1	214.4	215.8	219.3	215.6	215.4	215.8	215.7	14.2	26.4	52.0
MC-L-01-14	MC-N-01-13	MC-N-01-12	1269.66	Irregular Channel	0.36703	218.7	214.1	220.6	215.8	219.7	215.6	220.0	215.8	221.0	27.2	73.3
MC-L-01-15	MC-N-01-14	MC-N-01-13	746.08	Irregular Channel	0.36189	221.4	218.7	223.7	220.6	222.8	219.7	223.0	220.0	89.7	26.9	45.7
MC-L-01-16	00-05219	MC-N-01-14	64.93	Irregular Channel	-0.74	220.9	221.4	229.0	223.7	222.8	222.8	223.0	223.0	128.1	27.5	46.0
MC-L-01-17	MC-N-01-15	00-15202	74.86	Irregular Channel	2.47	223.0	221.1	225.3	229.0	224.1	223.0	224.3	223.4	201.5	27.9	46.1
MC-L-02-01	MC-N-02-01	MC-N-02-00	503.09	Irregular Channel	5.53579	204.9	177.1	208.8	207.7	205.9	178.1	206.5	178.7	1296.9	18.8	59.6
MC-L-02-02	MC-N-02-02	MC-N-02-01	735.34	Irregular Channel	0.56436	209.1	204.9	214.8	208.8	209.8	205.9	210.1	206.5	114.9	19.0	60.6
MC-L-02-03	MC-N-02-03	MC-N-02-02	198.37	Irregular Channel	0.09074	209.2	209.1	215.0	214.8	210.4	209.8	211.0	210.1	1063.3	19.8	62.2
MC-L-02-04	00-05001	MC-N-02-03	25.6	Irregular Channel	-11.6	206.3	209.2	215.8	215.0	210.4	210.4	211.0	211.0	12023.3	19.2	50.1
MC-L-02-05	MC-N-02-04	00-15005	62.07	Irregular Channel	1.27	209.3	208.5	213.5	215.8	210.4	210.2	211.1	210.9	997.9	19.4	50.0
MC-L-02-06	MC-N-02-05	MC-N-02-04	205.44	Irregular Channel	0.3456	210.0	209.3	214.1	213.5	211.6	210.4	212.5	211.1	2.6	19.5	50.0
MC-L-11-01	MC-N-11-01	MC-N-01-08	124.03	Irregular Channel	0.7	213.3	212.4	215.4	213.6	213.6	213.6	213.7	213.6	11.6	2.7	26.6
MC-L-11-02	MC-N-11-02	MC-N-11-01	1020.21	Irregular Channel	0.97137	223.2	213.3	225.4	215.4	223.3	213.6	223.6	213.7	312.2	2.7	26.6
MC-L-11-03	00-05402	MC-N-11-02	1020.21	Irregular Channel	0.33	226.5	223.2	235.2	225.4	226.7	223.3	226.8	223.6	4.4	2.7	6.3
MC-L-21-01	MC-N-21-01	MC-N-01-11	476.56	Irregular Channel	0.51	216.9	214.4	221.7	219.3	218.4	215.4	219.2	215.7	233.8	14.3	39.6
MC-L-21-02	MC-N-21-02	MC-N-21-01	455.67	Irregular Channel	0.22824	217.9	216.9	219.8	221.7	218.5	218.4	219.2	219.2	72.8	15.3	42.0
MC-L-21-03	12-00244	MC-N-21-02	1156.83	Irregular Channel	0.53422	224.1	217.9	230.7	219.8	225.0	218.5	225.0	219.2	45.6	16.3	22.1
Swale 1-A-1	01-00210	01-00390	147.7	Irregular Channel	0.92	233.5	232.1	238.1	235.5	234.7	234.7	234.9	234.9	38.2	1.2	1.7
Swale 1-A-2	Swale 1	01-00210	477.5	Irregular Channel	0.53	236.0	233.5	239.0	238.1	236.0	234.7	236.0	234.9	52.7	0.0	0.0
Swale 15A	15-00220	15-00120	202.03	Irregular Channel	1.65	236.2	232.9	239.6	236.0	236.6	233.8	236.8	234.5	29.8	1.9	3.3

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
CROOKS CREEK																
00-005551	00-05552	00-05550	21.45	12" DIA	-1.86	200.4	200.8	202.8	202.8	201.5	201.4	201.9	201.6	4.9	0.9	2.2
00-05039	CC-N-03-002	CC-L-03-003A	126.36	Irregular Channel	0.07	203.7	203.6	207.9	209.9	203.9	203.9	204.1	204.1	102.5	0.1	0.8
00-05045	CC-N-01-021	CC-L-01-030	231.3	Irregular Channel	-0.13	203.1	203.4	208.6	208.1	204.3	204.3	204.8	204.8	709.9	1.7	12.0
00-05053	03-00300	CC-Drainage-01	1855.38	Irregular Channel	1.22	235.0	212.5	237.7	216.4	235.0	212.6	235.1	212.8	41.1	0.1	0.6
00-05060	17-00430	D-WOODS-1	131.56	Irregular Channel	1	233.3	232.0	235.9	236.5	233.6	233.0	235.9	235.9	65.7	2.0	3.6
00-05187	CC-N-00-030	CC-L-00-031A	18.5	Irregular Channel	0	213.0	213.0	220.9	222.2	214.5	214.4	214.6	214.4	54.1	31.6	33.9
00-05224	CC-N-02-014	CC-L-02-018	109.85	Irregular Channel	0.25	200.3	200.1	203.8	203.5	202.1	202.1	202.7	202.7	5.8	14.5	34.0
00-05250	CC-N-02-001	CC-L-02-002	154.51	Irregular Channel	0.429	196.3	195.7	201.7	206.1	198.0	196.8	198.4	197.2	388.7	21.0	34.8
00-05254	00-15253	CC-L-02-003	79.54	Irregular Channel	0.429	197.0	196.6	202.3	201.6	198.7	198.3	199.1	198.8	289.6	21.0	34.8
00-05263	CC-N-00-004	CC-L-00-005A	101.22	Irregular Channel	0.751	190.8	190.0	196.7	213.4	194.4	194.4	195.2	195.2	1753.0	98.1	162.4
00-05283	CC-N-05-003	CC-L-05-004	158.82	Irregular Channel	0.743	230.7	229.5	234.5	232.5	231.6	230.5	231.8	230.8	163.2	11.1	16.5
00-05309	CC-N-05-002	CC-L-05-003A	162.66	Irregular Channel	0.61	223.6	222.6	226.9	232.2	224.7	223.2	224.9	223.4	116.9	11.3	18.3
00-05349	CC-N-00-027	CC-L-00-028A	18.5	Irregular Channel	0	204.3	204.3	213.5	213.5	207.8	207.7	208.2	208.2	6.3	62.4	79.0
00-05501	00-05502	00-05500	18.13	15" DIA	0.55	193.9	193.8	196.5	196.5	194.8	194.8	195.1	195.0	4.8	0.6	1.6
00-05501	00-05502	00-05510	17.35	12" DIA	1.15	194.0	193.8	196.5	196.5	194.8	194.8	195.1	195.0	3.8	0.4	1.0
00-05502	CC-N-01-001	CC-L-01-002	12.7	Irregular Channel	-7.09	193.8	194.7	196.5	204.4	194.8	194.8	195.0	195.0	830.5	1.0	2.7
00-05521	00-05522	00-05520	14.43	12" DIA	-1.39	199.1	199.3	201.7	201.7	199.4	199.2	199.6	199.4	4.2	0.0	0.4
00-05521	00-05522	00-05530	14.83	15" DIA	-0.67	198.8	198.9	201.7	201.7	199.4	199.2	199.6	199.4	5.3	1.0	1.8
00-05522	CC-N-01-002	CC-L-01-004	164.89	Irregular Channel	0.073	198.7	198.5	201.7	204.9	199.2	198.7	199.4	198.9	51.5	1.0	2.2
00-05541	00-05542	00-05540	24.71	12" DIA	1.21	200.3	200.0	202.1	202.1	200.9	200.4	201.4	200.5	3.9	1.0	2.2
00-05542	CC-N-01-003	CC-L-01-006	272.6	Irregular Channel	0.11	200.0	199.7	202.1	204.1	200.4	199.9	200.5	200.0	37.8	1.0	2.2
00-05552	CC-N-01-004	CC-L-01-008	127.01	Irregular Channel	-0.02	200.8	200.8	202.8	205.2	201.4	201.2	201.6	201.4	9.4	0.9	2.1
00-05561	00-05562	00-05560	24.96	12" DIA	0.4	201.5	201.4	203.3	203.3	202.3	202.2	202.6	202.4	2.3	0.9	2.1
00-05562	CC-N-01-005	CC-L-01-010	18.42	Irregular Channel	-2.5	201.4	201.8	203.3	204.7	202.2	202.2	202.4	202.4	647.9	0.9	2.1
00-05571	00-05572	00-05570	21.53	12" DIA	0.7	201.6	201.5	203.4	203.4	202.3	202.3	202.6	202.6	3.0	0.9	1.3
00-05572	00-05561	CC-L-01-011	283.4	Irregular Channel	0.007	201.5	201.5	203.4	203.3	202.3	202.3	202.6	202.6	26.5	0.9	2.3
00-15035	00-05039	00-05035	32.8	12" DIA	1.9	204.3	203.7	207.9	207.9	204.4	203.9	204.8	204.1	4.9	0.1	0.8
00-15049	00-05045	00-05047	31.87	30" DIA	0.3	203.3	203.3	208.6	208.6	204.3	204.3	204.9	204.8	20.6	0.5	3.8
00-15049	00-05045	00-05048	31.8	30" DIA	0.5	203.3	203.1	208.6	208.6	204.3	204.3	204.9	204.8	30.0	0.7	4.3
00-15049	00-05045	00-05049	32.14	30" DIA	0.1	203.2	203.2	208.6	208.6	204.3	204.3	204.9	204.8	10.2	0.6	4.1
00-15054	00-05053	00-05054	26.66	12" DIA	1.9	235.5	235.0	237.7	237.7	235.7	235.0	235.8	235.1	5.0	0.2	0.7
00-15059	00-05060	00-05059	26.66	12" DIA	0.5	233.5	233.3	235.9	235.9	233.6	233.6	235.9	235.9	2.6	0.2	1.4
00-15067	16-00450	00-05067	41.03	24" DIA	1	204.7	204.3	208.8	208.8	206.0	204.9	206.8	205.4	22.6	6.8	13.6
00-15067	16-00450	00-05068	41.13	24" DIA	1	204.7	204.3	208.8	208.8	206.0	204.9	206.8	205.4	22.3	6.9	13.7
00-15191	00-05187	00-05190	30.23	84" DIA	2.3	210.4	209.7	220.9	220.9	214.6	214.5	214.6	214.6	621.7	27.9	29.7
00-15191	00-05187	00-05191	31.46	84" DIA	1.5	210.1	209.6	220.9	220.9	214.6	214.5	214.6	214.6	435.9	-12.2	-12.4
00-15191	00-05187	00-05192	31.53	84" DIA	0.4	209.7	209.5	220.9	220.9	214.6	214.5	214.6	214.6	197.9	-12.1	-12.1
00-15253	00-05250	00-05252	35.64	36" DIA	0.1	196.6	196.6	201.6	201.7	198.3	198.0	198.8	198.4	25.0	11.1	18.1
00-15253	00-05250	00-05253	35.64	36" DIA	0.1	196.7	196.7	201.6	201.7	198.3	198.0	198.8	198.4	25.0	9.9	16.7
00-15256	00-05254	00-05256	19.72	51" H, 66" BOX	1.5	197.2	197.0	202.3	202.3	198.8	198.7	199.3	199.1	313.9	21.0	34.8
00-15258	00-05263	00-05257	39.94	48" DIA	0.3	191.1	191.0	196.7	196.7	194.5	194.4	195.4	195.2	71.9	24.4	40.6
00-15258	00-05263	00-05258	39.94	48" DIA	0.5	191.0	190.8	196.7	196.7	194.5	194.4	195.4	195.2	99.1	25.4	41.2
00-15258	00-05263	00-05260	39.92	48" DIA	0.6	191.3	191.1	196.7	196.7	194.5	194.4	195.4	195.2	113.7	23.8	40.0
00-15258	00-05263	00-05262	39.97	48" DIA	0.2	191.0	190.9	196.7	196.7	194.5	194.4	195.4	195.2	64.3	24.6	40.7
00-15286	00-05283	00-05286	50.42	24" DIA	2.4	231.9	230.7	234.5	234.5	232.7	231.6	233.0	231.8	34.8	4.6	5.9
00-15286	00-05283	00-05287	50.57	24" DIA	0.9	231.3	230.8	234.5	234.5	232.7	231.6	233.0	231.8	21.6	7.7	10.6
00-15308	00-05309	00-05308	21.41	24" DIA	1.4	223.9	223.6	226.9	226.9	225.7	224.7	226.3	224.9	27.2	11.3	18.3
00-15365	00-05349	00-05365	70.5	58" H, 120" BOX	1.2	205.2	204.3	213.5	213.5	207.8	207.8	208.3	208.2	851.5	31.3	39.6
00-15365	00-05349	00-05370	70.61	58" H, 120" BOX	1.23	205.2	204.3	213.5	213.5	207.8	207.8	208.3	208.2	850.8	31.3	39.6
00-21680	00-21690	00-21671	20.11	24" DIA	0.5	203.6	203.5	206.0	206.0	204.2	203.7	204.7	204.1	16.0	1.6	4.4
00-21680	00-21690	00-21681	20.09	24" DIA	1.29	203.7	203.4	206.0	206.0	204.2	203.7	204.7	204.1	25.7	1.9	4.2
00-21690	CC-N-01-020	CC-L-01-028	24.91	Irregular Channel	3.01	203.4	202.7	206.0	204.0	203.7	203.6	204.1	204.0	67.1	3.5	15.3

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
00-22680	00-22960	00-22661	23.83	12" DIA	0.8	202.2	202.0	204.6	204.6	202.2	202.2	203.0	203.0	3.0	0.0	1.1
00-22680	00-22960	00-22671	24.29	12" DIA	0.82	202.4	202.2	204.6	204.6	202.2	202.2	203.0	203.0	3.0	0.0	0.9
00-22680	00-22960	00-22681	24.32	30" DIA	-1.77	200.8	201.2	204.6	204.6	202.2	202.2	203.0	203.0	50.6	3.5	7.4
00-22960	CC-N-01-015	CC-L-01-022	15.57	Irregular Channel	-8.09	200.6	201.9	204.6	204.6	202.2	202.2	203.0	203.0	58.6	0.0	2.3
01-00060	01-00080	01-00070	81.6	10" DIA	0.5	238.5	238.1	242.6	242.2	238.6	238.6	238.6	238.6	1.6	0.0	0.0
01-00080	01-00100	01-00090	36.03	10" DIA	0.5	238.1	237.9	242.2	242.2	238.6	238.5	238.6	238.6	1.6	0.6	0.6
01-00100	01-00120	01-00110	134	12" DIA	0.5	237.9	237.3	242.2	242.2	238.5	238.3	238.6	238.4	2.5	1.1	1.2
01-00120	Swale 1B Control	Swale 1-B	183.2	Irregular Channel	0.49	237.3	236.4	242.2	239.0	238.3	238.2	238.4	238.3	2.7	1.1	1.3
01-00230	01-00250	01-00220	35.18	10" DIA	0.4	238.7	238.5	241.2	241.2	238.9	238.9	238.9	238.9	1.4	0.0	0.0
01-00250	01-00270	01-00240	126.08	10" DIA	0.3	238.5	238.2	241.2	241.8	238.9	238.6	238.9	238.7	1.2	0.5	0.5
01-00270	01-00100	01-00260	71.2	10" DIA	0.3	238.2	237.9	241.8	242.2	238.6	238.5	238.7	238.6	1.2	0.6	0.6
01-00410	18-01110	18-01040.1	94.83	12" DIA	1.58	236.3	234.8	239.0	238.5	236.7	236.5	236.7	236.6	4.5	1.1	1.3
01-00430	01-00410	01-00380	22.15	12" DIA	0.5	236.4	236.3	239.0	239.0	236.8	236.7	236.9	236.7	2.5	1.1	1.2
02-00020	00-15308	02-00010	70	12" DIA	0.4	226.1	225.8	229.6	226.9	226.5	225.7	226.5	226.3	2.3	0.8	0.9
02-00040	02-00020	02-00030	285.92	12" DIA	0.8	228.5	226.2	235.9	229.6	228.8	226.5	228.8	226.5	3.2	0.6	0.6
02-00080	02-00060	02-00070	120	60" DIA	0.3	230.1	229.8	238.7	239.1	233.5	233.5	233.5	233.5	142.7	0.9	0.9
02-00100	02-00080	02-00090	322	12" DIA	0.6	236.3	234.2	240.6	238.7	236.7	233.5	236.7	233.5	2.8	1.3	1.3
02-00120	02-00100	02-00110	27.5	12" DIA	0.1	237.6	237.3	240.9	240.6	238.0	236.7	238.0	236.7	3.5	1.3	1.3
02-00140	02-00120	02-00130	97.72	6" DIA	2.3	240.5	238.3	243.5	240.9	240.5	238.0	240.5	238.0	0.8	0.0	0.0
02-Dummy-01	02-00040	02-00050	135.69	12" DIA	0.8	229.7	228.6	239.1	235.9	230.0	228.8	230.0	228.8	3.2	0.6	0.6
03-00010	03-00050	03-00040	28	21" DIA	1.3	203.8	203.4	207.9	208.2	207.9	207.9	207.9	207.9	20.3	5.1	5.2
03-00030	03-00010	03-00020	65	21" DIA	0.3	204.0	203.8	208.3	207.9	207.9	207.9	207.9	207.9	8.3	4.2	4.3
03-00050	03-00070	03-00060	37	21" DIA	0.4	203.4	203.2	208.2	208.2	207.9	207.9	207.9	207.9	10.4	5.1	5.2
03-00090	03-00030	03-00080	102.41	21" DIA	0.3	204.3	204.0	208.8	208.3	207.9	207.9	208.0	207.9	8.4	4.2	4.3
03-00110	03-00090	03-00100	160.09	18" DIA	0.3	204.8	204.3	209.2	208.8	208.0	207.9	208.0	208.0	5.6	4.2	4.3
03-00130	03-00110	03-00120	233.07	18" DIA	0.3	205.4	204.8	210.6	209.2	208.1	208.0	208.1	208.0	5.6	3.4	3.5
03-00150	03-00130	03-00140	400	18" DIA	0.3	206.6	205.4	212.6	210.6	208.1	208.1	208.2	208.1	5.8	2.6	2.7
03-00170	03-00150	03-00160	149.59	18" DIA	0.4	207.2	206.6	213.3	212.6	208.1	208.1	208.3	208.2	6.7	0.8	0.9
03-00190	03-00170	03-00180	85.97	18" DIA	0.4	208.0	207.2	215.0	213.3	208.3	208.1	208.3	208.3	10.1	0.7	0.8
03-00230	03-00200	03-00210	116.33	18" DIA	0.5	208.7	208.1	213.7	215.0	210.3	210.3	211.0	211.0	7.4	1.9	2.4
03-00250	03-00230	03-00240	135.93	15" DIA	0.3	209.4	208.9	214.0	213.7	210.3	210.3	211.1	211.0	3.7	2.0	2.3
03-00260	03-00250	03-00270	29.5	10" DIA	1	210.1	209.8	214.3	214.0	210.3	210.3	211.1	211.1	2.2	0.0	0.0
03-00280	03-00250	03-00290	246.79	12" DIA	0.4	210.8	209.6	215.3	214.0	211.1	210.3	211.2	211.1	2.4	0.5	0.9
03-00300	03-00280	03-00310	199.43	10" DIA	0.7	212.5	211.0	216.4	215.3	212.6	211.1	212.8	211.2	1.9	0.1	0.6
03-00320	03-00340	03-00330	311.17	18" DIA	0.4	209.9	208.7	215.7	214.2	212.0	212.0	212.0	212.0	6.7	3.5	3.5
03-00340	03-00550	03-00560	169.6	24" DIA	0.2	208.8	208.4	214.2	213.2	212.0	211.9	212.0	211.9	11.1	8.5	8.5
03-00360	03-00340	03-00350	199.32	15" DIA	0.7	210.4	208.8	216.0	214.2	212.0	212.0	212.0	212.0	5.9	1.6	1.6
03-00380	03-00150	03-00370	230.97	12" DIA	0.3	208.4	207.6	213.3	212.6	209.0	208.1	209.0	208.2	2.1	1.4	1.4
03-00390	03-00410	03-00400	85.18	10" DIA	0.4	209.2	208.9	213.9	213.5	211.9	211.9	211.9	211.9	1.4	1.0	1.0
03-00410	03-00430	03-00420	55.89	10" DIA	0.4	208.8	208.6	213.5	213.3	211.9	211.9	211.9	211.9	1.4	1.0	1.0
03-00430	03-00450	03-00440	70.85	10" DIA	0.4	208.5	208.2	213.3	213.0	211.9	211.9	211.9	211.9	1.4	1.0	1.0
03-00450	03-00470	03-00460	27.7	24" DIA	2.1	208.1	207.5	213.0	213.3	211.9	211.8	211.9	211.8	32.7	10.1	10.1
03-00470	03-00490	03-00480	49.1	24" DIA	0.7	207.9	207.5	213.3	213.3	211.8	211.8	211.8	211.8	21.2	10.1	10.1
03-00510	03-00530	03-00520	86	24" DIA	0.5	206.5	206.0	213.3	212.0	207.2	203.0	207.2	203.6	17.3	5.0	5.0
03-00530	CC-N-00-018	CC-L-00-019A	487	Irregular Channel	0.4168	200.9	198.9	212.0	207.2	203.0	201.8	203.6	202.1	1012.8	75.4	116.7
03-00550	03-00450	03-00540	58.51	24" DIA	0.3	208.4	208.2	213.2	213.0	211.9	211.9	211.9	211.9	13.2	8.6	8.6
03-00580	03-00340	03-00570	41.86	15" DIA	1.36	209.4	208.8	214.1	214.2	212.0	212.0	212.0	212.0	7.5	2.0	2.0
03-00600	03-00580	03-00590	375.14	15" DIA	0.3	210.5	209.4	215.9	214.1	212.1	212.0	212.1	212.0	3.5	2.0	2.0
03-00620	03-00600	03-00610	189.77	10" DIA	3.8	218.2	210.9	223.4	215.9	218.6	212.1	218.6	212.1	4.3	2.1	2.1
03-00640	03-00620	03-00630	160.23	10" DIA	3.7	224.1	218.2	229.5	223.4	224.5	218.6	224.5	218.6	4.2	2.1	2.1
03-00660	03-00640	03-00650	175.95	10" DIA	0.9	225.7	224.1	230.8	229.5	226.7	224.5	226.7	224.5	2.1	2.1	2.1
03-00680	03-00320	03-00670	82.22	15" DIA	0.5	210.5	210.0	216.1	215.7	212.1	212.0	212.1	212.0	4.6	2.5	2.5
03-00700	03-00680	03-00690	325.45	15" DIA	0.7	212.7	210.5	218.3	216.1	213.3	212.1	213.3	212.1	5.3	2.6	2.6

