FINAL
CITY OF SPRINGFIELD
STORMWATER FACILITIES MASTER PLAN

October 2008

Prepared for:

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DHI WATER & ENVIRONMENT

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Acronyms

BMP	Best Management Practice
CIPs	Capital Improvement Projects
CN	Curve number
DEM	Digital Elevation Model
DHI	Danish Hydraulic Institute
GIS	Geographic Information System
HGL	Hydraulic Grade Line
LCOG	Lane Council of Governments
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
ODEQ	Oregon Department of Environmental Quality
SBUH	Santa Barbara Urban Hydrograph
SWFMP	Stormwater Facilities Master Plan
TMDL	Total Maximum Daily Load
UGB	Urban growth boundary
WLA	Wasteload allocations

EXECUTIVE SUMMARY

Introduction/ Background

In 2003, the City of Springfield initiated a project to develop a comprehensive stormwater facilities master plan (SWFMP). In the absence of this plan, the City has typically been designing and constructing facilities for treating and conveying stormwater runoff on an individual development or site by site basis. In addition, as is typical for nearly all cities, most of the City of Springfield's stormwater collection and conveyance system was historically designed and built with the sole objective of addressing flooding issues. The purpose of this document is to provide a guide to plan for more comprehensive, efficient, and multi-objective management of the City's stormwater system. Specific objectives of the SWFMP are as follows:

- Compile and evaluate physical data regarding the existing storm system.
- Determine existing and future condition flooding locations and conditions and prioritize such locations in order to develop capital improvement projects to address the problems.
- Develop a City-wide SWFMP that enables the City to address its flood protection and water quality goals through a list of prioritized flood control and water quality CIPs.
- Review existing stormwater standards/codes and recommend changes that will further the implementation of Springfield's goals and policies related to stormwater (for list of City stormwater goals, see Chapter 4 of the City of Springfield's Stormwater Management Plan, January 2004).

Study Area Characteristics

The City of Springfield is located in the Upper Willamette Drainage Basin, primarily on the east side of the Willamette River. The majority of City's stormwater runoff drains through an integrated network of pipes and open channels, discharging either directly to the mainstem Willamette or McKenzie Rivers or through outfalls to a tributary of either of those rivers. The study area (i.e., modeled drainage area) comprises about 25.2 square miles, which includes land both within and outside the city limits and urban growth boundary (UGB). For modeling purposes, the City of Springfield was divided into 15 primary subbasins, and each subbasin was further broken down into catchments.

The City's drainage system as a whole is comprised of approximately 185 miles of storm sewer and 26 miles of open channel drainage. Storm drainage pipes of 24" diameter and greater (generally) were included in the evaluation of this plan, resulting in the modeling of approximately 57.6 miles of storm sewer and 22.9 miles of open channel system.

Most of the major portions of the stormwater drainage system infrastructure were built during the 1960's and as development increased, the system was retrofit with extensions and additions, but most of the main conveyance system was not upsized to facilitate the increased flows associated with full build out.

With respect to water quality, the Willamette River and McKenzie River (a tributary to the Willamette River) are listed on the State's 303(d) list indicating that water quality standards for specific pollutants in these streams are currently being exceeded. In addition, in 2006 the Willamette River total maximum daily load (TMDL) was finalized which requires the City to specifically address the parameters of temperature, bacteria, and mercury. The McKenzie River 303(d) listing for temperature was incorporated into the Willamette River TMDL. The City must address TMDLs as part of their Stormwater Management Program (associated with their Phase II NPDES MS4 Permit) and TMDL Implementation Plans.

Study Methods

The first step in development of this SWFMP included evaluating the City's existing storm drainage infrastructure and evaluating future needs posed by anticipated growth and buildout of the UGB, specifically the City devoted resources to first updating and supplementing their existing information regarding the physical aspects of the storm drainage system. These data gathering tasks were completed in early 2006.

To evaluate the capacity of the City's storm system, a hydrologic/ hydraulic model (the DHI MIKE URBAN model) was used to simulate existing conditions. As there were limited flow data available for conducting a model calibration, a model validation was conducted by comparing model results for existing conditions with field observations from a specified storm. These field observations consisted of flow levels from a significant storm event that generated flooding conditions in November of 1996. The November 1996 storm was selected by the City as the storm for comparison to model results since the City had the most on the ground observations recorded for this event, and it was the largest event in memorable history for City staff.

Once the model was validated, the system was evaluated for the 2-year, 5-year, 10-year, and 100-year events, in addition to the November 1996 storm (the volumetric equivalent of a 25-year event). Existing and future land use conditions were simulated. Flooding locations requiring development of a flood control CIP were identified based on future land use conditions and the simulated November 1996 storm. The identified flooding locations were qualified by City staff and prioritized in order to facilitate the development of flood control CIPs. Based on the prioritization, flood control CIPs and associated cost estimates were developed, either as a conceptual level estimate or as a more detailed design estimate.

With respect to water quality, locations where water quality improvements were desired were initially identified by the City of Springfield and LCOG as part of their stormwater basin characterization study. Such locations were reviewed and consolidated. A majority of the locations overlapped with those locations identified as requiring flood control CIPs. The water quality locations were prioritized in conjunction with the flood control locations, and conceptual level water quality CIPs and associated cost estimates were developed.

In parallel with the development of flood control and water quality CIPs, a review of existing City codes and design standards related to stormwater management, water quality, and related natural resources was conducted, in order to assist the City in aligning its stormwater related practices with the Goals, Policies and Implementation Actions identified in the City of Springfield Stormwater Management Plan (January 2004).

Study Results

Analysis of the City's storm system resulted in the identification of 43 priority locations for addressing flooding and/or water quality issues, and these locations were used as the basis for the development of flood control and water quality CIPs. A total of 15 flood control CIPs, addressing 18 of the highest priority flood locations and a total of 12 water quality CIPs addressing 15 of the highest priority water quality problem locations were developed. Five of these projects were identified as viable in terms of combining both a flood control and a water quality CIP. Table ES-1 summarizes the proposed flood control CIPs and Table ES-2 summarizes the proposed water quality CIPs.

As mentioned above, in addition to the development of flood control and water quality CIPs, a review of City stormwater codes and standards was conducted. In order to further the implementation of City stormwater goals, overall recommendations included the following:

- Provide consistency for the development community by having consistent development standards in the region (i.e., with the City of Eugene).
- Clearly stipulate a threshold amount of impervious area that triggers the requirement for onsite stormwater quality facilities.
- Reduce water quality impacts from streets and parking lots through the allowance of pervious pavements and requirements for implementation of green street standards.
- Allow and encourage vegetated stormwater treatment facilities in required landscaped areas.
- Improve requirements to address stormwater quality issues in the City's drinking water protection district.
- Improve protective standards to minimize the removal of trees and vegetation.
- Strengthen protective measures for riparian areas.
- Consider the development of an updated erosion control handbook for the region.
- Consider full adoption of the Land and Drainage Alteration Permit (LDAP) program and reduce the threshold excavation volume to which this permit applies.
- Clearly establish maintenance responsibilities and ownership for stormwater quality and quantity facilities in the City's codes and standards and establish an inspection system to ensure adequate maintenance.

Table ES-1: Summary of Flood Control CIPs

CIP Number	CIP Name/ Location	Brief Description	Estimated Cost (does not include land acquisition or permitting costs)	
			Construction Costs:	Engineering/ Administration Costs:
1-FC*	Glenwood	New storm system construction; pipe and open channel improvements for flood control.	$3,870,400	$967,600
2-FC*	Gray Creek/ 72nd Street	New storm system construction; pipe and open channel improvements for flood control.	$4,237,100	$1,059,275
3-FC	Jasper Natron	New storm system construction.	$2,206,500	$551,625
4-FC*	Channel 6	Pipe and open channel improvements for flood control; construction of a regional detention facility.	$901,100	$225,275
5-FC	59th and Aster and Daisy Street	Pipe improvements for flood control.	$1,724,800	$431,200
6-FC	Irving Slough	Open channel improvements for flood control; construction of a storage facility.	$1,757,200	$439,300
10-FC*	North Gateway-Sportsway Channel	Construct a combination flood control/ water quality facility.	$417,900	$104,475
11-FC	N. Willamette Heights	Develop a basin plan to guide new and redevelopment activities with respect to drainage.		$60,000 for planning – construction costs would be estimated based on planning results.
13-FC	South 67th Street	Pipe improvements for flood control	$249,600	$62,400
14-FC	S. Willamette Heights	Develop a basin plan to guide new and redevelopment activities with respect to drainage.		$60,000 for planning – construction costs would be estimated based on planning results.
15-FC	Over-Under	Pipe improvements for flood control	$1,918,400	$479,600
17-FC	Gateway Gamebird System	Develop a basin plan to guide new and redevelopment activities with respect to drainage.		$60,000 for planning – construction costs would be estimated based on planning results.
18-FC*	69th Street	Open channel improvements for flood control	$1,898,000	$474,500
19-FC	Upstream end of South A Street	Pipe improvements for flood control	$518,400	$129,600
20-FC	Lawnridge	Pipe improvements for flood control	$721,600	$180,400
		Total:	**$20,421,000**	**$5,285,250**

* Note: These projects also have a water quality component which is listed in Table ES-2.

Table ES-2: Summary of Water Quality CIPs

CIP Number	CIP Name/ Location	Brief Description	Estimated Cost (does not include land acquisition or permitting costs)	
			Construction Costs:	Engineering/ Administration Costs:
1-WQ*	Glenwood	Implement the existing refinement plans for the Glenwood development areas.	N/A	N/A
2-WQ*	75th Street Channel	Install an offline water quality treatment system (low flow bypass and water quality pond).	$495,510	$123,878
4-WQ*	Channel 6 from I-5 to 9th Street	Green pipe open channel improvements and offline water quality treatment system.	$1,579,400	$394,850
7-WQ	72nd Street Channel	Sediment trap and green pipe open channel improvement.	$1,177,970	$294,493
10-WQ*	North Gateway-Sportsway Channel	Construct a combination flood control/ water quality facility.	Costs estimated for the flood control facility include water quality costs. See Table ES-1 for CIP 10.	
12-WQ	Mill Race – Mill Race and Outfalls	Construct a daylight or diversion pretreatment structure, an offline water quality treatment facility (pond or wetland), and green pipe open channel improvement.	$623,045	$246,920
16-WQ	Island Park	Green pipe open channel improvements and an offline water quality treatment facility.	$1,572,420	$393,105
18-WQ*	69th Street Channel	Over-under pipe system or green pipe open channel and an offline water quality treatment facility.	$423,870	$105,968
32-WQ	28th and Olympic	Develop an industrial management plan with the intent to improve water quality from industrial sources.		$60,000 for planning – construction costs not estimated.
37-WQ	Jasper Basin – Middle Fork Willamette river at Clearwater	Offline water quality treatment facility.	$232,830	$58,208
42-WQ	42nd Street Outfall Channel	Offline water quality treatment facility.	$656,700	$164,175
43-WQ	Maple Island Slough	Develop a vegetation management plan with the intent to improve water quality from the corporate park.		$60,000 for planning – construction costs not estimated.
		Total:	**$6,761,745**	**$1,901,597**

* Note: These projects also have a flood control component which is provided in Table ES-1.

SECTION 1 - INTRODUCTION

1.1 Overview

This document is the Stormwater Facilities Master Plan (SWFMP) for the City of Springfield that presents the methods and results of the project, which are focused on flood control and water quality capital improvement project (CIP) development. This Plan also addresses storm system development code, design standards and procedural changes that are recommended for the City in order to better support the implementation of Springfield's stormwater goals and objectives. This section of the plan provides a summary of the need for the plan, a description of the approach for preparing the plan, and a summary of how this plan is organized.

1.2 Need for the Plan

In 2003, the City of Springfield initiated a project to develop a comprehensive stormwater facilities master plan. In the absence of this plan, the City has typically been designing and constructing facilities for treating and conveying stormwater runoff on an individual development or site by site basis. In addition, as is typical for nearly all cities, most of the City of Springfield's stormwater collection and conveyance system was historically designed and built with the sole objective of addressing flooding issues. The purpose of this plan is to provide a guiding document in order to plan for more comprehensive, efficient, and multi-objective management of the City's stormwater resources. In addition to providing proposed capital improvement projects (CIPs) for flood control and water quality, a review of existing stormwater standards/codes was conducted to recommend changes that will support the implementation of Springfield's goals and policies related to stormwater.

1.3 Approach

The first steps in developing this SWFMP included evaluating the City's existing storm drainage infrastructure and then evaluating future needs posed by anticipated growth and buildout of the Urban Services Area. To conduct these activities, the City first devoted resources to updating and supplementing their existing information regarding the physical aspects of the storm drainage system. This included compiling inventories and as-builts of detailed information regarding the piped system for inclusion in the City's Geographic Information System (GIS). It also included conducting a survey of the major portions of the open channel system to measure cross-sectional dimensions and channel bottom elevations. These data gathering tasks were completed in early 2006.

Based on the updated and newly compiled GIS storm system information, a hydrologic/hydraulic model was developed to evaluate the capacity of the City's storm drainage system. The DHI MIKE URBAN model was selected for this evaluation due to model capabilities (i.e., hydrologic, hydraulic, and GIS interface), staff familiarity with the model, and consistency with the City's modeling software used to evaluate Springfield's sanitary collection system. To focus project resources, the model study area covers the City's piped stormwater system, with pipe diameters equal to or greater than 24 inches included in the model. The study also includes the evaluation of flooding along open channels/waterways that are part of the larger drainage system (associated with 24" diameter or equivalent pipe), located within and outside the City limits.

Flooding

Flooding issues anticipated as a result of an estimated 25-year design storm event during the future condition modeling scenario were identified. There were 38 areas initially identified as flood control CIP priority locations. Flooding was identified as occurring when any water came up into the street. A workshop was held to review and prioritize these areas for the development of capital improvement projects. Eighteen of the 38 areas were identified as higher priority.

Conceptual CIPs were developed and evaluated using the DHI model for five of the highest priority locations. CIP fact sheets and more detailed cost estimates were developed for these five areas and are described in Section 5.3 and provided in Appendix E. For the remaining 13 higher priority areas, general assumptions were made regarding potential CIP project elements in order to develop planning level cost estimates. Detail related to the flood control CIP development is included in Section 5.3.

Water Quality

Given that significant flooding issues were identified and need to be addressed, the locations for flood control capital projects were then reviewed and modified to also address water quality to the extent practicable. As a result, 15 areas were identified as water quality CIP priority locations. Ten of these locations overlap with the areas earlier identified as a flood control priority areas.

To address the identified water quality CIP priority locations, conceptual CIPs and planning level cost estimates were developed. Detail related to the water quality CIP development is included in Section 5.4.

Code/Standards Review

Lastly, a review was conducted of Springfield's stormwater development standards, codes, and maintenance manual to identify areas where changes could be made to further the implementation of Springfield's goals and policies related to stormwater. A technical memo outlining the results of the code review is included in Appendix F.

1.4 Document Organization

The remaining sections of this Springfield SWFMP are organized as follows:

- Section 2.0 includes a brief summary, including maps, of the characteristics of the City of Springfield study area that are relevant to the storm drainage system.
- Section 3.0 describes the evaluation methods used to develop the flood control elements of the plan.

- Section 4.0 describes the evaluation methods used to develop the water quality elements of the plan.
- Section 5.0 describes the selection and prioritization of management alternatives (i.e., CIPs) that are proposed to address the expected flooding and water quality problems as identified in Sections 3.0 and 4.0.
- Section 6.0 describes a summary of recommendations for changes to stormwater standards and codes.
- Appendices A and B include the hydrologic and hydraulic model results tables.
- Appendix C includes a copy of a technical memo that was prepared by DHI and reviewed by URS. Most of the text from Section 3 was taken from this memo. However, the memo provides more details related to the model methods and issues than was considered necessary for inclusion in the main section of the plan.
- Appendix D includes the unit cost estimates for CIPs.
- Appendix E includes detailed CIP summaries, CIP fact sheets, and CIP figures for the modeled CIPs developed to address the five higher priority flood control CIP locations.
- Appendix F includes a detailed technical memo to outline recommended code changes.

SECTION 2 – STUDY AREA CHARACTERISTICS

This section provides a summary of the citywide study area characteristics relevant to the storm drainage system.

2.1 Study Area Location

The City of Springfield is located in the Upper Willamette Drainage Basin and primarily on the east side of the Willamette River as shown in the vicinity and location maps (Figures 2-1 and 2-2). The city is bound by the Willamette River to the south, the city of Eugene and the Interstate 5 corridor to the west, and the McKenzie River to the north. The study area (i.e., modeled drainage basins) comprises about 25.2 square miles, which includes land both within and outside the city urban growth boundary (UGB). Area outside the UGB was modeled to provide a more accurate estimate of flow conditions affecting the City's stormwater drainage system and allow for planning of areas that may potentially be annexed into the UGB. Of the 16,110 acre study area, approximately 14,449 acres are within the city limits and UGB and 1,661 acres are outside the UGB. Area within the actual city limits is approximately 9,808 acres or 15.3 square miles.

2.2 Rainfall

The average annual precipitation in the City of Springfield is approximately 46 inches. Review of average monthly rainfall over the last 30 years indicates that approximately 80% of the total annual precipitation occurs during the six-month period between October and March. The months of July and August generally have the least amount of precipitation. More information regarding design storm events and rainfall distributions are included in Section 3.

2.3 Topography

Topography in the City of Springfield, within the city limits is relatively flat, but surrounding areas to the south/ southwest and east have relatively steep slopes as shown in Figure 2-3. In general, the study ranges in elevation from approximately 1465 feet to 394 feet above sea level. Elevations in the central part of the city generally range from 400 to 750 feet above sea level. Areas in the central part of the city generally have very low slopes, typically about 0.5 percent. These topographic characteristics including the steep slopes surrounding the City and relatively abrupt grade changes result in multiple capacity constraints with regards to the city's drainage system and overall stormwater conveyance due to insufficient capacity at grade changes and then insufficient grade in the flat areas to obtain capacity to move the flow downstream.

2.4 Land Use and Zoning

Development, specifically the conversion from undisturbed land to developed land uses can significantly affect the quantity and quality of stormwater runoff. Stormwater runoff flows and volumes increase with increased impervious surface, and existing drainage infrastructure is often not sufficient to store and convey the increased runoff.

Existing conditions (2006) land use is shown in Figure 2-4. The dominant existing land use category is low-density residential with commercial development located along the Highway 126 corridor and heavy industrial development located in the north-central portion of the city, along the McKenzie River. Light/ medium industrial development is located along the western portion of the City, and vacant and undeveloped areas are indicated as white in various locations on Figure 2-4. Existing impervious surface coverage is shown in Figure 2-6.

Land use classifications representing planned future conditions or full-build out conditions are shown in Figure 2-5. Future land use categories and coverage is based on the City's 2007 Plan Designation or zoning. Based on Figure 2-5, low-density residential is still the dominant land use category with commercial development primarily along the Highway 126 corridor, and industrial development in the north-central and southwest portions of the City. The primary difference between the existing and future land use maps is that the future development map shows full build-out conditions with no vacant parcels. In addition, per the Figure 2-4 and Figure 2-5 comparison, it appears that some of the areas previously developed as light/ medium industrial mixed use are now planned for light medium industrial only. Table 2-1 summarizes the existing and future land use coverage.

Table 2-1: Existing and Future Land Use Coverage (as % of the total study area)

Land Use Designation	Existing Condition (% total study area)	Future Condition (% total study area)
Agriculture	5.04	5.03
Campus Industrial	1.55	2.31
Commercial	4.06	4.64
Commercial Mixed Use	0.29	1.74
Forest	1.09	0.92
Government/ Education	0.98	1.32
Heavy Industrial	6.59	8.13
High Density Residential	0.75	0.54
Light Medium Industrial Mixed Use	0.55	0.81
Light Medium Industrial	3.76	4.75
Low Density Residential	43.94	51.69
Major Retail Center	0.54	0.97
Medium Density Residential Mixed	0.73	0.35
Medium Density Residential	5.14	6.27
Natural Resource	0.03	--
Nodal Development	0.58	--
Parks and Open Space	2.98	4.83
Rural Residential	0.42	0.57
Sand and Gravel	0.93	0.96
Special Heavy Industrial	0.49	0.43
Vacant (ROW or Undesignated)	19.56	3.75

2.5 Soils

Soil classification is an important variable in determining the flow rate and volume of stormwater runoff generated from an area. The soil type and associated soil characteristics (permeability and runoff potential) control the rate of stormwater infiltration into pervious surfaces. As development increases and less pervious surface is present, the effects of soil type on the overall stormwater discharge flows and volumes is reduced.

The predominant soil types in the City of Springfield are Coburg – Urban Land Complex and Oxley – Urban Land Complex. These soils are classified as hydrologic group C, which is the dominant hydrologic soil group for the City, characterized by slow infiltration rates when thoroughly wetted and soils that are moderately fine to fine in texture. Other soils classified as soil group C that are found in the City include Malabon – Urban Land Complex and Malabon Silty Clay Loam.

There are isolated patches of soils throughout the City classified as hydrologic group B (moderate infiltration rate with moderately fine to moderately course texture) and hydrologic group D (very slow infiltration rate with a permanent high water table, claypan or clay layer near the surface, or shallow soils over impervious surface). Examples of group B soils include the Salem – Urban Land complex and Newberg loam, and examples of group D soils include the Awbrig – Urban Land Complex and Holcomb silty-clay loam.

Isolated patches of soils classified as hydrologic group A (high infiltration rate, well to excessively well drained sands or gravels) are located in the northeastern portion of the City. The dominant group A soil type is the Camas gravelly sandy loam.

For purposes of the hydrologic modeling, an average soil infiltration rate was applied throughout the City. This would be one area of potential model refinement.

2.6 Drainage System

The City of Springfield was divided into 15 primary subbasins for purposes of developing this stormwater facilities master plan (Figure 2-2). One subbasin is located in the City of Eugene, outside of the City of Springfield city limits. Each subbasin was further broken down into catchments for purposes of the modeling effort. These smaller catchments are shown in the more detailed figures in Section 3.0. There are 330 catchments with an average area of approximately 50 acres.

The City's drainage system is comprised of approximately 185 miles of storm sewer and 26 miles of open channel drainage. Approximately 57.6 miles of storm sewer and 22.9 miles of open channel system in the study area were modeled for the stormwater master planning effort (pipe diameters > 24"). Three detention ponds used for flood control were also included in the model. The City's modeled drainage system network is an integrated network of pipe and open channel systems that outfall either directly to the mainstem Willamette or McKenzie Rivers or outfall to a tributary of either of those rivers (Figure 2-7).

Most of the major portions of the stormwater drainage system infrastructure were built during the 1960's and as development increased, the system was retrofit with extensions and additions, but most of the main conveyance system was not upsized to facilitate the increase in flows associated with full build out. Significant build out is still anticipated.

2.7 Water Quality

The Oregon Department of Environmental Quality (ODEQ) has the responsibility of developing water quality standards that protect beneficial uses of rivers, streams, lakes, and estuaries. Once standards are established, the state monitors water quality and reviews available data and information to determine if these standards are being met and water is protected. Section 303(d) of the Federal Clean Water Act requires each state to develop a list of water bodies that do not meet the standards. The list serves as a guide for developing and implementing watershed pollution reduction plans to achieve water quality standards and protect beneficial uses. These watershed pollution reduction plans are referred to as total maximum daily loads or TMDLs.

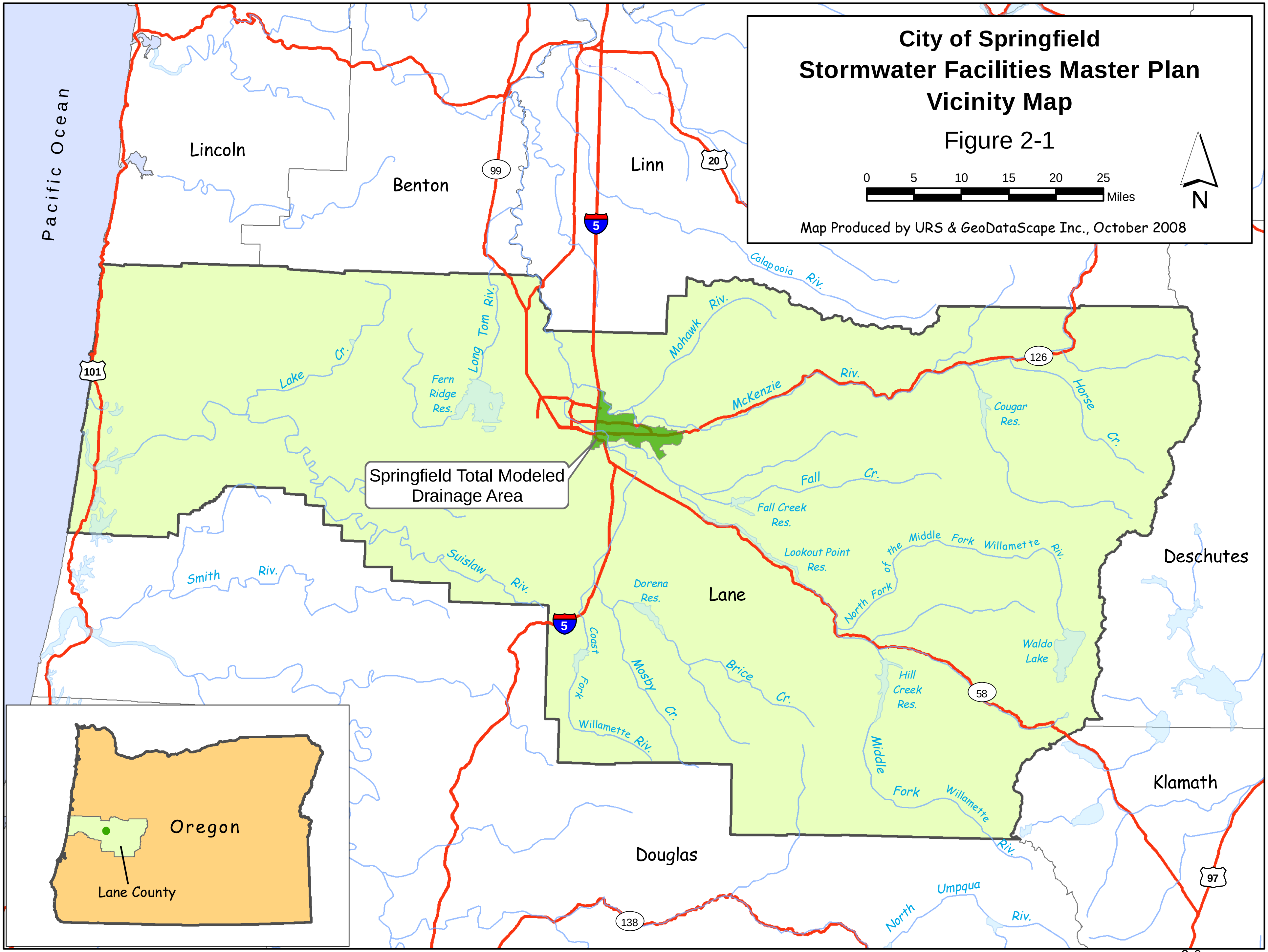
The City of Springfield piped and open channel stormwater conveyance system includes major outfalls that discharge into two primary water bodies: the Willamette River and the McKenzie River. The McKenzie River is a tributary to the Willamette River in the Upper Willamette watershed. In 2006, the Willamette River TMDL was finalized which addresses the parameters of temperature, bacteria, and mercury. The McKenzie River 303(d) listing for temperature was incorporated into the Willamette River TMDL. Wasteload allocations are documented in the TMDL for each parameter with the exception of mercury, which is being addressed by DEQ in a phased approach. During the first phase, DEQ will collect monitoring data for mercury, and in the second phase, DEQ will establish wasteload allocations for mercury specific for the various point and non point source dischargers including the City of Springfield. The City must address TMDLs as part of their Stormwater Management Program and TMDL Implementation Plans.

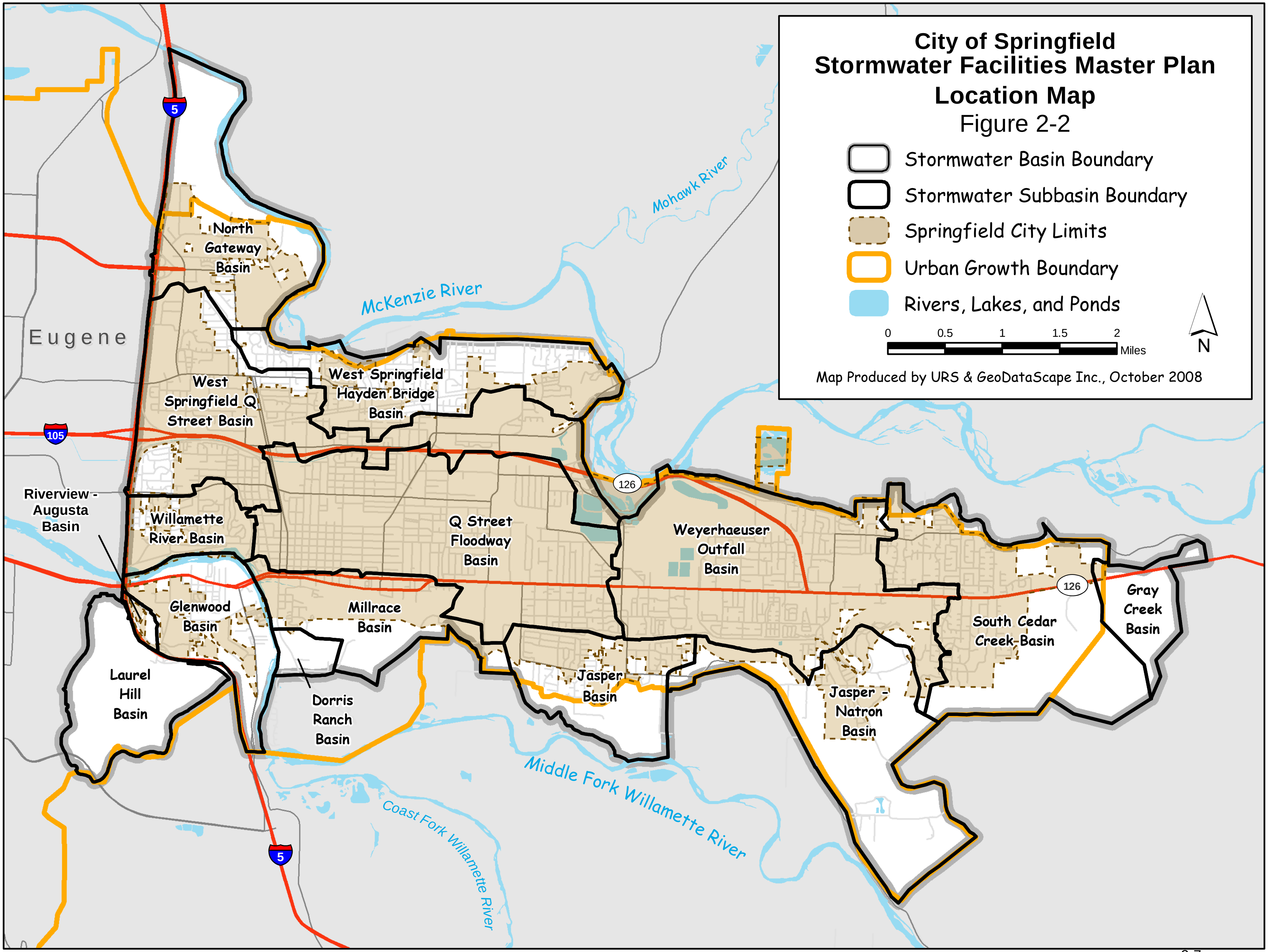
In addition, the City of Springfield operates under a Phase II NPDES Municipal Separate Storm Sewer System (MS4) permit, which requires the City to implement programs in order to address six minimum measures. The six minimum measures are as follows:

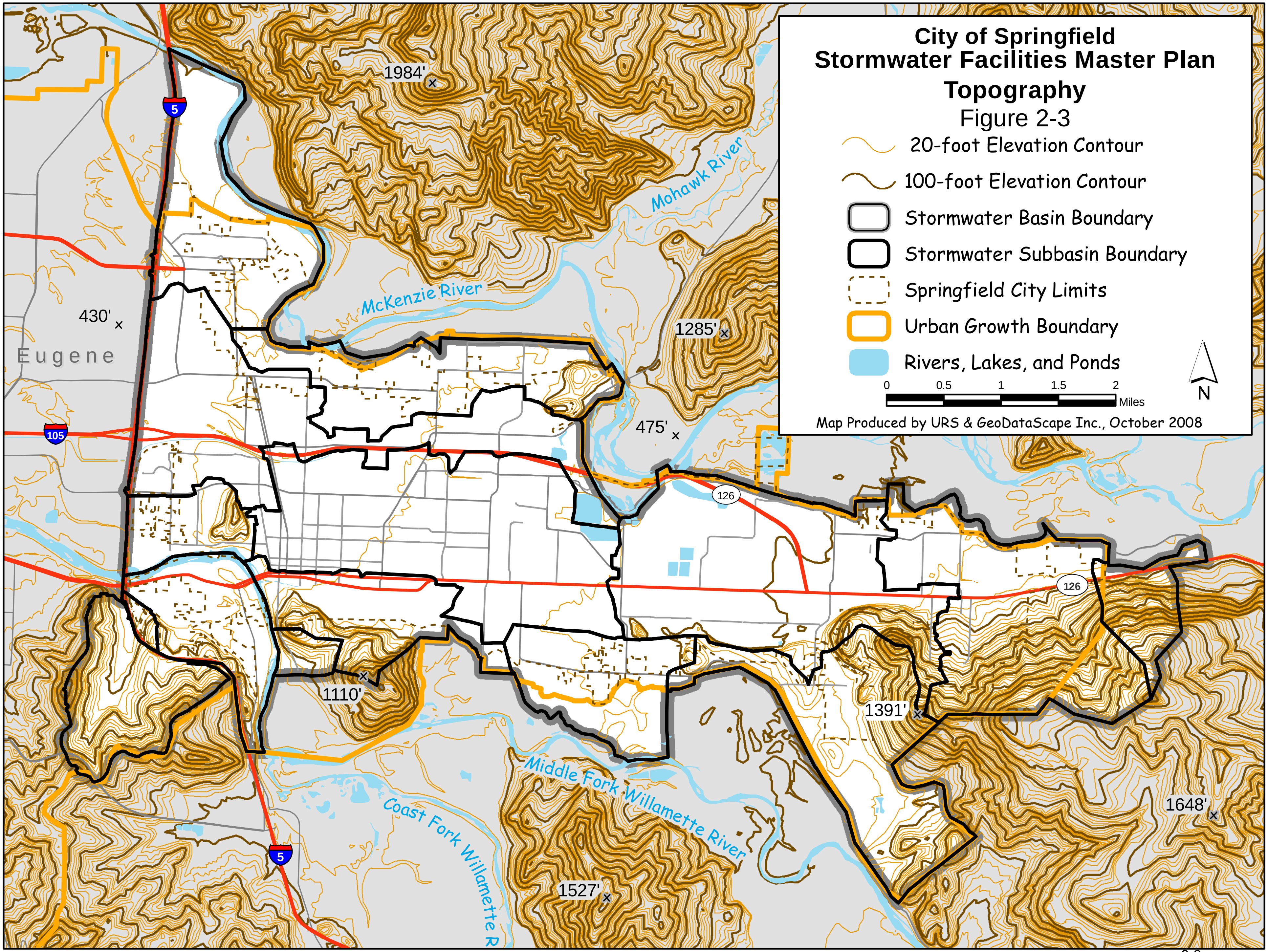
- Public education and outreach on stormwater impacts – This minimum measure requires the City to distribute educational materials to the community or conduct outreach activities about the impacts of stormwater discharge on receiving waters and the actions that the public can take to reduce pollutants in stormwater runoff.
- Public participation and involvement – This minimum measure is related to compliance with State, Tribal, and local public notice requirements when implementing a public involvement/ participation program.
- Unlawful discharge detection and elimination - This minimum measure requires the City to implement an illicit discharge detection and elimination program including education and a process to respond and document complaints related to illicit discharges.
- Construction site runoff control – This minimum measure is related to the development, implementation, and enforcement of a program to reduce pollutants in stormwater runoff associated with land disturbance equal or exceeding one acre.

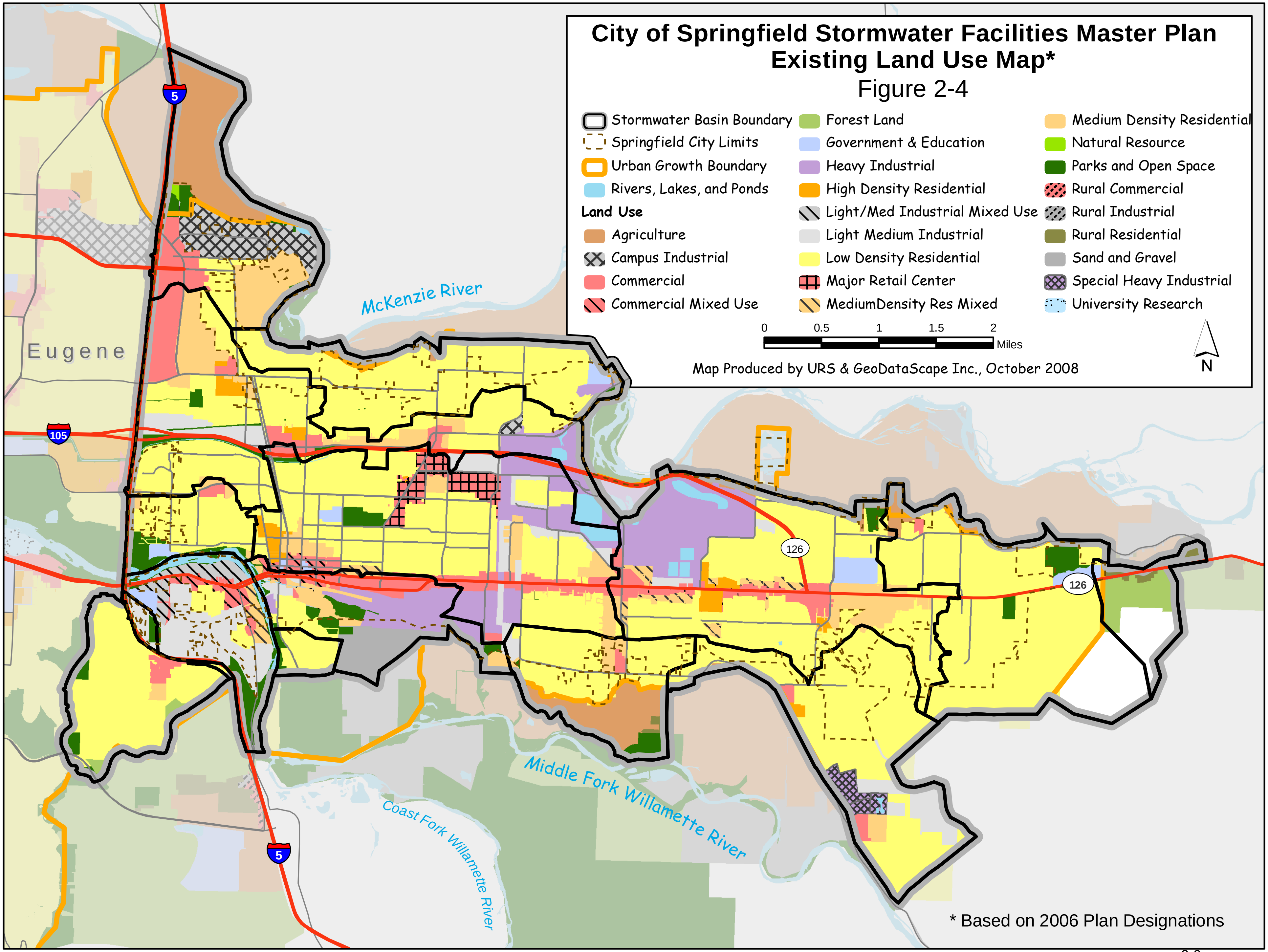
- Post construction runoff control – This minimum measure requires the City to develop, implement, and enforce a program to ensure reduction of pollutants to the maximum extent practicable from new and redevelopment projects. Such program must also include strategies for operations and maintenance and regulatory enforcement.
- Pollution prevention/ good housekeeping – This minimum measure requires development and implementation of an operations and maintenance program (including training) with the ultimate goal of reducing pollutant runoff from municipal operations.

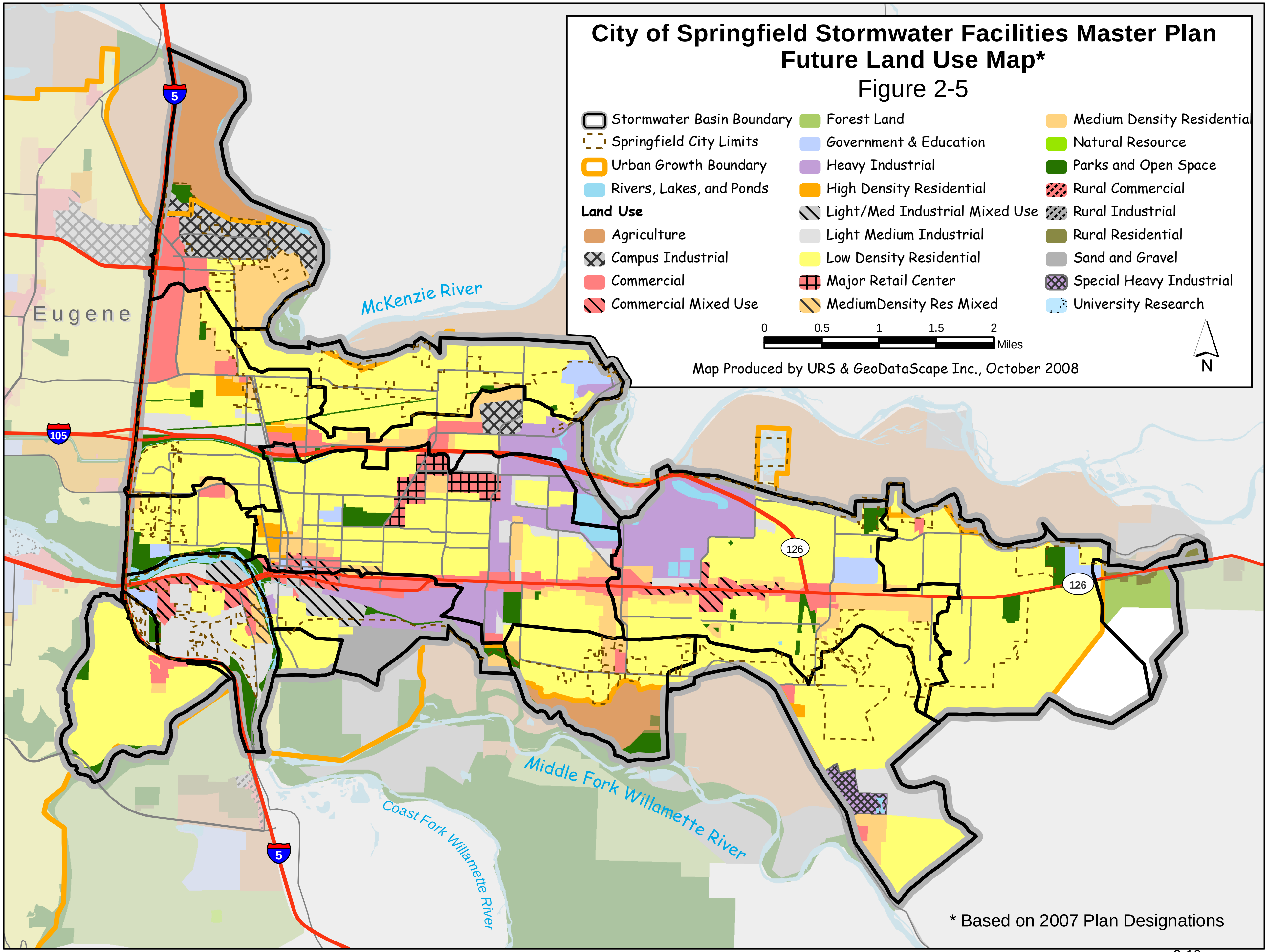
The City developed a Stormwater Management Plan (City of Springfield Stormwater Management Plan, January 2004) which includes best management practices (BMPs) to address each of these measures. In accordance with their Phase II permit, the City must also submit benchmarks, or total pollutant load reduction estimates, for each parameter with an established TMDL and wasteload allocation (WLA) with their next permit renewal application (in 2012). The establishment of benchmarks requires the City to estimate pollutant load generation for the TMDL parameters using land use and BMP drainage areas. Additional detail related to the City’s stormwater goals and policies with respect to their existing Stormwater Management Plan is included in Section 6 and Appendix F.

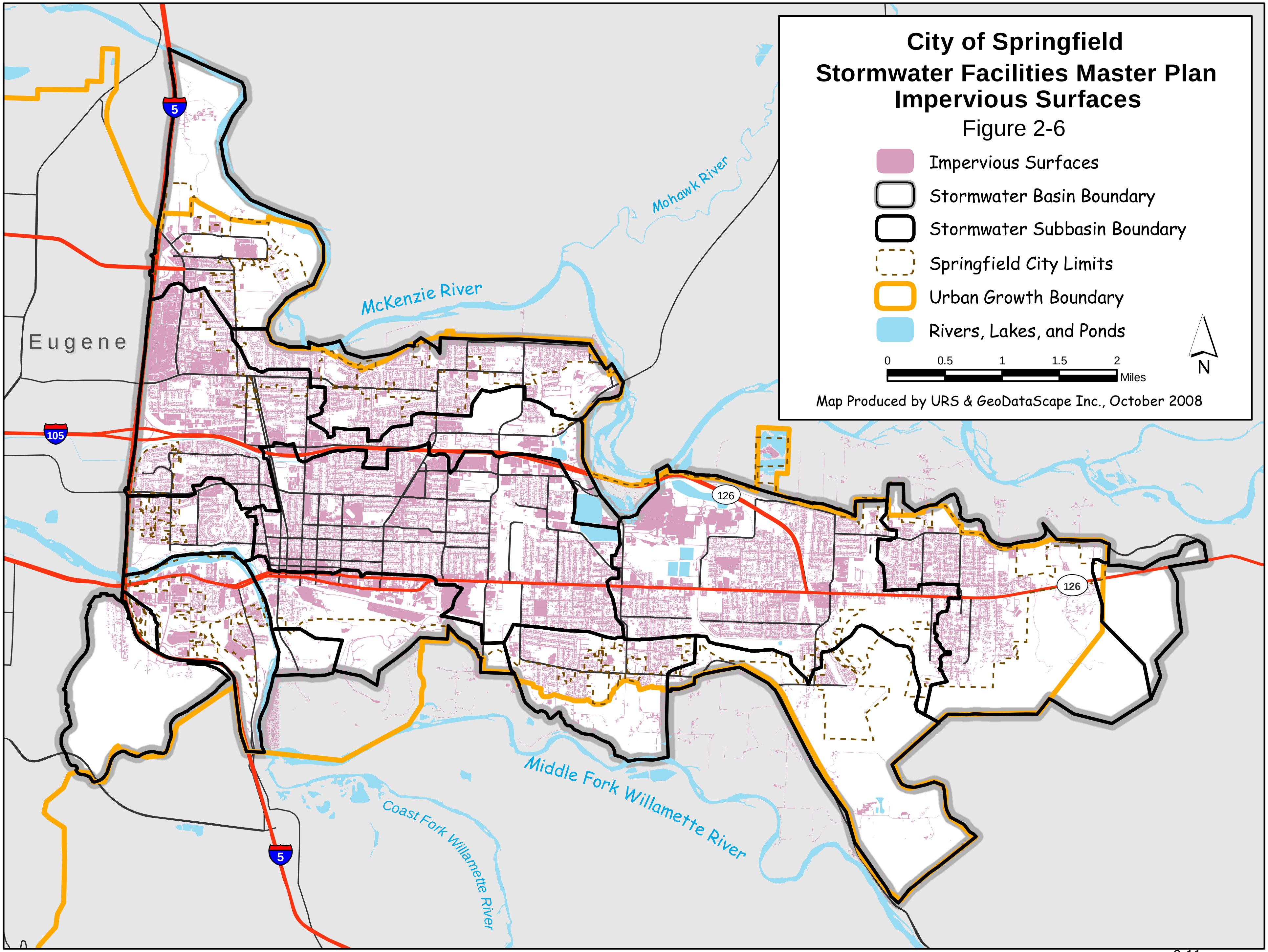

City of Springfield
Stormwater Facilities Master Plan
Vicinity Map
Figure 2-1
0 5 10 15 20 25 Miles
N
Map Produced by URS & GeoDataScape Inc., October 2008
Pacific Ocean
Lincoln
Benton
Linn
Lane
Douglas
Deschutes
Klamath
Springfield Total Modeled Drainage Area
Fern Ridge Res.
Long Tom Riv.
Lake Cr.
Mohawk Riv.
McKenzie Riv.
Calapooia Riv.
Cougar Res.
Horse Cr.
Fall Cr.
Fall Creek Res.
Lookout Point Res.
North Fork of the Middle Fork Willamette Riv.
Dorena Res.
Coast Fork Willamette Riv.
Mosby Cr.
Brice Cr.
Hill Creek Res.
Waldo Lake
Middle Fork Willamette Riv.
Siuslaw Riv.
Smith Riv.
North Umpqua Riv.
101
99
20
5
126
58
138
97
Oregon
Lane County

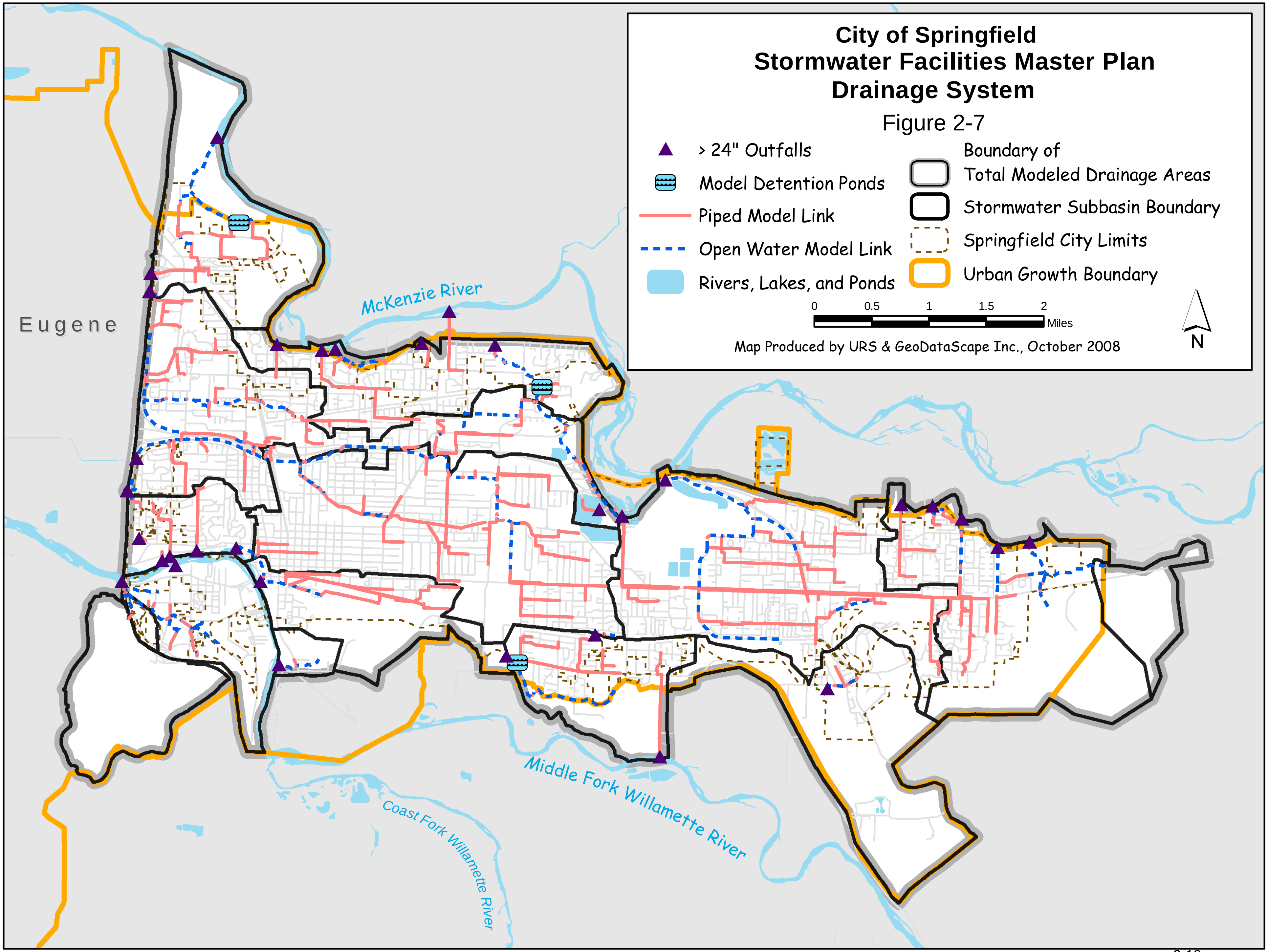

City of Springfield
Stormwater Facilities Master Plan
Location Map
Figure 2-2
Stormwater Basin Boundary
Stormwater Subbasin Boundary
Springfield City Limits
Urban Growth Boundary
Rivers, Lakes, and Ponds
0
0.5
1
1.5
2
Miles
N
Map Produced by URS & GeoDataScape Inc., October 2008
Eugene
McKenzie River
Mohawk River
Middle Fork Willamette River
Coast Fork Willamette River
North Gateway Basin
West Springfield Q Street Basin
West Springfield Hayden Bridge Basin
Riverview - Augusta Basin
Willamette River Basin
Q Street Floodway Basin
Weyerhaeuser Outfall Basin
Glenwood Basin
Millrace Basin
Laurel Hill Basin
Dorris Ranch Basin
Jasper Basin
Jasper - Natron Basin
South Cedar Creek Basin
Gray Creek Basin
5
105
126


City of Springfield
Stormwater Facilities Master Plan
Topography
Figure 2-3
20-foot Elevation Contour
100-foot Elevation Contour
Stormwater Basin Boundary
Stormwater Subbasin Boundary
Springfield City Limits
Urban Growth Boundary
Rivers, Lakes, and Ponds
0
0.5
1
1.5
2
Miles
N
Map Produced by URS & GeoDataScape Inc., October 2008
1984'
Mohawk River
McKenzie River
1285'
430'
Eugene
475'
126
105
5
1110'
1391'
Middle Fork Willamette River
Coast Fork Willamette R
1648'
1527'


City of Springfield Stormwater Facilities Master Plan
Existing Land Use Map*
Figure 2-4
Stormwater Basin Boundary
Springfield City Limits
Urban Growth Boundary
Rivers, Lakes, and Ponds
Land Use
Agriculture
Campus Industrial
Commercial
Commercial Mixed Use
Forest Land
Government & Education
Heavy Industrial
High Density Residential
Light/Med Industrial Mixed Use
Light Medium Industrial
Low Density Residential
Major Retail Center
MediumDensity Res Mixed
Medium Density Residential
Natural Resource
Parks and Open Space
Rural Commercial
Rural Industrial
Rural Residential
Sand and Gravel
Special Heavy Industrial
University Research
0 0.5 1 1.5 2 Miles
N
Map Produced by URS & GeoDataScape Inc., October 2008
McKenzie River
Eugene
Middle Fork Willamette River
Coast Fork Willamette River
5
105
126
* Based on 2006 Plan Designations


City of Springfield Stormwater Facilities Master Plan
Future Land Use Map*
Figure 2-5
Stormwater Basin Boundary
Springfield City Limits
Urban Growth Boundary
Rivers, Lakes, and Ponds
Land Use
Agriculture
Campus Industrial
Commercial
Commercial Mixed Use
Forest Land
Government & Education
Heavy Industrial
High Density Residential
Light/Med Industrial Mixed Use
Light Medium Industrial
Low Density Residential
Major Retail Center
MediumDensity Res Mixed
Medium Density Residential
Natural Resource
Parks and Open Space
Rural Commercial
Rural Industrial
Rural Residential
Sand and Gravel
Special Heavy Industrial
University Research
0 0.5 1 1.5 2
Miles
N
Map Produced by URS & GeoDataScape Inc., October 2008
Eugene
McKenzie River
Middle Fork Willamette River
Coast Fork Willamette River
5
105
126
* Based on 2007 Plan Designations


City of Springfield
Stormwater Facilities Master Plan
Impervious Surfaces
Figure 2-6
Impervious Surfaces
Stormwater Basin Boundary
Stormwater Subbasin Boundary
Springfield City Limits
Urban Growth Boundary
Rivers, Lakes, and Ponds
0
0.5
1
1.5
2
Miles
N
Map Produced by URS & GeoDataScape Inc., October 2008
Eugene
McKenzie River
Mohawk River
Middle Fork Willamette River
Coast Fork Willamette River
5
105
126


City of Springfield
Stormwater Facilities Master Plan
Drainage System
Figure 2-7
> 24" Outfalls
Model Detention Ponds
Piped Model Link
Open Water Model Link
Rivers, Lakes, and Ponds
Boundary of
Total Modeled Drainage Areas
Stormwater Subbasin Boundary
Springfield City Limits
Urban Growth Boundary
0
0.5
1
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Miles
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Map Produced by URS & GeoDataScape Inc., October 2008
Eugene
McKenzie River
Middle Fork Willamette River
Coast Fork Willamette River

SECTION 3 – FLOOD CONTROL STUDY METHODS AND RESULTS

This section describes the study methods and results related to evaluating the City's storm drainage system with respect to capacity. The bulk of this section is represented by Section 3.1, which provides detail related to the hydrologic\hydraulic modeling methods and process. Section 3.2 provides a description of the design storms selected to run the model and summary tables of model results.

3.1 Flood Control Modeling Methods

MIKE URBAN is a hydrologic/hydraulic model developed by the Danish Hydraulic Institute (DHI). This model was selected for analyzing the capacity of the City's drainage system. It is a complete urban water modeling system that is fully integrated with GIS. As described in the introduction, this model was selected by the City due to model capabilities (hydrologic, hydraulic, and GIS interface), staff familiarity with the model, and consistency with the City's modeling software used to evaluate Springfield's sanitary collection system. For the current project, the MOUSE engine was used to provide a detailed hydrodynamic solution for pipeflow and rainfall-runoff within the MIKE URBAN framework.

MIKE URBAN requires information describing both the physical system (e.g., pipe network, open channels, manholes, outlets) and the hydrology of the study area (e.g., basin boundaries, soil characteristics, etc). Each of the input data items are described in more detail in the following subsections with respect to the model that was developed for Springfield. In addition, the following subsections describe the development of the existing and future conditions models; the methods for developing flood maps; and the model validation process. Design storm selection and model results are then presented in Section 3.2.

3.1.1 GIS Data Used in Model Development

The following GIS shapefiles from the City were used as the basis for creating the City of Springfield Stormwater MIKE URBAN hydraulic model:

- stm_model_lines_03312006.shp: This shapefile includes the pipes in the City's storm drainage system.
- stm_model_nodes_03312006.shp: This shape file includes manholes and points where pipes connect to ditch and open waterway systems.
- stm_model_waterways_08212006.shp: This shapefile includes the open channels and waterways that are part of the City's storm drainage system.
- xsections_model_08242006.shp: This shapefile includes the locations of cross-sections along the waterways.
- Sf_stm_basin_ply.shp: This shape file includes the catchment areas delineated by the City.
- Spfd_impervious.shp: This shape file includes the impervious surfaces delineated within the City

- Lot_tax.shp: This shape file includes the plan designations (zoning) for each tax lot.
- Lot_use.shp: This shape file includes the existing land use per tax lot in 2006.

In addition, in order to develop the cross sections of the waterways, the Excel spreadsheet xsections_model_08242006.xls was used. This file was developed by the City and contained survey information regarding the location of each cross section along a reach and the geometry (the horizontal location along the line of the cross section and the associated depth) of the cross section. A Digital Elevation Model (DEM) providing topography and aerial photographs were also used to provide general information about the study area. Lastly, a variety of hand written notes from City staff that are familiar with the system were reviewed and noted characteristics of the system were incorporated into the model especially with respect to how various pipe and waterway segments are connected to each other.

Once all the information was imported into MIKE URBAN, a quality check was conducted to compare the data against the data sources. This quality check was completed by drawing longitudinal profiles of the system and hand checking the inverts, pipe sizes, manhole depths, rim elevations, etc. against the raw data. There were often inconsistencies when comparing data sources. For example, invert elevations from the pipe data did not always match inverts from the cross section data at the same location. If there was an inconsistency between the data sources, priority was given to assigning elevations as follows:

1. Hand written notes from City staff (based on field knowledge and field checks)
2. Cross section data
3. Pipe data
4. Manhole data

The City's shapefile sf_stm_basin_ply.shp was imported to create the City of Springfield Stormwater MIKE URBAN hydrologic model. The delineated stormwater catchments that were provided by the City were further divided and refined based on network topology and surface topography. The purposes of further refining the catchments were to more accurately route runoff and ensure that all runoff was represented in the modeled network, to create smaller catchments to better reflect flows in the system; and to distribute the inflow to the appropriate manholes/model input points.

During model development, significant issues were encountered with some of the data. Examples include issues associated with naming conventions, missing inverts, and GIS inconsistencies. A detailed description of these issues and how they were addressed are provided in DHI's technical memo provided in Appendix C.

3.1.2 Rainfall Data

With respect to rainfall data, both a real and a synthetic storm were initially used to evaluate the system. These storms included the following:

- November 1996 real storm event. Hourly data records of accumulated rainfall depth (see Figure 3-1) were used in the model. Total rainfall depth reached 7.7 inches over a 48-

hour period. (Data obtained from the National Weather Service from the rain gage located at the Eugene Mahlon Sweet Field Airport).

- 10- Year, 24-hour SCS Type 1A storm distribution with a rainfall depth of 4.3 inches (see Figure 3-2).

Figure 3-1 November 1996 Storm Event, Rain Intensity (inch/hour)

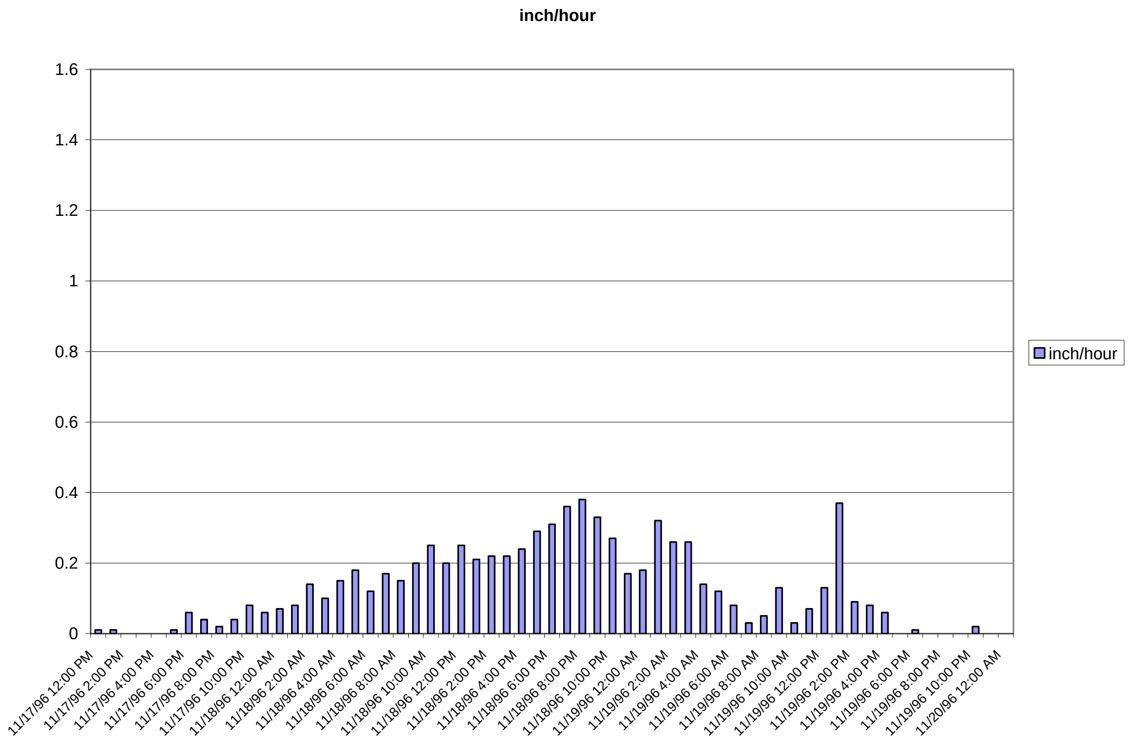
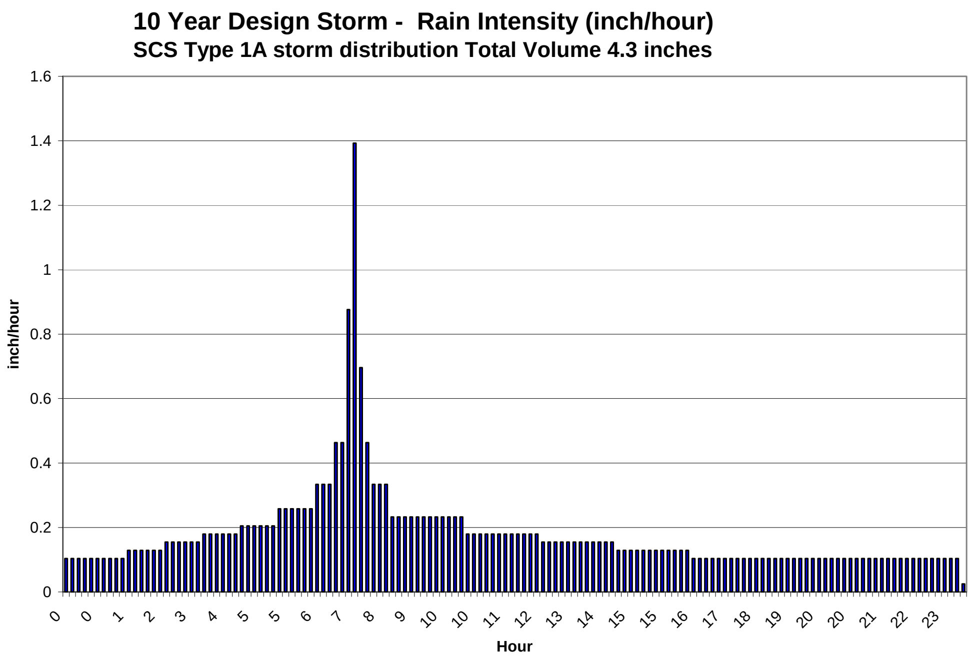


Figure 3-2 10 year Design Storm Event, Rain Intensity (inch/ hour)



Following the model validation process and based on a review of model results from the above storm events, a decision was made regarding the design storm events that should be used to produce the model results tables provided in this plan (Appendices A and B). How this decision was made, and the selected design storm events are described in Section 3.2.1.

3.1.3 Pipe Data

The pipe data was taken from the City’s shapefile with modifications made as described in Section 3.1.1, specifically based on hand written notes from the City and based on connecting pipe data with the cross-section data. Given the master planning level scope of this project, the model was limited to pipe sizes of 24” diameter and greater.   Smaller sized pipes were only included if they were located downstream of 24” diameter or larger pipes. Some pipes had noncircular cross sections. These cross sections were created in Excel and imported to MIKE URBAN (e.g., arch pipes).

Pipe material was assigned to each pipe segment, if available in the pipe database. Based on the material, a roughness value, Manning’s number (n), was assigned to each pipe. These values are provided in Table 3-1.

3.1.4 Open Waterway Data

The open waterway cross sections were edited and refined prior to importing the data into MIKE URBAN. These edits and refinements included the following:

- Some reaches were merged to reduce unnecessary detail in the model.

- Some reaches were split to account for connections with other systems.
- Default cross-sections were assigned where necessary.
- Inverts were checked for consistency when open channel and pipe sections connected.

More detail regarding the above edits and refinements is provided in Appendix C.

Once the links were edited and refined, each waterway was given a roughness value (i.e., a Manning's n) of 0.04. When waterway links were modified as a result of modeling conceptual CIPs, the Manning's n was increased to 0.08 to account for the likelihood of riparian vegetation enhancement in association with modifying the channel to obtain the appropriate permits. The following table provides a summary of the material and roughness values that were used in the model for pipes and waterways.

Table 3-1: Link Type and Associated Manning's n Values

Material/Link Type	**Manning (n)**
ADSP	0.0130
Cast Iron (CAS)	0.0130
Concrete (CON)	0.0130
CONCOR	0.0130
Concrete (Rough)	0.0147
Concrete (Smooth)	0.0118
Concrete Wooden Forms (CONWOO)	0.0130
COR	0.0130
Ductile Iron (DI)	0.0130
Generic Pipe	0.0130
Generic Waterway	0.0400
PVC	0.0130
STEEL	0.0130
Wood (WOO)	0.0130
WOOPOL	0.0130
Modified Waterway	0.08

3.1.5 Existing Conditions Hydrologic Model

The necessary hydrologic model data for each catchment consists of the following: name/ID, area, impervious area, slope, length of flow path, and infiltration information. These model input parameters were developed as follows:

1. Catchment ID: A unique field was created for the catchment ID which is the concatenation of the original ID field present in the shapefile and the FID field, which is an automated field of unique values, inherent to the shapefiles structure.