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
03-00720	03-00700	03-00710	400	10" DIA	3.5	227.2	213.1	231.1	218.3	227.6	213.3	227.6	213.3	4.1	1.6	1.6
03-00740	03-00360	03-00730	50.43	15" DIA	1.4	211.2	210.5	216.4	216.0	212.0	212.0	212.0	212.0	7.6	1.4	1.4
03-00760	03-00740	03-00750	335.79	12" DIA	0.4	212.8	211.4	217.9	216.4	213.3	212.0	213.3	212.0	2.3	1.0	1.0
03-00780	03-00760	03-00770	232.75	10" DIA	0.9	215.1	213.0	219.8	217.9	215.4	213.3	215.4	213.3	2.1	0.5	0.5
03-00800	16-00440	03-00810	35.19	21" DIA	0.3	203.0	202.9	208.2	207.8	203.5	200.4	203.5	201.0	8.5	1.6	1.6
05-00010	05-00030	05-00020	125	6" DIA	-0.32	205.1	205.5	206.0	207.9	206.3	206.2	206.3	206.2	0.3	0.3	0.3
05-00030	05-00050	05-00040	26.98	10" DIA	5.3	205.4	204.0	207.9	207.5	206.2	206.2	206.2	206.2	5.0	0.4	0.4
05-00050	05-00070	05-00060	158.9	12" DIA	0.2	203.3	203.0	207.5	208.4	206.2	206.2	206.2	206.2	1.7	0.4	0.4
05-00070	05-00090	05-00080	411.94	15" DIA	0.2	202.9	202.2	208.4	207.2	206.2	205.6	206.2	205.6	2.8	2.8	2.8
05-00090	05-00110	05-00100	47.68	15" DIA	0.2	202.2	202.2	207.2	207.1	205.6	205.5	205.6	205.5	1.6	2.8	2.8
05-00110	05-00130	05-00120	234.24	15" DIA	0.2	202.0	201.5	207.1	206.5	205.5	204.3	205.5	204.3	3.1	4.6	4.6
05-00130	05-00150	05-00140	229.8	15" DIA	0.2	201.4	201.0	206.5	204.7	204.3	203.7	204.3	203.7	2.8	4.6	4.6
05-00150	05-00330	05-00160	47.77	18" DIA	0.2	200.9	200.8	204.7	205.4	203.7	203.6	203.7	203.6	5.0	6.1	6.1
05-00170	05-00070	05-00180	27.54	12" DIA	0.2	203.1	203.1	207.9	208.4	206.3	206.2	206.3	206.2	1.5	1.8	1.7
05-00190	05-00170	05-00440	27.78	12" DIA	0.2	203.2	203.1	207.7	207.9	206.3	206.3	206.3	206.3	2.1	1.7	1.8
05-00210	05-00190	05-00200	248.82	12" DIA	0.2	203.7	203.2	210.1	207.7	206.8	206.3	206.8	206.3	1.6	1.8	1.8
05-00230	05-00210	05-00220	199.98	12" DIA	0.2	204.1	203.8	208.8	210.1	206.8	206.8	206.8	206.8	1.6	1.0	1.0
05-00250	05-00230	05-00240	71.63	12" DIA	0.2	204.4	204.2	208.0	208.8	206.8	206.8	206.8	206.8	1.7	1.1	1.1
05-00270	05-00210	05-00260	222.43	12" DIA	0.2	204.1	203.8	207.8	210.1	207.1	206.8	207.1	206.8	1.4	1.2	1.2
05-00290	05-00310	05-00280	83.13	12" DIA	0.2	200.8	200.6	204.7	205.2	203.6	203.6	203.6	203.6	1.7	0.3	0.3
05-00310	05-00380	05-00340	36	18" DIA	0.1	200.6	200.6	205.2	204.4	203.6	203.6	203.6	203.6	2.5	6.4	6.4
05-00330	05-00310	05-00300	52.75	18" DIA	0.23	200.7	200.6	205.4	205.2	203.6	203.6	203.6	203.6	5.0	6.1	6.1
05-00350	05-00330	05-00320	39.17	12" DIA	0.2	200.8	200.8	204.9	205.4	203.6	203.6	203.6	203.6	1.5	0.1	0.1
05-00390	05-00400	05-00351	14	18" DIA	0.2	200.6	200.5	204.4	206.4	201.2	200.0	201.2	200.5	7.4	2.9	2.8
05-00400	CC-N-02-002	CC-L-02-005	84.86	Irregular Channel	0.121	198.1	198.0	206.4	205.1	200.0	199.8	200.5	200.2	114.1	21.0	34.8
05-00410	05-00250	05-00360	32.5	8" DIA	0.4	204.6	204.4	207.8	208.0	206.8	206.8	206.8	206.8	0.8	0.5	0.5
05-00430	05-00410	05-00420	214	8" DIA	0.4	205.3	204.6	206.5	207.8	206.5	206.8	206.5	206.8	0.7	0.5	0.5
06-00000	22-00040	22-00070	325.41	36" DIA	0.2	229.7	229.0	236.3	234.2	234.0	234.0	234.1	234.1	29.6	4.3	4.4
06-00020	06-00000	06-00010	176	12" DIA	1.1	232.3	230.6	237.5	236.3	234.3	234.0	234.5	234.1	3.5	1.9	2.1
06-00040	06-00020	06-00030	72	12" DIA	0.3	232.7	232.3	238.3	237.5	234.4	234.3	234.7	234.5	2.5	1.9	2.1
06-00060	06-00040	06-00050	14	12" DIA	0.3	235.0	235.0	238.2	238.3	235.7	234.4	235.7	234.7	0.1	2.0	2.1
06-00080	06-00060	06-00090	31	12" DIA	0.7	235.2	235.0	237.8	238.2	235.8	235.7	235.8	235.7	2.9	1.5	1.6
06-00100	06-00060	06-00070	56	12" DIA	0.6	235.4	235.0	238.3	238.2	235.7	235.7	235.7	235.7	2.7	0.5	0.6
06-00120	06-00080	06-00110	258.52	12" DIA	1.76	239.8	235.3	243.8	237.8	240.1	235.8	240.2	235.8	4.7	1.0	1.0
06-00130	06-00150	06-00140	185.05	12" DIA	1.2	243.6	241.4	247.6	244.9	243.6	241.5	243.6	241.5	3.9	0.0	0.0
06-00150	06-00170	06-00160	108.82	12" DIA	0.6	241.4	240.2	244.9	243.7	241.5	240.3	241.5	240.4	3.7	0.0	0.1
06-00170	09-00000	06-00180	175.65	12" DIA	0.6	240.2	239.4	243.7	242.4	240.3	238.5	240.4	238.6	2.4	0.1	0.1
07-00010	07-00030	07-00040	291.9	12" DIA	0.3	206.5	205.8	210.0	209.6	210.0	209.4	210.0	209.4	1.8	2.0	1.9
07-00030	07-00210	07-00200	135.5	8" DIA	0.4	205.7	205.1	209.6	211.0	209.4	207.3	209.4	207.9	0.8	2.0	1.9
07-00060	07-00140	07-00150	440	24" DIA	0.1	206.7	206.2	210.6	209.4	209.4	209.4	209.4	209.4	7.5	-4.8	-4.6
07-00080	07-00060	07-00070	277.48	12" DIA	0.3	207.5	206.8	210.9	210.6	209.6	209.4	209.6	209.4	1.8	0.9	1.0
07-00140	07-00030	07-00190	388.76	24" DIA	0.1	206.1	205.7	209.4	209.6	209.4	209.4	209.4	209.4	7.5	-3.4	-3.2
07-00170	07-00060	07-00160	70.22	24" DIA	0.1	206.8	206.7	210.6	210.6	209.4	209.4	209.4	209.4	7.1	-7.1	-6.9
07-00210	CC-N-00-026	CC-L-00-027A	273.39	Irregular Channel	0.172	203.6	203.1	211.0	213.0	207.3	207.1	207.9	207.8	382.6	62.4	80.0
07-00230	07-00030	07-00220	272.64	12" DIA	0.3	206.4	205.8	210.0	209.6	209.5	209.4	209.6	209.4	1.8	1.6	1.5
07-00270	07-00060	07-00260	274.31	12" DIA	0.3	207.5	206.8	210.6	210.6	209.5	209.4	209.6	209.4	1.8	1.0	1.0
07-00310	07-00270	07-00300	45.08	12" DIA	0.5	207.8	207.6	210.4	210.6	209.5	209.5	209.6	209.6	2.5	0.7	0.7
07-00320	07-00230	07-00330	126.57	12" DIA	0.3	206.9	206.5	209.6	210.0	209.6	209.5	209.6	209.6	2.0	1.0	0.9
08-00100	08-00120	08-00070	215	12" DIA	0.3	237.7	237.0	242.4	240.1	238.3	238.1	238.6	238.4	2.0	0.9	1.1
08-00120	08-00260	08-00190	28	12" DIA	0.3	236.8	236.7	240.1	239.9	238.1	238.0	238.4	238.3	2.0	2.0	2.2
08-00140	08-00100	08-00090	155	12" DIA	0.3	238.2	237.8	244.6	242.4	238.7	238.3	238.8	238.6	1.9	0.9	1.1
08-00160	08-00140	08-00110	42	12" DIA	0.3	238.6	238.4	243.8	244.6	239.0	238.7	239.1	238.8	2.0	0.9	1.1
08-00180	08-00160	08-00130	155	12" DIA	0.3	239.1	238.7	242.6	243.8	239.4	239.0	239.5	239.1	1.9	0.4	0.5

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
08-00220	13-00170	D-ZUHLKE-01	87.65	Irregular Channel	-0.67	235.5	236.1	240.5	240.1	237.0	237.0	237.1	237.1	353.2	2.5	2.8
08-00240	08-00220	08-00150	40	12" DIA	0.3	235.9	235.5	240.5	240.5	237.2	237.0	237.4	237.1	3.7	2.5	2.9
08-00260	08-00240	08-00170	248	12" DIA	0.3	236.6	235.9	239.9	240.5	238.0	237.2	238.3	237.4	2.0	2.0	2.2
09-00000	09-00020	09-00010	22.64	12" DIA	1.1	238.2	238.0	242.4	242.4	238.5	238.0	238.6	238.2	3.7	0.7	1.0
09-00020	18-00740	18-00490	367	12" DIA	0.5	237.6	235.7	242.4	238.4	238.0	236.1	238.2	236.2	2.6	0.8	1.5
09-00040	09-00020	09-00030	16.11	6" DIA	0.2	238.2	238.2	239.8	242.4	238.5	238.0	238.7	238.2	0.3	0.2	0.5
09-00060	09-00040	09-00050	100	6" DIA	0.2	238.5	238.2	239.7	239.8	238.8	238.5	239.3	238.7	0.3	0.2	0.5
09-00080	09-00060	09-00070	93.61	6" DIA	0.2	238.6	238.4	239.8	239.7	238.9	238.8	239.8	239.3	0.3	0.2	0.4
10-00010	10-01200	10-01210	154.84	18" DIA	1	210.2	208.7	217.3	215.7	212.5	211.7	213.3	212.5	10.5	7.7	7.5
10-00030	10-00010	10-00020	120.58	12" DIA	1	211.6	210.4	219.3	217.3	215.9	212.5	216.5	213.3	3.6	6.1	6.0
10-00050	10-00030	10-00040	289.49	12" DIA	2.4	218.5	211.7	224.1	219.3	224.0	215.9	224.1	216.5	5.5	6.2	6.0
10-00070	10-00050	10-00060	273.67	12" DIA	1.4	222.5	218.6	227.8	224.1	227.8	224.0	227.8	224.1	4.2	5.1	5.0
10-00090	10-00070	10-00080	307.14	12" DIA	1.8	228.1	222.6	233.1	227.8	233.1	227.8	233.1	227.8	4.8	4.8	4.8
10-01020	10-01040	10-01030	137.15	15" DIA	0.5	219.9	219.2	225.2	224.2	221.1	220.7	223.3	222.8	4.6	4.1	4.6
10-01040	10-01060	10-01050	229.98	15" DIA	0.9	219.1	216.9	224.2	228.3	220.7	218.7	222.8	220.8	6.3	6.2	6.5
10-01060	10-01080	10-01070	322.98	15" DIA	1.1	216.7	213.1	228.3	219.0	218.7	215.4	220.8	216.9	6.8	7.0	7.4
10-01080	10-01100	10-01090	161.38	18" DIA	0.5	212.8	212.0	219.0	217.4	215.4	214.6	216.9	215.9	7.7	8.1	8.5
10-01100	10-01180	10-01170	253.4	18" DIA	0.6	211.9	210.2	217.4	218.4	214.6	213.0	215.9	214.0	8.5	8.6	9.2
10-01120	10-01140	10-01110	136.99	12" DIA	0.5	216.8	215.5	219.8	220.7	217.1	215.5	217.1	216.1	3.6	0.6	0.8
10-01140	10-01100	10-01130	269.17	12" DIA	1	215.3	212.5	220.7	217.4	215.5	214.6	216.1	215.9	3.6	0.6	0.9
10-01160	10-01140	10-01150	90	12" DIA	0.7	216.1	215.5	217.1	220.7	216.1	215.5	216.1	216.1	3.0	0.0	0.0
10-01180	10-01200	10-01190	204.64	18" DIA	0.7	210.1	208.7	218.4	215.7	213.0	211.7	214.0	212.5	8.8	8.4	9.2
10-01200	10-03010	10-03250	294.12	24" DIA	0.55	208.2	206.5	215.7	212.5	211.7	210.2	212.5	210.9	16.8	16.1	16.7
10-01220	10-01240	10-01250	316.23	30" DIA	0.2	204.7	204.0	211.2	212.5	207.7	207.7	208.7	208.7	18.3	19.0	19.8
10-01240	10-01260	10-01270	157.9	48" DIA	0.6	202.5	201.5	212.5	210.5	207.7	207.7	208.7	208.7	116.0	19.1	23.0
10-03010	10-03070	10-01230	294.12	24" DIA	0.29	206.5	205.7	212.5	211.3	210.2	208.4	210.9	209.1	12.2	17.5	18.1
10-03030	10-03010	10-03020	151.42	12" DIA	0.94	208.2	206.7	211.7	212.5	210.3	210.2	211.0	210.9	3.5	0.8	0.8
10-03050	10-03010	10-03041	149.12	12" DIA	0.7	207.8	206.7	211.4	212.5	210.2	210.2	211.0	210.9	3.0	0.7	0.7
10-03070	10-01220	10-03040	149.25	24" DIA	0.4	205.7	205.2	211.3	211.2	208.4	207.7	209.1	208.7	13.5	18.4	19.1
10-03090	10-03070	10-03060	269.74	12" DIA	0.5	208.0	206.7	211.7	211.3	208.7	208.4	209.3	209.1	2.5	1.0	1.0
10-03120	CC-N-00-024	10-01290	124.58	18" DIA	0.3	203.0	202.8	208.5	208.4	206.8	206.7	207.4	207.3	4.7	5.6	6.3
10-03140	10-03120	10-03080	179	18" DIA	0.4	203.8	203.0	210.5	208.5	207.0	206.8	207.6	207.4	6.7	5.6	6.3
10-03160	10-03140	10-03170	324.69	18" DIA	0.4	205.1	203.9	210.0	210.5	207.4	207.0	208.2	207.6	6.6	5.6	6.3
10-03180	10-03160	10-03190	109.07	18" DIA	0.4	205.1	203.9	210.5	210.0	207.6	207.4	208.6	208.2	11.4	5.6	6.3
10-03240	10-01240	10-01295	156.63	30" DIA	0.2	204.4	204.0	211.9	212.5	207.7	207.7	208.7	208.7	19.7	-0.1	3.0
11-00010	11-00030	11-00020	176.29	10" DIA	0.403	225.4	224.7	228.0	235.5	225.5	224.5	225.5	224.5	1.4	0.0	0.0
11-00030	11-00050	11-00040	168.75	12" DIA	0.5	224.4	223.6	235.5	232.6	224.5	223.6	224.5	223.6	2.4	0.1	0.1
11-00050	11-00070	11-00060	104.68	12" DIA	0.3	223.4	223.1	232.6	230.9	223.6	223.1	223.6	223.1	2.0	0.1	0.1
11-00070	11-00090	11-00080	111.76	12" DIA	0.3	222.9	222.5	230.9	229.1	223.1	222.5	223.1	222.5	2.0	0.1	0.1
11-00090	11-00110	11-00100	124.38	12" DIA	0.7	222.3	221.5	229.1	226.7	222.5	221.4	222.5	221.8	3.0	0.1	0.1
11-00110	11-00130	11-00120	158.35	12" DIA	0.8	221.3	220.0	226.7	225.0	221.4	219.9	221.8	220.2	3.1	0.1	1.7
11-00130	11-00150	11-00140	178.11	12" DIA	3	219.8	214.5	225.0	220.0	219.9	214.5	220.2	214.8	6.1	0.1	1.7
11-00150	11-00170	11-00160	59.21	12" DIA	10.47	214.4	208.2	220.0	220.5	214.5	207.7	214.8	208.7	11.5	0.1	2.5
11-00170	11-00190	11-00180	147.55	24" DIA	0.5	207.4	206.6	220.5	217.0	207.7	207.7	208.7	208.7	15.8	0.1	2.6
11-00190	11-00210	11-00200	133.78	24" DIA	0.5	206.4	205.7	217.0	213.7	207.7	207.7	208.7	208.7	16.4	0.1	2.5
11-00210	11-00230	11-00220	67.93	24" DIA	0.54	205.6	205.2	213.7	212.8	207.7	207.7	208.7	208.7	16.7	-0.1	2.5
11-00230	11-00250	11-00240	42.68	30" DIA	0.14	204.8	204.7	212.8	212.7	207.7	207.7	208.7	208.7	15.4	-0.1	3.0
11-00250	10-03240	11-00280	115.92	30" DIA	0.22	204.7	204.4	212.7	211.9	207.7	207.7	208.7	208.7	19.4	-0.1	3.0
11-00270	11-00170	11-00260	132.09	24" DIA	0.31	207.8	207.4	220.1	220.5	207.8	207.7	208.7	208.7	12.6	0.0	0.1
13-00020	13-00040	13-00030	452.85	15" DIA	0.2	235.0	234.0	239.0	237.0	235.4	233.6	235.5	233.9	2.9	0.7	0.9
13-00040	13-00180	13-00190	51	36" DIA	0.2	232.3	232.2	237.0	239.6	233.6	233.6	233.9	233.8	29.5	11.1	14.0
13-00060	13-00040	13-00050	45.93	30" DIA	0.2	232.9	232.8	236.8	237.0	233.6	233.6	233.9	233.9	18.2	2.7	3.2
13-00080	13-00060	13-00070	7.37	12" DIA	0.2	234.4	234.4	237.1	236.8	234.4	233.6	234.4	233.9	1.9	0.0	0.0