2. Catchment Area and Impervious Area: The area, perimeter, and associated impervious area for each catchment were calculated in ArcGIS. The existing impervious area was

based on the spfd_impervious.shp shapefile provided by the City. The following equation was used to calculate the percentage of impervious area for each catchment:

- PERCENT_IM = (IMPERV_SUR/ACRES)*100
- Where:
    i. IMPERV _SUR – represents the area of impervious surfaces in acres
    ii. ACRES – is the area in acres of each catchment
    iii. PERCENT_IM – is the percentage of impervious area in each catchment

3. Slope:
The slope of each cell of the DEM was calculated using ArcGIS Spatial Analyst's Slope command. The result of this process is referred to as the Slope GRID. The mean slope for each catchment area was then calculated by applying the ArcGIS Spatial Analyst Zonal Statistics command on the Slope GRID, which creates several statistics for a given area (catchment).

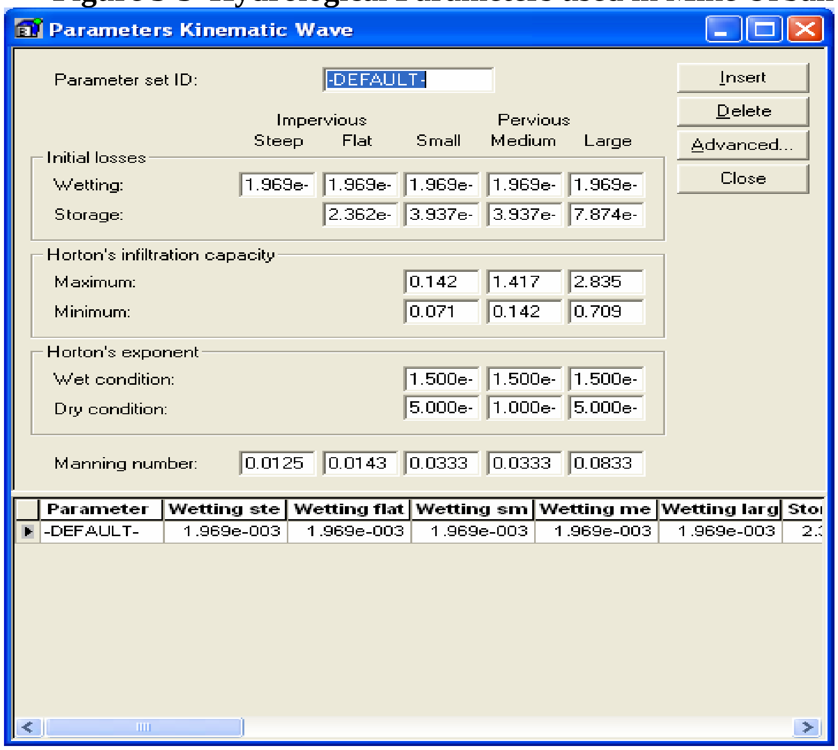
4. Length of Flow Path: The length in Model B (a Kinematic Wave rainfall-runoff model) describes the length of the conceptual catchment flow path. In most cases, the length was automatically calculated using the area divided by the perimeter multiplied by 4, assuming circular shaped areas. Lengths for areas that have special shapes were estimated manually. The same was true for catchments where the inflow manhole was placed far from the center of the polygon. For circular shaped areas, the following equations were used to calculate the length, where "r" is the estimated radius of the circular catchment area:

- Area = pi * r^2
- Perimeter = 2 * pi * r
- 4 * Area / Perimeter = 4 * (pi * r^2) / (2 * pi * r) = 2 * r = Diameter (or flow path)

5. Hydrological Model Parameters: For assigning infiltration rates using Model B (a Kinematic Wave rainfall-runoff model) of MIKE URBAN, the surface areas are classified into to two groups; impervious and pervious. For the impervious areas (rooftops, roadways, etc.,) the key factor effecting the rate and volume of runoff that would occur is slope. Consequently areas in this group are classified as either being steep or flat. For this study, the percent steep impervious area was calculated by assuming that areas with slope greater than 20 % are considered steep. The remainder of the modeled impervious area is considered flat. The model treated these two areas differently in terms of initial losses as shown in Figure 3-3.

For the pervious areas, the key factor effecting the rate and volume of runoff is the soil type. The pervious areas are classified according to their permeability as having either slow, medium or fast infiltration rates. The slow, medium, and fast infiltration rates equate to the parameters of "small", "medium", and "large" in the model. All soils for Springfield were classified as "medium" and the MIKE URBAN default hydrological model parameter set was used along with the Runoff Model B concept for these areas. This assumption may be refined and other soil types accounted for with future modifications to the model. Figure 3-3 shows a screen shot of the overall hydrologic parameter values used for the system.

Figure 3-3 Hydrological Parameters used in Mike Urban



3.1.6 Development of Flood Maps

When the existing conditions model was completed, the model was run with both the November 1996 storm and the SCS 10-Year, 24-hour storm in order to see where the model was predicting capacity deficiencies in the system. Maps were produced to highlight areas where flooding is anticipated to occur for the selected design storms. Figure 3-4 and 3-5 show the system characteristics when flooding occurs.

Figure 3-4 shows the maximum water level (in red) along a defined profile for a piped section of the model. A link is defined from an upstream node/manhole to a downstream node/manhole. In this figure, flooding is occurring in the first few pipe sections, as the maximum water level is shown to exceed the elevation of the manholes rims. Water has exited the system and is discharged to the ground surface. The water is not lost from the model; the discharge volume will re-enter the system once sufficient capacity is again reached. A piped system was not identified as flooding when surcharging; flooding was only identified for the system when water comes out of the manholes and onto the ground surface.

Figure 3-4 Hydraulic Profile for Piped System during Flooding Conditions

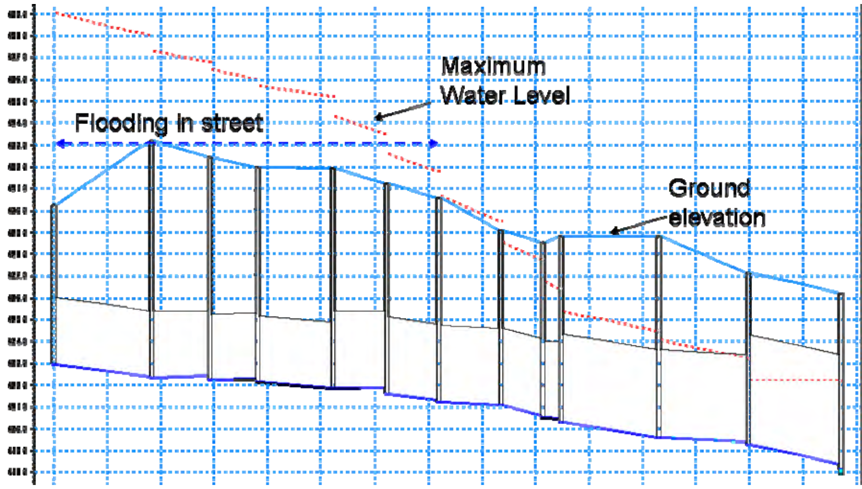
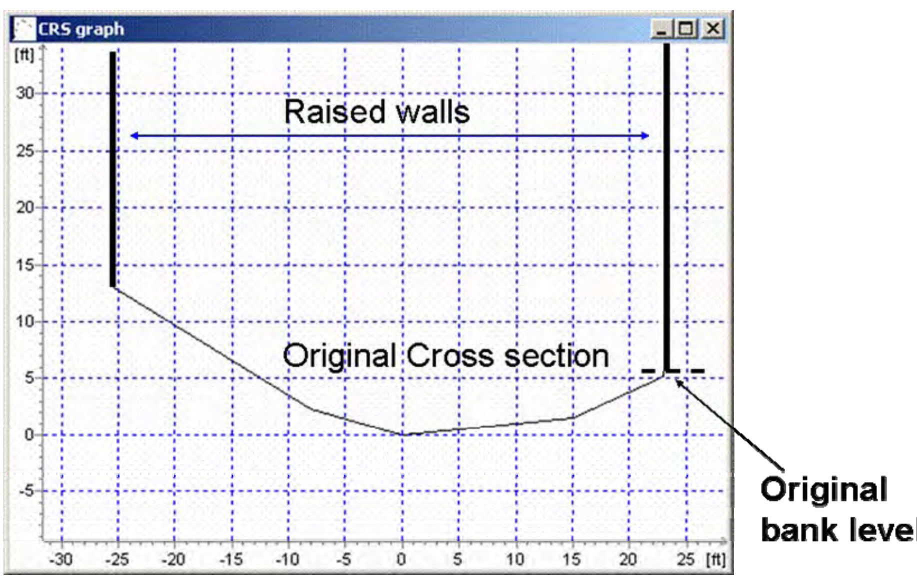


Figure 3-5 shows a typical cross section used in an open waterway (open channel) link. Typically, for the open waterway systems, there are several cross sections that comprise the waterway link. Flooding occurs when the water level in the link exceeds the original bank levels of the cross section. However, in the model, the walls of some of the waterways were raised on both sides of the channel up to a certain level (typically 25 ft over the bottom elevation used in the model). This was necessary (using the current version of MIKE URBAN) in order to keep the simulation running and to prevent the water from being lost from the model in cases where water went above the top of the channel banks. Model results were then compared to the original cross section data to determine whether flooding in fact occurred for that particular link.

Figure 3-5 Typical Cross Section Along a Waterway Used in the Model



In order to identify and display the flooding results, the following steps were taken following model simulation:

- To better assess the open waterways, the maximum water level (HGL) for each computational grid point* in the model was extracted from the results file and compared with the original bank level (Figure 3-5) of the actual cross section. Flooding was identified as occurring when the maximum water level exceeded the minimum top of bank.

  * Computational grid points are the open waterway cross sections located within and at the upstream and downstream ends of the link. Hydraulic results are provided from the model not only for the beginning and end of each link (which are computational grid points), but also for each location where a cross section occurs in the link (computational grid points).

- The flooding results were then displayed on maps using ArcGIS for both waterways and pipes. Flooded segments are shown in red. For open waterway links, this means that if any computational grid point along the link is flooded, then the entire link is shown as flooded on the map. Segments that were not identified as flooded are shown in green. For an open waterway link, this means that none of the computational grid points along the link are flooded.

3.1.7 Validation of the Existing Conditions Model

As there was limited flow data available for conducting a model calibration, the model validation consisted of a comparison of modeled results for existing conditions with field observations of flow levels from a significant storm event that generated flooding conditions in November of 1996. The November 1996 storm was selected as the storm for comparison by the City since they had the most on the ground observations recorded for this event, and it was the largest event in memorable history for City staff.

A first round of validation results was reviewed by the City. After reviewing the model results and flood map generated from the November 1996 storm event, the results were compared with field observations from the November 1996 storm, and the following adjustments were made to the model:

- The model was adjusted geometrically at selected locations (per hand written notes and drawings provided by the City). These revisions included adjustments to some system dimensions and elevations at select locations in accordance with field data or new information provided by the City.
- The following detention/storage basins were added and/or adjusted in the model: Amberside Pond, Jasper Pond and the Corporate Pond. Geometry and functional data for the basins were interpreted from drawings provided by the City.
- External boundary conditions were added to some of the system outfalls. The water levels were either determined from field measurements or from City in-house knowledge.
- Some catchments were modified or further divided in order to better represent the flow distribution in the model.
- Some catchments were disconnected from the model, as they were determined not to be contributing flows to the modeled system.

- Five new catchments in the Laurel Hill area were added to the model in order to account for flow coming from the City of Eugene and draining to the southwestern portion of the Glenwood storm water system.
- A new catchment was added to the Gray Creek waterway at the far eastern portion of the City to account for drainage coming from outside the Urban Growth Boundary (UGB).*
- New catchment areas were delineated in the Jasper Natron area.*
- For the new and modified catchments, the hydrologic model input parameters were recalculated (i.e., area, impervious area, slope, etc.).
- For the new and modified catchments, an appropriate connection node was assigned in the model. Wherever necessary, some catchment connections were also relocated due to geometrical changes to the system.

* Note: For the starred bulleted items above, these changes were actually made when more detailed review of the model was conducted in order to use the model to evaluate capital improvement projects. The flood map shown in Figure 3-8 does not incorporate these catchment area changes.

An overview of the model adjustments is provided in the following two figures (Figures 3-6 and 3-7).

Figure 3-6 Model Adjustments Conducted as a Result of the Model Validation Process

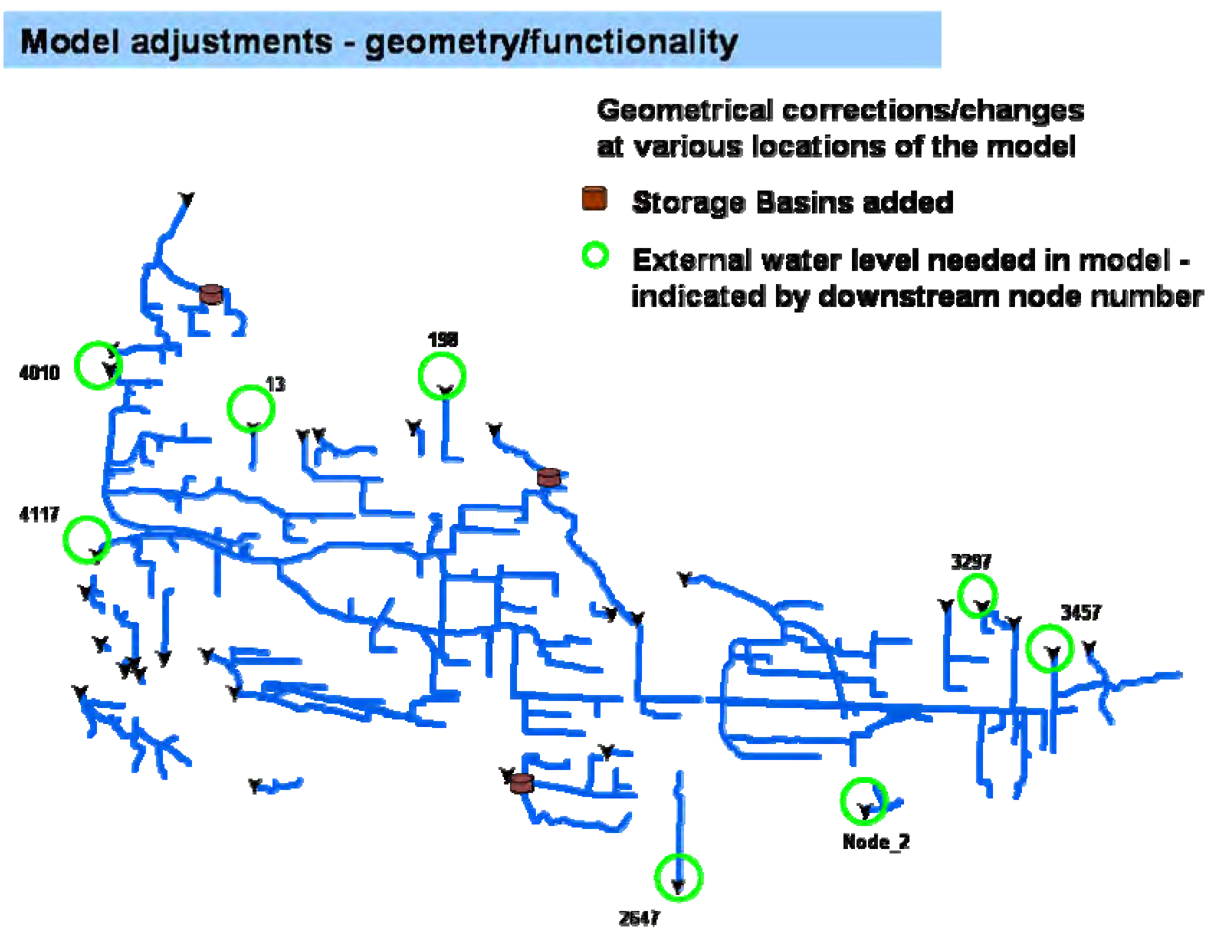
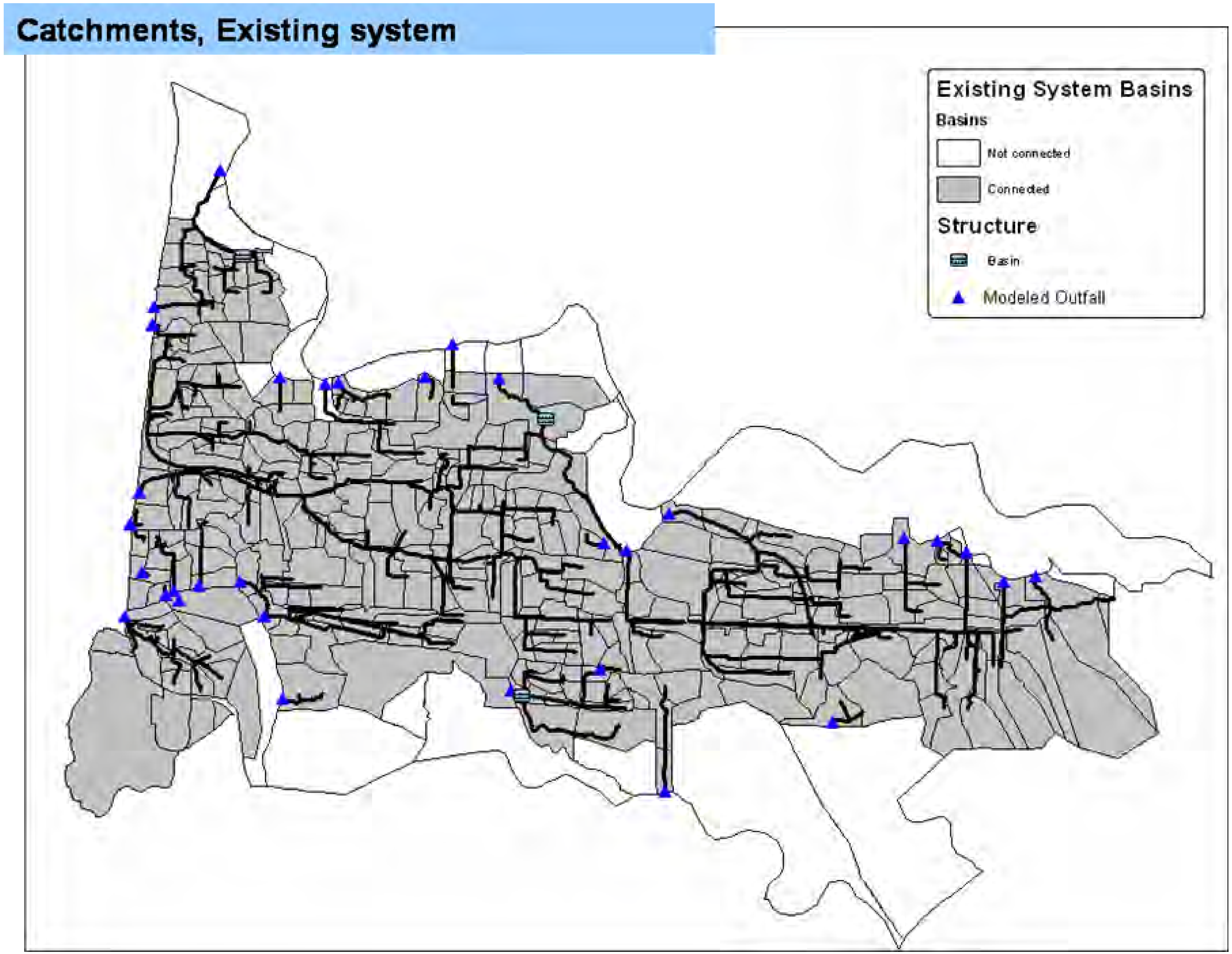


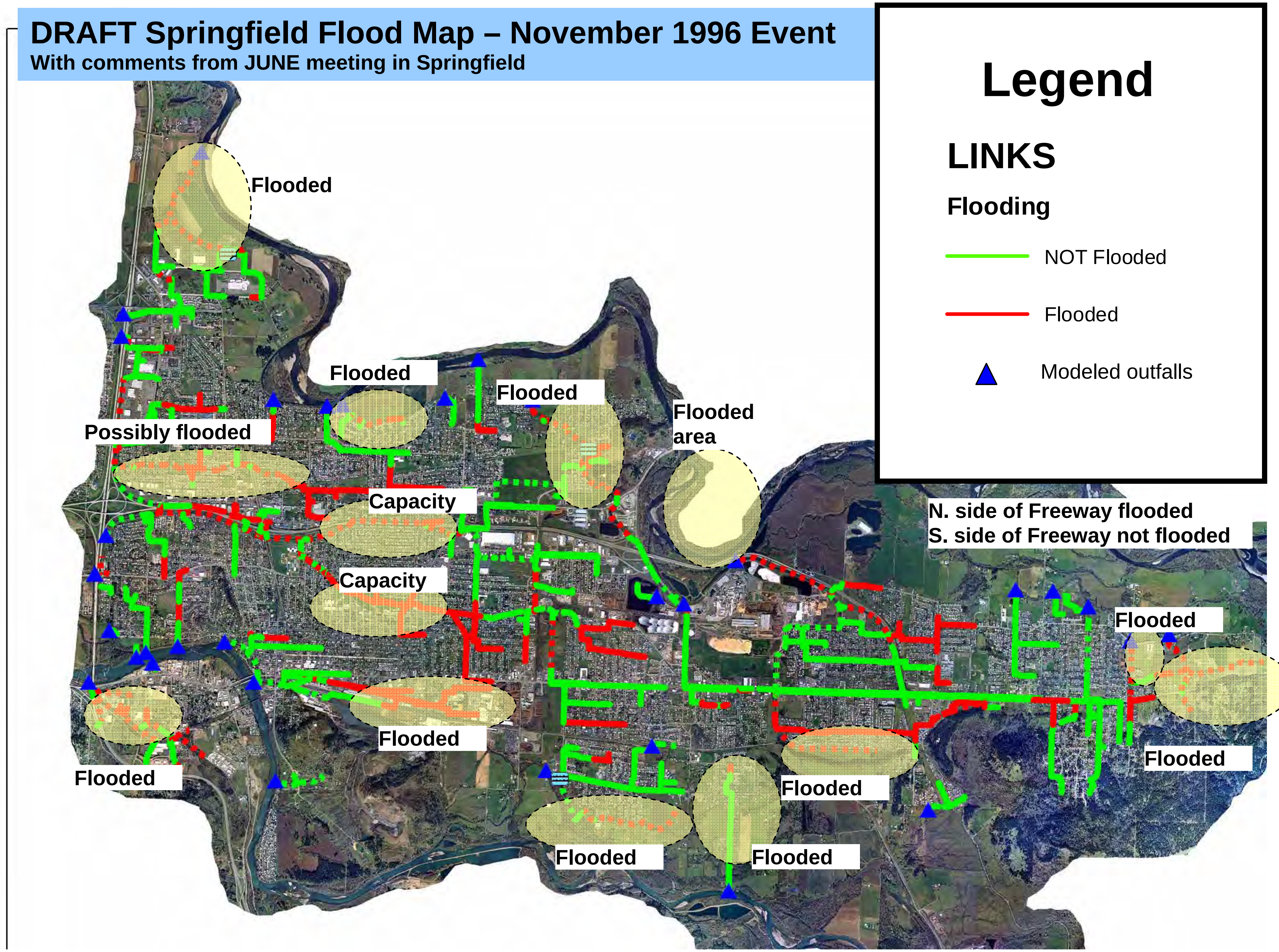
Figure 3-7 Catchments (in gray) Reflecting Model Adjustments Made as a Result of the Model Validation Process



Once the model validation process was completed, the November 1996 storm event was simulated in the model, and the flooding results were mapped. The flood map below illustrates the model projected flooding problems along with areas that were reported by the City to have flooded during this event (Figure 3-8). The revised model produced flooding results that were generally consistent with the City's field observations, and thus were considered by the City to be acceptable. The future conditions model was then developed.

The model validation process was valuable in ensuring that the model was predicting flooding in areas that were consistent with where field staff have encountered flooding issues. In addition, it allows the model to be used as a tool for predicting the relative severity of flooding problems when the specific problems are compared to each other (i.e., which locations are anticipated to have the worst problems). However, flow monitoring is recommended in order to actually calibrate and verify the model with measured flows as opposed to anecdotal information. This will be especially important when the model is used to assist in the design of CIPs. For example, if the model is slightly over conservative, a good calibration can result in significant cost savings in CIPs (potentially in the millions of dollars). If the model is under predicting flows, then flooding and property damage may occur more frequently than anticipated. While flow monitoring costs typically are in the tens of thousands of dollars range, these flow measurements and calibration are considered to be highly worthwhile when compared to potential cost savings, and they are recommended as a part of this plan.

Figure 3-8 Flood Map – November 1996 Storm Event, Observed Flooding Circled and Mapped with Model Estimated Flooding Results



3.1.8 Development of the Future Condition Hydrologic Model

Following the completion of the model validation process for the existing conditions model, the model was adjusted to account for future conditions. The only difference between the existing and future model is the impervious percentage area used for each catchment. In order to estimate the impervious area for each catchment under the future condition, the following process was followed:

1. Project a Future Impervious % for the **Vacant Areas** within Each Catchment:

    - Identify Vacant Areas Slated for Future Development: The lot_use shape file was overlayed onto the catchment areas shape file. For each catchment area, the vacant areas (from the lot_use shape file) were identified.

    - Identify the Future Land Use for the Vacant Areas: The vacant areas were then overlayed with the Plan Designation shape file (PlanDes.shp) in order to predict the type of development anticipated to occur on the vacant lands. The plan designation shape file includes 25 plan designation use codes.

    - Assign an Impervious Percentage to Each Future Land Use Category: For each of the 25 plan designation use codes, a future percent imperviousness was assigned. In order to develop and assign these future impervious percentages, an analysis of the existing impervious percentages by plan designation use code was conducted. The results are provided in Table 3-2 at the end of this subsection. For each plan designation use code, the city-wide actual existing impervious percentage was calculated using GIS, then the plan designation use codes were sorted into six categories: 1) outside UGB, 2) residential, 3) high density residential, 4) commercial, 5) industrial and 6) open space. Given the expectation that development densities would increase in the future, the projected impervious percentages were subjectively estimated to be somewhat higher than the actual existing average impervious percentages calculated for each of the six categories of plan designation use codes.

    - Develop an Area-Weighted Impervious Percentage for Vacant Lands: The projected average impervious percentages from Table 3-2 were assigned to the plan designation use codes within the vacant areas. An area-weighted impervious percentage was then developed for the vacant area within each catchment area.

2. Calculate the Actual Existing Impervious % for the **Non-Vacant Areas** within Each Catchment:

- Develop an Impervious Percentage for the Non-Vacant Lands: Existing condition impervious percentages were originally calculated for each catchment to include vacant area. For the future condition, because percent impervious values for the vacant areas were calculated separately under step 1 (above), a revised percent impervious for each catchment excluding vacant areas was calculated. The impervious areas from the spfd_impervious.shp file were used to calculate the impervious percentages for only the non-vacant areas in each catchment.

3. Develop an Overall Area-Weighted Impervious Percentage for Each Catchment Area:

   - An overall area-weighted impervious percentage was calculated for each catchment based on: 1) the projected future impervious percentage for the vacant lands, and 2) the actual existing impervious percentage for the non-vacant lands. The calculation that was conducted for each catchment is as follows:

     A = % Impervious for the vacant area in the catchment (calculated as described under step 1, bullet #4 above).

     a = The area of vacant land within the catchment (as described under step 1, bullet #1 above).

     B = % Impervious for the non-vacant area in a catchment (calculated as described under step 2 above).

     b = The area of non-vacant land within a catchment (as described under step 2 above).

     Overall Future Impervious % for the Catchment = [(A x a) + (B x b)]/(a+b)

In a few cases, the projected future impervious percentage that was calculated for a catchment was smaller than the actual existing impervious percentage. This was due to the fact that in some cases there was a significant amount of impervious area already located within lands designated as vacant. These impervious areas already covered more area than anticipated based on projected impervious percentage associated with the plan designation use codes. When the projected future impervious percentage was smaller than the existing impervious percentage, the existing impervious percentage (i.e., the larger number) was used in the model for the future conditions scenario.

Table 3-2: Estimates of Impervious Percentage's for Future Plan Designation Land Use Categories

Plan Designation Use Code	Plan Designation Use Description	City-Wide Actual Existing Impervious Area in Acres	City-Wide Total Area in Acres	Existing % Impervious	Assigned General Land Use Category	Existing Avg. % Impervious for Each General Land Use Category	Projected Average % Impervious for Each General Land Use Category
No Use Code	Area outside of the UGB (no plan des.)	0.91	2808.23	0.03%	Outside UGB	0%	2%
V	Vacant	*	*	*			
D	Residential, duplex	120.6	307.66	39.20%	Residential	30%	35
E	Education	99.63	309.59	32.18%	Residential		
J	Religious	46.05	132.1	34.86%	Residential		
N	MH on a single lot	90.63	354.39	25.57%	Residential		
S	Residential, Single Family	1059.71	3655.51	28.99%	Residential		
Z	Roads	41.72	164.06	25.43%	Residential		
K	MH in a park	116.39	220.3	52.83%	High Density Residential	51%	55%
M	Residential, Multi-Family	137.88	271.71	50.75%	High Density Residential		
Q	Residential, Group Quarters	3.87	7.21	53.68%	High Density Residential		
Y	Alley Ways, Walkways, Bikepaths	6.97	17.17	40.59%	High Density Residential		
F	Transportation Related	17.58	39.83	44.14%	Commercial	47%	60%
G	Government	34.99	324.19	10.79%	Commercial		
H	Wholesale Trade	46.58	86.86	53.63%	Commercial		
L	Recreation	16.05	49.68	32.31%	Commercial		
O	General Services	193.08	327.51	58.95%	Commercial		
R	Retail Trade	305.62	465.9	65.60%	Commercial		
B	Railroad	10.29	85.89	11.98%	Industrial	30%	45%
C	Communication	1.65	13.91	11.86%	Industrial		
I	Industrial	401.76	1212.71	33.13%	Industrial		
U	Utilities	27.97	171.38	16.32%	Industrial		
A	Agricultural	49.6	3501.39	1.42%	Open Space	2%	2%
P	Parks	20.46	469.74	4.36%	Open Space		
T	Timber	3.1	510.25	0.61%	Open Space		
W	Water	3.47	271.65	1.28%	Open Space		

* The vacant lands were removed from this analysis of existing impervious percentages.

3.2 Model Results

This section includes a summary of the design events selected for evaluating the system along with maps of the modeled system and a summary of the model results files.

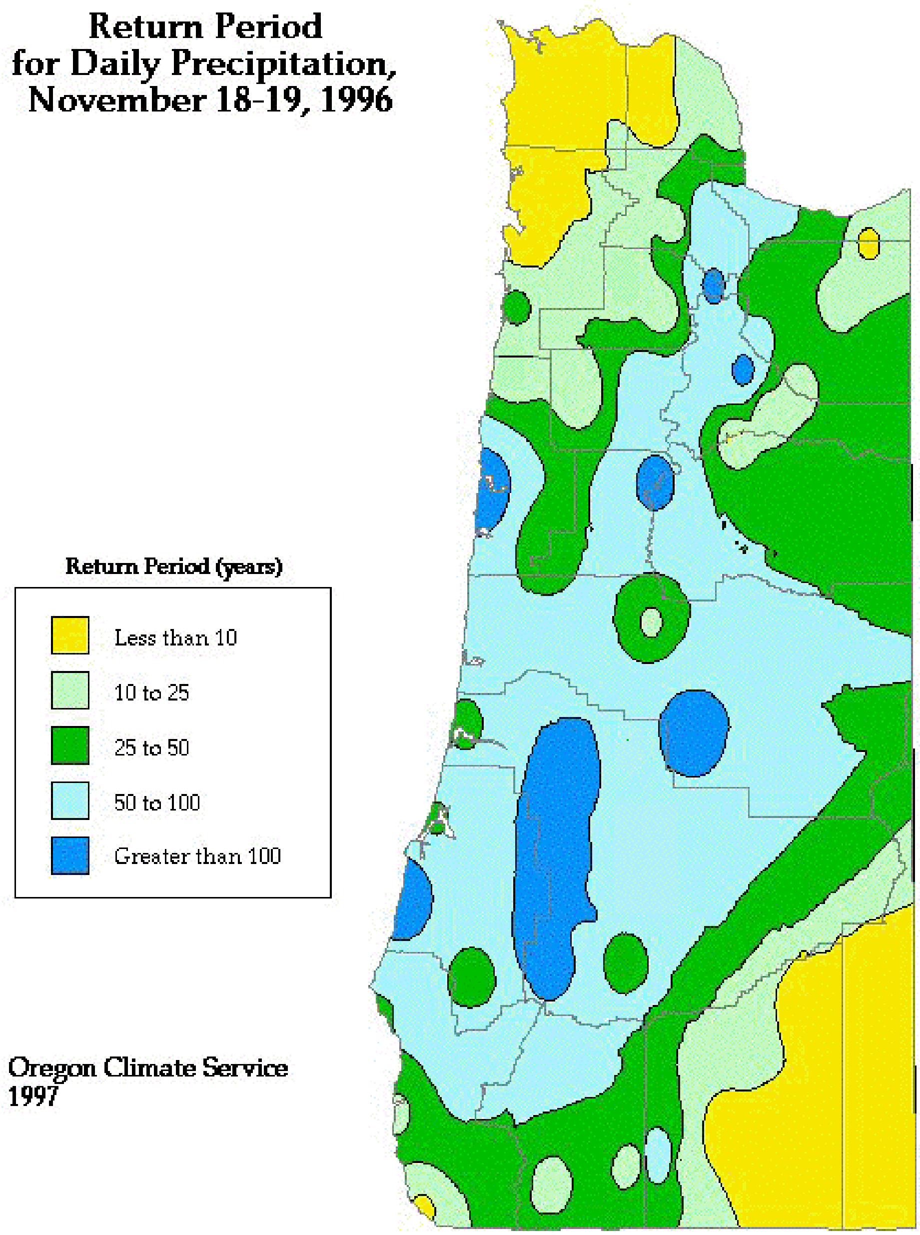
3.2.1 Selection of Design Events

The November 1996 actual rainfall event (as previously shown in Figure 3-1) and the 10-year, 24-hour SCS Type 1A design storm (as previously shown in Figure 3-2) were run through the future conditions model to determine the level and extent of flooding issues anticipated to occur in Springfield in the future. The results from these model simulations are illustrated in Figures 3-10 and 3-11. As shown in the figures, significant portions of the City's system are expected to be deficient. When comparing the two figures, it was noted that many more problems are expected to occur as a result of running the SCS 10-year design event as opposed to running the November 1996 event. Based on a review of these results, the level of conservatism associated with the SCS synthetic design events was discussed with the City.