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
13-00100	13-00060	13-00090	27.37	12" DIA	0.2	234.4	234.4	237.1	236.8	234.4	233.6	234.4	233.9	1.7	0.0	0.0
13-00120	13-00060	13-00110	310.84	12" DIA	0.4	235.6	234.4	239.0	236.8	236.0	233.6	236.1	233.9	2.3	0.7	0.9
13-00130	13-00150	13-00140	31.55	24" DIA	2.2	235.8	235.1	240.1	240.4	236.0	235.7	236.2	235.9	33.7	0.9	2.4
13-00150	13-00230	13-00240	226.36	24" DIA	0.2	234.9	234.4	240.4	239.0	235.7	234.9	235.9	235.0	10.1	3.7	5.4
13-00170	13-00150	13-00160	49.38	12" DIA	0.2	236.1	236.0	240.1	240.4	237.0	235.7	237.1	235.9	1.6	2.8	3.1
13-00210	13-00040	13-00200	254	30" DIA	0.2	233.3	232.8	238.0	237.0	234.4	233.6	234.6	233.9	18.4	7.8	10.0
13-00230	13-00360	13-00331	137.99	30" DIA	0.2	233.9	233.6	239.0	241.1	234.9	234.6	235.0	234.8	18.5	5.4	7.0
13-00270	13-00330	13-00290	86	18" DIA	0.2	231.8	231.6	239.6	239.0	232.9	232.8	233.2	233.1	4.7	3.0	3.9
13-00270	13-00330	13-00300	86	18" DIA	0.2	231.8	231.6	239.6	239.0	232.9	232.8	233.2	233.1	4.7	3.0	3.9
13-00270	13-00330	13-00310	86	18" DIA	0.2	231.8	231.6	239.6	239.0	232.9	232.8	233.2	233.1	4.7	3.0	3.9
13-00330	18-00521	18-00330	17.2	18" DIA	0.5	231.6	231.5	239.0	239.0	232.8	232.8	233.1	233.1	7.2	3.0	3.9
13-00330	18-00521	18-00350	17.2	18" DIA	0.5	231.6	231.5	239.0	239.0	232.8	232.8	233.1	233.1	7.2	3.0	3.9
13-00330	18-00521	18-00370	17.2	18" DIA	0.5	231.6	231.5	239.0	239.0	232.8	232.8	233.1	233.1	7.2	3.0	3.9
13-00360	13-00210	13-00220	115.1	30" DIA	0.2	233.6	233.4	241.1	238.0	234.6	234.4	234.8	234.6	18.3	6.1	7.7
13-00380	13-00360	13-00350	414.95	10" DIA	0.3	235.4	234.2	240.6	241.1	235.9	234.6	235.9	234.8	1.2	0.7	0.7
13-00400	13-00380	13-00370	44.98	10" DIA	0.3	235.6	235.5	240.6	240.6	236.1	235.9	236.1	235.9	1.2	0.7	0.7
13-00420	13-00400	13-00390	125.62	8" DIA	0.9	236.9	235.7	241.9	240.6	236.9	236.1	236.9	236.1	1.2	0.0	0.0
13-00440	13-00420	13-00410	63.45	8" DIA	0.9	237.5	236.9	240.5	241.9	237.5	236.9	237.5	236.9	1.2	0.0	0.0
14-00040	14-00060	14-00050	127	15" DIA	0.3	209.7	209.3	215.0	215.5	209.8	209.1	209.8	209.3	3.7	0.1	0.1
14-00060	14-00080	14-00070	117.39	15" DIA	0.4	209.0	208.5	215.5	214.9	209.1	208.5	209.3	208.7	4.4	0.1	0.7
14-00080	14-00100	14-00090	360.61	15" DIA	0.3	208.3	207.1	214.9	213.3	208.5	207.1	208.7	207.3	3.6	0.2	0.8
14-00100	14-00120	14-00110	351	15" DIA	0.6	206.9	204.7	213.3	208.8	207.1	204.9	207.3	205.1	5.1	0.3	0.9
14-00120	14-00140	14-00130	130	15" DIA	0.2	204.6	204.3	208.8	207.1	204.9	204.5	205.1	204.6	3.1	0.3	0.9
14-00140	14-00160	14-00150	25.82	15" DIA	0.2	204.2	204.1	207.1	207.8	204.5	204.3	204.6	204.4	3.1	0.5	1.2
14-00160	16-00440	16-00110	378.65	24" DIA	1.07	204.1	200.0	207.8	207.8	204.3	200.4	204.4	201.0	23.4	0.5	1.2
14-00180	14-00140	14-00170	15.17	15" DIA	0.4	204.2	204.2	207.3	207.1	204.5	204.5	204.6	204.6	4.1	0.0	0.0
14-00200	14-00060	14-00210	38	12" DIA	1.8	209.8	209.2	214.0	215.5	209.8	209.1	210.1	209.3	4.8	0.0	0.6
16-00050	16-00090	16-00100	12	12" DIA	0.3	205.0	205.0	207.3	207.3	205.1	205.0	205.1	205.0	2.0	0.0	0.0
16-00070	16-00050	16-00060	52.12	12" DIA	0.3	205.2	205.0	208.0	207.3	205.2	205.1	205.2	205.1	1.8	0.0	0.0
16-00090	00-05039	D-MILLERSBURG-01	95.18	Irregular Channel	1.33	205.0	203.7	207.3	207.9	205.0	203.9	205.0	204.1	1190.8	0.0	0.0
16-00170	CC-N-00-014	16-00160	10.69	12" DIA	2.81	199.3	199.0	206.7	206.0	200.4	200.4	201.1	201.0	6.0	3.8	3.8
16-00190	16-00170	16-00180	78.21	12" DIA	0.3	201.3	201.1	205.4	206.7	202.8	200.4	202.8	201.1	1.9	3.8	3.8
16-00200	16-00190	16-00190.1	449.5	12" DIA	0.3	202.7	201.3	206.4	205.4	205.6	202.8	205.7	202.8	2.0	2.8	2.9
16-00220	16-00200	16-00210	63.77	12" DIA	1.4	203.6	202.7	206.8	206.4	205.7	205.6	205.8	205.7	4.2	2.0	2.2
16-00240	16-00220	16-00230	44.77	12" DIA	0.6	203.9	203.6	205.8	206.8	205.8	205.7	205.8	205.8	2.9	1.1	1.9
16-00300	16-00320	16-00310	8.65	12" DIA	-1.39	201.0	201.1	203.8	203.8	202.2	202.2	203.5	203.3	4.2	2.3	4.5
16-00320	16-00340	16-00330	38.32	18" DIA	0	201.1	201.1	203.8	203.8	202.2	202.2	203.3	203.3	0.3	2.3	4.5
16-00340	CC-N-02-014	16-00350	36.67	12" DIA	0.3	201.1	201.0	203.8	203.5	202.2	202.1	203.3	202.7	2.0	2.3	4.5
16-00410	00-05224	CC-NORTHDITCH-01	49.97	Irregular Channel	0.7	200.8	200.5	204.8	203.8	202.1	202.1	202.7	202.7	416.1	3.7	8.4
16-00440	CC-N-00-015	16-00430	260.72	24" DIA	0.93	200.0	197.6	207.8	208.2	200.4	200.4	201.0	201.0	21.8	1.9	2.6
16-00450	00-05224	16-00390	1761.52	24" H, 72" BOX	0.2	204.3	200.3	208.8	203.8	204.9	202.1	205.4	202.7	53.8	13.6	27.2
16-21660	16-00410	16-00400	118.01	24" DIA	-0.29	200.5	200.8	204.8	204.8	202.1	202.1	202.9	202.7	12.1	3.6	8.3
17-00350	CC-N-04-002	CC-L-04-003	215.12	Irregular Channel	-0.67	220.2	221.7	225.0	226.1	221.8	221.8	222.1	222.1	2717.5	2.6	14.6
17-00370	17-00350	17-00360	713.64	12" DIA	0.3	228.1	220.2	231.7	225.0	228.6	221.8	228.8	222.1	3.8	1.8	2.5
17-00390	17-00370	17-00380	876.45	12" DIA	0.3	229.9	228.1	234.0	231.7	231.9	228.6	233.8	228.8	1.6	1.8	2.5
17-00410	17-00390	17-00400	236.86	12" DIA	0.6	231.3	229.9	236.2	234.0	232.5	231.9	235.0	233.8	2.8	1.9	2.5
17-00430	17-00410	17-00420	197.47	12" DIA	0.2	232.0	231.4	236.5	236.2	233.0	232.5	235.9	235.0	2.0	2.0	2.5
18-00000	00-05060	D-WOODS-2	139.89	Irregular Channel	0.14	233.5	233.3	236.8	235.9	234.0	233.6	235.9	235.9	15.3	1.4	2.4
18-00020	18-00000	18-00010	16.44	15" DIA	0.6	233.6	233.5	236.8	236.8	234.1	234.0	235.9	235.9	5.0	1.4	2.4
18-00040	18-00020	18-00030	172	12" DIA	0.5	234.6	233.7	239.0	236.8	235.1	234.1	236.4	235.9	2.5	1.2	2.0
18-00100	18-00101	18-00051	207.74	12" DIA	0.4	237.7	236.8	240.7	241.3	238.1	237.3	238.2	237.6	2.3	0.7	1.1
18-00101	18-00040	18-00050	398.48	12" DIA	0.5	236.8	234.7	241.3	239.0	237.3	235.1	237.6	236.4	2.6	1.2	2.0
18-00102	18-00101	18-00052	41.48	8" DIA	0.5	237.0	236.8	241.3	241.3	237.4	237.3	237.7	237.6	0.8	0.5	0.9

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
18-00120	18-00100	18-00090	30	12" DIA	0.5	237.9	237.8	240.6	240.7	238.3	238.1	238.4	238.2	2.4	0.6	1.0
18-00140	18-00120	18-00110	10.25	12" DIA	0.7	238.2	238.1	240.6	240.6	238.5	238.3	238.6	238.4	2.9	0.6	1.0
18-00160	18-00100	18-00130	10	4" DIA	1	237.9	237.8	240.7	240.7	238.1	238.1	238.2	238.2	0.2	0.0	0.0
18-00280	18-00300	18-00150	10.29	12" DIA	0.6	238.8	238.7	241.2	241.2	239.1	237.1	239.5	237.4	2.7	0.7	2.5
18-00300	18-00320	18-00170	33.05	12" DIA	1.8	236.8	236.2	241.2	241.3	237.1	236.5	237.4	236.8	4.8	0.7	2.5
18-00320	18-00340	18-00190	345	15" DIA	0.5	236.1	234.3	241.3	239.3	236.5	234.7	236.8	235.0	4.7	0.7	2.6
18-00340	18-00440	18-00210	165	15" DIA	1	234.4	232.7	239.3	238.7	234.7	233.2	235.0	233.6	6.7	1.0	3.2
18-00400	18-00420	18-00230	10	12" DIA	0.7	236.3	236.2	238.7	238.7	236.6	233.6	236.7	233.7	3.0	0.9	1.0
18-00420	18-00440	18-00250	35.17	12" DIA	1.8	233.3	232.7	238.7	238.7	233.6	233.2	233.7	233.6	4.8	0.9	1.0
18-00440	18-00480	18-00290	70.85	15" DIA	0.5	232.6	232.2	238.7	239.0	233.2	232.8	233.6	233.1	4.5	2.2	4.8
18-00460	18-00440	18-00270	11.27	12" DIA	0.9	236.3	236.2	238.7	238.7	236.5	233.2	236.6	233.6	3.4	0.3	0.6
18-00480	18-00521	18-00310	6.67	15" DIA	1.5	232.1	232.0	239.0	239.0	232.8	232.8	233.1	233.1	7.9	2.2	4.8
18-00500	18-00521	18-00390	10.03	12" DIA	3	232.3	232.0	239.0	239.0	233.0	232.8	233.1	233.1	6.2	1.3	1.8
18-00521	00-15286	CC-L-05-005	61.02	Irregular Channel	-0.77	231.5	232.0	239.0	234.5	232.8	232.7	233.1	233.0	361.3	11.2	16.5
18-00560	18-00500	18-00410	300	12" DIA	2	238.3	232.3	243.0	239.0	238.6	233.0	238.6	233.1	5.0	0.8	0.9
18-00580	18-00560	18-00430	35.14	12" DIA	1.8	239.0	238.4	243.0	243.0	239.3	238.6	239.3	238.6	4.8	0.8	0.9
18-00600	18-00580	18-00450	10	12" DIA	1	240.6	240.5	243.0	243.0	240.9	239.3	241.0	239.3	3.6	0.8	0.9
18-00720	09-00000	18-00470	37.02	12" DIA	0.9	238.0	237.7	242.3	242.4	238.5	238.5	238.6	238.6	3.3	0.6	0.9
18-00740	18-00760	18-00510	6.8	18" DIA	0	235.4	235.4	238.4	238.6	236.1	236.0	236.2	236.2	0.3	2.4	3.5
18-00760	18-01050	18-01030	6.01	12" DIA	0	235.3	235.3	238.6	238.6	236.0	235.4	236.2	235.6	0.1	2.4	3.5
18-00780	18-00760	18-00530	33.5	4" DIA	0.9	235.7	235.4	238.4	238.6	236.0	236.0	236.2	236.2	0.2	0.0	0.0
18-00800	18-00740	18-00550	37	18" DIA	0.43	235.6	235.5	238.4	238.4	236.1	236.1	236.3	236.2	6.9	1.3	1.8
18-00820	18-00800	18-00570	12.69	12" DIA	0.95	236.1	235.9	238.4	238.4	236.5	236.1	236.6	236.3	3.5	1.2	1.7
18-00860	18-00760	18-00590	43.7	4" DIA	0.9	235.8	235.4	238.4	238.6	236.0	236.0	236.2	236.2	0.2	0.0	0.0
18-00960	18-00980	18-00610	15.8	12" DIA	0.9	235.7	235.5	237.3	238.0	235.7	235.6	237.3	237.3	3.4	0.0	-0.7
18-00980	LINN-0	24-00790	37.43	12" DIA	0.2	235.1	235.0	238.0	238.2	235.6	235.6	237.3	237.4	1.7	0.4	1.2
18-01000	18-00980	18-00630	4.71	12" DIA	0.6	235.2	235.2	237.3	238.0	235.6	235.6	237.3	237.3	2.8	0.0	-1.2
18-01020	18-01000	18-00650	41.02	12" DIA	0.5	235.5	235.3	238.2	237.3	235.6	235.6	237.4	237.3	2.4	0.0	-0.3
18-01040	18-01020	18-00670	7.7	12" DIA	0.8	235.7	235.6	238.2	238.2	235.7	235.6	237.4	237.4	3.2	0.0	-0.1
18-01050	19-00080	CC-DRAINAGE-02	1167.69	Irregular Channel	0.9	235.0	224.5	238.6	228.5	235.4	226.7	235.6	228.5	347.7	3.5	7.0
18-01100	18-00020	18-00070	67.4	12" DIA	1.3	234.3	233.4	236.8	236.8	234.4	234.1	235.9	235.9	4.0	0.2	0.5
18-01110	18-00820	D-ALEXANDER-01	47.98	Irregular Channel	-2.71	234.8	236.1	238.5	238.4	236.5	236.5	236.6	236.6	17.2	1.1	1.3
19-00020	10-01020	10-01010	316.03	12" DIA	1.3	224.3	220.1	227.4	225.2	225.1	221.1	226.8	223.3	4.1	4.1	4.5
19-00040	19-00020	19-00010	167.89	10" DIA	0.7	223.8	222.7	230.9	227.4	225.2	225.1	226.9	226.8	1.8	0.7	0.7
19-00060	19-00020	19-00030	50.99	10" DIA	0.784	223.1	222.7	226.8	227.4	225.2	225.1	226.8	226.8	1.9	0.8	0.9
19-00080	19-00020	19-00050	93.42	10" DIA	1.9	224.5	222.7	228.5	227.4	226.7	225.1	228.5	226.8	3.0	3.0	4.0
22-00020	22-00120	22-00010	175	36" DIA	0.2	229.5	229.1	237.7	234.2	234.0	234.0	234.1	234.1	29.8	-0.5	-0.5
22-00060	22-00040	22-00050	178.5	36" DIA	0.2	229.4	229.1	236.2	234.2	234.0	234.0	234.1	234.1	29.5	-0.5	-0.5
22-00120	22-00040	22-00030	24.94	12" DIA	0.2	229.1	229.1	234.2	234.2	234.0	234.0	234.1	234.1	1.6	-0.9	-0.9
22-Dummy-01	10-00090	22-00100	43.39	12" DIA	0.9	228.5	228.2	234.2	233.1	234.0	233.1	234.1	233.1	3.1	5.1	5.4
CC-N-00-001	CC-N-00-000	CC-L-00-001	473.43	Irregular Channel	-0.017	188.2	188.3	224.3	205.3	192.1	192.0	193.0	192.9	6309.0	89.0	160.7
CC-N-00-002	CC-N-00-001	CC-L-00-002	1207.64	Irregular Channel	0.194	190.6	188.2	226.6	224.3	193.2	192.1	194.0	193.0	5978.5	93.4	161.8
CC-N-00-003	CC-N-00-002	CC-L-00-003	1207.64	Irregular Channel	0	190.6	190.6	226.6	226.6	193.9	193.2	194.7	194.0	429.5	96.2	163.3
CC-N-00-004	CC-N-00-003	CC-L-00-004	532.52	Irregular Channel	-0.1	190.0	190.6	213.4	226.6	194.4	193.9	195.2	194.7	2006.5	97.4	161.9
CC-N-00-005	00-15258	CC-L-00-005B	95.52	Irregular Channel	1.07	192.0	191.0	215.4	196.7	194.5	194.5	195.4	195.4	1942.1	98.4	162.6
CC-N-00-006	CC-N-00-005	CC-L-00-006	160.91	Irregular Channel	-0.062	191.9	192.0	209.3	215.4	194.8	194.5	195.8	195.4	4837.2	98.6	162.9
CC-N-00-007	CC-N-00-006	CC-L-00-007	150.25	Irregular Channel	0.433	192.6	191.9	209.9	209.3	195.2	194.8	196.1	195.8	12782.1	98.8	163.2
CC-N-00-008	CC-N-00-007	CC-L-00-008	156.1	Irregular Channel	0.79	193.8	192.6	203.7	209.9	195.9	195.2	196.5	196.1	4028.4	78.9	129.7
CC-N-00-009	CC-N-00-008	CC-L-00-009	246.47	Irregular Channel	0.215	194.3	193.8	204.3	203.7	196.8	195.9	197.4	196.5	1352.5	78.9	129.8
CC-N-00-010	CC-N-00-009	CC-L-00-010	522.47	Irregular Channel	0.0085	194.4	194.3	204.3	204.3	197.5	196.8	198.3	197.4	291.4	79.0	129.9
CC-N-00-011	CC-N-00-010	CC-L-00-011	62.14	Irregular Channel	0.17	194.5	194.4	207.0	204.3	197.6	197.5	198.3	198.3	687.8	78.5	128.3
CC-N-00-012	CC-N-00-011	CC-L-00-012	416.74	Irregular Channel	0.329	195.8	194.5	208.4	207.0	198.6	197.6	199.2	198.3	571.0	78.3	123.3
CC-N-00-013	CC-N-00-012	CC-L-00-013	634.83	Irregular Channel	0.273	197.6	195.8	204.8	208.4	200.3	198.6	200.9	199.2	630.3	78.5	123.5