The November 1996 storm actually produced more flooding problems than City staff can remember having occurred at any other time in the last 30 years. As a result, the November 1996 storm has been considered to represent approximately a 25-year rainfall event. Using a Log III Pearson analysis, the Oregon State Climatologist computed the return periods for daily precipitation amounts for the November 1996 storm and created a map for western Oregon (see Figure 3-9 below). The map confirms that the November 1996 event was at least a 25-year event for Springfield. Yet, the model results from the November 1996 storm event show less flooding problems than the model results from running the SCS 10-year event. These results were not surprising given some recent rainfall related studies in the Eugene area.

When a stormwater master plan was recently developed for the City of Eugene, an analysis of rainfall data and model results also indicated that the SCS Type 1A storms are expected to be very conservative. Design storms were developed for Eugene based on 48 years of rainfall record (1948 to 1996). Real rainfall events from the period of record (as opposed to synthetic events) were selected for use in developing Eugene's stormwater master plan. When the model results from these real storms (including the reported largest storm event in a 48 year period of record) were compared to results from SCS storms, the results were similar to those results observed from the Springfield model in that the SCS storms were producing significantly higher flows than the real events for the same return period. An additional analysis in Eugene also revealed that cost savings resulting from using the real storms for design storm events as opposed to using SCS Type 1A design storms was in the millions of dollars. Specifically, for three small study areas within the City of Eugene that were reviewed in detail, the CIP costs savings was over $4,000,000. One of the reasons these SCS design events are considered to be conservative is that the events are based on short (24-hour) duration storms with very significant peak intensities. In reality, the significant storms that we experience in the Northwest are long duration (several days) high volume events.

Figure 3-9 Map of Estimated Return Periods from the Oregon State Climatologist



As a result of the discussion above, a decision was made to identify flooding problems and design conceptual CIPs based on the use of the November 1996 rainfall event as opposed to using the more conservative SCS synthetic design events. This is expected to represent an approximate 25-year level of protection. In addition to the 25-year event, model results were desired for inclusion in this plan for the 2-year, 5-year, 10-year, and 100-year events. Given that the SCS events were determined to be significantly conservative based on peak intensities and a distribution of rainfall that is not common in the Willamette Valley, design events that were run through the model to represent the 2-year, 5-year, 10-year, and 100-year storm events were estimated from the rainfall distribution of the November 1996 event. The rainfall totals from the November 1996 event, which coincides with the volume estimated for a 25-year storm event, were adjusted based on the differences in rainfall totals between the SCS events as shown in the following table:

SCS Design Event	**SCS Rainfall Total**	**% of the SCS 25-Year Event Total**
2-Year	3.3 inches	68.8
5-Year	3.8 inches	79.2
10-Year	4.3 inches	89.6
25-Year	4.8 inches	100
100-Year	5.2 inches	108.3

For example, since the SCS 10-year rainfall total is approximately 89.6% of the SCS 25-year rainfall total, the November 1996 rainfall totals were adjusted by this same percentage to obtain a hydrograph for an estimated 10-year event to be used in running the model.

It should also be noted that even when using a real rainfall event for design purposes as opposed to a synthetic 24-hour event, the rainfall is still estimated to provide some level of conservatism and a factor of safety in the model. This is due to the fact that rainfall totals from the National Weather Service's Eugene Mahlon Sweet Airport gauge are expected to be somewhat higher than rainfall totals experienced in Springfield, based on an analysis of precipitation conducted for the City of Eugene in 1996 (Woodward-Clyde, 1996). Whether this difference in rainfall totals between the Airport guage and City gauges is due to an actual west to east gradient in rainfall that exists in the Willamette Valley (the Airport is located approximately 10 miles northwest of the City) or whether it is due to the types of equipment that have been used to measure rainfall, the City of Eugene rain gauges showed the National Weather Service's gauge to measure higher rainfall totals by a significant amount (approximately 37%).

Figure 3-10 Future Condition System Flood Map 10y Design Storm

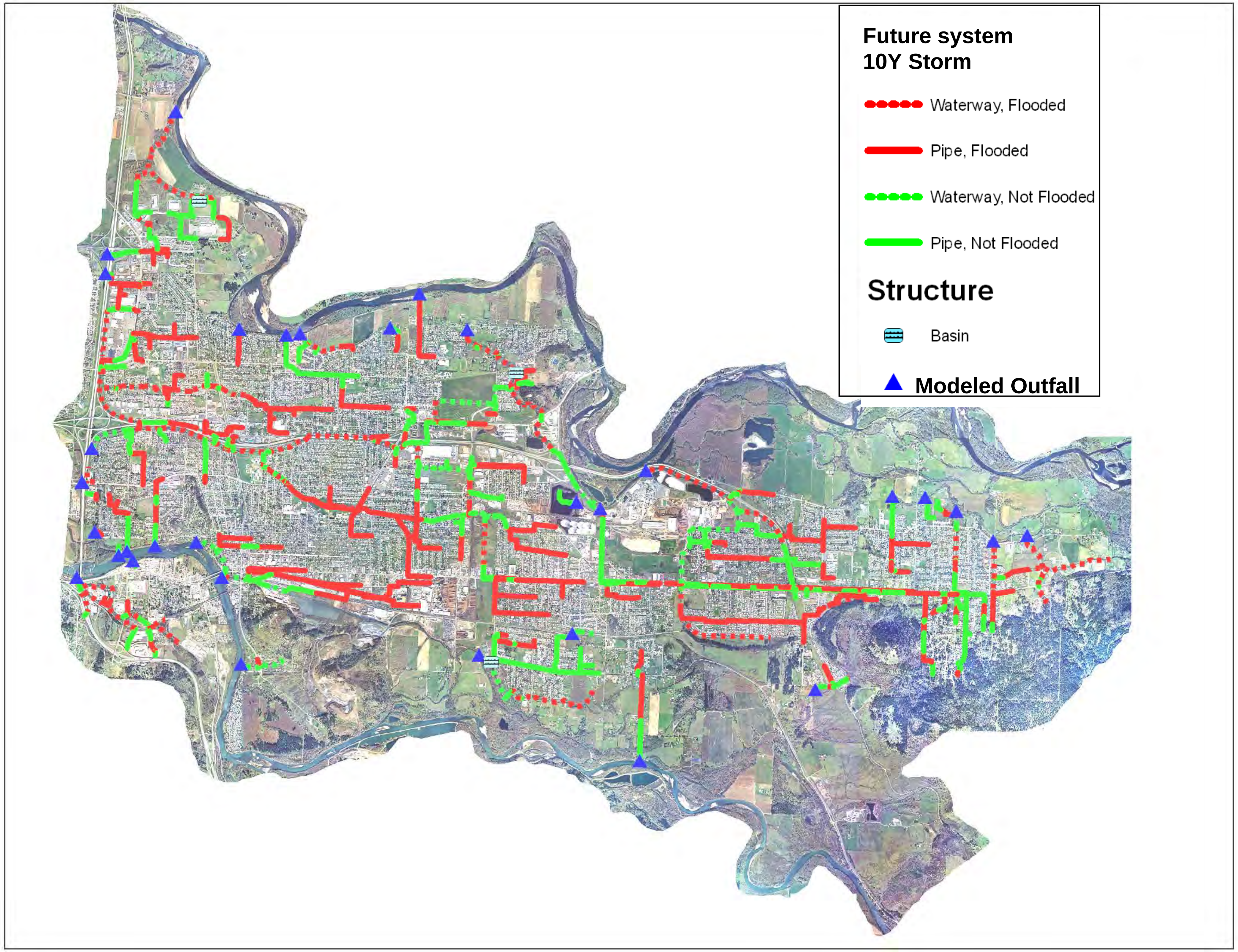
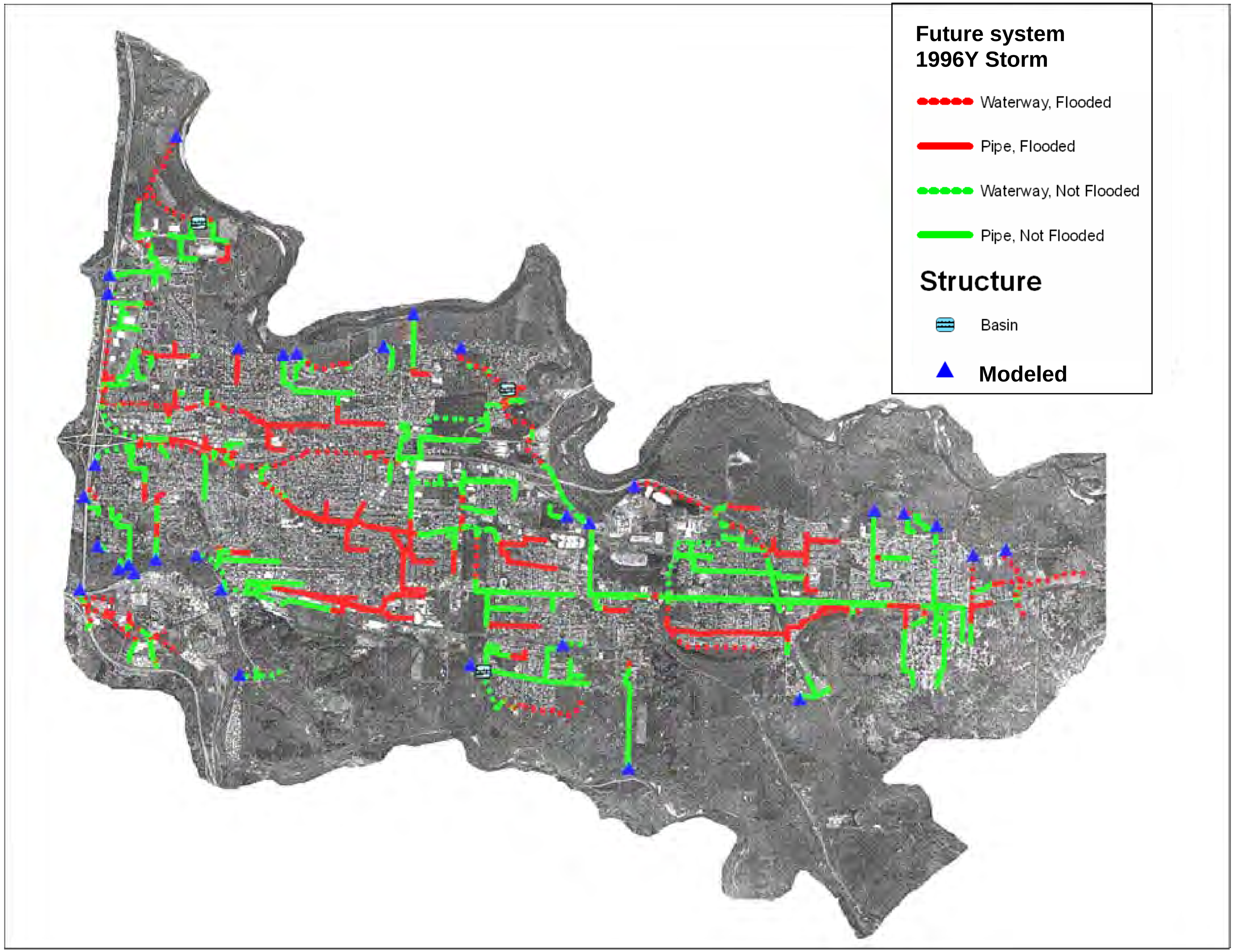
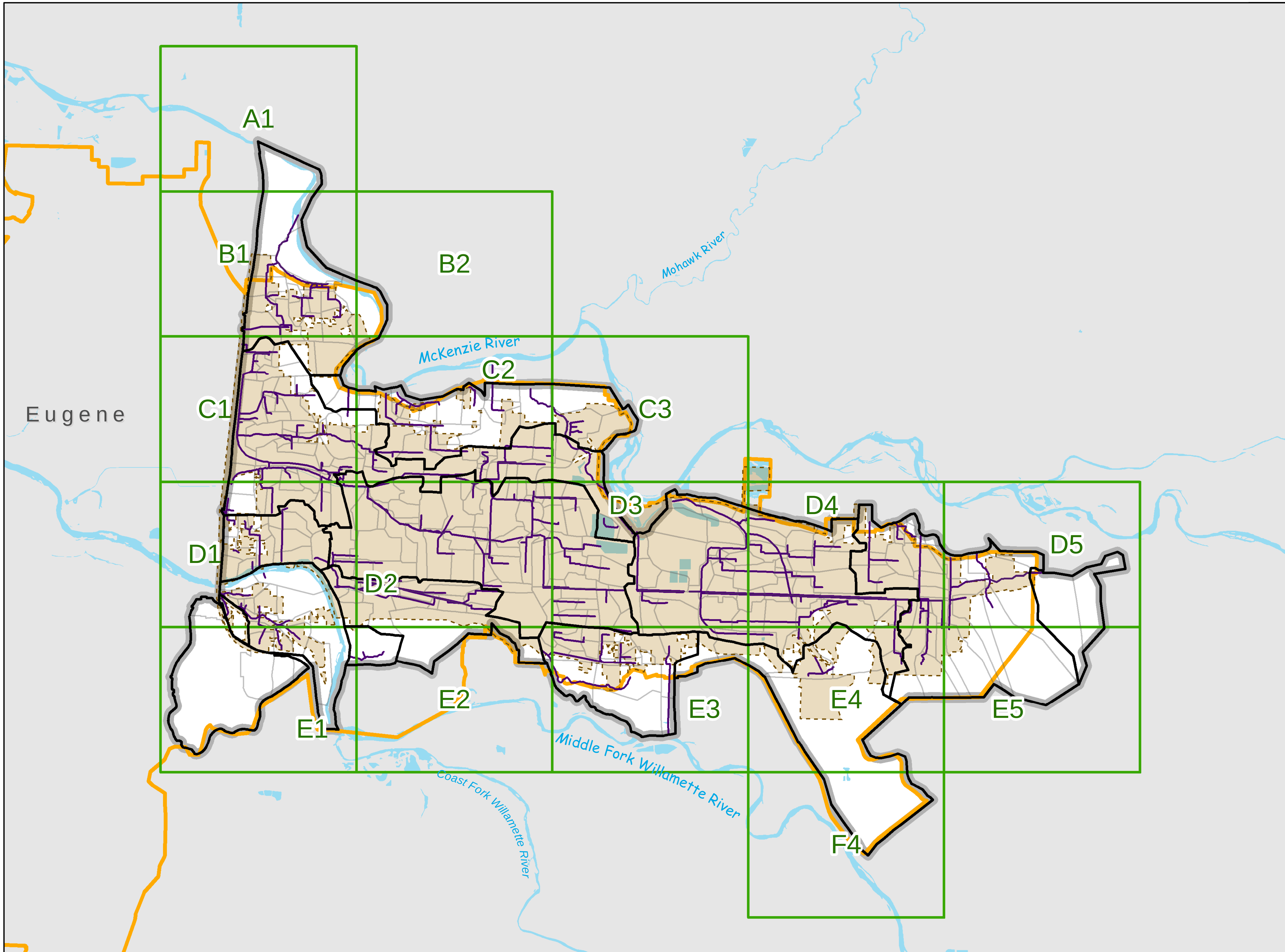


Figure 3-11 Future Condition System Flood Map 1996 Storm Event



3.2.2 Model Output from Model Runs

The 2, 5, 10, 25, and 100-year events as described in the previous section were run through the model. Hydrologic results from the model for each modeled catchment are provided in Appendix A. Hydraulic results for each modeled link are provided in Appendix B. The maps (Figure 3-12 – Pages A1 through F4) on the following pages show the location of the modeled system and include catchment names and node numbers to reference to the tables in the appendices. The flood map that was produced from the future condition, November 1996 storm event (Figure 3-11) was used to identify and develop CIP projects for flood control as described in Section 5.



City of Springfield Stormwater Facilities Master Plan

Drainage System

Figure 3-12
Index Map

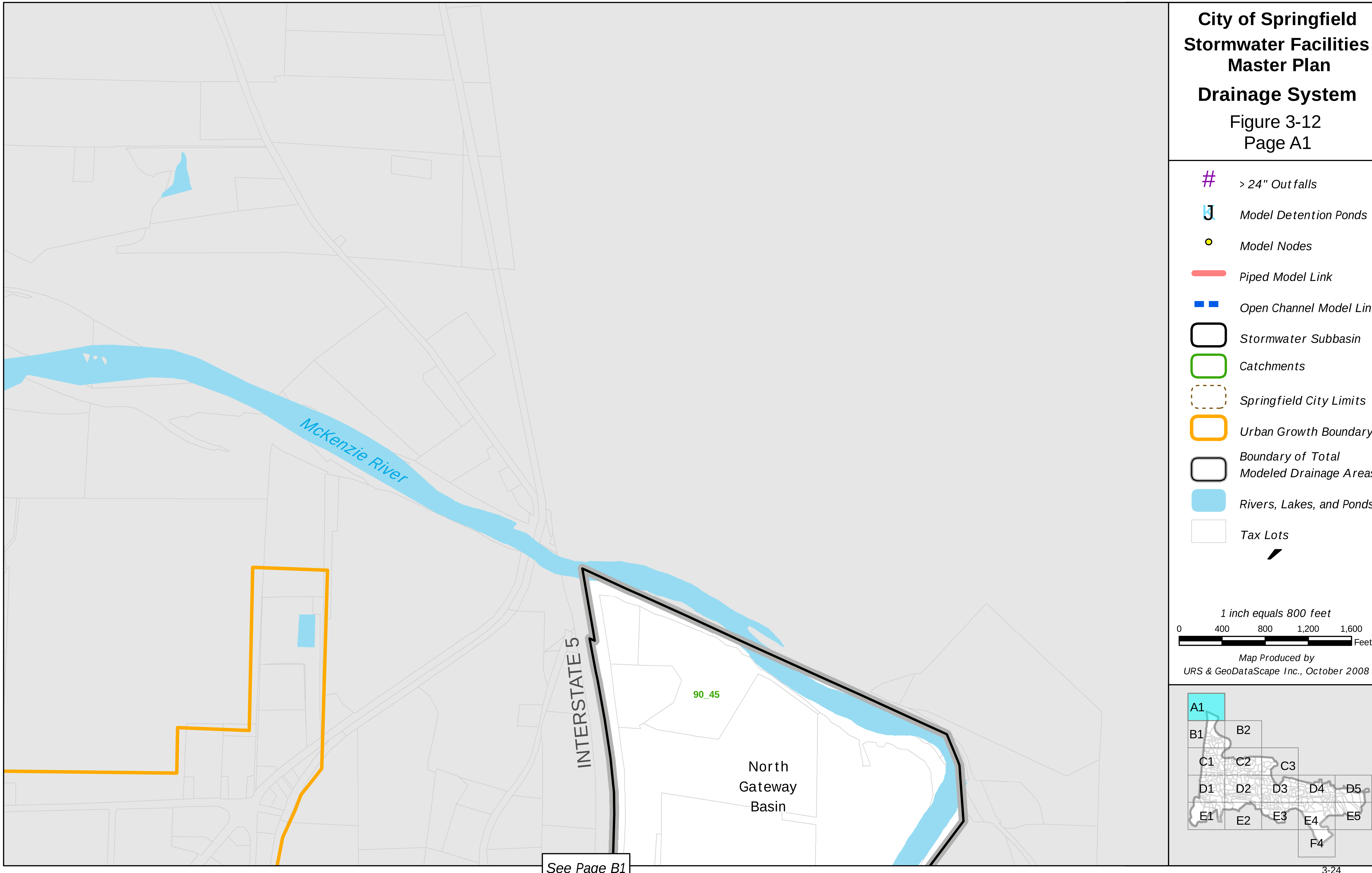
Map Tile Extents
Model Drainage Links
Catchments
Urban Growth Boundary
Stormwater Subbasin
Springfield City Limits
Boundary of Total Modeled Drainage Areas
Rivers, Lakes, and Ponds

N

1 inch equals 1 mile

0 0.5 1 1.5 2 Miles

Map Produced by
URS & GeoDataScape Inc., October 2008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> 24" Outfalls
Model Detention Ponds
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Boundary of Total
Modeled Drainage Areas
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Tax Lots
1 inch equals 800 feet
0
400
800
1,200
1,600
Feet
Map Produced by
URS & GeoDataScape Inc., October 2008
A1
B1
B2
C1
C2
C3
D1
D2
D3
D4
D5
E1
E2
E3
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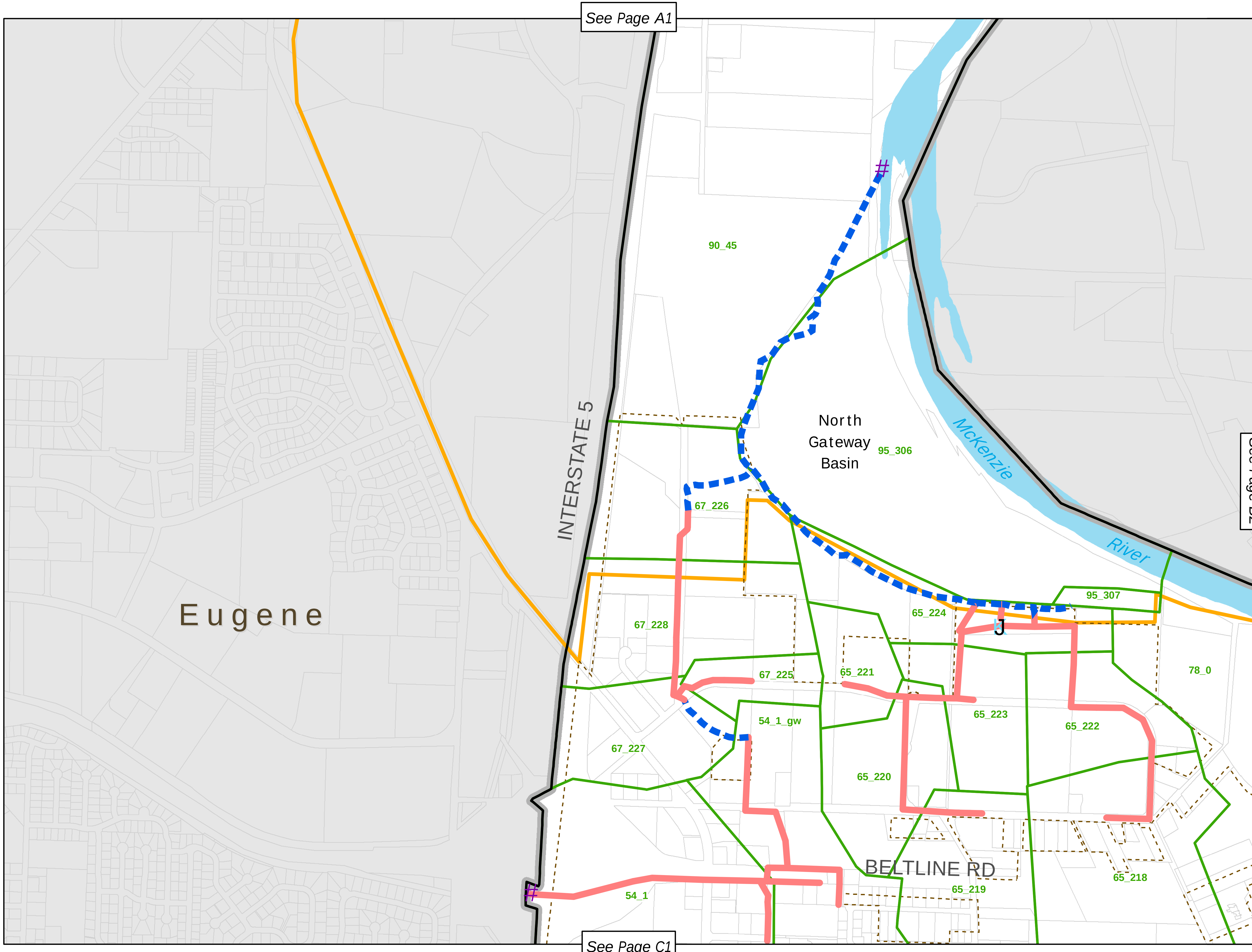
E5
F4
McKenzie River
INTERSTATE 5
90_45
North
Gateway
Basin
See Page B1



City of Springfield Stormwater Facilities Master Plan

Drainage System

Figure 3-12
Page B1

> 24" Outfalls
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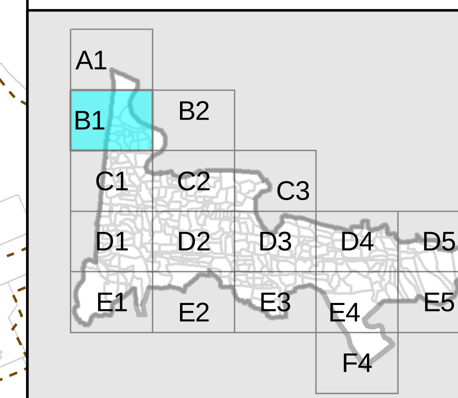
Rivers, Lakes, and Ponds
Tax Lots

1 inch equals 800 feet

0 400 800 1,200 1,600 Feet

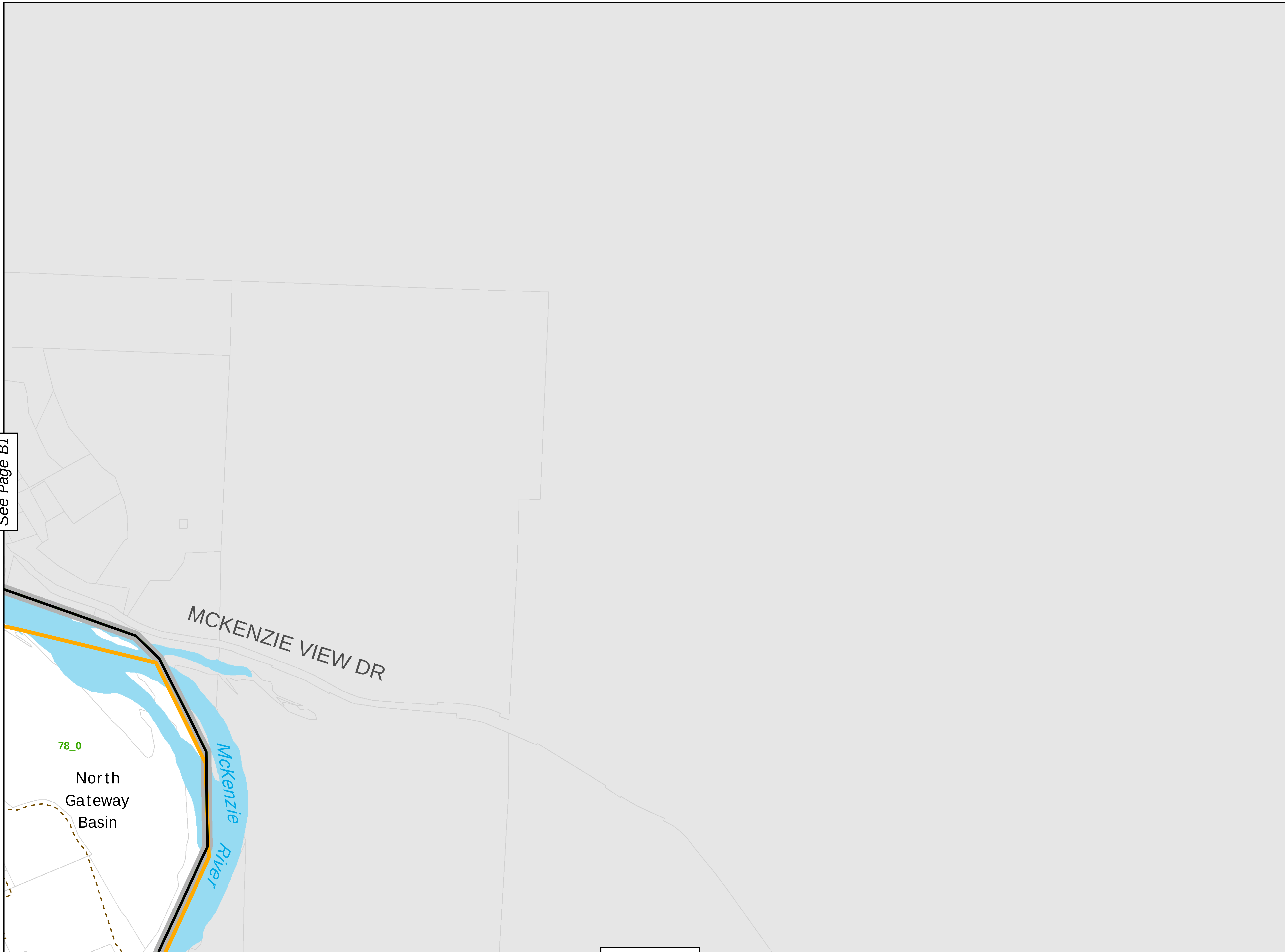
Map Produced by
URS & GeoDataScape Inc., October 2008



City of Springfield Stormwater Facilities Master Plan

Drainage System

Figure 3-12
Page B2



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- # > 24" Outfalls
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- Model Nodes
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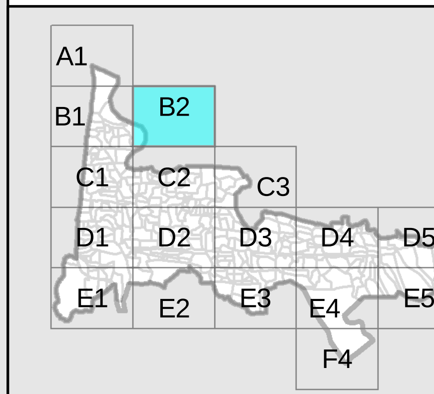
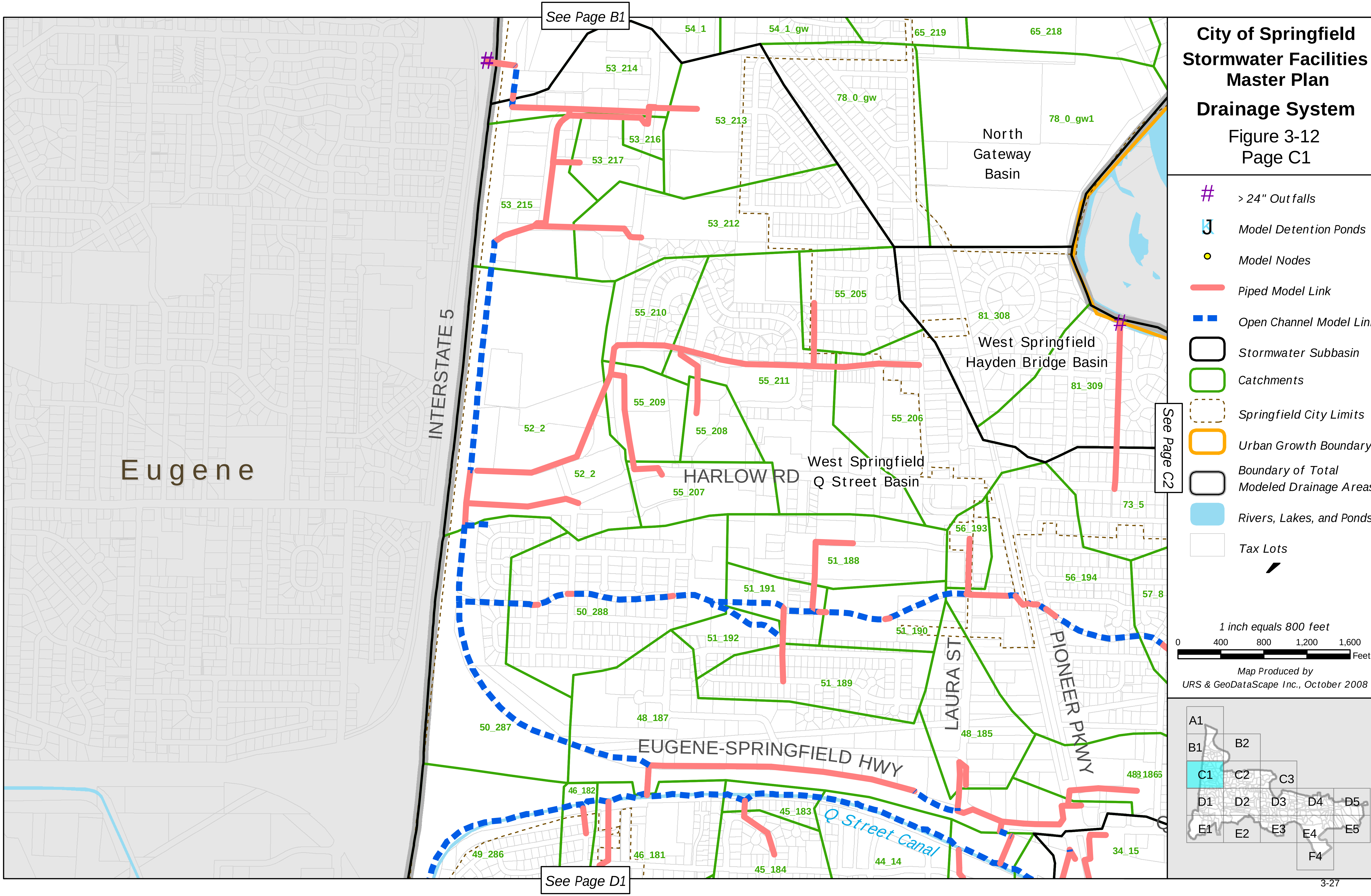
- Open Channel Model Link
- Stormwater Subbasin
- Catchments
- Springfield City Limits
- Urban Growth Boundary
- Boundary of Total Modeled Drainage Areas
- Rivers, Lakes, and Ponds
- Tax Lots

1 inch equals 800 feet

0 400 800 1,200 1,600 Feet

Map Produced by
URS & GeoDataScape Inc., October 2008

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1 inch equals 800 feet
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Feet
Map Produced by
URS & GeoDataScape Inc., October 2008
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E5
F4
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INTERSTATE 5
North
Gateway
Basin
West Springfield
Hayden Bridge Basin
West Springfield
Q Street Basin
HARLOW RD
LAURA ST
PIONEER PKWY
EUGENE-SPRINGFIELD HWY
Q Street Canal
54_1
54_1_gw
65_219
65_218
53_214
78_0_gw
78_0_gw1
53_213
53_216
53_217
53_215
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55_210
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55_211
81_309
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55_208
52_2
52_2
55_207
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51_188
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51_192
51_190
51_189
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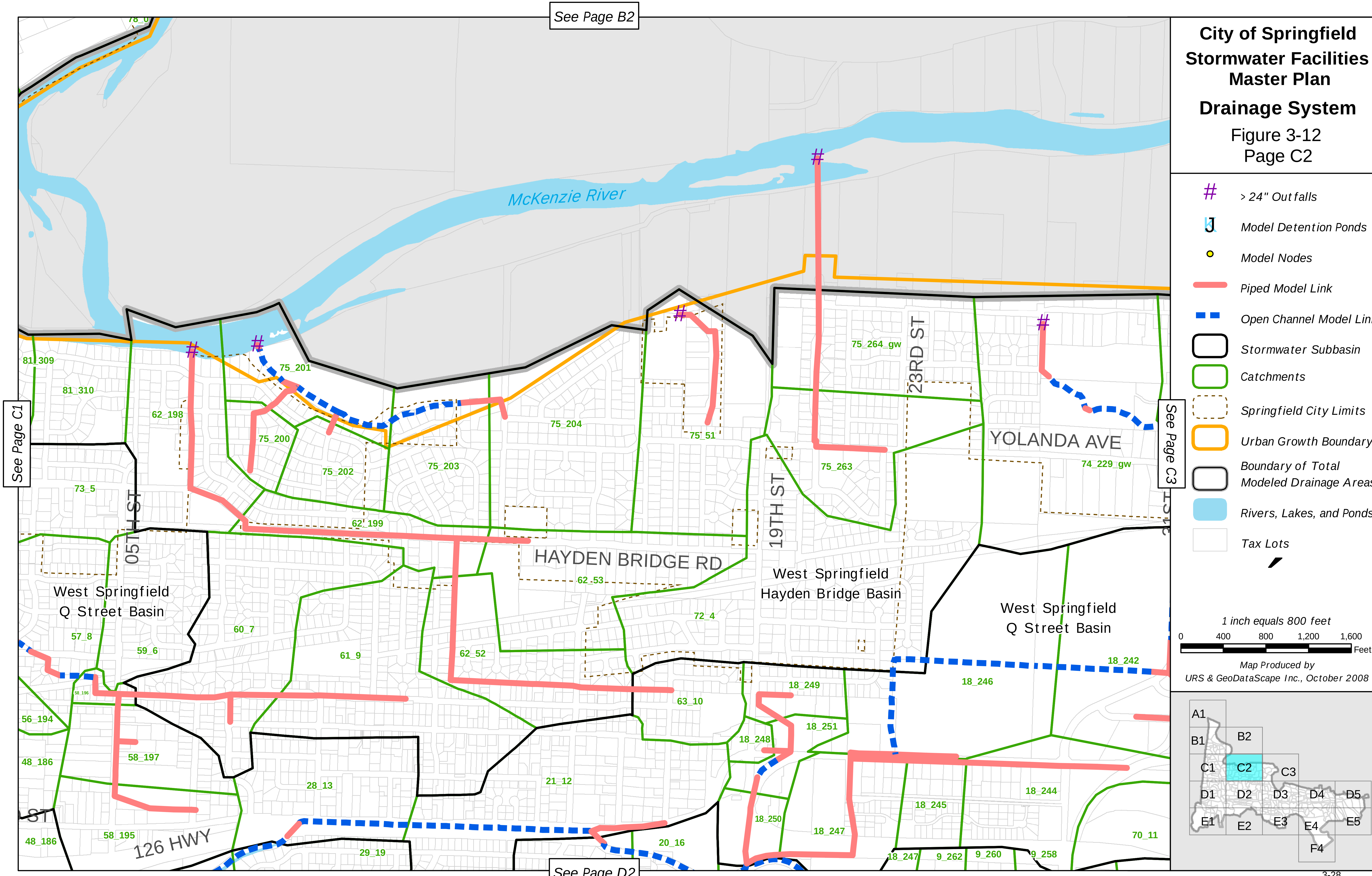
34_15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1 inch equals 800 feet
0 400 800 1,200 1,600
Feet
Map Produced by
URS & GeoDataScape Inc., October 2008
A1
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C3
D1
D2
D3
D4
D5
E1
E2
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E4
E5
F4
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McKenzie River
YOLANDA AVE
HAYDEN BRIDGE RD
19TH ST
23RD ST
05TH ST
126 HWY
West Springfield
Q Street Basin
West Springfield
Hayden Bridge Basin
West Springfield
Q Street Basin
81_309
81_310
62_198
75_201
75_200
75_202
75_203
75_204
75_51
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75_263
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62_53
72_4
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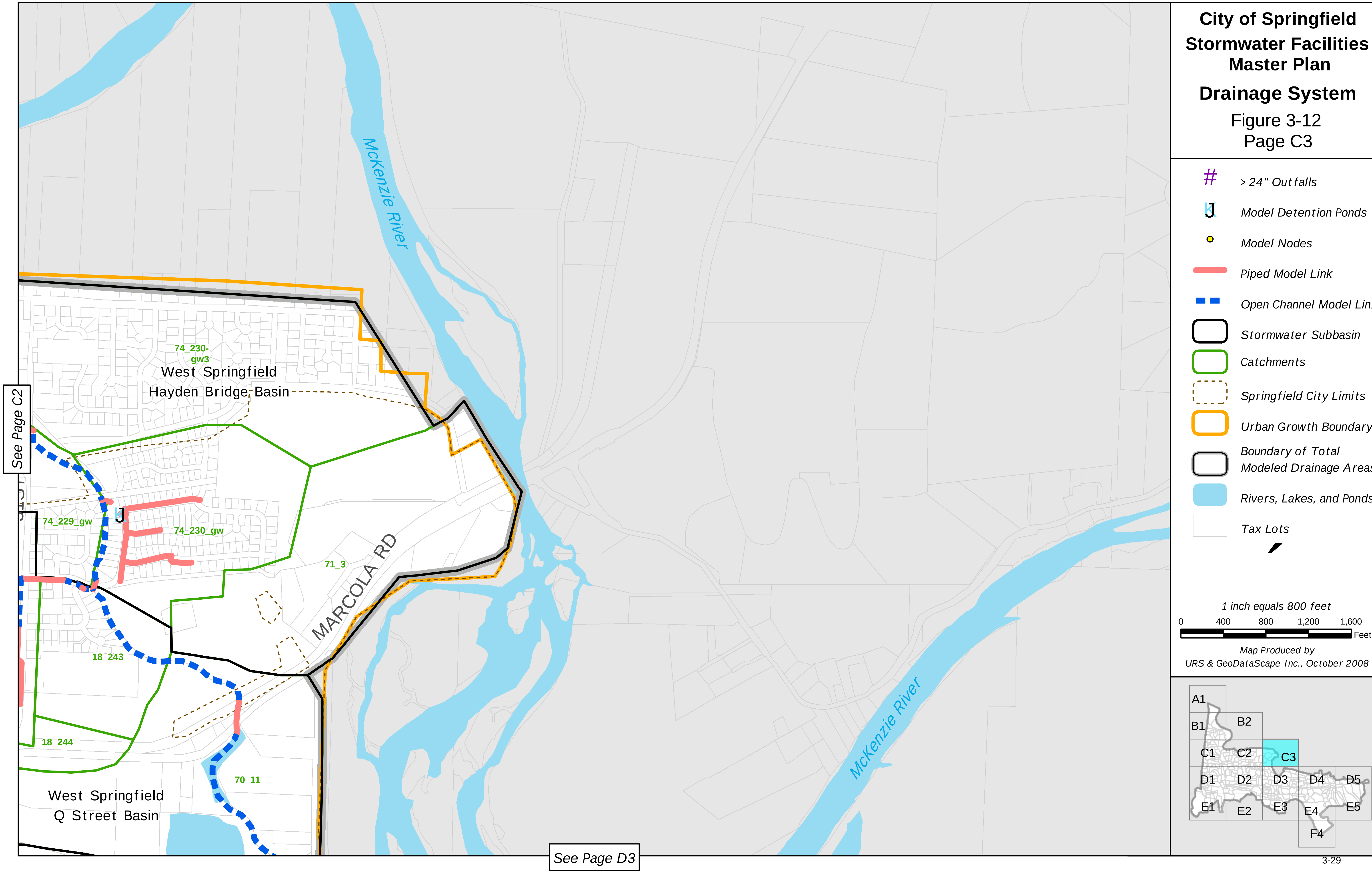
70_11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1 inch equals 800 feet
0 400 800 1,200 1,600 Feet
Map Produced by
URS & GeoDataScape Inc., October 2008
McKenzie River
West Springfield
Hayden Bridge Basin
West Springfield
Q Street Basin
MARCOLA RD
74_230-gw3
74_229_gw
74_230_gw
71_3
18_243
18_244
70_11
See Page C2
See Page D3
A1
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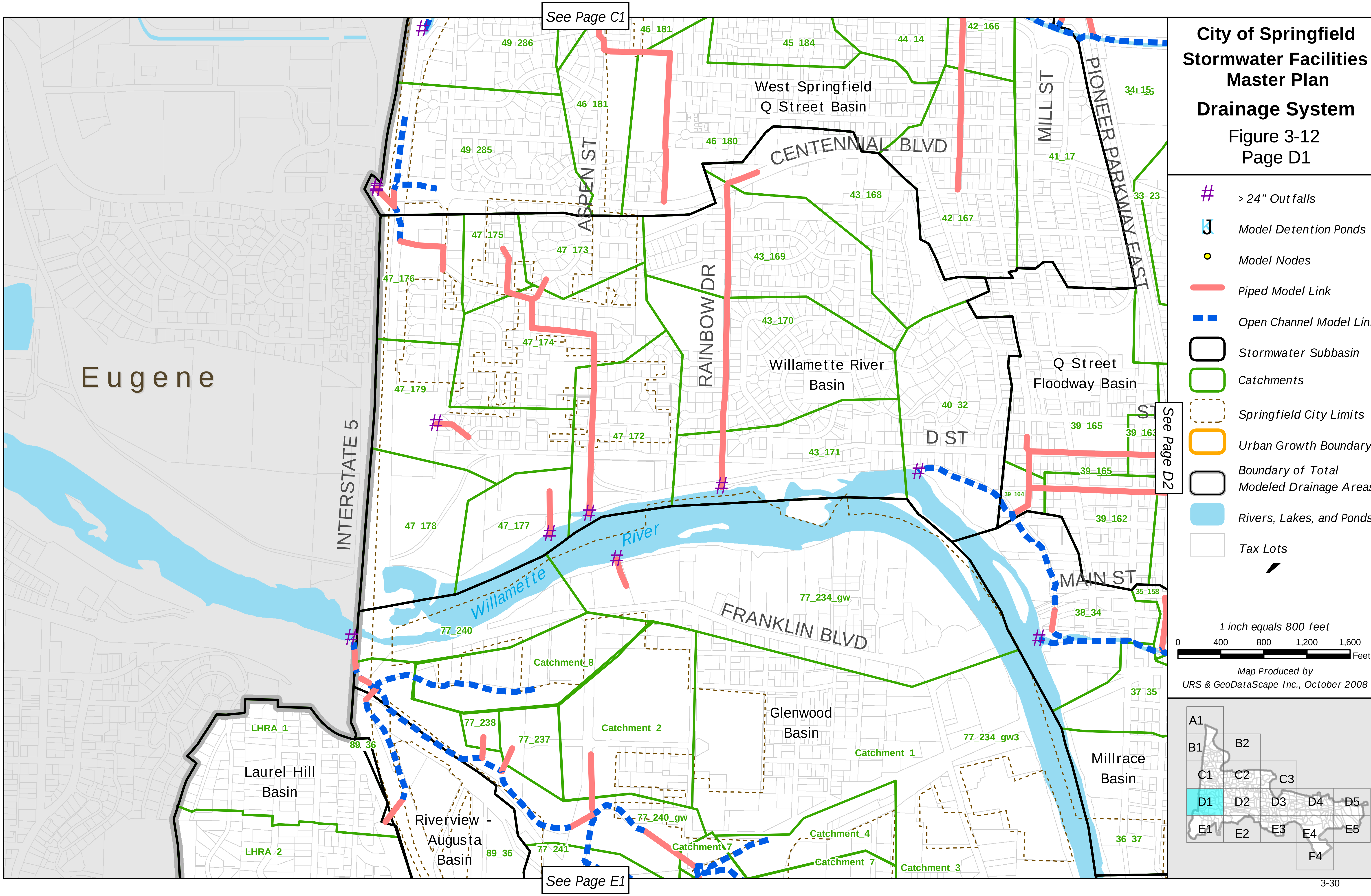
F4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URS & GeoDataScape Inc., October 2008
A1 B1 B2 C1 C2 C3 D1 D2 D3 D4 D5 E1 E2 E3 E4 E5 F4
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See Page D2
See Page E1
Eugene
INTERSTATE 5
ASPEN ST
RAINBOW DR
CENTENNIAL BLVD
MILL ST
PIONEER PARKWAY EAST
D ST
MAIN ST
FRANKLIN BLVD
Willamette River
West Springfield Q Street Basin
Willamette River Basin
Q Street Floodway Basin
Glenwood Basin
Laurel Hill Basin
Riverview - Augusta Basin
Millrace Basin
49_286
49_285
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46_180
45_184
44_14
42_166
42_167
41_17
34_15
33_23
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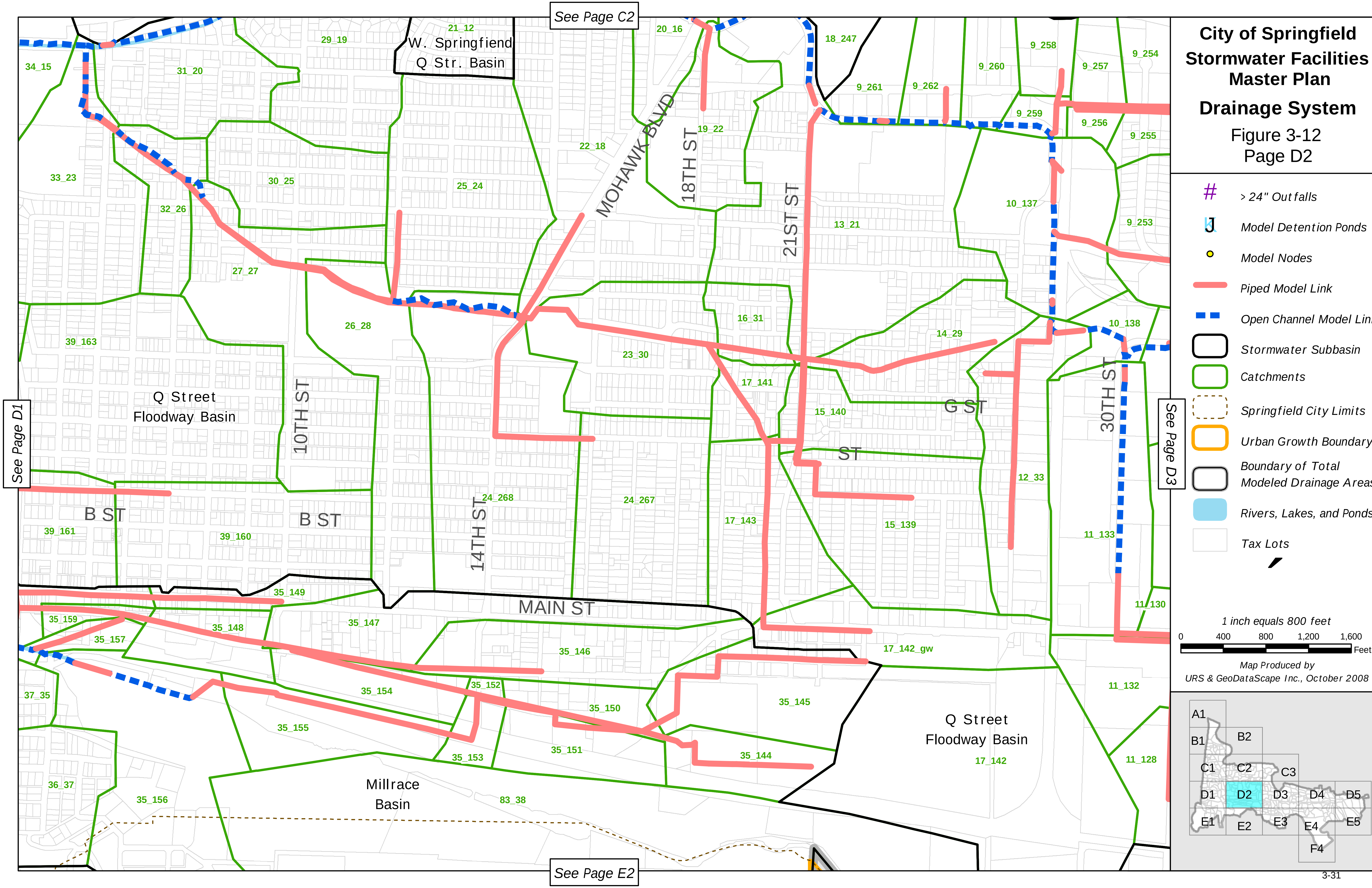
Catchment_4
Catchment_7
Catchment_8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F4
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W. Springfiend
Q Str. Basin
Q Street
Floodway Basin
Millrace
Basin
MOHAWK BLVD
18TH ST
21ST ST
10TH ST
14TH ST
30TH ST
G ST
ST
B ST
MAIN ST
34_15
29_19
21_12
20_16
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9_254
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9_260
9_261
9_262
9_259
9_256
9_255
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33_23
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25_24
22_18
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13_21
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9_253
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12_33
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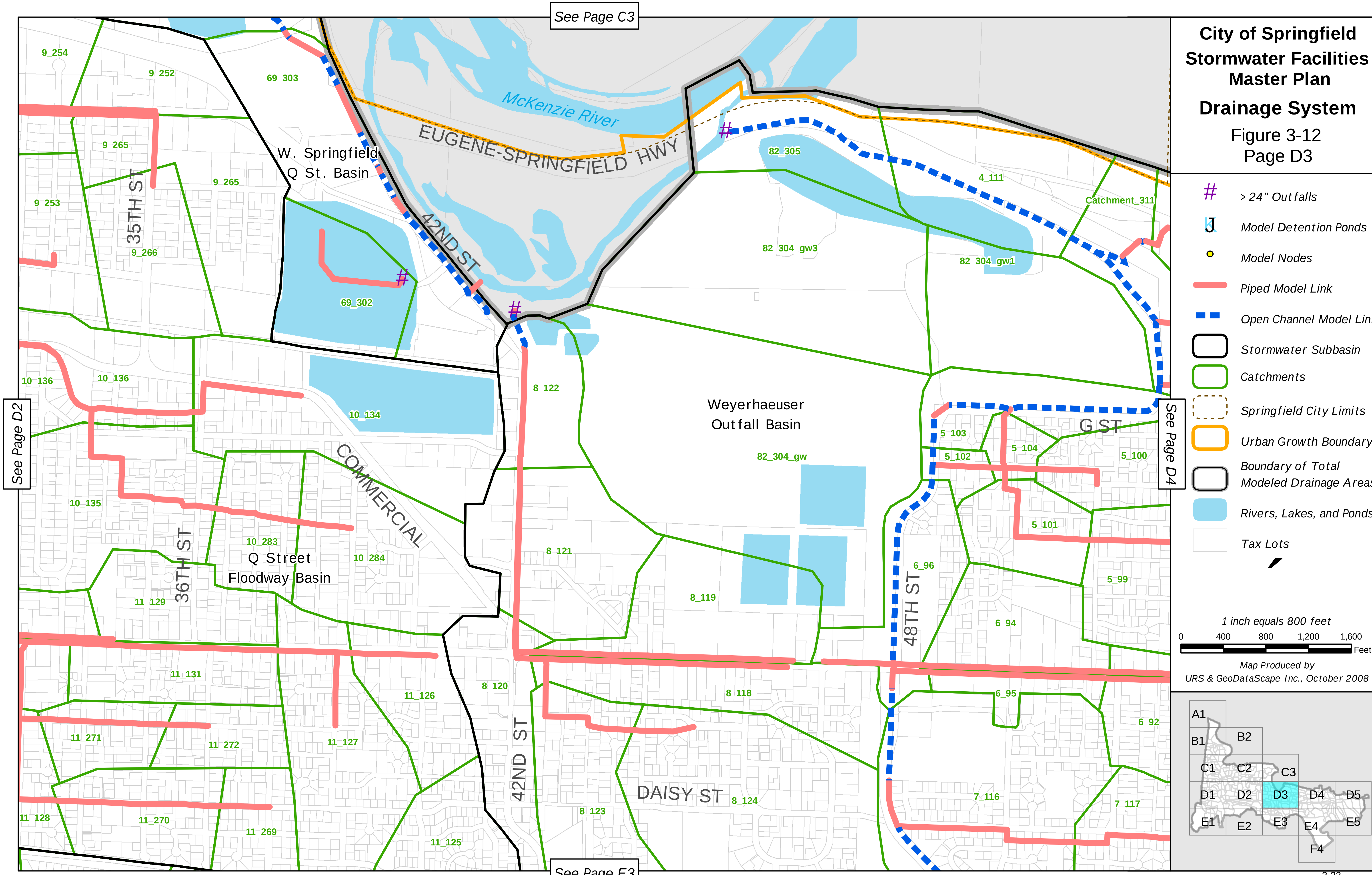

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0 400 800 1,200 1,600 Feet
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URS & GeoDataScape Inc., October 2008
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C3
D1
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E1
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E3
E4
E5
F4
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McKenzie River
EUGENE-SPRINGFIELD HWY
W. Springfield Q St. Basin
Weyerhaeuser Outfall Basin
Q Street Floodway Basin
35TH ST
36TH ST
42ND ST
48TH ST
COMMERCIAL
G ST
DAISY ST
9_254
9_252
9_265
9_253
9_266
69_303
69_302
10_136
10_134
10_135
10_283
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11_126
11_127
11_271
11_272
11_128
11_270
11_269
11_125
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8_121
8_120
8_119
8_118
8_123
8_124
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82_304_gw1
82_304_gw
4_111
Catchment_311
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5_104
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5_100
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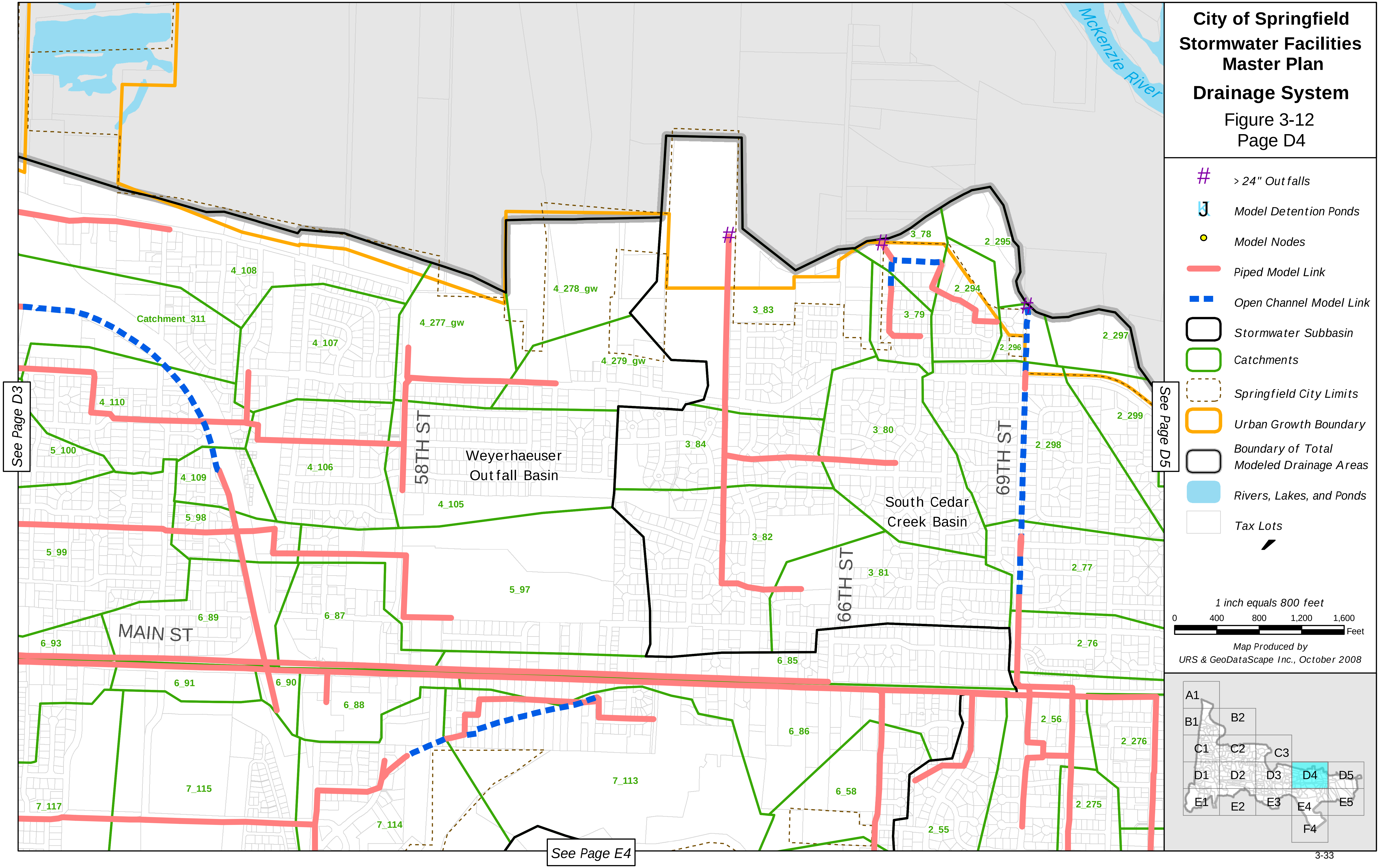
6_92
7_116
7_117



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Rivers, Lakes, and Ponds
Tax Lots
1 inch equals 800 feet
0 400 800 1,200 1,600
Feet
Map Produced by
URS & GeoDataScape Inc., October 2008
A1
B1
B2
C1
C2
C3
D1
D2
D3
D4
D5
E1
E2
E3
E4
E5
F4
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Weyerhaeuser Outfall Basin
South Cedar Creek Basin
58TH ST
66TH ST
69TH ST
MAIN ST
Catchment_311
4_108
4_107
4_110
4_106
4_109
4_105
4_277_gw
4_278_gw
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2_76
2_56
2_55
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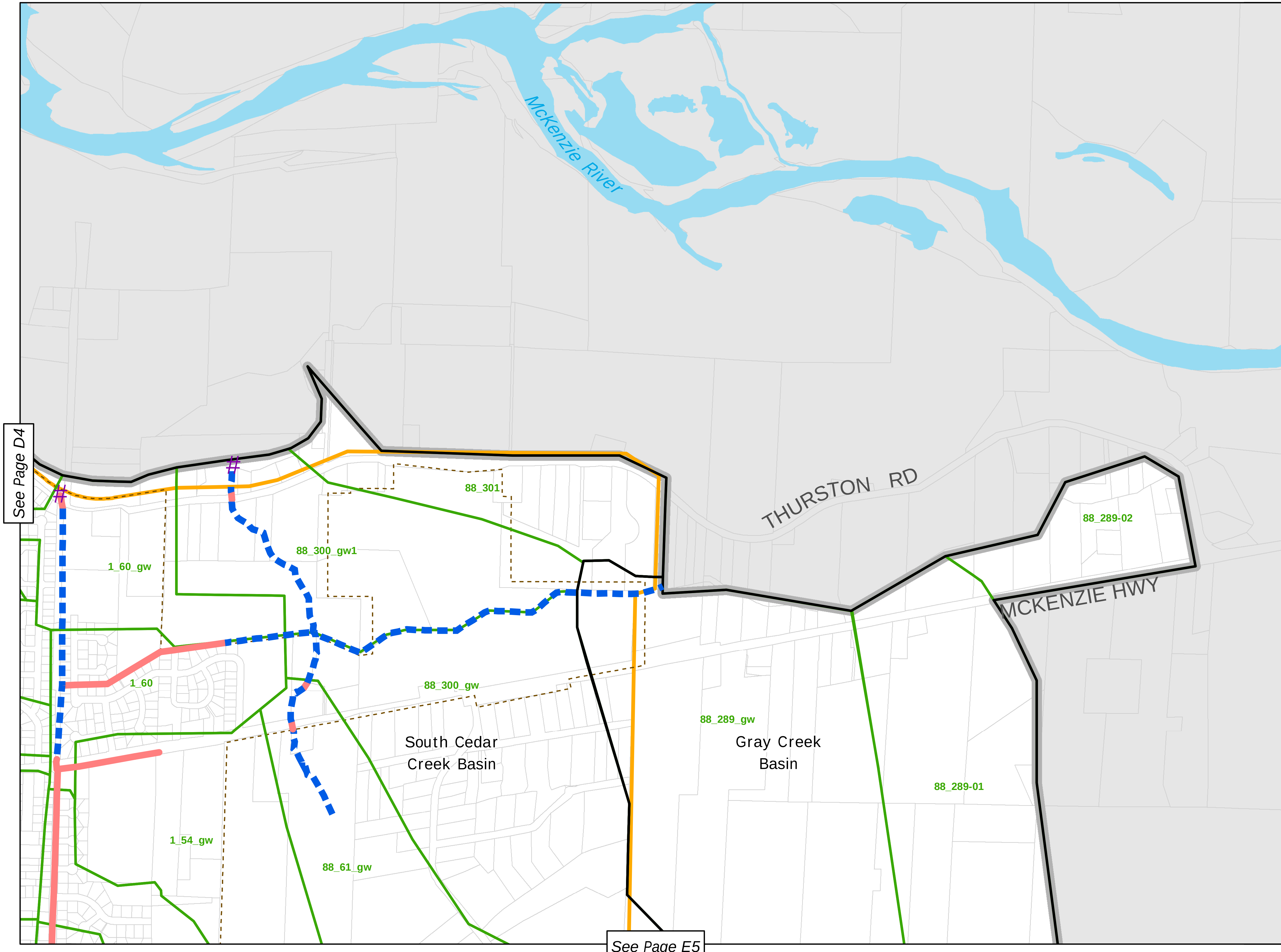

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City of Springfield Stormwater Facilities Master Plan

Drainage System

Figure 3-12
Page D5

- > 24" Outfalls
- Model Detention Ponds
- Model Nodes
- Piped Model Link
- Open Channel Model Link
- Stormwater Subbasin
- Catchments
- Springfield City Limits
- Urban Growth Boundary
- Boundary of Total Modeled Drainage Areas
- Rivers, Lakes, and Ponds
- Tax Lots

1 inch equals 800 feet

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Map Produced by
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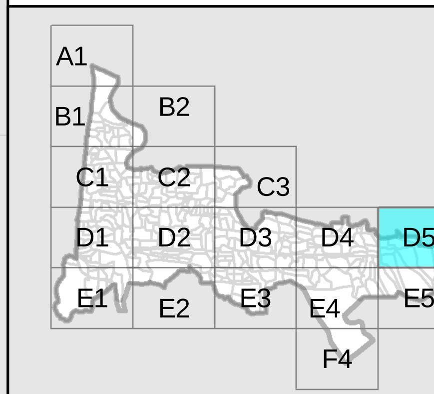

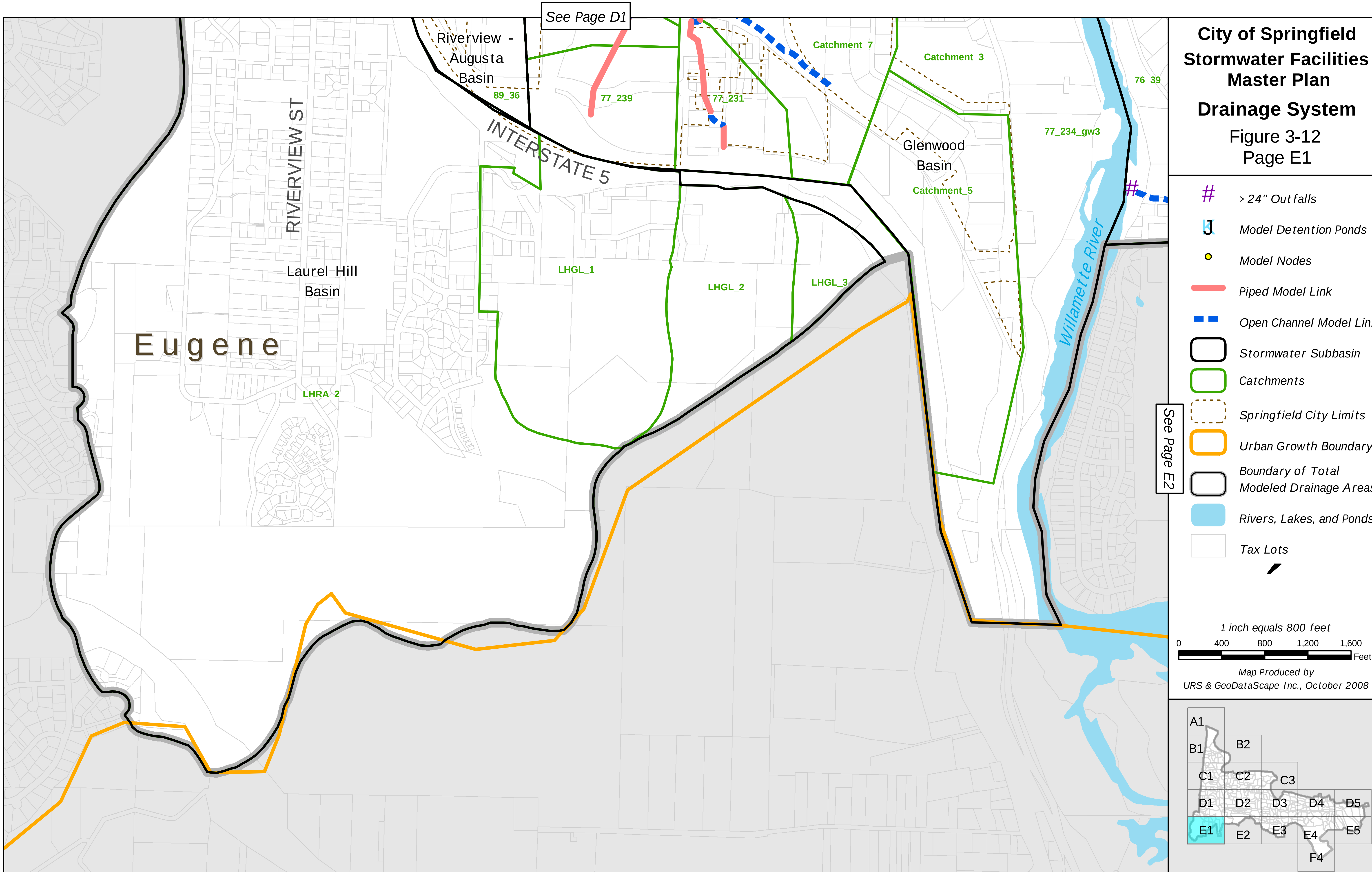
City of Springfield
Stormwater Facilities Master Plan
Drainage System
Figure 3-12
Page E1
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Riverview - Augusta Basin
89_36
77_239
77_231
Catchment_7
Catchment_3
76_39
77_234_gw3
Glenwood Basin
Catchment_5
INTERSTATE 5
RIVERVIEW ST
Laurel Hill Basin
Eugene
LHRA_2
LHGL_1
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Willamette River
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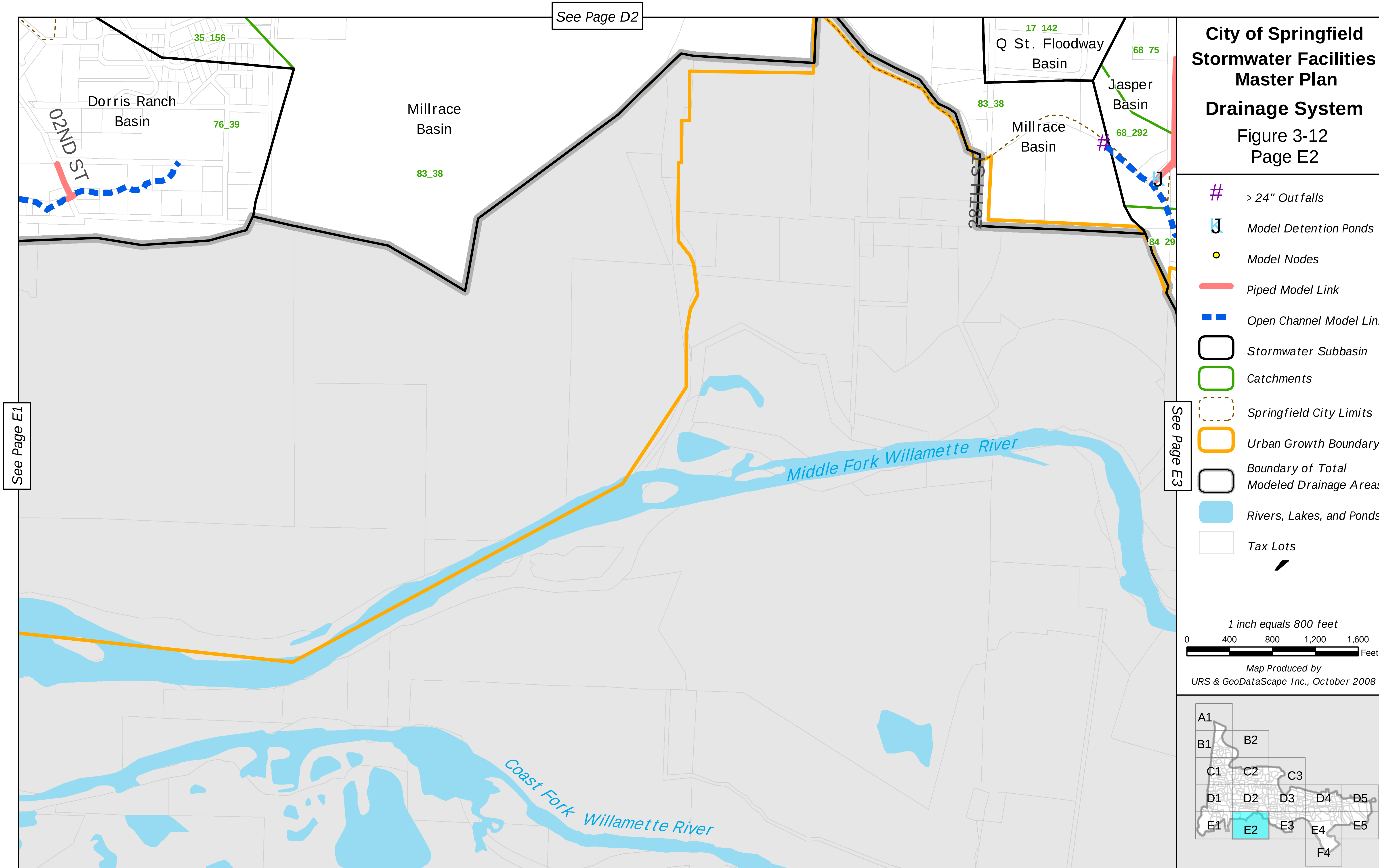