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
CC-N-00-014	CC-N-00-013	CC-L-00-014	199.38	Irregular Channel	0.085	197.7	197.6	206.0	204.8	200.4	200.3	201.0	200.9	786.1	78.6	123.6
CC-N-00-016	CC-N-00-015	CC-L-00-016	102.29	Irregular Channel	0.137	197.7	197.6	208.4	208.2	200.6	200.4	201.2	201.0	4221.7	74.9	118.7
CC-N-00-017	CC-N-00-016	CC-L-00-017	80.55	Irregular Channel	0.161	197.9	197.7	208.1	208.4	200.6	200.6	201.2	201.2	4836.0	75.1	118.8
CC-N-00-018	CC-N-00-017	CC-L-00-018	624.93	Irregular Channel	0.165	198.9	197.9	207.2	208.1	201.8	200.6	202.1	201.2	812.4	75.7	120.9
CC-N-00-019	03-00530	CC-L-00-019B	208.76	Irregular Channel	0.4168	201.8	200.9	208.2	212.0	203.8	203.0	204.5	203.6	1012.7	70.5	111.9
CC-N-00-020	CC-N-00-019	CC-L-00-020	503.96	Irregular Channel	0.135	202.5	201.8	206.4	208.2	205.6	203.8	206.3	204.5	92.5	70.6	111.9
CC-N-00-021	CC-N-00-020	CC-L-00-021	228.76	Irregular Channel	-0.162	202.1	202.5	208.3	206.4	205.9	205.6	206.5	206.3	101.2	70.6	112.0
CC-N-00-022	CC-N-00-021	CC-L-00-022	451.77	Irregular Channel	-0.1	201.7	202.1	207.7	208.3	206.2	205.9	206.8	206.5	18.4	68.3	89.9
CC-N-00-023	CC-N-00-022	CC-L-00-023	451.77	Irregular Channel	0.242	202.8	201.7	216.1	207.7	206.5	206.2	207.2	206.8	155.9	68.6	89.8
CC-N-00-024	CC-N-00-023	CC-L-00-024	479.44	Irregular Channel	-0.10637	202.3	202.8	208.4	216.1	206.7	206.5	207.3	207.2	125.2	59.2	70.2
CC-N-00-025	CC-N-00-024	CC-L-00-025	98.71	Irregular Channel	-0.01	202.2	202.3	212.1	208.4	206.7	206.7	207.4	207.3	62.7	58.4	70.7
CC-N-00-026	CC-N-00-025	CC-L-00-026	620.56	Irregular Channel	0.14	203.1	202.2	213.0	212.1	207.1	206.7	207.8	207.4	1173.9	60.5	75.8
CC-N-00-027	07-00210	CC-L-00-027B	437.91	Irregular Channel	0.171	204.3	203.6	213.5	211.0	207.7	207.3	208.2	207.9	381.9	62.6	80.5
CC-N-00-028	00-15365	CC-L-00-028B	20.2	Irregular Channel	0	205.2	205.2	219.7	213.5	207.8	207.8	208.3	208.3	30.9	32.7	37.6
CC-N-00-029	CC-N-00-028	CC-L-00-029	682.78	Irregular Channel	0.18	206.4	205.2	220.7	219.7	209.0	207.8	209.2	208.3	1205.9	32.8	37.8
CC-N-00-030	CC-N-00-029	CC-L-00-030	541.06	Irregular Channel	0.573	213.0	206.4	222.2	220.7	214.4	209.0	214.4	209.2	1142.8	31.6	33.9
CC-N-00-031	00-15191	CC-L-00-031B	37.05	Irregular Channel	0	212.6	212.6	221.8	220.9	214.6	214.6	214.7	214.6	55.7	31.6	33.9
CC-N-00-032	CC-N-00-031	CC-L-00-032	69.8	Irregular Channel	1.6	213.7	212.6	223.6	221.8	215.0	214.6	215.1	214.7	390.7	31.7	33.9
CC-N-00-034	CC-N-00-033	CC-L-00-034	282.75	Irregular Channel	0.877	215.9	213.4	224.7	222.4	217.7	216.2	217.8	216.4	4015.4	31.9	34.4
CC-N-00-035	CC-N-00-034	CC-L-00-035	486.15	Irregular Channel	0.187	216.8	215.9	225.6	224.7	218.6	217.7	218.6	217.8	1744.9	32.6	35.4
CC-N-01-001	CC-N-00-003	CC-L-01-001	125.98	Irregular Channel	3.26	194.7	190.6	204.4	226.6	194.8	193.9	195.0	194.7	10195.6	1.1	5.2
CC-N-01-002	00-05501	CC-L-01-003	365.66	Irregular Channel	1.28	198.5	193.9	204.9	196.5	198.7	194.8	198.9	195.1	208.8	1.0	2.7
CC-N-01-003	00-05521	CC-L-01-005	17.48	Irregular Channel	5.15	199.7	198.8	204.1	201.7	199.9	199.4	200.0	199.6	126.5	1.0	2.2
CC-N-01-004	00-05541	CC-L-01-007	154.08	Irregular Channel	0.37	200.8	200.3	205.2	202.1	201.2	200.9	201.4	201.4	49.2	1.0	2.2
CC-N-01-005	00-005551	CC-L-01-009	252.91	Irregular Channel	0.55	201.8	200.4	204.7	202.8	202.2	201.5	202.4	201.9	408.9	0.9	2.2
CC-N-01-006	00-05571	CC-L-01-012	101.42	Irregular Channel	-0.09	201.5	201.6	203.0	203.4	202.3	202.3	202.6	202.6	10.7	1.0	2.7
CC-N-01-007	CC-N-01-006	CC-L-01-013	61.73	Irregular Channel	-0.28	201.4	201.5	202.8	203.0	202.3	202.3	202.6	202.6	54.1	1.0	2.8
CC-N-01-008	CC-N-01-007	CC-L-01-014	166.65	Irregular Channel	0.5	202.2	201.4	203.6	202.8	202.5	202.3	202.7	202.6	73.3	1.3	3.0
CC-N-01-009	CC-N-01-008	CC-L-01-015	86.82	Irregular Channel	-0.68	201.6	202.2	203.0	203.6	202.5	202.5	202.7	202.7	85.1	1.3	3.1
CC-N-01-010	CC-N-01-009	CC-L-01-016	24.02	Irregular Channel	1.92	202.1	201.6	203.5	203.0	202.5	202.5	202.7	202.7	142.8	-0.3	2.0
CC-N-01-011	CC-N-01-010	CC-L-01-017	52.77	Irregular Channel	-0.42	201.9	202.1	203.3	203.5	202.5	202.5	202.7	202.7	66.6	-0.3	2.0
CC-N-01-012	CC-N-01-011	CC-L-01-018	117.23	Irregular Channel	0.4	202.3	201.9	204.6	203.3	202.5	202.5	202.8	202.7	65.3	-0.2	2.1
CC-N-01-013	CC-N-01-012	CC-L-01-019	79.82	Irregular Channel	-0.31	202.1	202.3	204.6	204.6	202.5	202.5	202.8	202.8	57.7	-0.2	2.1
CC-N-01-014	CC-N-01-013	CC-L-01-020	229.18	Irregular Channel	0.17	202.5	202.1	204.6	204.6	202.5	202.5	202.9	202.8	42.6	0.0	2.1
CC-N-01-015	CC-N-01-014	CC-L-01-021	59.39	Irregular Channel	-0.94	201.9	202.5	204.6	204.6	202.2	202.5	203.0	202.9	20.0	0.0	2.2
CC-N-01-016	00-22680	CC-L-01-023	18.29	Irregular Channel	6.4	202.0	200.8	203.5	204.6	202.3	202.2	203.0	203.0	117.8	3.5	9.3
CC-N-01-017	CC-N-01-016	CC-L-01-024	204.26	Irregular Channel	0.39	202.8	202.0	204.8	203.5	203.4	202.3	203.7	203.0	29.1	3.5	9.2
CC-N-01-018	CC-N-01-017	CC-L-01-025	94.22	Irregular Channel	-0.53	202.3	202.8	204.3	204.8	203.4	203.4	203.7	203.7	53.2	3.5	9.2
CC-N-01-019	CC-N-01-018	CC-L-01-026	140.03	Irregular Channel	0.4	202.8	202.3	204.9	204.3	203.6	203.4	204.0	203.7	46.2	3.5	9.3
CC-N-01-020	CC-N-01-019	CC-L-01-027	23.98	Irregular Channel	-0.71	202.7	202.8	204.0	204.9	203.6	203.6	204.0	204.0	32.5	3.5	9.4
CC-N-01-021	00-21680	CC-L-01-029	487.1	Irregular Channel	-0.04	203.4	203.6	208.1	206.0	204.3	204.2	204.8	204.7	146.7	3.5	15.3
CC-N-01-022	00-15049	CC-L-01-031	116.68	Irregular Channel	1.05	204.4	203.2	209.1	208.6	204.7	204.3	205.1	204.9	1990.8	2.1	12.4
CC-N-01-023	CC-N-01-022	CC-L-01-032	899.78	Irregular Channel	0.102	205.3	204.4	208.3	209.1	205.8	204.7	206.1	205.1	713.0	2.1	14.8
CC-N-02-001	CC-N-00-007	CC-L-02-001	156.98	Irregular Channel	1.99	195.7	192.6	206.1	209.9	196.8	195.2	197.2	196.1	9238.9	21.1	36.6
CC-N-02-002	00-15256	CC-L-02-004	264.34	Irregular Channel	0.429	198.0	196.9	205.1	202.3	199.8	198.8	200.2	199.3	409.8	21.0	34.8
CC-N-02-003	05-00400	CC-L-02-006	525.37	Irregular Channel	0.02	198.3	198.1	202.7	206.4	200.6	200.0	201.2	200.5	50.2	18.5	32.6
CC-N-02-004	CC-N-02-003	CC-L-02-007	139.92	Irregular Channel	0.24	198.6	198.3	202.7	202.7	200.8	200.6	201.4	201.2	77.6	18.6	32.8
CC-N-02-005	CC-N-02-004	CC-L-02-008	23.01	Irregular Channel	4.09	199.5	198.6	203.6	202.7	200.9	200.8	201.4	201.4	323.1	18.6	32.9
CC-N-02-006	CC-N-02-005	CC-L-02-009	62.89	Irregular Channel	-1.48	198.6	199.5	202.7	203.6	201.0	200.9	201.6	201.4	194.4	18.6	33.0
CC-N-02-007	CC-N-02-006	CC-L-02-010	135.48	Irregular Channel	0.49	199.3	198.6	203.4	202.7	201.3	201.0	201.9	201.6	112.4	18.6	33.1
CC-N-02-008	CC-N-02-007	CC-L-02-011	180.55	Irregular Channel	-0.13	199.0	199.3	203.1	203.4	201.5	201.3	202.1	201.9	58.3	15.0	28.5
CC-N-02-009	CC-N-02-008	CC-L-02-012	94.07	Irregular Channel	0.7	199.7	199.0	203.8	203.1	201.6	201.5	202.2	202.1	133.9	15.0	28.5
CC-N-02-010	CC-N-02-009	CC-L-02-013	95.4	Irregular Channel	-0.016	199.5	199.7	203.6	203.8	201.8	201.6	202.4	202.2	63.4	15.0	28.4

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
CC-N-02-011	CC-N-02-010	CC-L-02-014	91.87	Irregular Channel	0.56	200.1	199.5	204.1	203.6	201.9	201.8	202.6	202.4	119.1	15.0	28.7
CC-N-02-012	CC-N-02-011	CC-L-02-015	95.9	Irregular Channel	-0.35	199.7	200.1	203.8	204.1	202.1	201.9	202.7	202.6	95.2	15.0	28.7
CC-N-02-013	CC-N-02-012	CC-L-02-016	147.94	Irregular Channel	0.39	200.3	199.7	202.7	203.8	202.1	202.1	202.7	202.7	249.3	15.3	31.1
CC-N-02-014	CC-N-02-013	CC-L-02-017	48.49	Irregular Channel	-0.47	200.1	200.3	203.5	202.7	202.1	202.1	202.7	202.7	276.6	16.0	38.5
CC-N-02-015	00-15067	CC-L-02-019	69.5	Irregular Channel	2	206.1	204.7	210.2	208.8	206.6	206.0	206.9	206.8	1060.0	13.8	27.6
CC-N-02-016	CC-N-02-015	CC-L-02-020	923.13	Irregular Channel	-0.089	205.3	206.1	209.4	210.2	207.4	206.6	208.1	206.9	16.7	13.8	28.2
CC-N-02-017	CC-N-02-016	CC-L-02-021	115	Irregular Channel	0	205.3	205.3	209.4	209.4	207.4	207.4	208.2	208.1	1.8	14.4	30.3
CC-N-03-001	CC-N-00-010	CC-L-03-001	191.08	Irregular Channel	3.79	201.6	194.4	205.8	204.3	201.8	197.5	201.9	198.3	644.4	0.7	2.4
CC-N-03-002	CC-N-03-001	CC-L-03-002	1546.61	Irregular Channel	0.131	203.6	201.6	209.9	205.8	203.9	201.8	204.1	201.9	13.7	0.7	2.4
CC-N-03-003	00-15035	CC-L-03-003B	39.74	Irregular Channel	1.53	205.0	204.3	211.2	207.9	205.0	204.4	205.1	204.8	475.7	0.1	0.8
CC-N-04-001	CC-N-00-021	CC-L-04-001	272.64	Irregular Channel	2.59	209.2	202.1	218.5	208.3	209.5	205.9	210.1	206.5	3912.8	2.6	19.2
CC-N-04-002	CC-N-04-001	CC-L-04-002	1016.17	Irregular Channel	1.229	221.7	209.2	226.1	218.5	221.8	209.5	222.1	210.1	3657.0	2.6	19.2
CC-N-05-001	CC-N-00-023	CC-L-05-001	460.46	Irregular Channel	1.14	208.0	202.8	218.8	216.1	208.9	206.5	209.2	207.2	4776.9	11.4	20.8
CC-N-05-002	CC-N-05-001	CC-L-05-002	1028.07	Irregular Channel	1.42	222.6	208.0	232.2	218.8	223.2	208.9	223.4	209.2	12934.1	11.4	19.3
CC-N-05-003	00-15308	CC-L-05-003B	730.47	Irregular Channel	0.768	229.5	223.9	232.5	226.9	230.5	225.7	230.8	226.3	131.4	11.6	20.4
LINN-0	LINN-1	24-00070	175.02	12" DIA	0.8	235.0	233.7	238.2	237.4	235.6	234.0	237.4	237.3	3.1	2.0	2.8
LINN-1	LINN-2	24-00080	46.07	12" DIA	0.5	233.4	233.1	237.4	237.4	234.0	233.6	237.3	237.3	3.0	2.0	2.8
LINN-10	LINN-11	24-00400	460.05	24" DIA	1.43	221.3	214.7	227.3	220.4	222.5	215.9	223.5	217.6	27.1	18.5	26.4
LINN-11	LINN-12	24-00470	209.03	24" DIA	1.5	214.6	209.8	220.4	216.5	215.9	211.2	217.6	211.9	34.4	27.1	37.5
LINN-12	LINN-13	24-00530	255.01	30" DIA	1.2	209.7	207.3	216.5	212.9	211.2	209.1	211.9	209.9	39.3	27.1	37.5
LINN-13	00-15365	24-00560	172	30" DIA	0.5	207.2	206.4	212.9	213.5	209.1	207.8	209.9	208.3	28.2	27.1	37.5
LINN-14	LINN-16	24-00010	149.03	15" DIA	0.5	208.5	207.7	211.9	211.9	208.5	207.4	208.5	208.2	4.6	0.0	0.0
LINN-15	LINN-16	24-00020	171.45	12" DIA	1	209.4	207.7	213.8	211.9	209.4	207.4	209.4	208.2	3.6	0.0	0.0
LINN-16	CC-N-02-017	24-00000	199.72	15" DIA	0.3	207.4	206.8	211.9	209.4	207.4	207.4	208.2	208.2	3.5	0.0	-0.2
LINN-17	00-15365	24-00590	313	15" DIA	0.13	208.1	207.7	212.9	213.5	212.9	207.8	212.9	208.3	2.3	7.5	7.5
LINN-18	LINN-23	24-00680	292.71	12" DIA	0.2	209.7	209.1	214.9	213.6	214.9	213.2	214.9	213.2	1.7	3.4	3.8
LINN-19	LINN-18	24-00700	42.98	12" DIA	0.2	210.1	209.8	215.9	214.9	214.8	214.9	214.8	214.9	3.1	-1.3	-1.3
LINN-2	LINN-3	24-00120	146.48	15" DIA	0.6	233.0	232.0	237.4	235.4	233.6	232.6	237.3	235.4	5.2	2.5	7.5
LINN-20	LINN-19	24-00710	285.22	12" DIA	0.2	210.9	210.2	214.5	215.9	214.5	214.8	214.5	214.8	1.8	-1.3	-1.3
LINN-21	LINN-20	24-00730	175	12" DIA	0.3	211.5	211.0	214.8	214.5	214.7	214.5	214.7	214.5	1.8	1.4	1.4
LINN-22	LINN-21	24-00760	50.06	12" DIA	0.5	211.6	211.5	214.8	214.8	214.8	214.7	214.8	214.7	1.6	1.4	1.4
LINN-23	LINN-17	24-00630	161	15" DIA	0.1	208.5	208.2	213.6	212.9	213.2	212.9	213.2	212.9	2.7	3.5	3.8
LINN-3	LINN-4	24-00140	130.52	15" DIA	0.6	232.0	231.2	235.4	235.7	232.6	231.9	235.4	234.3	5.2	2.5	6.7
LINN-4	LINN-5	24-00160	115	18" DIA	0.3	230.7	230.4	235.7	235.2	231.9	231.3	234.3	233.0	5.6	6.0	11.2
LINN-5	LINN-6	24-00200	150	18" DIA	0.5	230.3	229.4	235.2	233.0	231.3	230.3	233.0	231.3	7.8	6.0	11.2
LINN-6	LINN-7	24-00240	120.78	18" DIA	0.5	229.3	228.7	233.0	234.7	230.3	229.0	231.3	229.4	7.8	6.0	11.2
LINN-7	LINN-9	24-00290	189.26	24" DIA	0.5	228.2	227.2	234.7	234.8	229.0	228.1	229.4	228.4	16.4	6.0	11.2
LINN-9	LINN-10	24-00350	225.02	24" DIA	2.53	227.1	221.4	234.8	227.3	228.1	222.5	228.4	223.5	36.0	18.5	26.6
MURDER CREEK																
00-05001	MC-N-02-03	MC-L-02-04	25.6	Irregular Channel	-11.6	206.3	209.2	215.8	215.0	210.4	210.4	211.0	211.0	12023.3	19.2	50.1
00-05015	MC-N-01-03	MC-L-01-04	19.09	Irregular Channel	-2.25	207.5	208.0	215.6	211.4	208.9	208.9	209.7	209.7	242.7	9.3	20.5
00-05219	MC-N-01-14	MC-L-01-16	64.93	Irregular Channel	-0.74	220.9	221.4	229.0	223.7	222.8	222.8	223.0	223.0	128.1	27.5	46.0
00-05381	00-05382	00-05380	32.58	12" DIA	1.5	236.3	235.8	238.3	238.3	236.5	236.1	236.6	236.3	4.4	0.5	0.8
00-05382	00-05422	D-WAVERLY-01	134.55	Irregular Channel	0.85	235.8	234.7	238.3	237.7	236.1	234.9	236.3	235.0	21.0	1.1	2.3
00-05391	00-05392	00-05390	37.78	18" DIA	0.2	230.7	230.6	234.7	234.7	231.5	231.5	231.7	231.7	4.2	0.9	2.1
00-05392	00-05401	D-CONSER-04.1	12.81	Irregular Channel	-3.36	230.6	231.0	234.7	235.2	231.5	231.5	231.7	231.7	111.7	0.9	2.1
00-05401	00-05402	00-05400	40.7	15" DIA	3.1	231.0	229.8	235.2	235.2	231.5	226.7	231.7	226.8	11.4	3.1	6.7
00-05402	MC-N-11-02	MC-L-11-03	1020.21	Irregular Channel	0.33	226.5	223.2	235.2	225.4	226.7	223.3	226.8	223.6	4.4	2.7	6.3
00-05411	00-05412	00-05410	30.64	10" DIA	0.8	239.3	239.0	241.0	241.0	239.4	239.1	239.4	239.1	2.0	0.1	0.1
00-05412	00-05391	D-CONSER-03	443.89	Irregular Channel	1.88	239.0	230.7	241.0	234.7	239.1	231.5	239.1	231.7	186.7	0.1	0.1
00-05421	00-05422	00-05420	40.65	12" DIA	3.91	236.3	234.7	237.7	237.7	236.4	234.9	236.5	235.0	7.1	0.5	0.7
00-05422	00-05401	D-CONSER-05	375.05	Irregular Channel	0.97	234.7	231.0	237.7	235.2	234.9	231.5	235.0	231.7	60.0	1.6	3.0
00-05431	00-05432	00-05430	31.91	10" DIA	4.11	238.4	237.1	239.4	239.4	239.4	238.9	239.4	238.9	4.4	4.1	3.4