City of Springfield Stormwater Facilities Master Plan

Drainage System

Figure 3-12

Page E2

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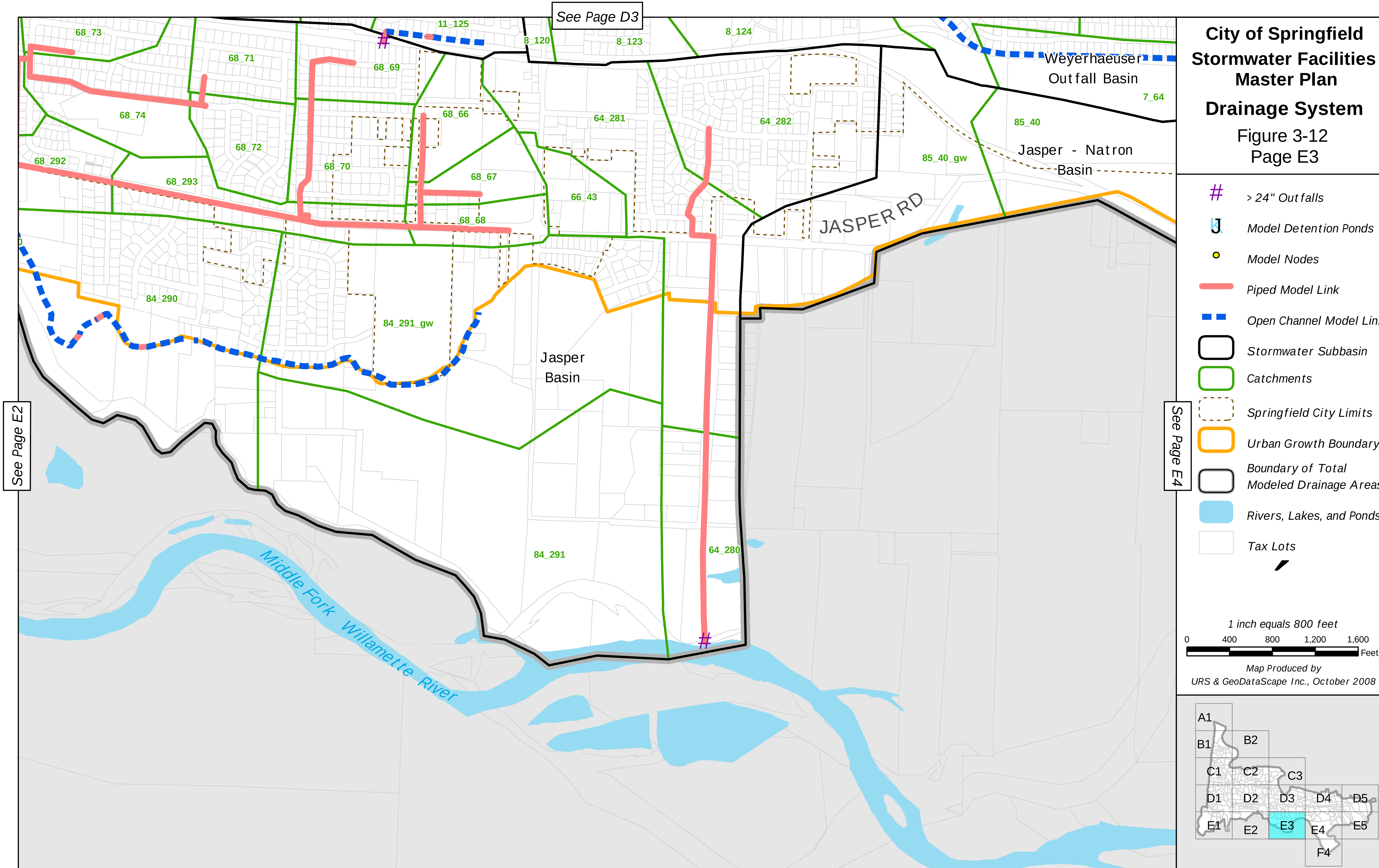
City of Springfield
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Master Plan
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Urban Growth Boundary
Boundary of Total Modeled Drainage Areas
Rivers, Lakes, and Ponds
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See Page D3
See Page E2
See Page E4
Weyerhaeuser Outfall Basin
Jasper - Natron Basin
Jasper Basin
JASPER RD
Middle Fork Willamette River
68_73
68_71
68_69
11_125
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8_123
8_124
7_64
68_74
68_66
64_281
64_282
85_40
68_72
68_292
68_70
85_40_gw
68_293
68_67
66_43
68_68
84_290
84_291_gw
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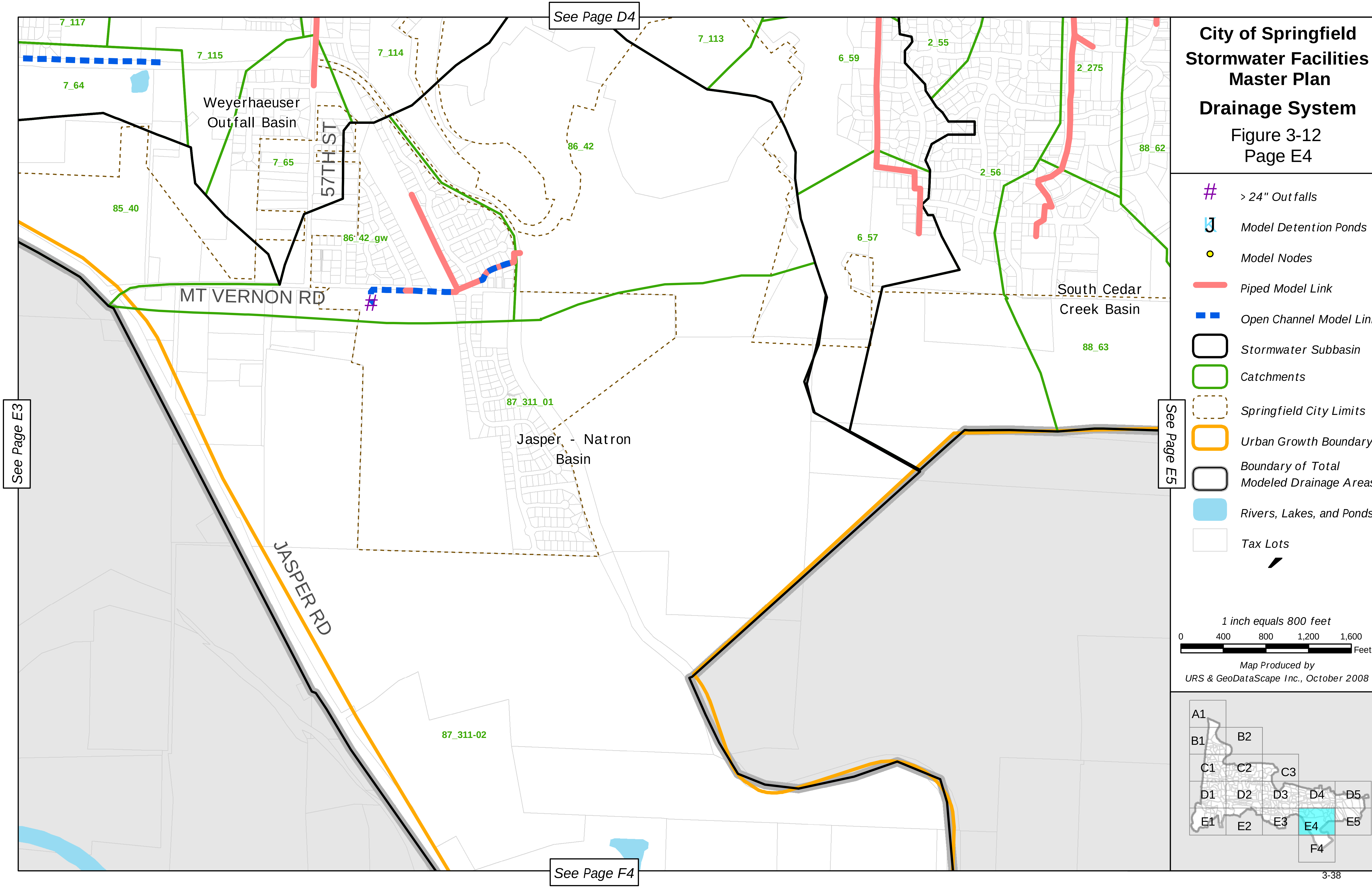
City of Springfield
Stormwater Facilities Master Plan
Drainage System
Figure 3-12
Page E4
> 24" Outfalls
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Weyerhaeuser Outfall Basin
Jasper - Natron Basin
South Cedar Creek Basin
MT VERNON RD
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City of Springfield Stormwater Facilities Master Plan

Drainage System

Figure 3-12
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- # > 24" Outfalls
- Model Detention Ponds
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- Piped Model Link
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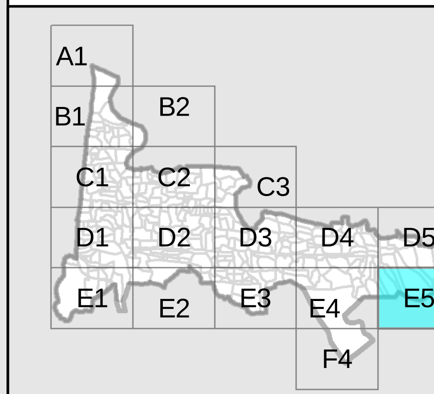

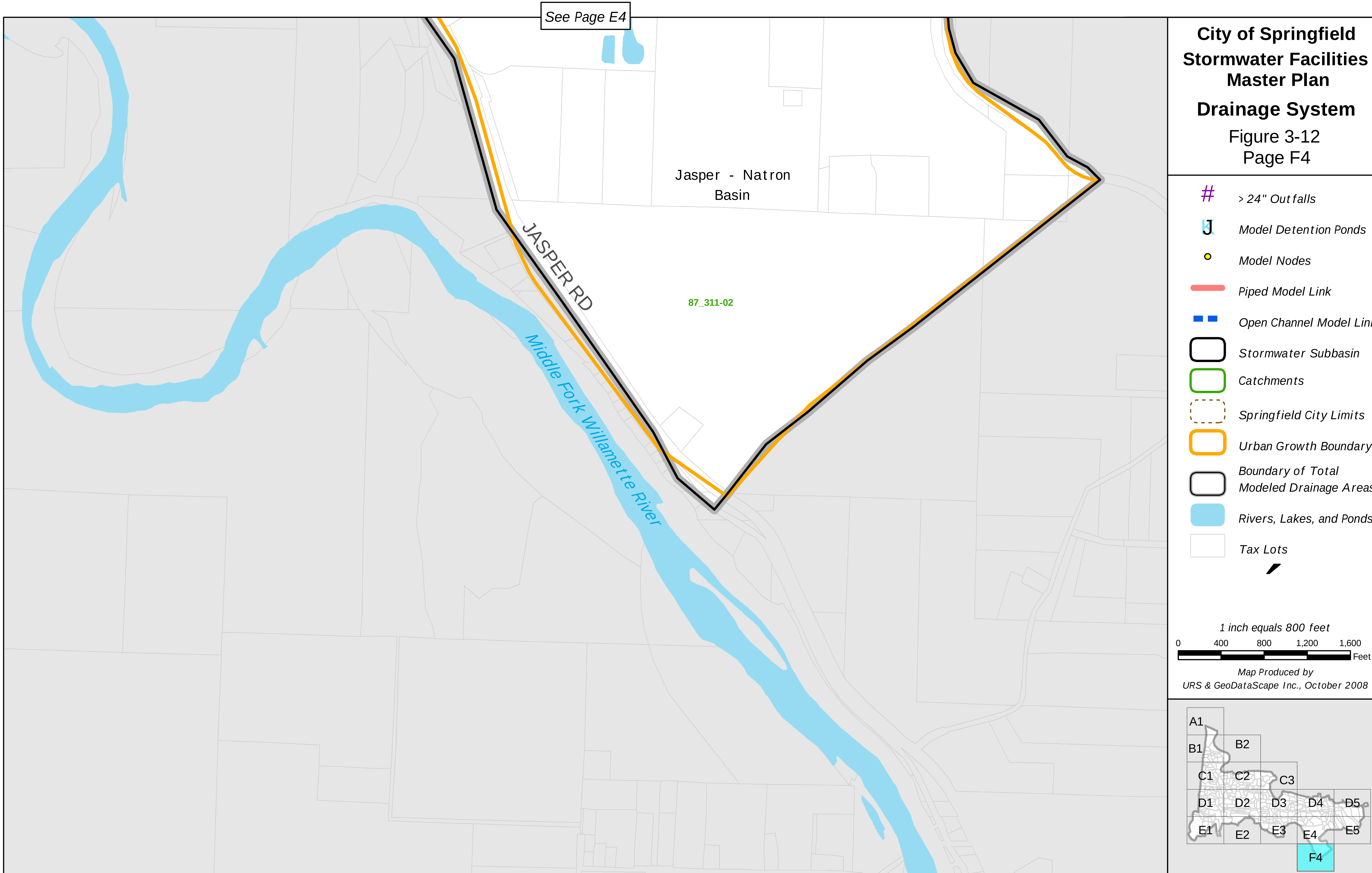
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Jasper - Natron Basin
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Middle Fork Willamette River
City of Springfield
Stormwater Facilities Master Plan
Drainage System
Figure 3-12
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> 24" Outfalls
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SECTION 4 – WATER QUALITY EVALUATION

The purpose of this section is to outline the general water quality problems that occur in urbanized environments, like the City of Springfield, and to summarize the general goals of the City of Springfield in addressing water quality problems and concerns. Section 4.1 describes the general characteristics and pollutants associated with stormwater runoff in urban environments. Section 4.2 describes how the City intends to address water quality through implementation of stormwater water quality CIPs and development standards. Section 4.3 describes two other stormwater quality related regulatory programs including the TMDL program under the Clean Water Act and the underground injection control (UIC) program under the Safe Drinking Water Act.

4.1 Stormwater Quality

As urbanization occurs, changes in the quality and quantity of stormwater runoff adversely affect the health of receiving waters. Historically, stormwater management has primarily focused on drainage and flood control. Increased development or urbanization results in an increase in the quantity and peak flow rate of runoff. As a result, drainage system components are often undersized to manage the increased load. While urban area flooding problems have historically been addressed through capital improvements for stormwater conveyance (See Section 3.0), other adverse impacts associated with urbanization, specifically the degraded quality of stormwater runoff are also a concern. Typical parameters of concern with respect to surface waters include bacteria, heavy metals, oil & grease, sediments, nutrients and temperature. Recently, more attention is also being paid to toxics (such as pesticides) and chemicals\contaminants of emerging concern such as pharmaceuticals. In the near future, these types of contaminants will likely receive more attention and focus from the regulators.

In an urbanized environment, the general characteristics of urban runoff may be attributed to the land use associated with the source of discharge. The Oregon Association of Clean Water Agencies funded a study in 1996 and created a report titled "Analysis of Oregon Urban Runoff Water Quality Monitoring Data Collected from 1990 to 1996" that was based on a series of statistical analyses of stormwater monitoring data collected by the Oregon Municipal Stormwater NPDES applicants and permitted agencies in the Willamette Valley. The report indicates that stormwater pollutant concentrations from different land uses are statistically different from each other. In general, among different land uses, industrial land use showed the highest pollutant concentrations, followed by transportation, commercial, and residential. Open space (i.e., undeveloped) land use represented lowest pollutant concentrations. (Note: These are the general results. Results sometimes varied depending upon the specific pollutant.) Therefore, as development occurs, and changes to land use are observed (e.g., transition of open space or undeveloped land use to a developed land use), pollutants in the stormwater runoff generally increase.

In addition to the ubiquitous problems associated with urbanization and stormwater runoff quality, spills and illicit discharges, which also commonly occur in urban environments, pose a threat to surface waters. Changes in land use associated with urbanization are a more predictable source of degraded water quality conditions. Unpredictable, intermittent spills and illicit discharges can also impact water quality. Generally these discharge sources involve a small quantity of pollutants entering a single stormwater conveyance system component (e.g., catchbasin, pipe). Typical pollutants associated with intermittent spills and illicit discharges vary greatly but may include oil and grease, automotive fluids, fertilizers and pesticides, trash and debris, and bacteria.

Typical stormwater pollutants and pollutant sources are summarized in Table 4-1.

Table 4-1: Typical Problem Pollutants in Stormwater

Typical Stormwater Pollutant*	Description	Major Sources Potentially Associated with Stormwater Runoff	Potential In stream Water Quality Problem
Bacteria**	- E. Coli - Enterococcus, - Fecal coliform, and - Fecal streptococcus	- Animal Wastes (droppings from wild/domestic animals), - Human Wastes (leaking sanitary sewer pipes, and seepage from septic tanks as well as illicit RV waste dumping).	These are commonly used indicators of human microbial pathogens. Water contact may cause eye and skin irritations and gastro-intestinal diseases if water is swallowed.
Heavy Metals	Antimony Arsenic Beryllium Cadmium Chromium Copper Lead Mercury Nickel Selenium Silver Thallium Zinc	- Vehicles (combustion of fossil fuels, improper disposal of car batteries, wear/tear of tires and brake pads), Metal Corrosion (rain gutters, metal roofs, etc.), - Pigments for Paints, - Solder, - Moss killers, - Fungicides, - Pesticides, - Wood Preservatives	Heavy metals are toxic to aquatic ecosystems. These metals are considered to be the most significant toxic substances which are commonly found in urban stormwater runoff.
Oil & Grease	A broad group of pollutants including: - Animal fats, and - Petroleum products.	- Food Wastes (animal and vegetable fats from garbage), - Petroleum Products (gas, oils, lubricants, etc.).	These compounds can coat the surface of the water limiting oxygen exchange, clog fish gills, and cling to waterfowl feathers. When ingested these compounds can be toxic to birds, animals and other aquatic life.
Total Suspended Solids	Sediments in the water are considered to be pollutants when they exceed natural concentrations and adversely affect water quality and/or beneficial uses of the water.	- Erosion from increased stream flows, - Construction site runoff, - Landscaping activities, - Agricultural activities, - Logging, - All other activities where the ground surface is disturbed.	Sediments cause increased turbidity, reduced prey capture for sight feeding predators, clogging of gills/filters of fish and aquatic insects reduced oxygen levels and blocked light which limits food production available for fish. Sediments also accumulate in stream bottoms which reduces the capacity of the stream (and hence increases the potential for

Table 4-1: Typical Problem Pollutants in Stormwater

Typical Stormwater Pollutant*	Description	Major Sources Potentially Associated with Stormwater Runoff	Potential In stream Water Quality Problem
			flooding) and covers stream bottom habitats. Sediment also acts as a carrier of toxic pollutants such as metals and organics.
Nutrients	- Nitrogen - Phosphorus	- Landscaping activities, - Yard debris, - Human wastes (leaks from septic tanks and sanitary sewers), - Animal wastes, - Vehicle exhausts, - Agricultural activities, - Detergents (car washing), - Food Processing	Excess levels of nutrients can lead to eutrophication in downstream receiving waters. Problems include surface algal scum, odors, reduced oxygen levels, and dense mats of algae. In addition to water quality problems, these effects have an adverse impact to the aesthetic quality of water bodies.
Organics	There are many organic compounds both natural and synthetic; however, the synthetic organics are of most concern and include pollutants from: - Fuels - Solvents - Pesticides - Herbicides.	- Illegal dumping, - Illicit connections, - Spills, - Leaks from drums and storage tanks, - Landscaping activities - Agricultural activities.	Most synthetic organics are highly toxic to aquatic life at very low concentrations, and many are carcinogenic (cancer causing) or suspected carcinogens.
Litter and other Floatable Debris	- Plastics, - Paper products, - Yard debris, - Tires, - Metal, - Glass, - Appliances, - Old Electronics.	- Littering, - Dumping, - Spills.	These pollutants degrade the aesthetic quality of water bodies. In addition, they contribute pollutants as they decompose, and they can reduce the capacity of the water body. Excess yard debris contributes to high levels of nutrients and it reduces oxygen levels as it decomposes. Some discarded materials such as appliances, tires, and auto wreckage may contain toxic/ heavy metals such as mercury, cadmium and copper.

* Note: While elevated temperatures are a problem in many streams statewide, urban stormwater runoff has not been implicated as a source of this problem in the Willamette Valley and management measures have not been encouraged to address temperature issues from piped systems. However, for perennial open channel portions of the system, shading is a management measure that has been encouraged and is included in this SWFMP in the form of proposed "green pipes" (see Table 5-2, proposed water quality capital projects WQ #4, #7, #12, and #16). Green pipes are open channel improvements associated with enhanced vegetation and cover.

** Note: Several regional DNA tracking studies have shown that the largest portion of bacteria in streams is associated with birds and rodents which are not sources typically controlled by municipalities. The controllable sources (pet waste, cross-connections and failing septic systems) were shown to represent only a very small percentage of the problem.

4.2 City of Springfield Stormwater Quality Goals and Objectives

The City of Springfield operates under a Phase II NPDES Municipal Separate Storm Sewer System (MS4) permit, which requires the City to implement stormwater management strategies for reducing pollutants discharged from their stormwater systems. Such management strategies are called Best Management Practices (BMPs), and the BMPs are developed in order to address six minimum measures, as specified in the permit. The six minimum measures are as follows: public education and outreach, public participation and involvement, unlawful discharge detection and elimination, construction site runoff control, post construction runoff control, and pollution prevention\ good housekeeping. Each minimum measure requires that BMPs are implemented to reduce the discharge of pollutants to the maximum extent practicable (MEP) and each BMP includes reference to measurable goals (in order to assess progress of implementing the BMP), the responsible party, and the rationale for how and why each BMP was selected. The BMPs are outlined in the City's Stormwater Management Plan (MS4 Plan) (City of Springfield Stormwater Management Plan, 2004).

The City's MS4 Plan summarizes (in the form of BMPs) a variety of programmatic, non-structural, and source control activities that the City conducts in order to improve stormwater quality and reduce pollutant discharges in stormwater. Some programmatic BMPs contain reference to activities that result in the installation of structural BMPs to further reduce pollutant discharge in stormwater. Specifically, BMPs associated with Minimum Control Measure #5, Post Construction Stormwater Management for New Development and Redevelopment relate to the selection, design, installation, and maintenance of structural stormwater BMPs to promote improved water quality.

Development of this SWFMP and associated CIPs for stormwater quality are directly referenced under BMP DS3: Stormwater Facilities Master Plan (SWFMP) and Capital Improvement Program, under the Stormwater Management Plan's Minimum Control Measure #5. Given the recent finalization of the Willamette River TMDL and 303(d) listings for a number of Willamette River tributaries that run through the City of Springfield, the City is focused on using the proposed CIPs in this SWFMP to address water quality objectives in accordance with their MS4 Plan. The types of water quality CIPs proposed in this plan include ponds, green pipes (i.e., well vegetated open channels with enhanced vegetated cover to provide shading), and low impact development practices. The Table 4-1 pollutants addressed by these CIPs are provided in Table 5-2.

In addition, as development occurs, developers are required to implement stormwater quality treatment practices, hence, also addressing Table 4-1 pollutants. A review of current development codes was conducted and recommendations regarding code changes are provided in Section 6 and Appendix F. One of the main recommendations was to provide regional consistency in standards with the City of Eugene. Specifically, the recommendation states that the cities should consider concurrent adoption of the most up-to-date City of Portland Stormwater Management Manual (2008). Both Springfield and Eugene are currently relying on portions of Portland's 2004 Stormwater Management Manual. It should be noted, however, that the Phase I MS4 NPDES permittees (of which the City of Eugene is included) are currently negotiating a renewed permit with DEQ. DEQ has indicated that they may be specifying development standard requirements in the permit related to low impact development, % capture of runoff, % capture of TSS, and requiring the matching of pre- and post-development hydrographs with respect to flow volumes and durations in addition to peak flows. This is a new direction for development standards and the purpose is to address impacts from increased runoff volumes such as erosion of stream channels. Depending on the results of permit negotiations, the new Phase I MS4 NPDES permit could have a significant impact on Eugene's existing stormwater quality related development standards. Hence, regional consistency would also mean significant changes in Springfield's standards as well. The purpose of providing this information here is to indicate the regulatory direction that is being emphasized with respect to development standards to assure that Springfield's goals and objectives will also be consistent with the direction EPA and DEQ are taking with respect to Clean Water Act compliance in urban areas.

4.3 Other Stormwater Quality Related Regulatory Requirements

In addition to the MS4 NPDES permits required under the Clean Water Act, there are two other requirements that relate to stormwater quality. These include the total maximum daily load (TMDL) program under the Clean Water Act, and the stormwater underground injection control (UIC) program under the Safe Drinking Water Act. These are briefly described below.

<u>TMDL Program</u>

As described in Section 2.7, under the City's Phase II NPDES MS4 permit, pollutant load reduction estimates, or benchmarks are required to work towards achieving any applicable TMDL stormwater wasteload allocations. For Springfield, the development of benchmarks is required in 2011 for bacteria and mercury to address waste load allocations in the Willamette River TMDL (see Section 2.7). To prepare for this task of developing benchmarks, a pollutant loads spreadsheet model was prepared for the City. The model requires input associated with areas, land uses, rainfall, and BMP drainage areas. The results show loads estimated both with and without BMPs in place. The difference in loads between these two scenarios represents the City's pollutant load reduction estimates, or benchmarks. As the Phase I MS4 NPDES communities have already been required to develop benchmarks, the loads model was developed to be consistent with DEQ approved methods and processes that these communities have developed. If water quality CIPs from this SWFMP have been completed by 2011, they should be accounted for in the spreadsheet model to take credit for pollutant load reductions.

<u>UIC Program</u>

The Safe Drinking Water Act (SDWA) regulates the injection of stormwater into the ground in order to protect the quality of groundwater. Underground Injection Controls (UICs) or drywells are of specific interest to DEQ. The City of Springfield has not traditionally made significant use of public UICs or drywells for managing stormwater and all public UICs have been decommissioned. So, these requirements do not present issues with respect to the public system. The City does, however, encourage the use of drywells for private residential development in order to infiltrate the discharge of roof runoff. Again, this is not expected to be an issue under the SDWA as the State of Oregon authorizes the discharge of residential roof runoff as an acceptable discharge to UICs.

As a result of this SWFMP and recommended changes to development codes and design standards, the City would like to move in the direction of lower impact development practices which typically result in enhanced infiltration of stormwater into the ground. The types of low impact development practices that are being considered include rain gardens, swales, pervious pavements, and reduced impervious areas. Under the regulatory framework, these practices are not considered to be UICs because the stormwater infiltrates from the surface of the ground and filters through surface cover and soils as opposed to being discharged directly into the subsurface. Therefore, these types of practices would not need to be addressed under SDWA requirements.

SECTION 5 – PROPOSED CAPITAL IMPROVEMENT PROJECTS FOR FLOOD CONTROL AND WATER QUALITY

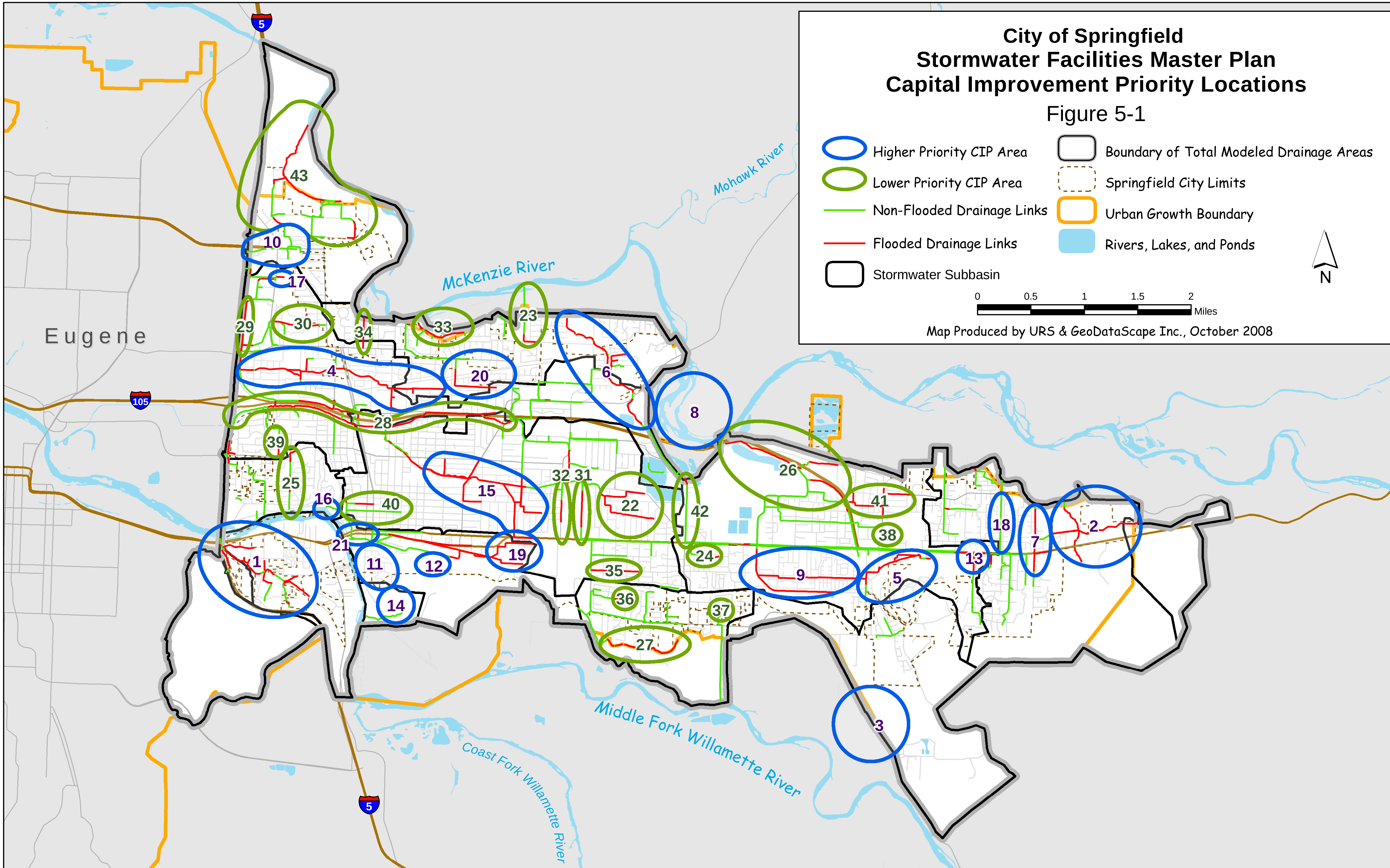
Section 3.0 of this plan provides a summary of methods used to evaluate the City's drainage system with respect to flooding and Section 4.0 of this plan outlines general water quality problems and City goals with respect to water quality. The purpose of this section is to develop and propose conceptual CIPs to address the flooding and water quality issues that were identified. Section 5.1 provides a summary of the overall capital improvement project development. Section 5.2 outlines the cost estimating assumptions and methods. Section 5.3 provides a summary of the process to develop flood control CIPs and the resulting proposed CIP list, summaries, and costs. Section 5.4 provides a summary of the process used to develop water quality CIPs and the resulting proposed CIP list including summaries and costs. Section 5.5 provides a summary of all locations identified as in need of flood control or water quality improvements. Where possible, both flood control and water quality CIPs were developed in conjunction with one another, based on identified priorities.

5.1 Overall Capital Improvement Project Development

The City of Springfield and URS identified flood control and water quality CIPs to address locations identified as requiring flood control or water quality improvements. A total of 38 locations were initially identified as areas that would benefit from flood control improvements, and a total of 15 locations were identified as areas that would benefit from water quality improvements. Ten of the locations identified for water quality improvement overlapped with those identified for flood control improvement; therefore a total of 43 priority locations (for both flood control and water quality) were identified. Of those 43 priority locations, 21 were identified as being higher priority for flood control because 1) they were locations where the City is receiving significant pressure from the development community to provide direction related to drainage issues and areas where significant flooding has already been observed to occur under existing conditions, or 2) they were locations where it would be feasible to combine both water quality and flood control CIPs to address both objectives. The 43 priority locations are shown on Figure 5-1.

Given the number of flood control priority locations identified, flood control CIPs were only developed to address the highest priority locations. To address the highest priority locations, a total of 15 flood control CIPs were developed. Four of the CIPs (to address five of the highest priority flood control locations) were developed using modeling, resulting in more detailed cost estimates. The other 11 CIPs were developed more conceptually with planning level cost estimates. Additional detail regarding the proposed flood control CIPs is included in Section 5.3 and documented in Tables 5-1 and 5-4.

Water quality CIPs were solely developed conceptually with planning level cost estimates (i.e. no detailed modeling was conducted). A total of 12 water quality CIPs were developed. Additional detail regarding the water quality CIPs is included in Section 5.4 and Table 5-2.


City of Springfield
Stormwater Facilities Master Plan
Capital Improvement Priority Locations
Figure 5-1
Higher Priority CIP Area
Lower Priority CIP Area
Non-Flooded Drainage Links
Flooded Drainage Links
Stormwater Subbasin
Boundary of Total Modeled Drainage Areas
Springfield City Limits
Urban Growth Boundary
Rivers, Lakes, and Ponds
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Map Produced by URS & GeoDataScape Inc., October 2008
Eugene
McKenzie River
Mohawk River
Middle Fork Willamette River
Coast Fork Willamette River
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5.2 Cost Estimating Assumptions and Methods

Costs for each priority capital project were estimated using unit costs that were developed for this project. The unit cost tables and a summary of the unit cost tables are provided in Appendix D. The unit cost tables in Appendix D are based on updates to cost tables prepared for the City of Eugene basin planning project dated January 1999. Changes to the 1999 values are noted on the tables and generally include a 15% increase for inflation based on a City of Eugene review of cost increases on recent projects. The unit costs used are consistent with those used by the City of Eugene in recent (2007) updates to their Stormwater Master Plan. Capital costs were based on unit cost information plus 25% contingency for engineering/design and administrative services as shown in the CIP fact sheets. Permitting and land acquisition costs were not included.

5.3 Capital Improvement Projects for Flood Control

This section is divided into two subsections. The first subsection provides a summary of the process that was used to identify the priority locations in need of flood control improvements and develop a comprehensive flood control CIP list to address the priority locations, and the second subsection provides a summary of the resulting CIP list and more detailed cost information for those higher priority flood control CIPs.

5.3.1 Process to Develop Flood Control CIPs

Based on the hydraulic modeling results of the City of Springfield's drainage system, the future condition flood map (Figure 3-11) was reviewed in a workshop setting with City of Springfield staff. The drainage system was reviewed in its entirety on a drainage area by drainage area basis. Major areas with flooding problems were circled and discussed in terms of the severity of existing observed flooding and in terms of the imminent pressures on the system associated with expected upstream future development. There were 38 general locations identified as potentially requiring flood control CIPs based on modeling results for future conditions. Three other general locations were preliminarily identified as opportunity areas for water quality improvement and not flood control, and these locations are discussed later in Section 5.4.

Due to the significant amount of flooding problems identified in the City, it was clear that project resources devoted to this master plan would not accommodate the evaluation and development of conceptual CIPs for each of the 38 locations identified as requiring flood control CIPs. In addition, funding the construction of CIPs for all 38 locations would not be feasible for the City in a master planning time frame of ten or twenty years. Therefore, in the workshop setting, discussions were held to prioritize the locations for further modeling evaluations in order to develop conceptual flood control CIPs, CIP fact sheets, and CIP cost estimates.

In order to prioritize the list of 38 general locations requiring flood control, discussions centered on areas where the City is receiving significant pressure from the development community to provide direction related to drainage issues, and on areas where significant flooding has already been observed to occur under existing conditions. As a result, 18 of the 38 general locations were identified as higher priority. Twenty of the locations were moved to lower priority based on the fact that during recent significant rainfall events, flooding was not observed and, based on field knowledge of the system, is not expected to occur in the future. The model may be conservative for these areas, over predicting problems, and future calibration of the model may help refine flow information for these areas. The 18 locations identified as higher priority were selected as higher priority because flooding has already been observed under existing conditions and/or significant development upstream is anticipated. Figure 5-1 shows the higher priority and lower priority CIP locations.

The 18 higher priority locations were again sorted based on subjective discussions related to future development and the severity of existing flooding. Typically, in a municipal stormwater master plan, a CIP is focused on a somewhat smaller area than those identified in Figure 5-1, and may include replacement of only one or two pipe segments. However, for this plan, CIPs for the circled areas potentially include multiple modifications to the system that in another master plan might reflect several CIPs. Based on the size of the areas and extent of the systems in each area, it was determined that detailed modeling would be conducted for the five highest priority locations. These five highest priority locations were locations 1, 2, 3, 4 and 7 (Figure 5-1). Four flood control CIPs were developed to address these five highest priority locations, using detailed modeling.

While detailed modeling was not conducted for the remaining thirteen higher priority locations, a general discussion took place regarding the optimum scale and type of CIP needed to address the flooding problem. Model results were used to develop conceptual flood control CIP projects and develop approximate planning level cost estimates that could be used for master planning level purposes. A total of 11 conceptual flood control CIPs were developed to address the flood issues in the remaining 13 higher priority locations. All 15 (4 modeled, 11 conceptual) developed flood control CIPs are listed in Table 5-1.

5.3.2 CIP Summaries and Cost Estimates

This section includes two subsections. The first subsection summarizes the four flood control CIPs that were modeled and references Appendix E for the resulting CIP fact sheets and cost estimates. The second subsection includes CIP summaries and cost estimates for the 11 conceptual flood control CIPs, that were developed to address the remaining 13 higher priority flood control locations that were not evaluated using the model.

5.3.2.1 Model Evaluations and Four Proposed CIPs for the Five Highest Priority Flood Locations

Appendix E contains the summary text, CIP fact sheets, and figures describing the four flood control CIPs developed to address the five higher priority flood locations. The CIPs were developed using iterative model simulations, and cost estimates were developed for the selected, proposed improvements to address flooding. Most improvements include upsizing existing storm pipes or making improvements to the open channel conveyance system. Although four CIPs were developed using modeling, the CIPs address five higher priority locations due to the fact that Gray Creek (location 2) and 72nd Street (location 7) are included within the same drainage area.

For each of the four CIPs developed, Appendix E contains an overall summary of the process used to develop that flood control CIP. Following the summary is a CIP fact sheet that includes specific flood control project elements and cost estimates. Figures showing the plan and profile views of the CIP are also provided following the fact sheets to facilitate a review of the system.

5.3.2.2 Cost Estimates for the Eleven CIPs to Address the Thirteen Remaining High Priority Flood Locations

For the remaining 13 higher priority flooding locations, discussions were held with the City regarding likely system modifications (CIPs) that would be proposed to address the flooding identified. Eleven conceptual flood control CIPs were developed to address the remaining 13 higher priority flooding locations. The model was not used to evaluate or refine these flood control CIP alternatives in detail. Other than hydrologic/hydraulic flow results, Table 5-1 provides a summary of the flood control CIP considered for each area, assumptions made in the sizing, and approximate planning level cost estimates.

Table 5-1: Summary of Conceptual Flood Control CIP Costs for Higher Priority Flood Locations

Flood Control CIP Number	Associated Priority Location Number (Figure 5-1)	Name/ Location	Originally Included in Model (Y/N)	Description of Flooding Problem	Proposed Modifications	Design Assumptions	Total Conceptual CIP Cost
1-FC	1	Glenwood	Y	See Appendix E			Construction Costs: $3,870,400 Engineering/ Administration Costs: $967,600
2-FC	2 and 7	Gray Creek/72nd Street	Y	See Appendix E			Construction Costs: $4,237,100 Engineering/ Administration Costs: $1,059,275
3-FC	3	Jasper Natron	N	See Appendix E			Construction Costs: $2,206,500 Engineering/ Administration Costs: $551,625
4-FC	4	Channel 6	Y	See Appendix E			Construction Costs: $901,100 Engineering/ Administration Costs: $225,275
5-FC	5 and 9	59th and Aster and Daisy Street	Y	• Project locations are adjacent to one another. • Segment of the 59th Street system is disconnected. • Backwater conditions occur and existing pipes are undersized	Construct a parallel pipe system from 48th to 60th. See Figure 5-1 and Table 5-4 for additional location description.	• New pipe size determined for the conceptual design and cost estimate were estimated as the minimum pipe size of the existing system. • Cost based on 7840’ of 36” diameter CSP. • Cost assumes 2-5’ of cover over the pipe. • Engineering and administrative costs included at 25% of the construction costs.	Construction Costs: $1,724,800 Engineering/ Administration Costs: $431,200

Table 5-1: Summary of Conceptual Flood Control CIP Costs for Higher Priority Flood Locations

Flood Control CIP Number	Associated Priority Location Number (Figure 5-1)	Name/ Location	Originally Included in Model (Y/N)	Description of Flooding Problem	Proposed Modifications	Design Assumptions	Total Conceptual CIP Cost
6-FC	6	Irving Slough	Y	• Backwater conditions exist from the upstream detention pond to the outfall. • Multiple choke points exist along the Slough.	Improve the open channel system (remove choke points) and construct a 4-acre-ft (estimated) storage facility to address capacity issues. See Figure 5-1 and Table 5-4 for additional location description.	• Cost assumes Type 2 open channel ($730/lf). • Cost of open channel improvements assumes improvements necessary for full length of channel from existing detention facility (2080'). • Footprint of required storage facility estimated at 4 acre-ft (1-acre footprint and 4' deep facility). • Permitting and land acquisition costs not included. • Engineering and administrative costs included at 25% of the construction costs.	<u>Construction Costs</u>: $1,757,200 <u>Engineering/ Administration Costs</u>: $439,300
8-FC	8	Oxbow	N	• Complicated – conceptual costs not calculated per City direction.	N/A	Waiting for the Army Corps Metro Waterways McKenzie River Floodplain study to be completed prior to proceeding with developing concepts for this CIP.	N/A
10-FC	10	North Gateway – Sportsway Channel	Y	• Existing flood control (i.e., capacity) and water quality issues.	Construct a combination flood control and water quality facility. See Figure 5-1 and Table 5-4 for additional location description.	• Conceptual design plan prepared by URS (formerly Woodward Clyde) in 1999 for the Sports Center Regional Facility Project includes an initial facility size (7 acre/ft.) • Proposed facility is a combination water quality and flood control facility. • Per conceptual design, facility to operate more like a wetland (shallow); therefore assumed footprint is 7-acres. • Permitting and land acquisition costs not included. • Engineering and administrative costs included at 25% of the construction costs.	<u>Construction Costs</u>: $417,900 <u>Engineering/ Administration Costs</u>: $104,475
11-FC	11	N. Willamette Heights	N	• Limited existing conveyance system (pipes <24" – not included in the model). • New development anticipated for the area.	Develop a small, basin plan to guide the new and redevelopment activities with respect to drainage. Construction costs to be developed afterwards.	• Unit cost is estimated to be $60,000.	$60,000 for planning – construction costs not estimated.
N/A	12	McKenzie Forest Products/ Mill Pond	N	• No reported flooding problems.	Water Quality CIP proposed.	This CIP is addressed under the water quality section. See Table 5-2 for more details related to this CIP.	N/A

Table 5-1: Summary of Conceptual Flood Control CIP Costs for Higher Priority Flood Locations

Flood Control CIP Number	Associated Priority Location Number (Figure 5-1)	Name/ Location	Originally Included in Model (Y/N)	Description of Flooding Problem	Proposed Modifications	Design Assumptions	Total Conceptual CIP Cost
13-FC	13	South 67th Street	Y	• The 67th Street system has a steep gradient while the Main Street system (downstream) has relatively no gradient. • Water backs up from the Main Street system at the intersection of Main Street and 67th.	Construct a parallel pipe system along 67th Street and Main Street. See Figure 5-1 and Table 5-4 for additional location description.	• New pipe size determined as the minimum of the existing system. • Cost based on 2080' of 24" diameter CSP. • Cost assumes 2-5' of cover over the pipe. • Engineering and administrative costs included at 25% of the construction costs.	Construction Costs: $249,600 Engineering/ Administration Costs: $62,400
14-FC	14	S. Willamette Heights	N	• Limited existing conveyance system (small pipes less than 24" – not included in the model). • New development anticipated for the area.	Develop a small, basin plan to guide the new and redevelopment activities with respect to drainage. Construction costs to be developed afterwards.	• Unit cost is estimated to be $60,000.	$60,000 for planning – construction costs not estimated.
15-FC	15	Over-Under	Y	• Existing pipe system has limited capacity.	Construct parallel pipe system from 21st Street west to the Q Street Channel and along 21st Street. See Figure 5-1 and Table 5-4 for additional location description.	• New pipe size determined as the minimum of the existing system. • Cost based on 8720' of 36" diameter CSP. • Cost assumes 2-5' of cover over the pipe. • Engineering and administrative costs included at 25% of the construction costs.	Construction Costs: $1,918,400 Engineering/ Administration Costs: $479,600
N/A	16	Island Park	N	• No reported flooding problems.	Water Quality CIP proposed.	This CIP is addressed under the water quality section. See Table 5-2 for more details related to this CIP.	N/A
17-FC	17	Gateway Gamebird System	Y	• Limited existing conveyance system (small pipes less than 24"– not included in the model). • Redevelopment anticipated for the area.	Develop a small, basin plan to guide the new and redevelopment activities with respect to drainage. Construction costs to be developed afterwards.	• Unit cost is estimated to be $60,000.	$60,000 for planning – construction costs not estimated.

Table 5-1: Summary of Conceptual Flood Control CIP Costs for Higher Priority Flood Locations

Flood Control CIP Number	Associated Priority Location Number (Figure 5-1)	Name/ Location	Originally Included in Model (Y/N)	Description of Flooding Problem	Proposed Modifications	Design Assumptions	Total Conceptual CIP Cost
18-FC	18	69th Street	Y	• Pipes are entering the 69th Street system from the west, below the water surface elevation in the system. High system water surface elevation due to Cedar Creek. • As a result, the system backs up and floods the subdivision to the west.	Improve the downstream open channel system to alleviate backwater conditions. See Figure 5-1 and Table 5-4 for additional location description.	• Cost assumes Type 2 open channel ($730/lf). • Cost of open channel improvements assumes improvements necessary for full length of flooded channel to outfall (2600'). • Permitting and engineering and administrative costs included at 25% of the construction costs.	Construction Costs: $1,898,000 Engineering/ Administration Costs: $474,500
19-FC	19	Upstream end of South A Street	Y	• Existing pipe system is undersized to meet the drainage requirement. • Observed flooding limited to the upstream portion of the A Street system.	Construct parallel pipe system at upstream "C" configuration of the A Street system. See Figure 5-1 and Table 5-4 for additional location description.	• New pipe size determined as the minimum of the existing system. • Cost based on a total of 4320' of 24" diameter CSP. • Cost assumes 2-5' of cover over the pipe. • Engineering and administrative costs included at 25% of the construction costs.	Construction Costs: $518,400 Engineering/ Administration Costs: $129,600
20-FC	20	Lawnridge	Y	• Existing pipe system is undersized to meet the drainage requirement.	Upsize the existing pipe system. See Figure 5-1 and Table 5-4 for additional location description.	• New pipe size determined as a one-foot diameter increase of the existing pipe network. • Required pipe size estimated at 36". • Required pipe length is 3280'. • Cost assumes 2-5' of cover over the pipe. • Engineering and administrative costs included at 25% of the construction costs.	Construction Costs: $721,600 Engineering/ Administration Costs: $180,400
N/A	21	Lower Mill Race	N	• No reported flooding problems.	Water Quality CIP proposed.	N/A	N/A
						Total Estimated CIP Costs for Flood Control:	**$25,706,375**

5.4 Capital Improvement Projects for Water Quality

This section is divided into two subsections. The first subsection provides a summary of the process that was used to develop a comprehensive water quality CIP list to address the existing and expected water quality problems, and the second subsection provides a summary of the resulting CIP list with cost and conceptual design information for those CIPs.

5.4.1 Process to Develop Water Quality CIPs

Following the development of the initial 38 priority locations for flood control (and resulting 15 flood control CIPs), the City of Springfield, in conjunction with LCOG, conducted a stormwater basin characterization study and developed waterway evaluation tables in order to assess locations where water quality improvements were necessary.

A workshop was held with the City of Springfield staff to review the results of the stormwater basin characterization study, specifically those locations identified for potential water quality CIPs and to determine additional areas as necessary. A total of 15 locations were identified as areas in need of water quality enhancement in the form of water quality CIPs. Ten of the 15 locations coincided with those areas already identified and prioritized as part of the flood control. Three locations that were preliminarily identified during the flood control evaluation but were deemed to be water quality opportunity areas were included as part of the 15 locations. Finally, two additional locations were identified that did not coincide with the previous flood control CIP identification efforts.

Each of the 15 locations was prioritized in accordance with the flood control prioritization previously conducted. The 10 locations that were identified as both a flood control and water quality priority area were considered higher priority and were prioritized in accordance with the original flood control prioritization (see Figure 5-1 and Table 5-4). The three locations that were preliminarily identified (and prioritized) during the flood control evaluation but deemed to be water quality opportunity areas were also considered higher priority, and their overall prioritization remained the same as the original flood control prioritization ranking selected for the area (see Tables 5-1 and 5-2, locations 12, 16, and 21). The two additional locations identified for water quality but not for flood control were deemed to be lower priority, as existing flooding and development pressures were not yet prevalent at these sites (see Table 5-2, locations 42 and 43).

During the same workshop with the City, for each of the 15 locations in need of water quality CIPs, discussions regarding the feasibility of various treatment options and the overall pollutant reduction goals were discussed. Given that a majority of the priority locations were also being addressed with a flood control CIP, water quality CIPs were developed to compliment the proposed flood control CIP or to be independent from those flood control CIPs. This approach was taken so that the City may install the separate flood control and water quality systems in accordance with the proposed CIP as time and resources allow. No additional detailed hydraulic modeling was conducted for development of the water quality CIPs, as opposed to what was conducted for those highest priority flood control areas (Appendix E). Twelve water quality CIPs were developed to address the water quality priority locations (both higher and lower). For three priority locations (6, 21, and 23), a water quality CIP was deemed practical only if a flood control facility is ever developed for these locations and the CIP could be constructed to address both objectives. Therefore, for these locations water quality CIPs were not developed. Results of the water quality CIP evaluation are summarized in Table 5-2.

Table 5-2: Summary of Potential Water Quality CIPs

Water Quality CIP Number	Associated Priority Location Number (Figure 5-1)	Geographic Cluster	Name/ Location	Target Pollutants	Potential Pollutant Sources	Natural Resource Limitations	Potential System Design Flaw	Potential Structural WQ CIP Description	Design Assumptions	Conceptual CIP Cost	Land Acquisition Required? (Y or N)
1-WQ	1	Southwest	Glenwood	TMDL parameters, sediment	New development	Riparian and wetlands identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	New development is expected to occur in this area soon.	1. **Implement Glenwood Refinement Plans and incorporate LID into the development** - Implement the existing refinement plans for the Glenwood development area .	1. Refinement plans include detail related to development and installation of LID and rain garden features for stormwater treatment. 2. Implementation of refinement plans to also require refinement and implementation of development standards to properly size and design LID facilities. 3. No cost estimate has been prepared for this CIP, as implementation would be based on the development activities.	N/A	Unsure at this time.
2-WQ	2	Northeast	75th Street Channel	bacteria, temperature, sediment, dissolved oxygen	Untreated urban runoff, bacteria, pet waste, yard debris	Wetland areas identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	New development along 75th Street.	1. **Potential structural WQ CIP (pond) -** Install an offline treatment system (low flow bypass and water quality pond) to treat runoff associated with 75th Street.	1. Proposed locations for the structural WQ CIP include area along the south side of Thurston Road; however, the property is privately owned and may not be available for purchase. Another location is area to the north of Thurston Road, which may be a viable solution as one may leverage water quality treatment for existing and proposed runoff in return for develoment of area. 2. Proposed treatment facility sized based on volume of runoff generated for catchments 88_300_gw1, 88_301, 88_300gw, 88_61_gw, 88_289_gw, 88_289_01, 88_289_02 during a 1.4"/ 24 hour storm event, consistent with City of Eugene standards. 3. The required facility size is estimated as 8.3 acre-ft. This sizing does not account for hydraulic routing of runoff through the facility during the course of the storm. Therefore, the size is expected to be conservative. The unit cost of a retention pond is $59,700/acre-ft. 4. Engineering and administrative costs included at 25% of the construction cost. 5. Land acquisition and permitting costs not included.	Construction Costs: Treatment facility = $495,510 Engineering/ Administration Costs: $123,878	Y - for the construction of the proposed WQ treatment facility.
4-WQ	4	Northwest	Channel 6 from I-5 to 9th Street	TMDL Pollutants (bacteria), nutrients, pestides	Pet and yard waste, upstream trailer park discharges trash and sediment, citizens feed ducks in area	Wetland areas identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Overall flat gradient. No public areas adjacent to Channel 6 or within the upstream trailer park to buill a structural WQ facility.	1. **Open Channel Improvement (green pipe)** - Construct a green pipe open channel improvements along the Channel 6 system from I-5 to Don Street. 2. **Potential structural WQ CIP (pond)** - Upsize the proposed (flood control) detention pond located between 7th and 9th Avenues to include water quality.	1. The size and type of open channel improvement (Type 1, 2, 3, or 4) will be dependent on the future flows in the system once the proposed flood control detention pond is online (See CIP 4-FC). To estimate conceptual costs, a Type 2 open channel improvement was used ($730/lf). 2. The length of open channel improvement (from I-5 to Don Rd.) is estimated as 2000 feet. 3. The proposed flood control detention pond is estimated to store 100,000 cubic feet with 4' of depth and a 1-acre footprint. A 50% increase in size is proposed to address water quality. To estimate conceptual costs, the cost associated with a net increase in footprint of 0.5 acres and a net increase in size of 2 acre-ft is used. The unit cost of a retention pond is $59,700/acre-ft. This cost would be in addition to the cost of the flood control facility. 4. Engineering and administrative costs included at 25% of the construction cost. 5. Land acquisition and permitting costs not included.	Construction Costs: Open Channel Improvement = $1,460,000 Pond upsize = $119,400 Engineering/ Administration Costs: $394,850	Y - for the open channel widening and for the construction of the proposed flood control/ WQ detention pond.

Table 5-2: Summary of Potential Water Quality CIPs

Water Quality CIP Number	Associated Priority Location Number (Figure 5-1)	Geographic Cluster	Name/ Location	Target Pollutants	Potential Pollutant Sources	Natural Resource Limitations	Potential System Design Flaw	Potential Structural WQ CIP Description	Design Assumptions	Conceptual CIP Cost	Land Acquisition Required? (Y or N)
7-WQ	7	Northeast	72nd Street Channel	bacteria, temperature, sediment, dissolved oxygen	Untreated urban runoff, bacteria, pet waste, yard debris, transient activities	Wetland areas identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Encroaching development along 72nd St. Channel (west side) results in the discharge of pet and yard waste. Part of the existing open channel (Reach 6 per flood control CIP) is a concrete lined structure which doesn't promote infiltration or water quality. The gradient is steep so there is a water control structure (drop structure) on the channel.	1. **Sediment trap** - Construct a sediment trap at the downstream end of the channel. 2. **Open Channel Improvement (green pipe)** - Remove the concrete bottom of 72nd St. channel (Reach 6 in flood control CIP) and construct a green pipe along the full channel (Reaches 6 and 7 in flood control CIP). May require redesign of drop structure.	1. One sediment trap to be installed at the downstream end of the channel. Conceptual costs estimated as that of a Type 2 trash rack. 2. Open channel improvements (including potential removal of the concrete channel bottom) for Reach 6 are already included under the flood control CIPs so the associated costs for this part of the improvement are not reflected under this estimate. 3. The size and type of open channel improvement (Type 1, 2, 3, or 4) for Reach 7 (downstream of Reach 6) will be dependent on the future flows in the system once the proposed improvements to Reach 6 occur. To estimate conceptual costs, a Type 2 open channel improvement was used ($730/lf). Construction of a green pipe increases the Mannings n value and results in a larger channel footprint necessary to convey the same flow. 4. The length of open channel improvement (Reach 7) is estimated as 1600 feet. 5. Costs for retrofit of the drop structure are not included. 6. Engineering and administrative costs included at 25% of the construction cost. 7. Land acquisition and permitting costs not included.	Construction Costs: Sediment Trap = $9,970 Open channel improvements (Reach 7 only) = $1,168,000 Engineering/ Administration Costs: $294,493	Y - for the widening of the open channel.
10-WQ	10	Northwest	North Gateway - Sportsway Channel	Not specifically indicated; assuming flow, trash and debris, sediment	Future development, high transient population	City of Springfield conservation area per City's Waterway Evaluation Table. Field reconaissance necessary prior to design.	Trash and debris and sediment associated with new commercial development.	1. **Potential structural WQ CIP (pond/ wetland facility) -** Install a combination regional flood control and water quality facility.	1. This facility is also referenced as a dual flood control and water quality CIP under the flood control CIP list. 2. Conceptual design plan prepared by URS (formerly Woodward Clyde) for the Sports Center Regional Facility project (combination flood control and water quality facility) and includes an initial facility size of 7.6 acre-feet.The unit cost of a stormwater marsh/ wetland is $88,300/ acre-ft. 3. The construction and engineering cost estimates are the same as those reflected in Table 5-2 for flood control BMPs, as the facility serves a dual purpose. To avoid duplicative information and possible double counting, cost estimates associated with this facility are represented in Table 5-2.	See Table 5-2	Y - for the construction of the proposed flood control/ WQ detention pond.

Table 5-2: Summary of Potential Water Quality CIPs

Water Quality CIP Number	Associated Priority Location Number (Figure 5-1)	Geographic Cluster	Name/ Location	Target Pollutants	Potential Pollutant Sources	Natural Resource Limitations	Potential System Design Flaw	Potential Structural WQ CIP Description	Design Assumptions	Conceptual CIP Cost	Land Acquisition Required? (Y or N)
12-WQ	12	Southwest	Mill Race - Mill Race and Outfalls	TMDL parameters, sediment, industrial waste	High transient population, industrial and gravel industry, livestock waste	Riparian and wetlands identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Runoff from industrial areas. There are currently four projects associated with this site. Reference to the ACOE study to channelize the Mill Pond is not included.	1. **Daylight or diversion/ pretreatment structure** - Construct facility for water quality at the newly purchased City property (North Bank Project at the McKenzie River Forest Products site). 2. **Potential Structural WQ CIP (pond/ wetland)** - Construct facility for the Booth Kelly study area for flow and water quality. 3. **Open channel improvements (riparian enhancement/ green pipe)** - Construct open channel improvements to the channel downstream of Booth Kelly (Lower Mill Race).	1. Daylight or diversion structure to be constructed at newly purchased City property (North Bank project) between Mill Pond (and the existing ACOE study) and the proposed open channel improvements downstream of Booth Kelly. 2. Limited feasibility of daylighting pipe, so the conceptual CIP cost estimate for North Bank project is associated with open channel construction (Type 2 = $730/ft) and installation of a water quality pond. The length of necessary open channel improvement is estimated as 500 feet. 3. Proposed treatment facility sized based on volume of runoff generated for catchments 35_145, 35_144, 35_150, 35_151, 35_152, 35_153, 35_154, and 35_155 during a 1.4"/ 24 hour storm event, consistent with City of Eugene standards. 4. The required facility size is estimated as 4.4 acre-ft. This sizing does not account for hydraulic routing of runoff through the facility during the course of the storm. Therefore, the size is expected to be conservative. The unit cost of a retention pond is $59,700/acre-ft. 4. A Booth Kelley basin study has been previously prepared. The cost estimate in the study assumes a 12-acre facility at $30,000/acre. This estimated cost is reflected in this conceptual cost estimate. 5. Construction of the Lower Mill Race enhancements is anticipated to be funded via an OWEB grant. Therefore costs for this are not included in the conceptual cost estimate. 6. Engineering and administrative costs included at 25% of the construction cost. 7. Land acquisition and permitting costs not included.	Construction Costs: Open Channel Improvement (North Bank)= $365,000 Treatment Facility (North Bank) = $262,680 Treatment Facility (Booth Kelly) = $360,000 Engineering/ Administration Costs: $246,920	Y - for the open channel and for the construction of the proposed WQ treatment facilities.
16-WQ	16	Southwest	Island Park	TMDL parameters, nutrients, bacteria, sediment	Urban development, minimal existing stormwater treatment	Wetland areas identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Dense existing development encroaches on channel. Minimal existing stormwater treatment.	1. **Open Channel Improvements (green pipe)** - Construct a open channel improvements (green pipe) along the existing open channel corridor to the outfall from the senior center. 2. **Potential structural WQ CIP (pond)** - Construct a structural WQ facility (pond) at the park to capture runoff from the upstream pipe system.	1. The size and type of open channel improvement (Type 1, 2, 3, or 4) will be dependent on the future flows in the system. To estimate conceptual costs, a Type 2 open channel improvement was used ($730/lf). Construction of a green pipe increases the Mannings n value and results in a larger channel footprint necessary to convey the same flow. 2. The length of open channel improvement (from to the outfall) is estimated as 960 feet. 3. Proposed treatment facility sized based on volume of runoff generated for catchments 39_160, 39_161, 39_162, 39_163, 39_164, and 39_165 during a 1.4"/ 24 hour storm event, consistent with City of Eugene standards. 4. The required facility size is estimated as 14.6 acre-ft. This sizing does not account for hydraulic routing of runoff through the facility during the course of the storm. Therefore, the size is expected to be conservative. The unit cost of a retention pond is $59,700/acre-ft. 5. Engineering and administrative costs included at 25% of the construction cost. 6. Land acquisition and permitting costs not included.	Construction Costs: Open Channel Improvement = $700,800 Treatment Facility = $871,620 Engineering/ Administration Costs: $393,105	Y - for the construction of the proposed WQ treatment facility and possibly for the open channel improvements.

Table 5-2: Summary of Potential Water Quality CIPs

Water Quality CIP Number	Associated Priority Location Number (Figure 5-1)	Geographic Cluster	Name/ Location	Target Pollutants	Potential Pollutant Sources	Natural Resource Limitations	Potential System Design Flaw	Potential Structural WQ CIP Description	Design Assumptions	Conceptual CIP Cost	Land Acquisition Required? (Y or N)
18-WQ	18	Northeast	69th Street Channel	Sediment, bacteria	Bank stability, vehicular traffic, pet waste	N/A - Based on information on City's Waterway Evaluation Table. Field reconnaissance may identify additional issues.	Development encroaches on channel. Fairly urbanized. Lateral pipes from west that tie into the 69th Street system are below the HGL of the system so flooding occurs.	1. **Open Channel Improvements (either over-under pipe or green pipe) -** Construct an over-under pipe system along the 69th Street Channel, where a bioswale runs along the channel and a pipe runs underneath or construct a green pipe. 2. **Potential structural WQ CIP (pond) -** Construct a structural WQ facility (pond) at the downstream end of the 69th Street Channel.	1. Construction of an over-under pipe system to treat and convey flows from the east of 69th St may be limited by grade. Costs for a Type 2 open channel improvement for 69th St are already included under the flood control CIP (#18). Although, construction of a green pipe increases the Mannings n value and results in a larger channel footprint necessary to convey the same flow, the open channel improvements already costed out under the flood control CIP are considered representative of the water quality construction cost and not reflected in this estimate. 2. Construct a structural WQ facility (pond) at the downstream, eastern end of the 69th Street Channel to treat runoff from the south that is conveyed without treatment. 3. Proposed treatment facility sized based on volume of runoff generated for catchments 2_56, 2_275, and 88_63 during a 1.4"/ 24 hour storm event, consistent with City of Eugene standards. 4. The required facility size is estimated as 7.1 acre-ft. This sizing does not account for hydraulic routing of runoff through the facility during the course of the storm. Therefore, the size is expected to be conservative. The unit cost of a retenti 5. Engineering and administrative costs included at 25% of the construction cost. 6. Land acquisition and permitting costs not included.	Construction Costs: Treatment facility = $423,870 Engineering/ Administration Costs: $105,968	Y - for the open channel widening and for the construction of the proposed WQ treatment facility.
32-WQ	32	Southwest	28th and Olympic	Elevated temperature, sediment	Industrial discharges	Wetland areas identified in open channel waterways per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Industrial facilities generally discharge waters with elevated temperatures and untreated runoff to the MS4. Most dischargers have a 1200-Z permit which limits involvement from the City.	1. **Develop a management plan** - Develop a management plan for the area with the intent to improve water quality from the industrial sources.	1. To be consistent with the flood control CIPs outlined in Table 5-2 that involve development of management plans, the unit cost is estimated to be $60,000.	Engineering/ Administration Costs: $60,000	N/A
37-WQ	37	Southeast	Jasper Basin - Middle Fork Willamette River at Clearwater.	TMDL parameters, nutrients, bacteria, sediment	Future development; currently the Clearwater Park outfall discharges to the Middle Fork without treatment.	N/A - Based on information on City's Waterway Evaluation Table. Field reconnaissance may identify additional issues.	Future development likely to occur in this location. In addition, a portion of the contributing area to the outfall is associated with the construction of the Mill Race Intake, which effects water quality.	1. **Potential Structural WQ CIP (regional or site specific facilities)** - Install water quality facilities at Clearwater Park location.	1. For purposes of conceptual cost estimation, the CIP cost is based on construction of one large regional treatment facility at Clearwater Park. 2. Proposed treatment facility sized based on volume of runoff generated for catchments 64_282, 64_281, and 64_280 during a 1.4"/ 24 hour storm event, consistent with City of Eugene standards. 3. The required facility size is estimated as 3.9 acre-ft. This sizing does not account for hydraulic routing of runoff through the facility during the course of the storm. Therefore, the size is expected to be conservative. The unit cost of a retention pond is $59,700/acre-ft. 4. Engineering and administrative costs included at 25% of the construction cost. 5. Land acquisition and permitting costs not included.	Construction Costs: Treatment Facility = $232,830 Engineering/ Administration Costs: $58,208	Y - for the construction of the proposed WQ treatment facility.