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
00-05432	LINN-24	MC-DRAINAGE-12	380.8	Irregular Channel	0.07	237.1	236.8	239.4	238.9	238.9	238.9	238.9	238.9	9.3	5.2	7.4
00-15005	00-05001	00-05005	72.22	48" DIA	0.7	208.9	208.4	215.8	215.8	210.2	210.4	210.9	211.0	120.7	-21.1	-26.4
00-15005	00-05001	00-05006	72.05	48" DIA	3.2	208.5	206.3	215.8	215.8	210.2	210.4	210.9	211.0	255.0	40.4	69.8
00-15010	00-05015	00-05009	104.01	36" DIA	0.4	208.1	207.6	215.6	215.6	208.9	208.9	209.7	209.7	43.4	4.0	8.6
00-15010	00-05015	00-05010	102.97	36" DIA	0.5	208.1	207.5	215.6	215.6	208.9	208.9	209.7	209.7	48.8	5.3	11.7
00-15202	00-05219	00-05202	78.33	48" H, 36" BOX	0.3	221.1	220.9	229.0	229.0	223.0	222.8	223.4	223.0	64.1	27.8	46.0
01-00130	01-00150	01-00140	35.18	10" DIA	0.5	234.7	234.5	238.7	238.7	235.3	235.3	235.7	235.7	1.6	0.0	0.0
01-00150	01-00170	01-00160	107	10" DIA	0.3	234.5	234.2	238.7	238.1	235.3	235.2	235.7	235.5	1.2	0.8	0.9
01-00170	01-00190	01-00180	35.18	10" DIA	0.5	234.2	234.0	238.1	238.1	235.2	235.1	235.5	235.4	1.6	1.3	1.5
01-00190	01-00210	01-00200	124.6	10" DIA	0.5	234.0	233.5	238.1	238.1	235.1	234.7	235.4	234.9	1.4	1.3	1.5
01-00210	01-00390	Swale 1-A-1	147.7	Irregular Channel	0.92	233.5	232.1	238.1	235.5	234.7	234.7	234.9	234.9	38.2	1.2	1.7
01-00290	01-00310	01-00280	68.15	10" DIA	0.5	233.0	232.6	236.3	235.3	234.7	234.7	234.9	234.9	1.6	0.2	0.2
01-00310	01-00350	01-00300	95.94	10" DIA	0.5	232.6	232.1	235.3	235.5	234.7	234.7	234.9	234.8	1.6	0.6	0.7
01-00330	01-00310	01-00340	39.18	10" DIA	0.3	232.7	232.6	235.3	235.3	234.7	234.7	234.9	234.9	1.2	0.0	0.1
01-00370	MC-DRAIN-N-03	MC-DRAINAGE-03	676.2	Irregular Channel	0.54	232.0	228.3	234.5	233.4	232.2	228.7	232.3	229.1	1183.3	1.9	7.5
01-00390	01-00350	01-00360	16.53	12" DIA	1.7	232.5	232.1	235.5	235.5	234.7	234.7	234.9	234.8	5.2	1.4	1.7
08-00020	08-00040	08-00010	70	12" DIA	0.3	234.8	234.6	237.0	238.1	235.0	235.0	235.0	235.0	2.0	0.0	0.1
08-00040	23-00260	23-00130	27	12" DIA	0.3	234.6	234.5	238.1	237.7	235.0	233.3	235.0	233.4	1.9	0.7	0.8
08-00080	08-00060	08-00050	372	18" DIA	0.1	235.3	234.9	243.2	238.2	237.2	237.2	237.2	237.2	3.3	-0.2	-0.1
12-00000	12-00020	12-00010	21.72	10" DIA	3.1	237.7	237.0	242.7	242.7	237.7	237.2	237.7	237.3	3.9	0.0	0.0
12-00020	12-00040	12-00030	41.54	10" DIA	3.7	237.0	235.5	242.7	241.4	237.2	235.6	237.3	235.8	4.2	0.4	1.2
12-00040	12-00180	12-00190	523.19	12" DIA	1	235.4	230.1	241.4	235.0	235.6	230.6	235.8	230.9	3.6	0.4	1.2
12-00060	12-00080	12-00050	55.8	15" DIA	0.7	225.7	225.3	229.2	230.0	228.9	228.8	229.2	229.0	5.5	3.4	4.5
12-00100	12-00120	12-00070	299.58	10" DIA	1	236.8	233.8	244.0	242.0	237.1	234.0	237.1	234.0	2.2	0.5	0.6
12-00120	12-00180	12-00130	258.88	12" DIA	1.2	233.7	230.1	242.0	235.0	234.0	230.6	234.0	230.9	4.2	0.5	0.6
12-00140	12-00100	12-00090	8	10" DIA	0.12	238.0	237.9	243.8	244.0	238.0	237.1	238.0	237.1	1.9	0.0	0.0
12-00160	12-00100	12-00110	30.54	10" DIA	1	238.3	237.9	243.9	244.0	238.3	237.1	238.3	237.1	2.2	0.0	0.0
12-00180	12-00200	12-00150	244.48	15" DIA	1.1	230.0	227.3	235.0	230.5	230.6	229.2	230.9	229.8	6.8	2.6	3.7
12-00200	12-00060	12-00170	191.99	15" DIA	0.7	227.2	225.8	230.5	229.2	229.2	228.9	229.8	229.2	5.6	2.6	3.7
12-00220	12-00241	12-00211	58	18" DIA	0.4	224.5	224.2	230.6	230.6	226.2	225.3	226.9	225.4	7.8	13.6	17.4
12-00240	12-00241	12-00230	23.6	15" DIA	1.9	224.8	224.3	230.0	230.6	225.4	225.3	225.5	225.4	9.4	2.6	4.1
12-00241	12-00244	12-00243	48.73	36" DIA	1.8	224.2	223.1	230.6	230.7	225.3	225.0	225.4	225.0	98.8	15.6	20.3
12-00242	12-00220	12-00210	80.7	18" DIA	0.66	225.0	224.5	230.7	230.6	227.5	226.2	229.1	226.9	8.5	13.6	17.4
12-00244	MC-N-21-02	MC-L-21-03	1156.83	Irregular Channel	0.53422	224.1	217.9	230.7	219.8	225.0	218.5	225.0	219.2	45.6	16.3	22.1
15-00040	15-00020	15-00010	74.26	18" DIA	0.7	232.0	231.5	235.3	235.3	232.4	231.9	232.5	232.0	9.0	1.8	2.2
15-00100	15-00080	15-00030	41.23	18" DIA	0.2	232.5	232.4	236.0	238.0	233.8	233.8	234.5	234.4	4.6	1.8	2.9
15-00120	15-00100	15-00050	200.97	18" DIA	0.2	232.9	232.5	236.0	236.0	233.8	233.8	234.5	234.5	4.6	1.9	3.0
15-00220	15-00120	Swale 15A	202.03	Irregular Channel	1.65	236.2	232.9	239.6	236.0	236.6	233.8	236.8	234.5	29.8	1.9	3.3
15-00240	15-00260	15-00110	106.95	10" DIA	0.9	237.4	236.4	239.6	239.6	237.6	236.6	237.6	236.8	2.1	0.2	0.2
15-00260	15-00220	15-00090	34.85	10" DIA	0.63	236.4	236.2	239.6	239.6	236.6	236.6	236.8	236.8	1.7	0.2	0.2
23-00020	23-00060	23-00010	235	12" DIA	2	237.1	232.4	241.0	237.3	237.2	232.4	237.2	232.4	5.0	0.1	0.1
23-00040	23-00080	23-00030	255	12" DIA	2.2	237.1	231.9	239.4	234.4	237.3	232.0	237.4	232.0	5.1	0.4	0.6
23-00060	23-00140	23-00050	135	12" DIA	2	232.3	229.6	237.3	234.4	232.4	229.7	232.4	229.7	5.0	0.2	0.2
23-00080	12-00244	D-CONSER-01	412.5	Irregular Channel	2.14	231.9	223.1	234.4	230.7	232.0	225.0	232.0	225.0	151.4	0.3	0.5
23-00100	12-00242	23-00090	77	18" DIA	1.5	226.6	225.3	231.4	230.7	227.8	227.5	229.1	229.1	13.3	1.7	1.5
23-00140	23-00100	23-00070	191	12" DIA	1.5	229.5	226.7	234.4	231.4	229.7	227.8	229.7	229.1	4.4	0.5	0.5
23-00160	12-00241	23-00150	77	18" DIA	1.5	228.0	226.9	231.6	230.6	228.1	225.3	228.1	225.4	12.6	0.1	0.1
23-00180	23-00160	23-00170	88	18" DIA	2	229.8	228.0	233.3	231.6	229.8	228.1	229.8	228.1	14.8	0.1	0.1
23-00210	12-00244	D-CONSER-02	457.47	Irregular Channel	1.6	230.4	223.1	236.6	230.7	230.6	225.0	230.6	225.0	131.0	0.9	2.3
23-00220	23-00240	23-00190	28	12" DIA	1.96	231.4	230.8	236.8	236.6	231.7	231.1	231.7	231.3	5.0	1.1	1.2
23-00240	23-00210	23-00200	47.89	24" DIA	0.65	230.7	230.4	236.6	236.6	231.1	230.6	231.3	230.6	18.2	1.4	2.7
23-00260	23-00220	23-00230	79	12" DIA	1.5	233.0	231.5	237.7	236.8	233.3	231.7	233.4	231.7	5.0	1.0	1.1
23-00280	23-00260	23-00250	79	12" DIA	1.5	233.0	231.5	240.4	237.7	233.4	233.3	233.4	233.4	5.0	0.3	0.3

Table B-2 - Hydraulic Model Parameters and Results Sorted by Upstream Node ID

Upstream Node	Downstream Node	Conduit ID	Length (feet)	Size/Type	Slope (%)	US IE (feet)	DS IE (feet)	Ground Elevation (feet)		Existing 10-yr Water Surface		Future 10-yr Water Surface		Capacity (cfs)	Existing 10-yr Peak Flow	Future 10-yr Peak Flow
								US	DS	US	DS	US	DS			
23-00300	23-00280	23-00270	68	8" DIA	3.4	238.1	235.8	241.0	240.4	238.2	233.4	238.2	233.4	2.2	0.1	0.1
Det 8A Control	08-00040	08-00030	51	12" DIA	0.3	234.7	234.6	238.2	238.1	235.1	235.0	235.2	235.0	1.9	0.7	0.7
LINN-24	LINN-26	24-00801	184.55	12" DIA	0.374	236.8	236.1	238.9	238.4	238.9	235.9	238.9	236.3	2.2	3.7	3.7
LINN-25	MC-DRAIN-N-03	MC-DRAINAGE-11	1006.4	Irregular Channel	0.58	234.2	228.3	238.1	233.4	234.6	228.7	234.7	229.1	942.7	14.8	27.2
LINN-26	LINN-25	24-00800	55.95	30" DIA	0.374	234.6	234.4	238.4	238.1	235.9	234.6	236.3	234.7	25.1	15.2	24.1
MC-DRAIN-N-02	12-00242	MC-DRAINAGE-01	217	Irregular Channel	0.75	227.0	225.4	232.1	230.7	227.7	227.5	229.1	229.1	680.4	15.6	21.7
MC-DRAIN-N-03	MC-DRAIN-N-02	MC-DRAINAGE-02	218.15	Irregular Channel	0	228.3	227.0	233.4	232.1	228.7	227.7	229.1	229.1	6296.5	16.3	33.8
MC-DRAIN-N-04	01-00370	MC-DRAINAGE-04	681.28	Irregular Channel	0.62	236.3	232.0	237.6	234.5	236.4	232.2	236.5	232.3	320.3	0.5	3.6
MC-N-01-01	MC-N-01-00	MC-L-01-01	414.11	Irregular Channel	2.3	188.1	178.6	208.9	207.0	189.0	179.6	189.4	179.8	15498.4	9.5	28.0
MC-N-01-02	MC-N-01-01	MC-L-01-02	583.33	Irregular Channel	2.88859	205.0	188.1	209.3	208.9	206.0	189.0	206.6	189.4	1146.4	9.5	28.0
MC-N-01-03	MC-N-01-02	MC-L-01-03	625.59	Irregular Channel	0.48115	208.0	205.0	211.4	209.3	208.9	206.0	209.7	206.6	112.2	9.5	28.1
MC-N-01-04	00-15010	MC-L-01-05	359.2	Irregular Channel	0.44	209.7	208.1	211.3	215.6	210.7	208.9	210.8	209.7	3.8	9.2	19.1
MC-N-01-05	MC-N-01-04	MC-L-01-06	255.21	Irregular Channel	0.13714	210.0	209.7	211.7	211.3	211.2	210.7	211.6	210.8	9.9	9.2	19.0
MC-N-01-06	MC-N-01-05	MC-L-01-07	68.72	Irregular Channel	0.37835	210.3	210.0	211.7	211.7	211.4	211.2	211.7	211.6	15.2	9.3	19.1
MC-N-01-07	MC-N-01-06	MC-L-01-08	437.54	Irregular Channel	0.45482	212.3	210.3	213.5	211.7	213.3	211.4	213.5	211.7	21.4	9.6	28.2
MC-N-01-08	MC-N-01-07	MC-L-01-09	437.54	Irregular Channel	0.03	212.4	212.3	213.6	213.5	213.6	213.3	213.6	213.5	5.7	8.8	8.7
MC-N-01-09	MC-N-01-08	MC-L-01-10	230.12	Irregular Channel	0.03	212.5	212.4	213.7	213.6	213.7	213.6	213.7	213.6	12.0	10.2	10.2
MC-N-01-10	MC-N-01-09	MC-L-01-11	356.12	Irregular Channel	0.19375	213.2	212.5	214.2	213.7	214.2	213.7	214.2	213.7	8.5	31.0	31.0
MC-N-01-11	MC-N-01-10	MC-L-01-12	356.12	Irregular Channel	0.36	214.4	213.2	219.3	214.2	215.4	214.2	215.7	214.2	11.7	38.1	86.7
MC-N-01-12	MC-N-01-11	MC-L-01-13	259.67	Irregular Channel	-0.15	214.1	214.4	215.8	219.3	215.6	215.4	215.8	215.7	14.2	26.4	52.0
MC-N-01-13	MC-N-01-12	MC-L-01-14	1269.66	Irregular Channel	0.36703	218.7	214.1	220.6	215.8	219.7	215.6	220.0	215.8	221.0	27.2	73.3
MC-N-01-14	MC-N-01-13	MC-L-01-15	746.08	Irregular Channel	0.36189	221.4	218.7	223.7	220.6	222.8	219.7	223.0	220.0	89.7	26.9	45.7
MC-N-01-15	00-15202	MC-L-01-17	74.86	Irregular Channel	2.47	223.0	221.1	225.3	229.0	224.1	223.0	224.3	223.4	201.5	27.9	46.1
MC-N-02-01	MC-N-02-00	MC-L-02-01	503.09	Irregular Channel	5.53579	204.9	177.1	208.8	207.7	205.9	178.1	206.5	178.7	1296.9	18.8	59.6
MC-N-02-02	MC-N-02-01	MC-L-02-02	735.34	Irregular Channel	0.56436	209.1	204.9	214.8	208.8	209.8	205.9	210.1	206.5	114.9	19.0	60.6
MC-N-02-03	MC-N-02-02	MC-L-02-03	198.37	Irregular Channel	0.09074	209.2	209.1	215.0	214.8	210.4	209.8	211.0	210.1	1063.3	19.8	62.2
MC-N-02-04	00-15005	MC-L-02-05	62.07	Irregular Channel	1.27	209.3	208.5	213.5	215.8	210.4	210.2	211.1	210.9	997.9	19.4	50.0
MC-N-02-05	MC-N-02-04	MC-L-02-06	205.44	Irregular Channel	0.3456	210.0	209.3	214.1	213.5	211.6	210.4	212.5	211.1	2.6	19.5	50.0
MC-N-11-01	MC-N-01-08	MC-L-11-01	124.03	Irregular Channel	0.7	213.3	212.4	215.4	213.6	213.6	213.6	213.7	213.6	11.6	2.7	26.6
MC-N-11-02	MC-N-11-01	MC-L-11-02	1020.21	Irregular Channel	0.97137	223.2	213.3	225.4	215.4	223.3	213.6	223.6	213.7	312.2	2.7	26.6
MC-N-21-01	MC-N-01-11	MC-L-21-01	476.56	Irregular Channel	0.51	216.9	214.4	221.7	219.3	218.4	215.4	219.2	215.7	233.8	14.3	39.6
MC-N-21-02	MC-N-21-01	MC-L-21-02	455.67	Irregular Channel	0.22824	217.9	216.9	219.8	221.7	218.5	218.4	219.2	219.2	72.8	15.3	42.0
Swale 1	01-00210	Swale 1-A-2	477.5	Irregular Channel	0.53	236.0	233.5	239.0	238.1	236.0	234.7	236.0	234.9	52.7	0.0	0.0
Swale 1A Control	01-00370	01-00320	37.28	12" DIA	0.3	232.1	232.0	235.5	234.5	232.6	232.2	232.8	232.3	1.9	1.6	2.3

City of Millersburg
Stormwater Master Plan

APPENDIX

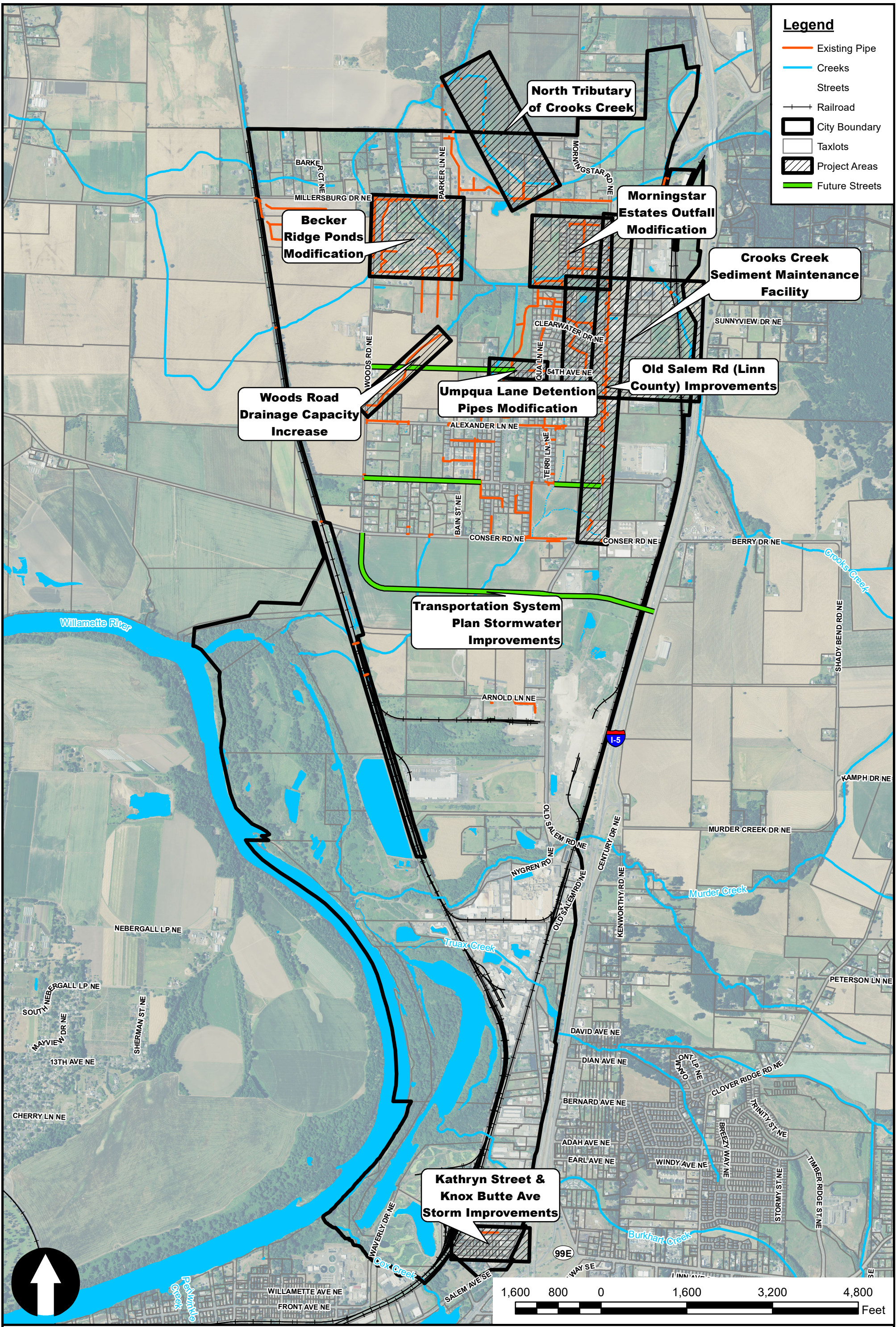
C

CIP FACT SHEETS AND COST
ESTIMATES

Appendix C

CIP Conceptual Plans and Cost Estimates

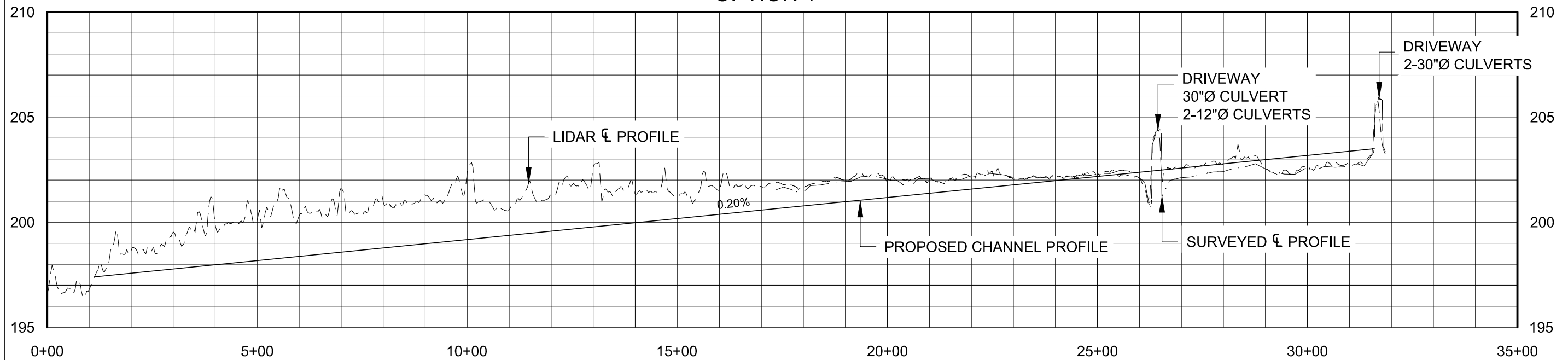
- > CIP Conceptual Plan Sheets
 - North Tributary of Crooks Creek Improvements
 - > Alternative 1
 - > Alternative 2
 - Hoffman Estates Capacity Increase
 - Becker Ridge Detention Ponds Modification
 - Morningstar Estates Outfall Modification
 - Umpqua Lane Detention Pipes Modification
 - Woods Road Drainage Capacity Increase
 - Transportation System Plan Stormwater Improvements
 - Kathryn St & Knox Butte Ave Storm Improvements
 - Old Salem Rd (Linn County) Improvements
- > CIP Cost Summary
- > CIP Detailed Cost Estimates
 - North Tributary of Crooks Creek Improvements
 - > Alternative 1
 - > Alternative 2
 - Hoffman Estates Capacity Increase
 - Becker Ridge Detention Ponds Modification
 - Morningstar Estates Outfall Modification
 - Umpqua Lane Detention Pipes Modification
 - Woods Road Drainage Capacity Increase
 - Transportation System Plan Stormwater Improvements
 - Kathryn St & Knox Butte Ave Storm Improvements
 - Old Salem Rd (Linn County) Improvements



PROPOSED PROJECTS
 CITY OF MILLERSBURG STORMWATER MASTER PLAN
 MILLERSBURG, OREGON



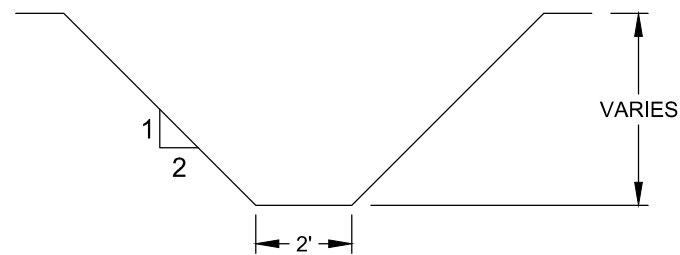
NORTH TRIBUTARY OF CROOKS CREEK OPTION 1



PROFILE VIEW

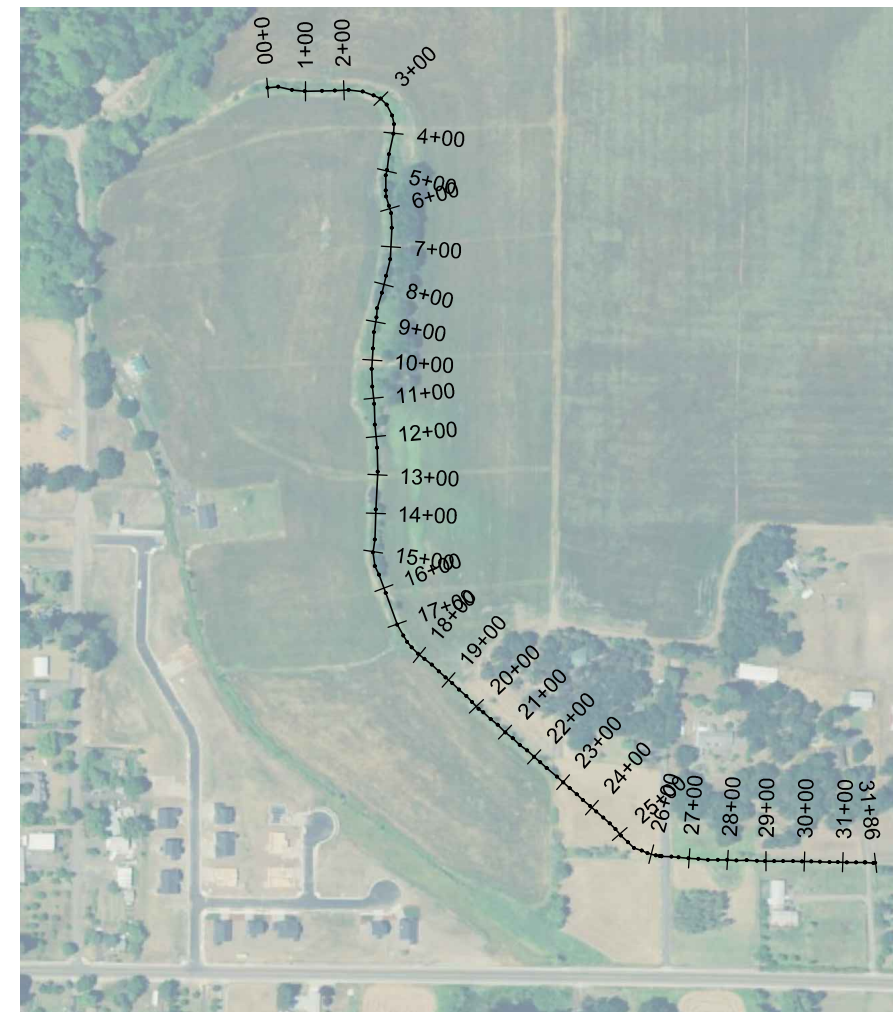
HORIZONTAL SCALE: 1" = 250'
VERTICAL SCALE: 1" = 5'

IMPACT	
ITEM	QUANTITY
CUT	953 CY
FILL	59 CY
AREA	0.72 AC



TYPICAL CHANNEL SECTION

SCALE: NTS



PLAN VIEW

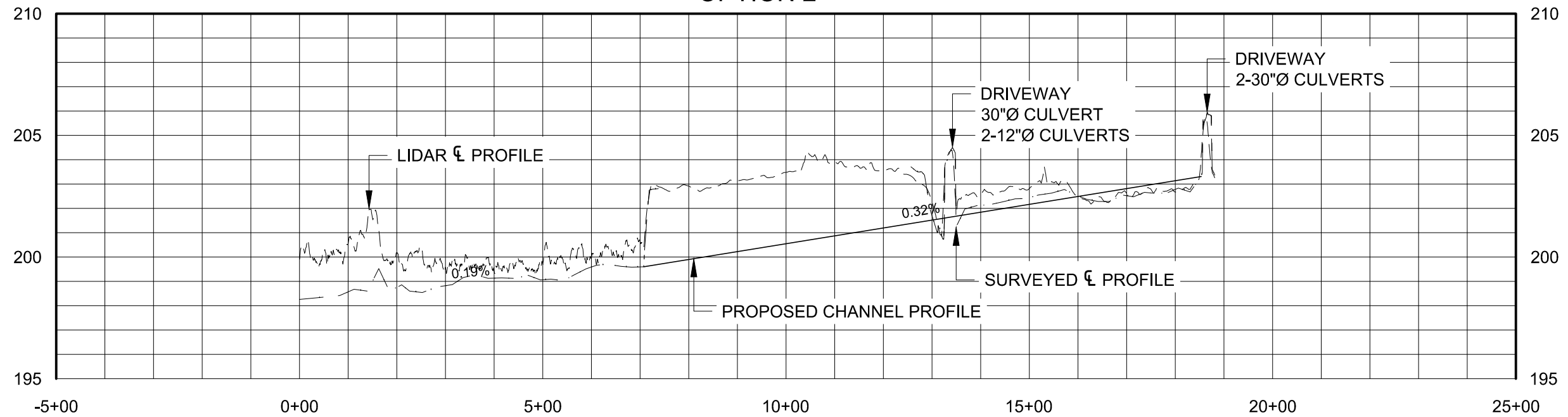
SCALE: 1" = 500'

NORTH TRIBUTARY OF CROOKS CREEK - CIP OPTION 1
 CITY OF MILLERSBURG STORMWATER MASTER PLAN

City of Millersburg, Oregon

CARDNO #: 21713530
 DATE: 08/28/2018
 BY: DEC
 CIP: A

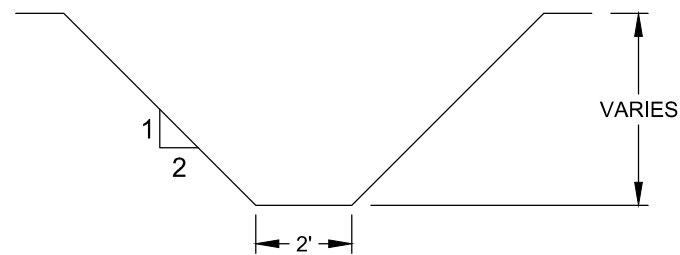
NORTH TRIBUTARY OF CROOKS CREEK OPTION 2



PROFILE VIEW

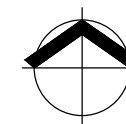
HORIZONTAL SCALE: 1" = 250'
VERTICAL SCALE: 1" = 5'

IMPACT	
ITEM	QUANTITY
CUT	953 CY
FILL	59 CY
AREA	0.72 AC



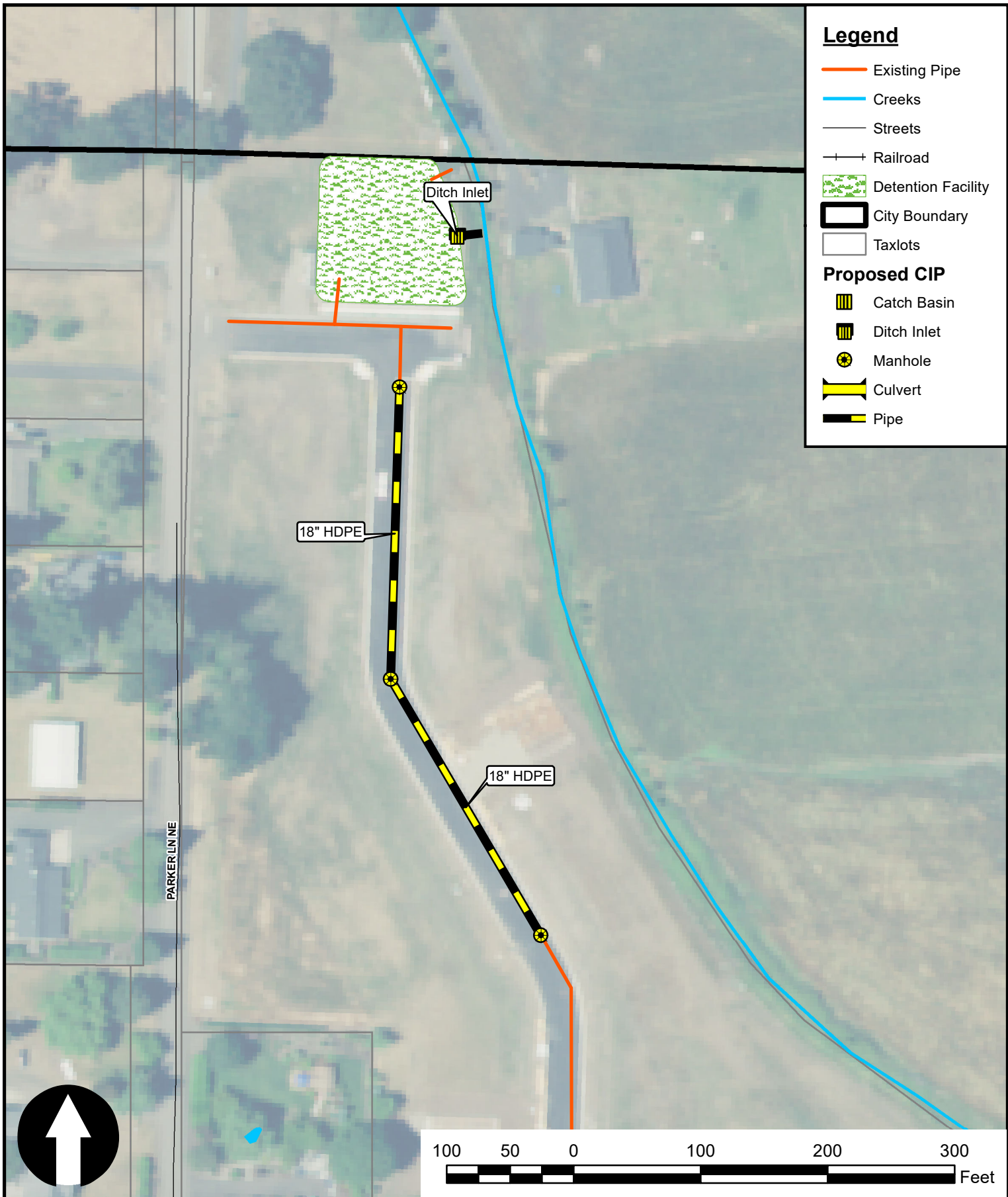
TYPICAL CHANNEL SECTION

SCALE: NTS



PLAN VIEW

SCALE: 1" = 250'

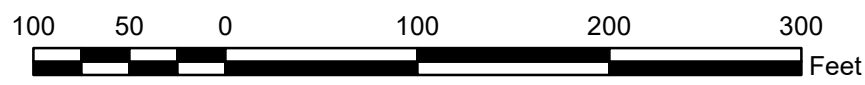


Legend

- Existing Pipe
 - Creeks
 - Streets
 - Railroad
 - Detention Facility
 - City Boundary
 - Taxlots
- Proposed CIP**
- Catch Basin
 - Ditch Inlet
 - Manhole
 - Culvert
 - Pipe

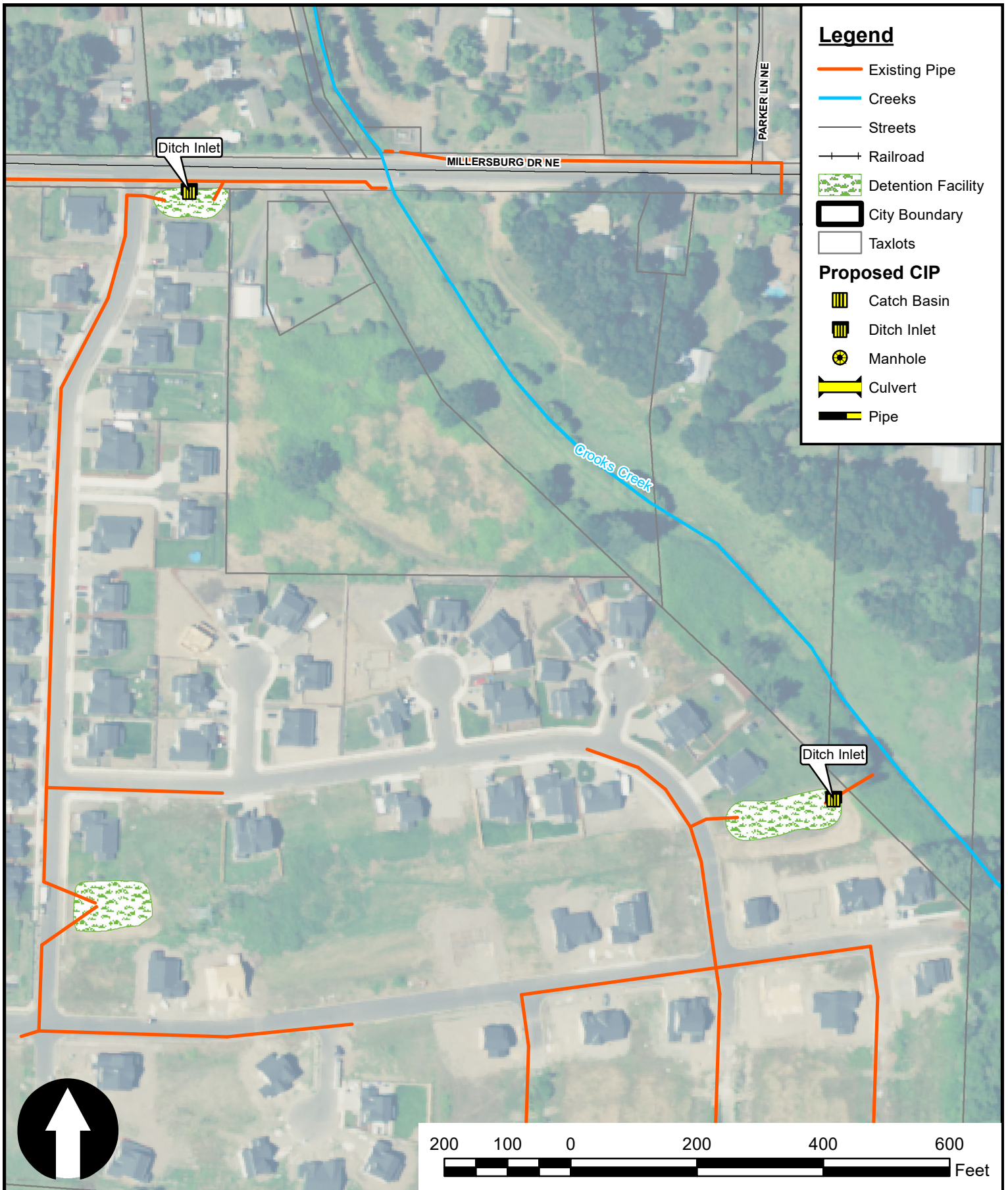
18" HDPE

18" HDPE



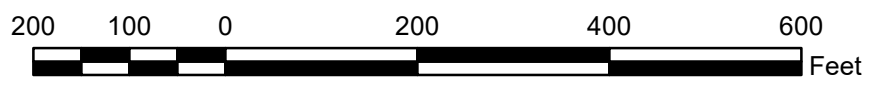
**HOFFMAN ESTATES STORMWATER
CAPACITY INCREASE**
CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON





Legend

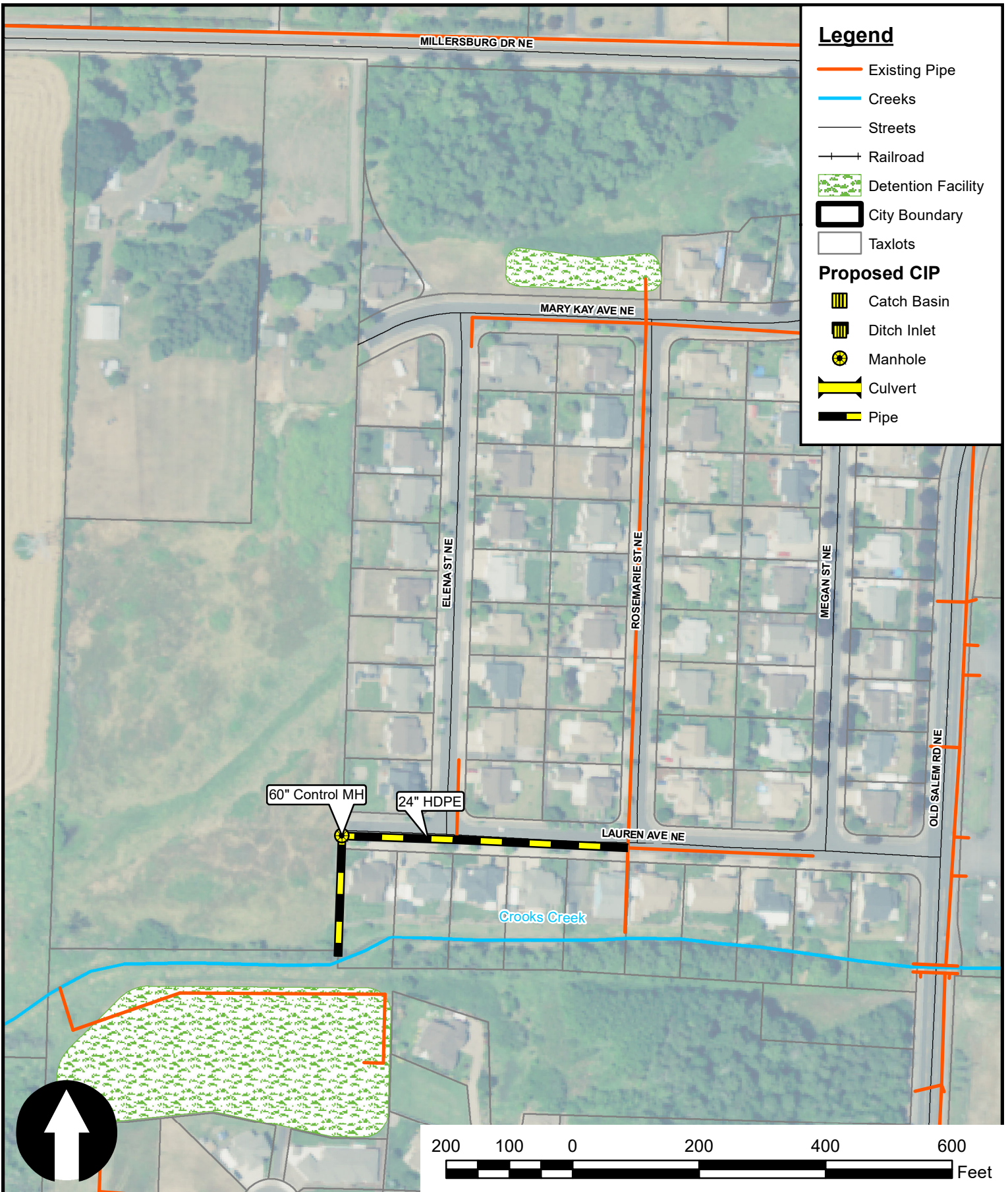
- Existing Pipe
- Creeks
- Streets
- +— Railroad
- Detention Facility
- City Boundary
- Taxlots
- Proposed CIP**
- Catch Basin
- Ditch Inlet
- Manhole
- Culvert
- Pipe















**BECKER RIDGE PONDS
MODIFICATION**

CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON





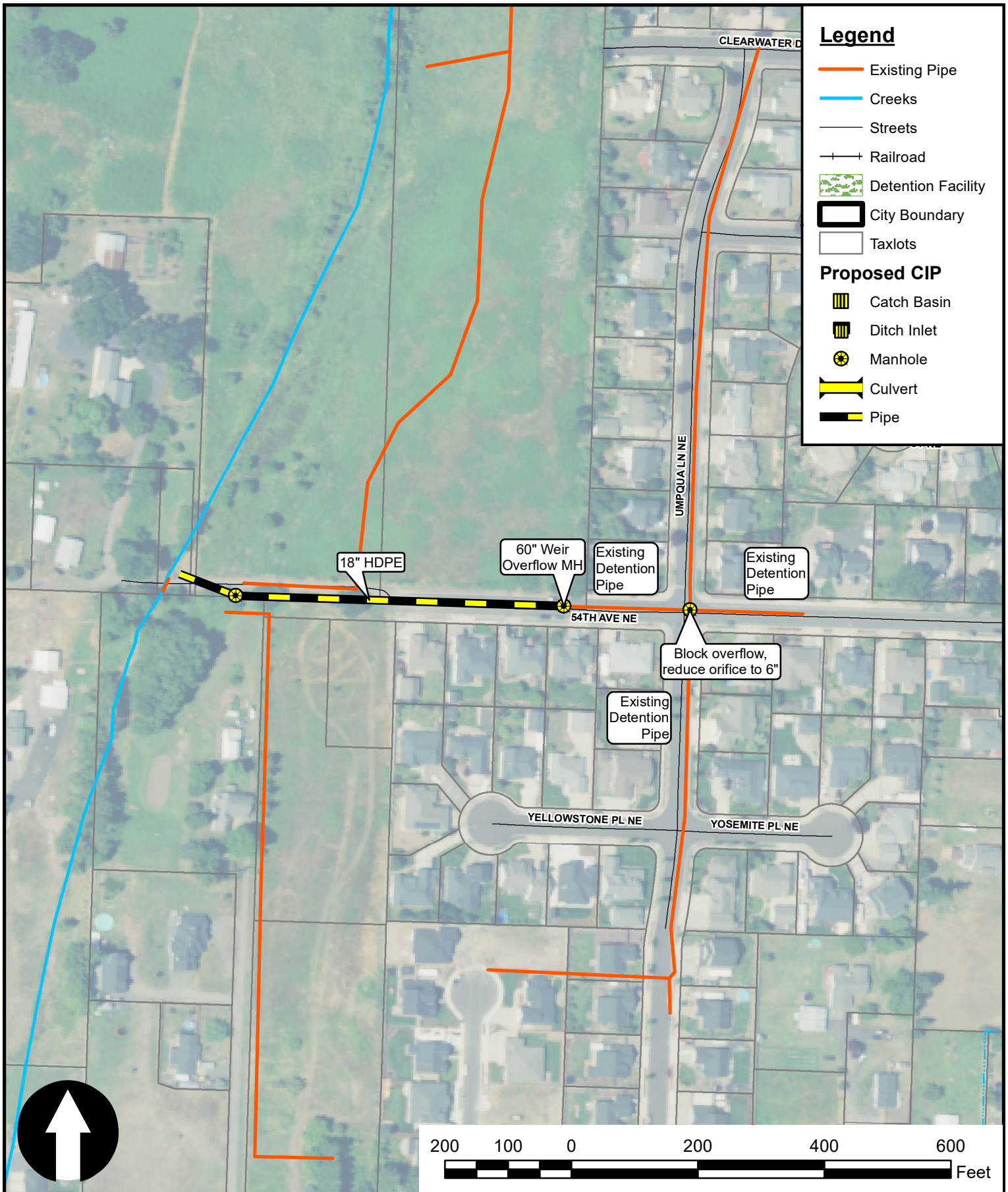
Legend

-  Existing Pipe
-  Creeks
-  Streets
-  Railroad
-  Detention Facility
-  City Boundary
-  Taxlots
- Proposed CIP**
-  Catch Basin
-  Ditch Inlet
-  Manhole
-  Culvert
-  Pipe

**MORNINGSTAR ESTATES
OUTFALL MODIFICATION**

CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON





Legend

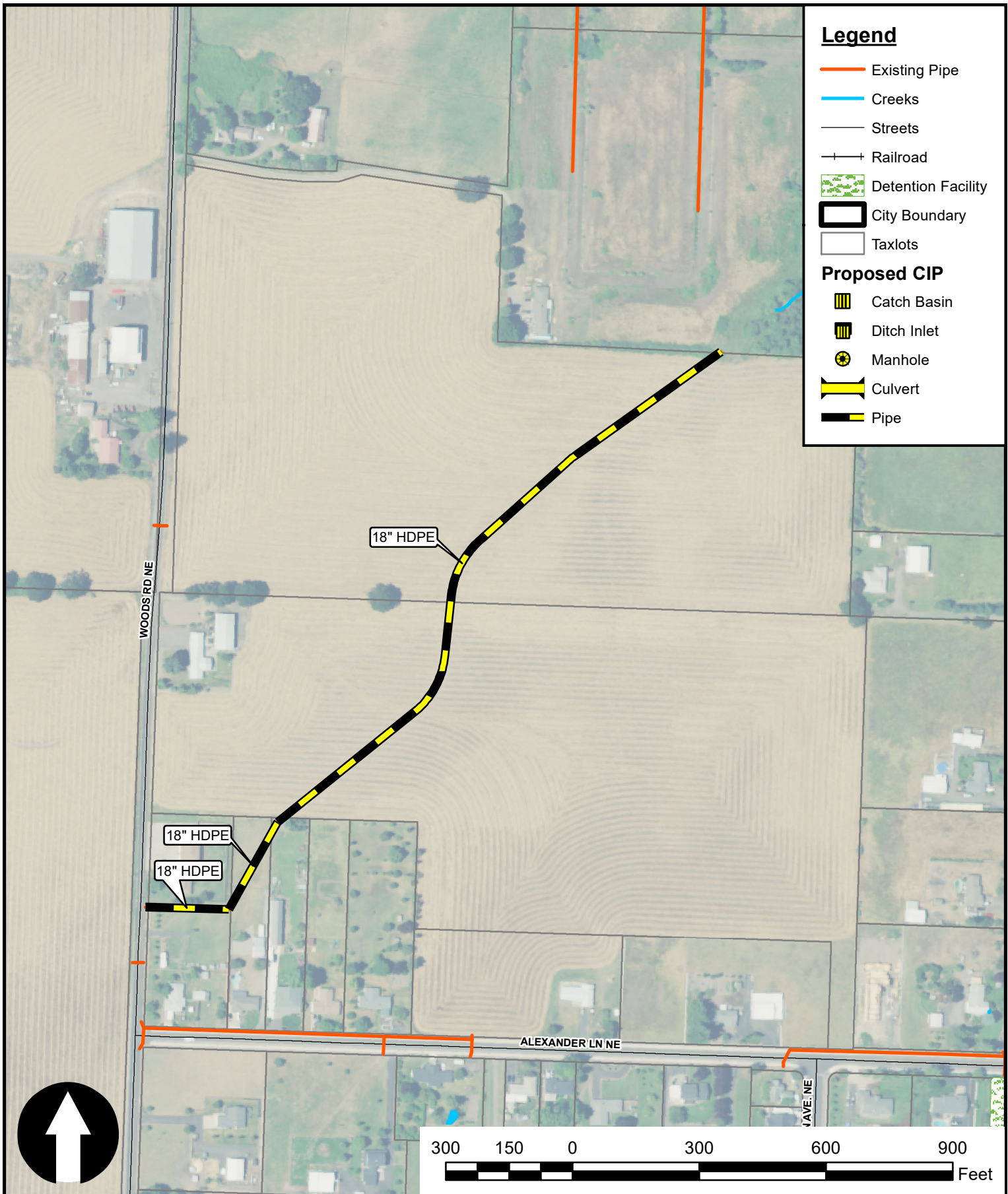
- Existing Pipe
- Creeks
- Streets
- +— Railroad
- Detention Facility
- City Boundary
- Taxlots
- Proposed CIP**
- Catch Basin
- Ditch Inlet
- Manhole
- Culvert
- Pipe



**UMPQUA LANE DETENTION PIPES
MODIFICATION**

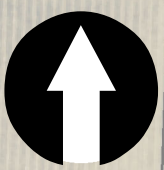
CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON





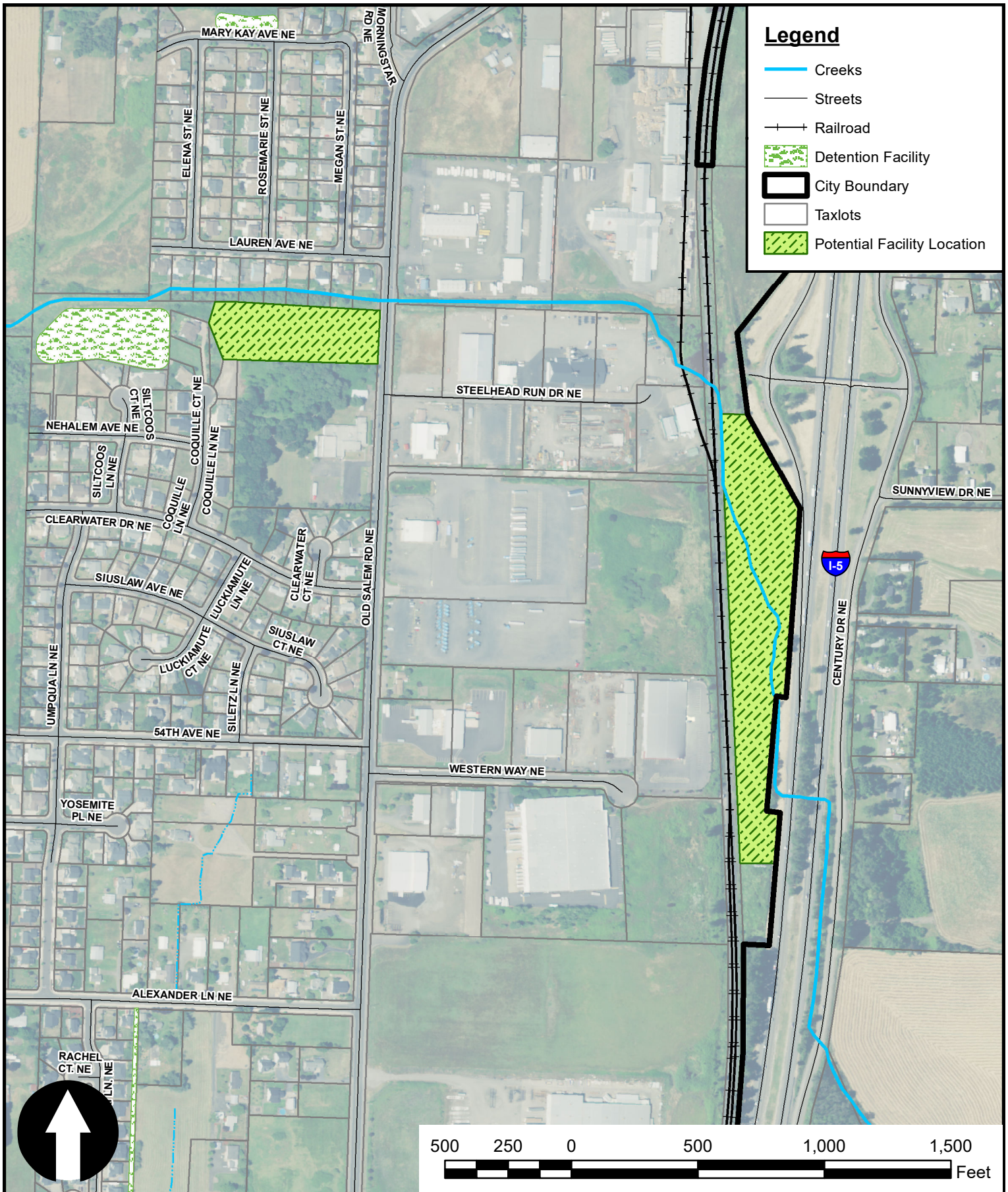
Legend

- Existing Pipe
 - Creeks
 - Streets
 - +— Railroad
 - Detention Facility
 - City Boundary
 - Taxlots
- Proposed CIP**
- Catch Basin
 - Ditch Inlet
 - Manhole
 - Culvert
 - Pipe



**WOODS ROAD DRAINAGE BUILD-OUT
CONDITIONS CAPACITY INCREASE**
CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON

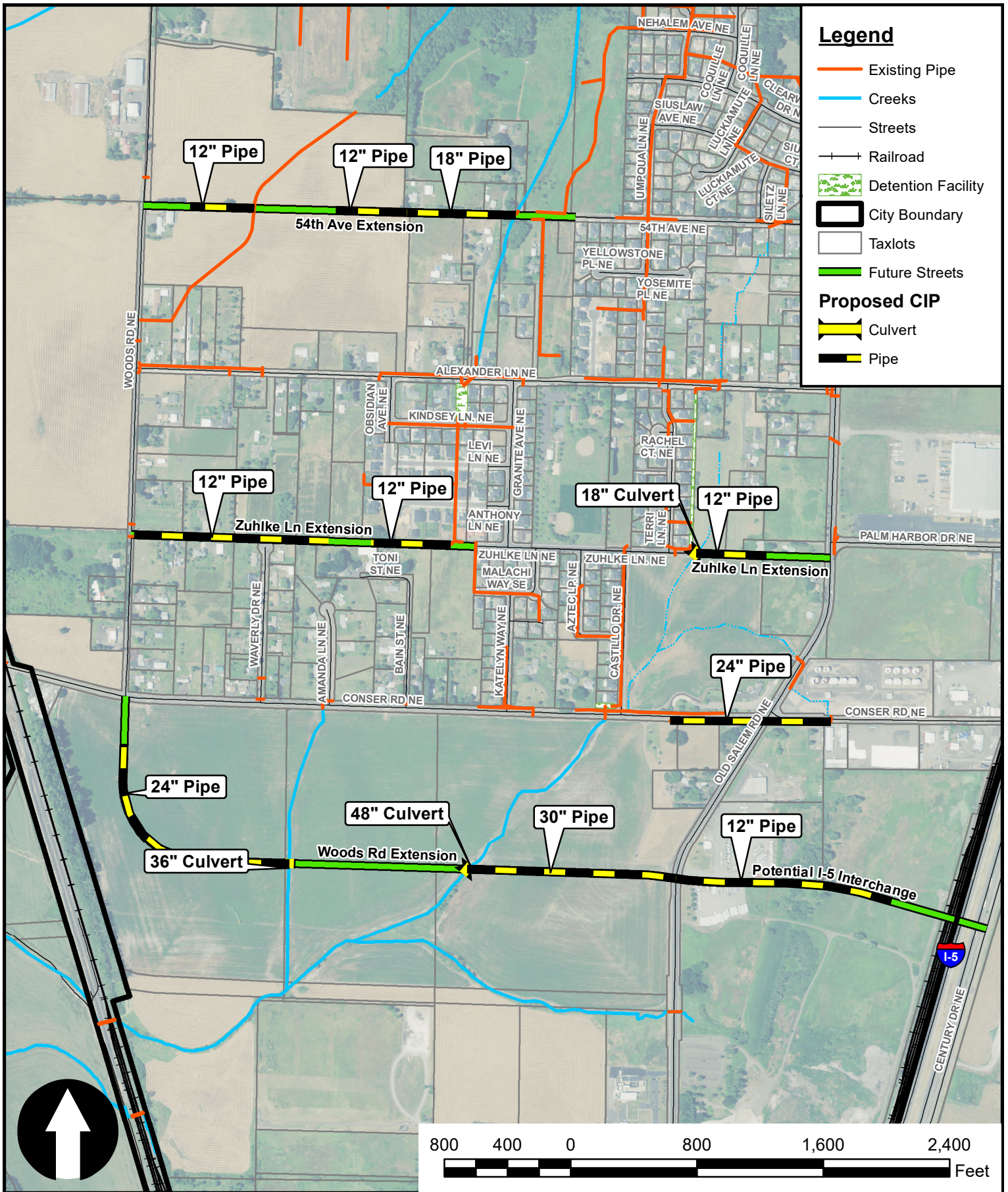




CROOKS CREEK SEDIMENT MAINTENANCE FACILITY

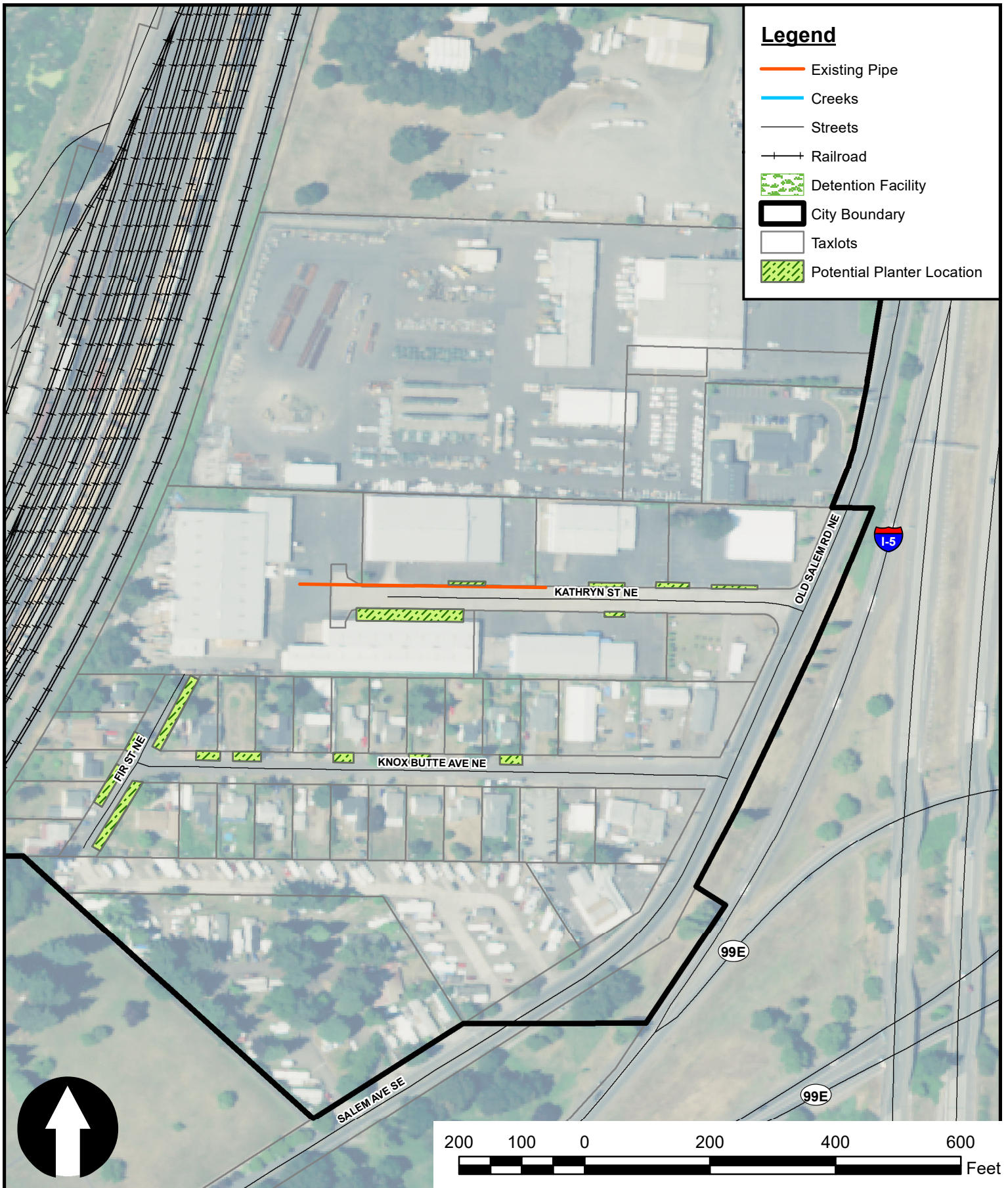
CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON





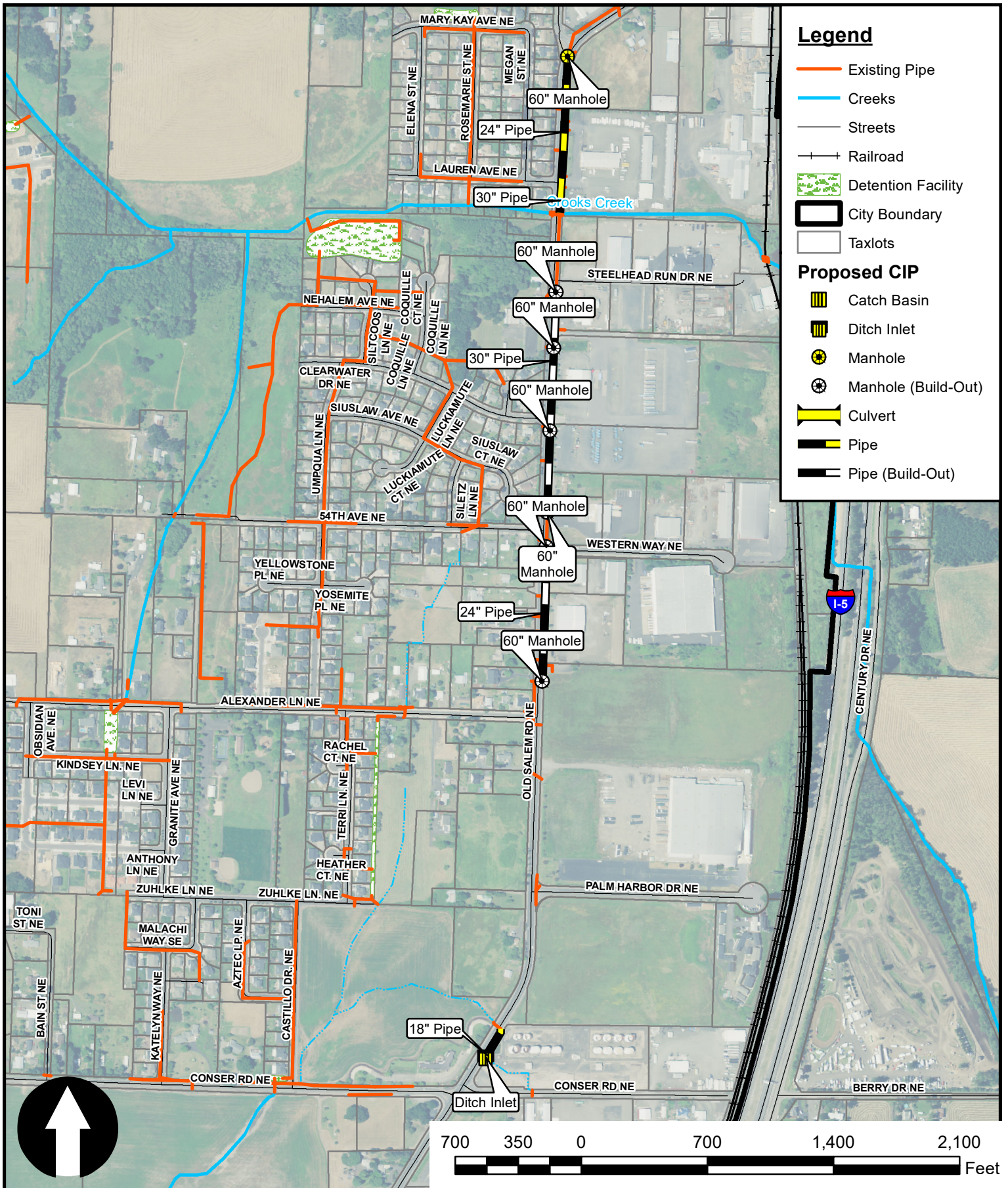
TRANSPORTATION SYSTEM PLAN
STORMWATER IMPROVEMENTS
 CITY OF MILLERSBURG STORMWATER MASTER PLAN
 MILLERSBURG, OREGON





**KATHRYN ST & KNOX BUTTE AVE
STORM IMPROVEMENTS**
CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON





OLD SALEM ROAD (LINN COUNTY) IMPROVEMENTS

CITY OF MILLERSBURG STORMWATER MASTER PLAN
MILLERSBURG, OREGON



NORTH TRIBUTARY OF CROOKS CREEK IMPROVEMENT

ALTERNATIVE 1 - REGRADE EXISTING CHANNEL

City of Millersburg, Oregon



Project Cost Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 14,000	14,000
A-2	Clear and grub site limits.	1	LS	\$ 5,000	5,000
A-3	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
Schedule A - Site Demolition & Erosion Control Subtotal					23,000
Schedule B - Channel Improvement					
B-1	Excavation of channel: 2ft bottom with, 2:1 side slopes	3,050	LF	\$ 20	61,000
B-2	Wetland planting and Seeding	680	SY	\$ 20	13,600
Schedule B - Channel Improvement					74,600
Schedule C - Private Culvert Improvements					
C-1	Replace 30-inch Culvert with HDPE pipe	1	LS	\$ 8,000	8,000
C-2	Remove culvert and dispose of offsite	8	EA	\$ 300	2,400
C-3	Install rocked creek crossing, 4" minus aggregate base	6	EA	\$ 2,000	12,000
Schedule C - Private Culvert Improvements					22,400
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 23,000
Schedule B - Channel Improvement Subtotal					\$ 74,600
Schedule C - Private Culvert Improvements					\$ 22,400
25% Engineering & Administration					\$ 30,000
5% Permitting					\$ 6,000
25% Contingency					\$ 30,000
CONSTRUCTION TOTAL					\$ 186,000

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

NORTH TRIBUTARY OF CROOKS CREEK IMPROVEMENT

ALTERNATIVE 2 - CONSTRUCT NEW CHANNEL

City of Millersburg, Oregon



Project Cost Estimate

Prepared By:					Date:
DEC					14-Jan-19
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 12,000	12,000
A-2	Clear and grub site limits.	1	LS	\$ 6,000	6,000
A-3	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
Schedule A - Site Demolition & Erosion Control Subtotal					22,000
Schedule B - Channel Improvement					
B-1	Excavation of channel: 2ft bottom with, 2:1 side slopes	1,150	LF	\$ 20	23,000
B-2	Grass seeding	1,150	LF	\$ 2.5	2,875
B-3	Wetland planting	122	SY	\$ 20	2,440
Schedule B - Channel Improvement					28,315
Schedule C - Private Culvert Improvements					
C-1	Replace 30-inch Culvert with HDPE pipe	1	LS	\$ 8,000	8,000
Schedule C - Private Culvert Improvements					8,000
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 22,000
Schedule B - Channel Improvement Subtotal					\$ 28,315
Schedule C - Private Culvert Improvements					\$ 8,000
25% Engineering & Administration					\$ 14,579
10% Permitting					\$ 5,832
25% Contingency					\$ 14,579
CONSTRUCTION TOTAL					\$ 93,304

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

HOFFMAN ESTATES CAPACITY INCREASE

REPLACE PIPE, INSTALL SECONDARY OVERFLOW
 City of Millersburg, Oregon



Preliminary Estimate

Prepared By:					Date:
DEC					14-Jan-19
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 12,000	12,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
A-3	Removal of existing storm piping, including disposal of material off site	500	LF	\$ 80	40,000
Schedule A - Site Demolition & Erosion Control Subtotal					56,000
Schedule B - Storm Improvement					
B-1	Install 18" HDPE Storm Sewer piping including: trenching, backfill, paving	500	LF	\$ 100	50,000
B-2	Install ODOT Ditch Inlet including: excavation, backfill	1	EA	\$ 2,200	2,200
Schedule B - Storm Improvement					52,200
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 56,000
Schedule B - Storm Improvement Subtotal					\$ 52,200
20% Engineering & Administration					\$ 21,640
25% Contingency					\$ 27,050
CONSTRUCTION TOTAL					\$ 156,890

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

BECKER RIDGE DETENTION PONDS MODIFICATION

INSTALL SECONDARY OVERFLOWS
 City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 5,000	5,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 3,000	3,000
Schedule A - Site Demolition & Erosion Control Subtotal					8,000
Schedule B - Storm Improvement					
B-1	Install ODOT Ditch Inlet including: excavation, backfill	2	EA	\$ 2,200	4,400
Schedule B - Storm Improvement					4,400
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 8,000
Schedule B - Storm Improvement Subtotal					\$ 4,400
20% Engineering & Administration					\$ 2,480
25% Contingency					\$ 3,100
CONSTRUCTION TOTAL					\$ 17,980

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

MORNINGSTAR ESTATES OUTFALL MODIFICAITON

REPLACE OUTLET PIPE AND CONTROL STRUCTURE
 City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 7,000	7,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
A-3	Removal of existing storm piping, including disposal of material off site	275	LF	\$ 80	22,000
Schedule A - Site Demolition & Erosion Control Subtotal					33,000
Schedule B - Storm Improvement					
B-1	Install 24" HDPE Storm Sewer piping including: trenching, backfill, paving	650	LF	\$ 150	97,500
B-2	Install 60" Storm Sewer flow control manhole including: excavation, backfill	1	EA	\$ 6,000	6,000
B-3	Modify existing 48" Storm Sewer manhole	2	EA	\$ 2,000	4,000
Schedule B - Storm Improvement					107,500
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 33,000
Schedule B - Storm Improvement Subtotal					\$ 107,500
20% Engineering & Administration					\$ 28,100
25% Contingency					\$ 35,125
CONSTRUCTION TOTAL					\$ 203,725

General Notes and Assumptions:

1) All Bid items include labor, materials and equipment to complete Task.

- 2) _____
- 3) _____

UMPQUA LANE DETENTION PIPES MODIFICATION

RE-ROUTE OVERFLOW, RESIZE EXISTING 8" ORIFICE AND BLOCKING EXISING OVERFLOW
 City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 12,000	12,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
Schedule A - Site Demolition & Erosion Control Subtotal					16,000
Schedule B - Storm Improvement					
B-1	Install 18" HDPE Storm Sewer piping including: trenching, backfill, paving	420	LF	\$ 100	42,000
B-2	Modify existing 60" Storm Sewer flow control manhole	1	EA	\$ 2,000	2,000
B-3	Install concrete weir in existing 60" Storm Sewer Manhole	1	EA	\$ 2,000	2,000
Schedule B - Storm Improvement					46,000
Schedule C - Water Line Adjustment					
C-1	Adjust existing 10" DIP water line under storm line	1	LS	\$ 12,000	12,000
C-2	CLSM backfill around sanitary line	6	CY	\$ 300	1,800
Schedule C - Water Line Adjustment					13,800
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 16,000
Schedule B - Storm Improvement Subtotal					\$ 46,000
Schedule C - Water Line Adjustment Subtotal					\$ 13,800
20% Engineering & Administration					\$ 15,160
25% Contingency					\$ 18,950
CONSTRUCTION TOTAL					\$ 109,910

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

WOODS ROAD DRAINAGE CAPACITY INCREASE

UPGRADE EXISTING PIPE 12" PIPE TO ACCOMMODATE BUILD-OUT CONDITIONS

City of Millersburg, Oregon



Preliminary Estimate

Prepared By:					Date:
DEC					14-Jan-19
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 12,000	12,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
A-3	Removal of existing storm piping, including disposal of material off site	2,024	LF	\$ 80	161,920
Schedule A - Site Demolition & Erosion Control Subtotal					177,920
Schedule B - Storm Improvement					
B-1	Install 18" HDPE Storm Sewer piping including: trenching, backfill, paving	2,024	LF	\$ 100	202,400
B-2	Modify existing 48" Storm Sewer manhole	2	EA	\$ 2,000	4,000
B-3	Modify existing Ditch Inlet	1	EA	\$ 1,200	1,200
Schedule B - Storm Improvement					207,600
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 177,920
Schedule B - Storm Improvement Subtotal					\$ 207,600
20% Engineering & Administration					\$ 77,104
25% Contingency					\$ 96,380
CONSTRUCTION TOTAL					\$ 559,004

General Notes and Assumptions:

1) All Bid items include labor, materials and equipment to complete Task.

2) _____

3) _____

TRANSPORTATION SYSTEM PLAN STORMWATER IMPROVEMENTS

COST ESTIMATES FOR STORMWATER COMPONENT OF TRANSPORTATION SYSTEM EXPANSION

City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Woods Road Extension					
A-1	Install 12" HDPW Storm Sewer piping including: trenching, backfill, paving	1800	LF	\$ 170	306,000
A-2	Install 24" HDPW Storm Sewer piping including: trenching, backfill, paving	1700	LF	\$ 200	340,000
A-3	Install 30" HDPW Storm Sewer piping including: trenching, backfill, paving	1400	LF	\$ 320	448,000
A-4	Install 36" HDPW Storm Sewer piping including: trenching, backfill, paving	80	LF	\$ 350	28,000
A-5	Install 48" HDPW Storm Sewer piping including: trenching, backfill, paving	80	LF	\$ 500	40,000
Schedule A - Woods Road Extension					1,162,000
Schedule B - Zuhlke Lane Extension					
B-2	Install 12" HDPW Storm Sewer piping including: trenching, backfill, paving	2,410	LF	\$ 170	409,700
B-3	Install 18" HDPW Storm Sewer piping including: trenching, backfill, paving	60	LF	\$ 180	10,800
Schedule B - Zuhlke Lane Extension					420,500
Schedule C - 54th Avenue Extension					
C-1	Install 12" HDPW Storm Sewer piping including: trenching, backfill, paving	1,000	LF	\$ 170	170,000
C-2	Install 18" HDPW Storm Sewer piping including: trenching, backfill, paving	700	LF	\$ 180	126,000
Schedule C - 54th Avenue Extension					296,000
Schedule D - Conser Road Improvements					
D-1	Install 24" HDPW Storm Sewer piping including: trenching, backfill, paving	1,020	LF	\$ 200	204,000
Schedule D - Conser Road Improvements					204,000
Schedule A - Woods Road Extension Subtotal					\$ 1,162,000
Schedule B - Zuhlke Lane Extension Subtotal					\$ 420,500
Schedule C - 54th Avenue Extension Subtotal					\$ 296,000
Schedule D - Conser Road Improvements Subtotal					\$ 204,000
CONSTRUCTION TOTAL					\$ 2,082,500

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) All Bid items include 20% engineering & administration cost, and 25% contingency cost
- 3) All Bid items assume manholes every 400' with curb inlets

KATHRYN STREET & KNOX BUTTE AVENUE STORM IMPROVEMENTS

CONSTRUCT STREET-SIDE PLANTERS TO MANAGE R.O.W. STORMWATER
 City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
	Schedule A - Storm Improvements				
A-1	Kathryn Street Stormwater Planters	2000	SF	\$ 25	50,000
A-2	Knox Butte Avenue Stormwater Planters	4000	SF	\$ 25	100,000
	Schedule A - Storm Improvements				150,000
	Schedule A - Storm Improvements				\$ 150,000
	20% Engineering & Administration				\$ 30,000
	25% Contingency				\$ 37,500
	CONSTRUCTION TOTAL				\$ 217,500

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

OLD SALEM ROAD (LINN COUNTY) IMPROVEMENTS (EXISTING CONDITION)

UPGRADE EXISTING STORMWATER PIPES TO ACCOMMODATE EXISTING CONDITIONS

City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 7,000	7,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
A-3	Removal of existing storm piping, including disposal of material off site	955	LF	\$ 80	76,400
A-4	Removal of existing storm manhole, including disposal of material off site	1	EA	\$ 2,500	2,500
Schedule A - Site Demolition & Erosion Control Subtotal					89,900
Schedule B - Existing Capacity Storm Improvements					
B-1	Install 18" HDPE Storm Sewer piping including: trenching, backfill, paving	185	LF	\$ 100	18,500
B-2	Install 24" HDPE Storm Sewer piping including: trenching, backfill, paving	455	LF	\$ 150	68,250
B-3	Install 30" HDPE Storm Sewer piping including: trenching, backfill, paving	315	LF	\$ 225	70,875
B-4	Install 60" Storm Sewer manhole including: excavation, backfill	1	EA	\$ 6,000	6,000
B-5	Install ODOT Ditch Inlet including: excavation, backfill	1	EA	\$ 2,200	2,200
Schedule B - Existing Capacity Storm Improvements					165,825
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 89,900
Schedule B - Storm Improvement Subtotal					\$ 165,825
20% Engineering & Administration					\$ 51,145
25% Contingency					\$ 63,931
CONSTRUCTION TOTAL					\$ 370,801

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2) _____
- 3) _____

OLD SALEM ROAD (LINN COUNTY) IMPROVEMENTS (BUILD-OUT CONDITION)

UPGRADE EXISTING STORMWATER PIPES TO ACCOMMODATE BUILD-OUT CONDITIONS

City of Millersburg, Oregon



Preliminary Estimate

Prepared By:				Date:	
DEC				14-Jan-19	
Item #	Description	Quantity Take-off		Unit Price	Estimated Cost
Schedule A - Site Demolition & Erosion Control					
A-1	Mobilization & General Conditions	1	LS	\$ 7,000	7,000
A-2	Install erosion and sediment control measures.	1	LS	\$ 4,000	4,000
A-3	Removal of existing storm piping, including disposal of material off site	1560	LF	\$ 80	124,800
A-4	Removal of existing storm manhole, including disposal of material off site	6	EA	\$ 2,500	15,000
Schedule A - Site Demolition & Erosion Control Subtotal					150,800
Schedule B - Storm Improvements					
B-2	Install 24" HDPE Storm Sewer piping including: trenching, backfill, paving	665	LF	\$ 150	99,750
B-3	Install 30" HDPE Storm Sewer piping including: trenching, backfill, paving	895	LF	\$ 225	201,375
B-4	Install 60" Storm Sewer manhole including: excavation, backfill	6	EA	\$ 6,000	36,000
Schedule B -Storm Improvements					337,125
Schedule A - Site Demolition & Erosion Control Subtotal					\$ 150,800
Schedule B - Storm Improvement Subtotal					\$ 337,125
20% Engineering & Administration					\$ 97,585
25% Contingency					\$ 121,981
CONSTRUCTION TOTAL					\$ 707,491

General Notes and Assumptions:

- 1) All Bid items include labor, materials and equipment to complete Task.
- 2)
- 3)

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