Table 5-2: Summary of Potential Water Quality CIPs

Water Quality CIP Number	Associated Priority Location Number (Figure 5-1)	Geographic Cluster	Name/ Location	Target Pollutants	Potential Pollutant Sources	Natural Resource Limitations	Potential System Design Flaw	Potential Structural WQ CIP Description	Design Assumptions	Conceptual CIP Cost	Land Acquisition Required? (Y or N)
42-WQ	42	Northwest	42nd Street Outfall Channel	Pollutants associated with spills from Weyco, typical roadway pollutants (sediment, oil and grease, metals), nutrients	Weyerhaeuser, vehicular traffic, stormwater runoff from older developed areas	N/A - Based on information on City's Waterway Evaluation Table. Field reconnaissance may identify additional issues.	Soil contamination and process water discharges to Irving Slough downstream of 42nd Street. Industrial discharges from Weyco are unable to be addressed through WQ CIPs. Spills associated with traffic occur along 42nd Street. In addition, large residential, commercial, and industrial parcels with no stormwater treatment flow to 42nd Street as well.	1. **Potential structural WQ CIP (pond) -** Install an offline treatment system (high flow bypass and water quality pond) on current (private) Weherhaeuser property to treat the low (water quality flows) along 42nd St.	1. Proposed treatment facility sized based on volume of runoff generated for catchments 8_121, 8_119, 8_118, 8_123, and 8_124 during a 1.4"/ 24 hour storm event, consistent with City of Eugene standards. 2. The required facility size is estimated as 11 acre-ft. This sizing does not account for hydraulic routing of runoff through the facility during the course of the storm. Therefore, the size is expected to be conservative. The unit cost of a retention pond is $59,700/acre-ft. 3. Engineering and administrative costs included at 25% of the construction cost. 4. Land acquisition and permitting costs not included.	Construction Costs: Treatment facility = $656,700 Engineering/ Administration Costs: $164,175	Y - for the construction of the proposed WQ treatment facility.
43-WQ	43	Northwest	Maple Island Slough	TMDL parameters, flow	Future development, transient camping	Riparian areas identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Future development and trash and debris. Maple Island Slough generally runs dry so there is limited opportunity for open channel improvement for water quality enhancement.	1. **Develop a vegetation management plan** - Develop a vegetation management plan for the corporate pond (included in the flood control model) that discharges to Maple Island Slough, with the intent to improve water quality from the corporate park.	1. To be consistent with the flood control CIPs outlined in Table 5-2 that involve development of management plans, the unit cost is estimated to be $60,000.	Engineering/ Administration Costs: $60,000	N
N/A	6	Northwest	Irving Slough in the Q Street Basin and West Springfield Hayden Bridge Basin	TMDL parameters, sediment, and flow	New development, maintenance practices	Riparian and wetlands identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	New development and annexations. However, per conversations with the City, this area currently has a high level of pretreatment, and with future annexations and development, water quality will be addressed through development standards.	None specified	If flood control CIPs are proposed, consider implementation of regional water quality CIPs.	NA	Unsure at this time.
N/A	21	Southwest	Lower Mill Race	TMDL parameters, sediment, industrial waste	High transient population, industrial and gravel industry, livestock waste	Riparian and wetlands identified per City's Waterway Evaluation Table. Field reconnaissance necessary prior to design.	Runoff from industrial areas. There are currently four projects associated with this site. Reference to the ACOE study to channelize the Mill Pond is not included.	See Priority Location #12 and assocated CIPs.	Proposed CIPs addressing priority location #12 will also address this area.	N/A	Y - for the open channel and for the construction of the proposed WQ treatment facilities.
N/A	23	Northwest	County outfall to McKenzie at 21st Street	TMDL parameters, sediment, and flow	New development, maintenance practices	N/A - Based on information on City's Waterway Evaluation Table. Field reconnaissance may identify additional issues.	New development and annexations. However, per conversations with the City, this area currently has a high level of pretreatment, and with future annexations and development, water quality will be addressed through development standards.	None specified	If flood control CIPs are proposed, consider implementation of regional water quality CIPs.	NA	Unsure at this time.
									Total Water Quality CIP Cost	**$ 9,028,000**	

5.4.2 CIP Summaries and Cost Estimates

Water quality CIPs developed to address the 15 water quality priority locations include open channel improvements (green pipe), structural water quality treatment facilities (retention ponds), and the development of vegetation/ drainage management plans. Descriptions of the various water quality CIPs including the associated priority locations addressed are summarized in Table 5-2.

As the modeling was not used to specifically size the proposed water quality CIPs, general size estimates were made to develop planning level costs for most CIP components. However, for proposed water quality treatment facilities (e.g., retention ponds), a conceptual sizing analysis was conducted in order to determine the relative system size based on the anticipated drainage area to the facility. The Eugene water quality design storm (1.4"/ 24 hours) was used in combination with the Santa Barbara Urban Hydrograph (SBUH) method to develop specific water quality flows and volumes for those priority areas with a proposed water quality treatment facility. A City soils map was used to estimate representative pervious area curve numbers (CN) for the analysis. As the areas were generally large (i.e., greater than 100 acres), time of concentration was generally estimated as one minute per acre, rounded to the upper 10 minutes. Table 5-3 summarizes the input parameters and associated runoff volumes used for the sizing of specific water quality treatment facilities associated with specified water quality CIPs.

Table 5-3: Summary of Input Parameters and Associated Water Quality Runoff Volumes for Select Water Quality Treatment Facility CIPs

42-WQ (42nd Street Outfall Channel)				Area		CN		
Subbasin	Soil Type	Dominant Land Use	Cummulative CN	Impervious	Pervious	Impervious	Pervious	**Runoff Volume (cf)**
8_121	A	IND	81	20.1	28.9	98	69	88,464.00
8_119	A	IND	81	22.6	21	98	63	95,190.00
8_118	A	IND	81	18.3	20.3	98	66	78,251.00
8_123	A	COM	89	29.1	17.5	98	74	84,133.00
8_124	A	RES	77	31.2	56.3	98	65	130,270.00
							TOTAL:	**476,308**
2-WQ (75th Street Channel)				Area		CN		
Subbasin	Soil Type	Dominant Land Use	Cummulative CN	Impervious	Pervious	Impervious	Pervious	**Runoff Volume (cf)**
88_300_gw1	B	RES	75	6	75.6	98	73	48,467.00
88_301	A	RES	61	6.7	39.4	98	55	27,938.00
88_300_gw	B	OSP	69	21.9	156.3	98	65	90,936.00
88_61_gw	B	RES	75	14.8	313	98	74	131,016.00
88_289_gw	B	OSP	69	2.2	214.5	98	69	32,729.00
88_289_01	B	OSP	69	1.2	115.2	98	69	20,817.00
88_289_02	B	OSP	69	1	30.7	98	68	8,347.00
							TOTAL:	**360,250**
18-WQ (69th Street Channel)				Area		CN		
Subbasin	Soil Type	Dominant Land Use	Cummulative CN	Impervious	Pervious	Impervious	Pervious	**Runoff Volume (cf)**
2_56	B	RES	75	35.4	96.3	98	67	149,664.00
2_275	B	RES	75	10	21.4	98	64	42,948.00
88_63	C	RES	83	11.5	77.8	98	81	114,275.00
							TOTAL:	**306,887**
12-WQ (Mill Race and Outfalls)				Area		CN		
Subbasin	Soil Type	Dominant Land Use	Cummulative CN	Impervious	Pervious	Impervious	Pervious	**Runoff Volume (cf)**
35_145	A	IND	81	22.4	12.1	98	50	94,301.00
35_144	A	IND	81	7	11	98	70	31,907.00
35_150	A	IND	81	4	7.2	98	72	19,168.00
35_151	A	IND	81	8.1	11	98	68	35,779.00
35_152	A	IND	81	0.9	0.5	98	50	3,843.00
35_153	A	IND	81	4.6	2.2	98	45	19,549.00
35_154	A	IND	81	11.8	4.5	98	36	49,912.00
35_155	A	IND	81	4.5	21.7	98	77	31,679.00
							TOTAL:	**286,138**
CIP = Island Park				Area		CN		
Subbasin	Soil Type	Dominant Land Use	Cummulative CN	Impervious	Pervious	Impervious	Pervious	**Runoff Volume (cf)**
39_160	A	COM	89	32.6	18.7	98	73	142,116.00
39_161	A	COM	89	19.5	5.7	98	58	82,092.00
39_162	A	COM	89	12	7.8	98	75	54,349.00
39_163	A	COM	89	49.4	43	98	79	231,768.00
39_164	A	COM	89	2.1	2	98	80	10,677.00
39_165	A	MFR	77	27	24.7	98	54	112,588.00
							TOTAL:	**633,590**
37-WQ (Jasper Basin - Middle Fork Willamette River at Clearwater)				Area		CN		
Subbasin	Soil Type	Dominant Land Use	Cummulative CN	Impervious	Pervious	Impervious	Pervious	**Runoff Volume (cf)**
64_282	A	AGR	39	17.8	42.2	98	14	73,869.00
64_281	A	AGR	39	19.2	59	98	20	78,906.00
64_280	A	AGR	39	3.2	31.9	98	33	13,472.00
							TOTAL:	**166,247**

5.5 Summary Listing of Proposed Capital Improvement Projects

Figure 5-1 summarizes the 43 priority locations for flooding and/or water quality, and these locations were used to identify flood control and/or water quality CIPs. For flood control, locations were identified based on results of the hydraulic modeling effort as those portions of the system requiring flood control improvements, based on predicted flows for future development conditions. For water quality, locations were identified based on the initial results of the waterway characterization study. A majority of the identified locations for flood control overlapped with those locations identified for water quality enhancements.

Figure 5-1 separates the 43 priority locations into higher priority and lower priority locations with respect to flood control. This distinction between higher and lower priority is based on 1) areas where the City is receiving significant pressure from the development community to provide direction related to drainage issues and areas where significant flooding has already been observed to occur under existing conditions, and 2) whether both water quality and flood control CIPs are feasible in the location, resulting in the location being a higher priority. Of the 43 priority locations, 21 locations are identified as higher priority for flood control.

Table 5-4 lists the overall priority of all 43 priority locations, along with a description of the type of CIP proposed (flood control and/or water quality) and how the location is addressed in the SWFMP. In summary, 15 flood control CIPs are proposed to address 18 of the high priority flood control locations; 12 water quality CIPs are proposed to address the 15 priority water quality locations. Six of the water quality and flood control CIPs overlapped in terms of location (see column 5 of Table 5-4).

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Higher	1	Glenwood	Yes	F, WQ	1	Using the model, developed conceptual flood control and water quality CIPs and a flood control CIP fact sheet.
Higher	2	Gray Creek	Yes	F,WQ	2	Using the model, developed conceptual flood control and water quality CIPs and a flood control CIP fact sheet. Flood control CIP development combined with that for location #7 (72nd St. Channel).
Higher	3	Jasper Natron	No	F	3	Using the model developed a conceptual flood control CIP and flood control CIP fact sheet.

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Higher	4	Channel 6	Yes	F,WQ	4	Using the model, developed conceptual flood control and water quality CIPs and a flood control CIP fact sheet.
Higher	5	59th and Aster	Yes	F	5	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP. Flood control CIP development combined with that for location #9 (Daisy St.).
Higher	6	Irving Slough	Yes	F		Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP. Identified as a water quality priority location, but no water quality CIP is currently proposed. (see Table 5-2 for rationale)
Higher	7	72nd St Channel	Yes	F, WQ	2 for FC 7 for WQ	Using the model, developed conceptual flood control and water quality CIPs and a flood control CIP fact sheet. Flood control CIP development combined with that for location #2 (Gray Creek).
Higher	8	Oxbow	No	None		Not addressed in SWFMP. Awaiting results of the Army Corps Metro Waterways McKenzie River Floodplain study.
Higher	9	Daisy St	Yes	F	See 5	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP. Flood control CIP development combined with that for location #5 (59th and Aster).

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Higher	10	North Gateway – Sportsway Channel	Yes	F, WQ	10	Developed cursory cost estimate for flood control and water quality CIP, based on hydraulic and hydrologic model results but not based on a modeled evaluation of the CIP.
Higher	11	N. Willamette Heights	No	F	11	Developed cursory cost estimate for a flood control CIP, not based on modeling.
Higher	12	McKenzie Forest Products/ Mill Pond	No	WQ	12	Developed cursory cost estimate for a water quality CIP, based on hydrologic model results tables but not based on a modeled evaluation of the CIP.
Higher	13	S. 67th Street	Yes	F	13	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP.
Higher	14	S. Willamette Heights	No	F	14	Developed cursory cost estimate for a flood control CIP, not based on modeling.
Higher	15	Over-Under	Yes	F	15	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP.
Higher	16	Island Park	No	WQ	16	Developed cursory cost estimate for a water quality CIP, based on hydrologic model results tables but not based on a modeled evaluation of the CIP.
Higher	17	Gateway Gamebird System	Yes	F	17	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP.

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Higher	18	69th Street	Yes	F, WQ	18	Developed cursory cost estimate for a flood control CIP, not based on hydraulic modeling. Develop cursory cost estimate for a water quality CIP, based on preliminary hydrologic modeling results.
Higher	19	Only the upstream end of South A	Yes	F	19	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP.
Higher	20	Lawnridge	Yes	F	20	Developed cursory cost estimate for a flood control CIP, based on hydraulic model results tables but not based on a modeled evaluation of the CIP.
Higher	21	Lower Mill Race	No	WQ	12	Developed cursory cost estimate for a water quality CIP, based on hydrologic model results tables but not based on a modeled evaluation of the CIP. Addressed under CIP developed for location #12 (Mill Pond).
Lower	22	Commercial Street Area	Yes	F		Did not develop a flood control CIP - Flooding is observed, however as redevelopment/development occurs, existing flooding and water quality will likely be addressed.
Lower	23	County Outfall to the McKenzie at approx. 21st.	Yes	F		Did not develop a flood control CIP - This County outfall has not been located. Also identified as a water quality priority location, but no water quality CIP proposed. While development is expected upstream, addressing flooding and/or water quality will require coordination with the County.

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Lower	24	E-W Pipes south of Main St. and East of 42nd	Yes	F		Did not develop a flood control CIP - Minor flooding has been observed.
Lower	25	Pipes along Rainbow Drive	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions.
Lower	26	105 Open Channel (i.e., 48th Street Channel)	Yes	F		Did not develop a flood control CIP - This channel is very deep. No property damage currently occurs when water rises. Flows in this channel are very dependent on downstream river flows.
Lower	27	Jasper Slough Culvert Crossings	Yes	F		Did not develop a flood control CIP - May just be an issue of culvert clearing/ realignment/ repair.
Lower	28	Q-Street	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions. Spill crest in the model may be lower than actual spill crest of the channel. May present a good opportunity for riparian enhancement/shading to address temperature issues in the Willamette River TMDL.
Lower	29	I-5 Gateway Channel (north of Harlow)	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions. Cross-sections in model may under-represent capacity. May present a good opportunity for riparian enhancement/shading to address temperature issues in the Willamette River TMDL.

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Lower	30	Oakdale East of Gateway	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions. Model is likely somewhat conservative for this section. Issues will be resolved when the area develops and drainage is addressed at that time.
Lower	31	Q-Street N-S Open Channel Section North of Main and East of 28th.	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions. Constructed a parallel channel for pre-treatment and enhance riparian for additional shading.
Lower	32	N-S Pipe sections in 28th St. Area	Yes	F, WQ	32	Did not develop a flood control CIP - No observed flooding under existing conditions. Developed cursory cost estimate for a water quality CIP, based on hydrologic model results tables but not based on a modeled evaluation of the CIP.
Lower	33	River Glen Channel, north of Hayden and between 7th and 14th	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions.
Lower	34	County Outfall to the McKenzie at approx. Chateau St.	Yes	F		Did not develop a flood control CIP - This is a County outfall and will require coordination with the County.
Lower	35	E-W pipe segment on Virginia St.	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions.
Lower	36	Pipes in Cherokee/ 38th St. Area	Yes	F		Did not develop a flood control CIP. Localized flooding.

Table 5-4: Comprehensive List of CIP Priority Locations

Priority for Addressing Flood Control in the CIP	Priority Location Number (From Figure 5-1)	General Location	Included in Current Hydraulic Model	Type of CIP Proposed (F = flood control; WQ = water quality)	Proposed CIP #	Plan for Addressing per the SWFMP
Lower	37	Upstream end of pipe on Clearwater Lane	Yes	F, WQ	37	Did not develop a flood control CIP - The City already has a handle on this localized flooding problem. Developed cursory cost estimate for a water quality CIP, based on hydrologic model results tables but not based on a modeled evaluation of the CIP.
Lower	38	Pipes in the vicinity of A St. and 58th	Yes	F		Did not develop a flood control CIP. Localized ponding occurs in the roadside ditches. Area will be redeveloped and flooding would be corrected then.
Lower	39	Pipes north of Centennial in the vicinity of Aspen	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions.
Lower	40	Pipes along C-Street	Yes	F		Did not develop a flood control CIP - No observed flooding under existing conditions. Project connected with water quality project at Island Park. Pipe surcharging would be corrected then.
Lower	41	Pipes in the vicinity of 58th and Thurston	Yes	F		Did not develop a flood control CIP - No observed flooding, just pipe surcharging. May get worse with future development.
Lower	42	42nd Street Outfall Channel	Yes	WQ	42	Developed cursory cost estimate for a water quality CIP, based on hydrologic model results tables but not based on a modeled evaluation of the CIP.
Lower	43	Maple Island Slough	Yes	WQ	43	Developed cursory cost estimate for a water quality CIP, not based on a modeled evaluation of the CIP.

Note: Rows that are not shaded represent the CIPs that were selected and developed for this SWFMP. Shaded rows represent lower priority locations that may be revisited in the future in terms of CIP development.

SECTION 6 – STORMWATER STANDARDS AND CODE REVIEW

In addition to the development of flood control and water quality CIPs, a review of City stormwater codes and standards was conducted. Overall recommendations resulting from this review included the following:

- Provide consistency for the development community by having consistent development standards in the region (i.e., with the City of Eugene).
- Clearly stipulate a threshold amount of impervious area that triggers the requirement for onsite stormwater facilities.
- Reduce water quality impacts from streets and parking lots through the allowance and encouragement of pervious pavement, and through requirements for implementation of green street standards.
- Allow and encourage vegetated stormwater treatment facilities in required landscaped areas.
- Improve requirements to address stormwater quality issues in the City's drinking water protection district.
- Improve protective standards to minimize the removal of trees and vegetation.
- Strengthen protective measures for riparian areas.
- Consider the development of an updated erosion control handbook for the region.
- Consider full adoption of the Land and Drainage Alteration Permit (LDAP) program and reduce the threshold excavation volume to which this permit applies.
- Clearly establish maintenance responsibilities and ownership for stormwater quality and quantity facilities in the City's codes and standards and establish an inspection system to ensure adequate maintenance.

Appendix F contains a technical memorandum summarizing the details associated with each of these recommendations for code and standards changes related to stormwater management, water quality, and related natural resources protections. These recommendations were prepared to assist the City in aligning its stormwater related practices with the Goals, Policies and Implementation Actions identified in the City of Springfield Stormwater Management Plan (January 2004).

APPENDIX A

HYDROLOGIC SUMMARY TABLES

APPENDIX A MAJOR HYDROLOGIC INPUT/OUTPUT DATA FOR THE SPRINGFIELD STORMWATER SYSTEM (SORTED BY SUBBASIN/ CATCHMENT DESCRIPTION)

Catchment Name	Subbasin/ Catchment Description	Inlet Node	Catchment Area (acres)	Impervious Area (%)			Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions					Subbasin Peak Flow (cfs) Future Land Use Conditions				
				Existing Land Use	Future Land Use	Increase (%)		2-Year	5-Year	10-Year	25-Year	100-Year	2-Year	5-Year	10-Year	25-Year	100-Year
1_273_gw	South Cedar Creek Basin_1	2247	66.4	10.3	25.7	15.4	0.027	8.37	11.55	14.21	16.86	18.98	9.87	13.04	15.69	18.34	20.46
1_274	South Cedar Creek Basin_1	2146	118.0	7.6	8.9	1.3	0.026	11.82	18.12	22.99	27.79	31.60	12.10	18.38	23.25	28.05	31.85
1_54_gw	South Cedar Creek Basin_1	1433	118.0	7.1	18.6	11.5	0.017	13.92	19.66	24.41	29.15	32.92	15.98	21.69	26.44	31.16	34.93
1_60	South Cedar Creek Basin_1	1233	38.9	36.9	38.2	1.3	0.003	6.19	8.09	9.66	11.22	12.47	6.27	8.17	9.74	11.30	12.54
1_60_gw	South Cedar Creek Basin_1	291	43.8	14.6	18.6	4.0	0.002	5.26	7.49	9.28	11.05	12.46	5.56	7.78	9.56	11.33	12.74
10_134	Q Street Floodway Basin_10	2072	75.8	23.8	25.6	1.8	0.002	9.79	13.72	16.83	19.90	22.34	10.03	13.95	17.05	20.12	22.56
10_135	Q Street Floodway Basin_10	723	61.3	33.0	33.2	0.2	0.001	8.44	11.66	14.19	16.68	18.65	8.46	11.69	14.21	16.70	18.67
10_136	Q Street Floodway Basin_10	2416	42.2	22.2	22.2	0.1	0.001	5.26	7.47	9.20	10.92	12.27	5.26	7.47	9.21	10.92	12.28
10_137	Q Street Floodway Basin_10	3501	48.0	20.5	25.9	5.4	0.002	6.00	8.48	10.45	12.39	13.94	6.45	8.92	10.88	12.82	14.36
10_138	Q Street Floodway Basin_10	3779	9.2	6.9	28.8	21.9	0.004	1.10	1.55	1.91	2.28	2.58	1.40	1.84	2.21	2.58	2.87
10_283	Q Street Floodway Basin_10	209	23.5	46.1	46.4	0.3	0.000	3.98	5.15	6.10	7.04	7.80	3.99	5.16	6.11	7.05	7.81
10_284	Q Street Floodway Basin_10	869	50.7	41.7	42.1	0.4	0.001	7.87	10.47	12.54	14.59	16.22	7.90	10.51	12.57	14.62	16.25
11_125	Q Street Floodway Basin_11	149	29.0	44.7	45.2	0.5	0.002	4.95	6.37	7.54	8.70	9.63	4.97	6.39	7.56	8.72	9.65
11_126	Q Street Floodway Basin_11	882	24.7	55.8	55.8	0.0	0.001	4.57	5.79	6.78	7.77	8.56	4.57	5.79	6.78	7.77	8.56
11_127	Q Street Floodway Basin_11	857	51.7	53.8	53.8	0.0	0.001	9.19	11.78	13.87	15.95	17.60	9.19	11.78	13.87	15.95	17.60
11_128	Q Street Floodway Basin_11	1472	21.8	20.9	21.0	0.1	0.001	2.77	3.89	4.78	5.66	6.36	2.77	3.89	4.78	5.66	6.36
11_129	Q Street Floodway Basin_11	2910	27.3	52.2	52.2	0.0	0.001	4.90	6.25	7.35	8.45	9.32	4.90	6.25	7.35	8.45	9.32
11_130	Q Street Floodway Basin_11	1759	10.1	47.4	54.8	7.4	0.001	1.77	2.26	2.67	3.07	3.40	1.89	2.38	2.78	3.19	3.51
11_131	Q Street Floodway Basin_11	1736	25.6	55.1	55.1	0.0	0.001	4.74	5.99	7.03	8.06	8.87	4.74	5.99	7.03	8.06	8.87
11_132	Q Street Floodway Basin_11	824	26.6	13.7	25.0	11.3	0.001	2.99	4.39	5.48	6.55	7.41	3.52	4.89	5.98	7.05	7.90
11_133	Q Street Floodway Basin_11	2440	53.3	14.1	21.8	7.7	0.003	6.25	8.99	11.17	13.33	15.04	6.96	9.67	11.84	13.99	15.70
11_269	Q Street Floodway Basin_11	670	16.5	41.4	41.4	0.0	0.000	2.69	3.51	4.18	4.85	5.37	2.69	3.51	4.18	4.85	5.37
11_270	Q Street Floodway Basin_11	2640	28.8	48.0	48.0	0.0	0.001	4.92	6.36	7.53	8.69	9.61	4.92	6.36	7.53	8.69	9.61
11_271	Q Street Floodway Basin_11	2695	16.2	60.6	60.6	0.0	0.000	3.15	3.94	4.59	5.24	5.76	3.15	3.94	4.59	5.24	5.76
11_272	Q Street Floodway Basin_11	1870	15.8	42.4	42.4	0.0	0.001	2.62	3.40	4.04	4.68	5.18	2.62	3.40	4.04	4.68	5.18
12_33	Q Street Floodway Basin_12	756	40.8	42.7	42.8	0.0	0.001	6.66	8.71	10.36	12.01	13.32	6.67	8.71	10.37	12.01	13.32
13_21	Q Street Floodway Basin_13	599	109.3	44.7	44.7	0.1	0.001	17.66	23.24	27.69	32.10	35.60	17.68	23.25	27.70	32.11	35.61
14_29	Q Street Floodway Basin_14	1767	30.9	44.8	44.8	0.0	0.001	5.17	6.70	7.95	9.19	10.18	5.17	6.70	7.95	9.19	10.18
15_139	Q Street Floodway Basin_15	777	52.7	43.3	43.5	0.1	0.001	8.31	11.01	13.16	15.29	16.98	8.32	11.02	13.17	15.30	16.99
15_140	Q Street Floodway Basin_15	1642	24.4	36.9	36.9	0.0	0.000	3.80	5.01	6.00	6.98	7.76	3.80	5.01	6.00	6.98	7.76
16_31	Q Street Floodway Basin_16	188	12.3	44.0	44.0	0.0	0.001	2.08	2.68	3.17	3.66	4.06	2.08	2.68	3.17	3.66	4.06
17_141	Q Street Floodway Basin_17	3003	11.0	44.3	44.3	0.0	0.000	1.88	2.42	2.87	3.31	3.66	1.88	2.42	2.87	3.31	3.66
17_142	Q Street Floodway Basin_17	741	115.0	30.0	32.8	2.8	0.002	15.56	21.58	26.30	30.97	34.67	16.14	22.14	26.85	31.51	35.21
17_142_gw	Q Street Floodway Basin_17	2306	32.1	74.5	76.1	1.6	0.002	6.98	8.52	9.80	11.08	12.11	7.06	8.59	9.88	11.16	12.18
17_143	Q Street Floodway Basin_17	3241	35.2	42.5	42.5	0.0	0.000	5.65	7.43	8.86	10.29	11.42	5.65	7.43	8.87	10.29	11.42
18_242	West Springfield Q Street Basin_18	3123	56.5	10.7	11.3	0.6	0.001	5.60	8.67	11.02	13.33	15.15	5.67	8.73	11.08	13.39	15.21
18_243	West Springfield Q Street Basin_18	2085	33.5	24.1	28.9	4.8	0.006	4.70	6.35	7.70	9.04	10.11	4.95	6.59	7.94	9.29	10.36
18_244	West Springfield Q Street Basin_18	2353	41.7	28.1	29.3	1.2	0.004	6.17	8.20	9.88	11.55	12.88	6.25	8.28	9.96	11.63	12.96
18_245	West Springfield Q Street Basin_18	1803	11.1	23.8	26.5	2.7	0.003	1.58	2.12	2.57	3.01	3.37	1.63	2.17	2.61	3.06	3.41
18_246	West Springfield Q Street Basin_18	1798	64.8	8.9	9.1	0.1	0.001	6.33	9.84	12.54	15.18	17.27	6.35	9.86	12.55	15.20	17.29
18_247	West Springfield Q Street Basin_18	3700	32.0	44.3	45.1	0.8	0.002	5.38	6.97	8.26	9.55	10.57	5.43	7.01	8.30	9.59	10.62
18_248	West Springfield Q Street Basin_18	2395	3.3	76.5	76.5	0.0	0.002	0.72	0.88	1.01	1.14	1.24	0.72	0.88	1.01	1.14	1.24
18_249	West Springfield Q Street Basin_18	808	10.7	77.3	77.3	0.0	0.001	2.37	2.87	3.30	3.73	4.07	2.37	2.87	3.30	3.73	4.07
18_250	West Springfield Q Street Basin_18	1311	9.1	39.6	39.6	0.0	0.008	1.53	1.97	2.33	2.70	2.99	1.53	1.97	2.33	2.70	2.99
18_251	West Springfield Q Street Basin_18	1328	9.5	66.8	66.8	0.0	0.002	1.98	2.43	2.81	3.19	3.49	1.98	2.43	2.81	3.19	3.49
19_22	Q Street Floodway Basin_19	603	30.4	78.2	78.2	0.0	0.001	6.72	8.18	9.40	10.62	11.59	6.72	8.18	9.40	10.62	11.59
2_275	South Cedar Creek Basin_2	2132	31.4	30.4	31.7	1.3	0.016	4.85	6.36	7.61	8.86	9.86	4.91	6.41	7.67	8.92	9.92
2_276	South Cedar Creek Basin_2	320	23.0	39.6	39.6	0.0	0.007	3.84	4.94	5.86	6.78	7.52	3.84	4.94	5.86	6.78	7.52
2_294	South Cedar Creek Basin_2	2240	14.0	8.4	18.6	10.2	0.003	1.63	2.32	2.89	3.45	3.90	1.85	2.54	3.11	3.67	4.12
2_295	South Cedar Creek Basin_2	2795	10.0	0.0	0.6	0.6	0.005	1.09	1.57	1.97	2.37	2.69	1.10	1.58	1.98	2.38	2.70
2_296	South Cedar Creek Basin_2	2538	5.8	4.7	17.3	12.6	0.004	0.67	0.95	1.18	1.42	1.60	0.78	1.06	1.29	1.52	1.71
2_297	South Cedar Creek Basin_2	3953	9.6	12.7	12.7	0.0	0.003	1.22	1.68	2.07	2.45	2.76	1.22	1.68	2.07	2.45	2.76
2_298	South Cedar Creek Basin_2	3593	54.1	48.4	48.4	0.0	0.001	9.16	11.89	14.08	16.26	18.00	9.16	11.89	14.08	16.26	18.00
2_299	South Cedar Creek Basin_2	240	20.2	34.2	35.3	1.0	0.002	3.16	4.14	4.96	5.77	6.41	3.19	4.17	4.99	5.80	6.45
2_55	South Cedar Creek Basin_2	2009	30.3	41.4	41.7	0.2	0.010	5.16	6.61	7.82	9.03	10.00	5.17	6.62	7.83	9.04	10.01
2_56	South Cedar Creek Basin_2	1205	131.7	23.2	26.9	3.7	0.018	16.40	23.34	28.76	34.10	38.34	17.30	24.19	29.60	34.93	39.16
2_76	South Cedar Creek Basin_2	175	21.7	42.6	44.1	1.5	0.002	3.65	4.70	5.58	6.45	7.14	3.70	4.75	5.63	6.50	7.19

Catchment Name	Subbasin/ Catchment Description	Inlet Node	Catchment Area (acres)	Impervious Area (%)			Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions					Subbasin Peak Flow (cfs) Future Land Use Conditions				
				Existing Land Use	Future Land Use	Increase (%)		2-Year	5-Year	10-Year	25-Year	100-Year	2-Year	5-Year	10-Year	25-Year	100-Year
2_77	South Cedar Creek Basin_2	183	33.6	48.8	49.1	0.4	0.002	5.91	7.55	8.90	10.25	11.32	5.92	7.57	8.92	10.27	11.34
20_16	Q Street Floodway Basin_20	2845	19.8	56.7	56.7	0.0	0.005	3.81	4.76	5.55	6.35	6.98	3.81	4.76	5.55	6.35	6.98
21_12	West Springfield Q Street Basin_21	1801	73.4	45.5	45.8	0.3	0.002	12.22	15.90	18.88	21.84	24.19	12.25	15.94	18.91	21.87	24.22
22_18	Q Street Floodway Basin_22	2348	81.0	61.4	61.5	0.0	0.001	15.37	19.39	22.66	25.92	28.51	15.37	19.39	22.67	25.92	28.51
23_30	Q Street Floodway Basin_23	2889	43.0	56.1	56.1	0.0	0.001	7.84	9.99	11.73	13.46	14.83	7.84	9.99	11.73	13.46	14.83
24_267	Q Street Floodway Basin_24	689	49.7	37.5	37.5	0.0	0.000	7.32	9.90	11.93	13.94	15.54	7.32	9.90	11.93	13.94	15.54
24_268	Q Street Floodway Basin_24	686	83.3	43.1	43.1	0.0	0.001	12.03	16.41	19.85	23.23	25.91	12.03	16.41	19.85	23.23	25.91
25_24	Q Street Floodway Basin_25	344	62.9	44.7	44.7	0.0	0.001	9.93	13.17	15.75	18.29	20.31	9.93	13.17	15.75	18.29	20.31
26_28	Q Street Floodway Basin_26	1714	47.1	58.2	58.2	0.0	0.001	7.96	10.36	12.27	14.17	15.68	7.96	10.36	12.27	14.17	15.68
27_27	Q Street Floodway Basin_27	3159	61.2	48.3	48.4	0.1	0.001	10.51	13.56	16.03	18.50	20.46	10.52	13.57	16.04	18.50	20.46
28_13	West Springfield Q Street Basin_28	1738	36.6	41.7	41.7	0.0	0.002	6.03	7.84	9.32	10.79	11.96	6.03	7.84	9.32	10.79	11.96
29_19	Q Street Floodway Basin_29	179	44.2	45.3	45.3	0.0	0.001	7.35	9.56	11.35	13.13	14.55	7.35	9.56	11.35	13.13	14.55
3_78	South Cedar Creek Basin_3	3349	8.9	0.1	17.4	17.4	0.003	0.96	1.40	1.76	2.12	2.41	1.20	1.63	1.99	2.35	2.64
3_79	South Cedar Creek Basin_3	2231	9.8	9.7	11.4	1.7	0.001	1.13	1.62	2.02	2.41	2.73	1.15	1.65	2.04	2.44	2.75
3_80	South Cedar Creek Basin_3	143	43.1	50.5	50.5	0.0	0.001	7.46	9.62	11.37	13.10	14.48	7.46	9.62	11.37	13.10	14.48
3_81	South Cedar Creek Basin_3	2539	39.0	46.1	46.1	0.0	0.001	6.59	8.53	10.11	11.67	12.92	6.59	8.53	10.11	11.67	12.92
3_82	South Cedar Creek Basin_3	2554	56.7	49.1	49.1	0.0	0.002	9.80	12.62	14.92	17.20	19.02	9.80	12.62	14.92	17.20	19.02
3_83	South Cedar Creek Basin_3	1887	81.3	20.2	26.9	6.7	0.002	9.78	14.07	17.41	20.71	23.33	10.76	15.00	18.33	21.62	24.24
3_84	South Cedar Creek Basin_3	3438	32.4	43.6	43.6	0.0	0.002	5.42	7.01	8.32	9.62	10.66	5.42	7.01	8.32	9.62	10.66
30_25	Q Street Floodway Basin_30	602	30.9	50.0	50.0	0.0	0.001	5.37	6.91	8.16	9.40	10.39	5.37	6.91	8.16	9.40	10.39
31_20	Q Street Floodway Basin_31	2490	36.1	58.5	58.5	0.0	0.002	6.91	8.66	10.12	11.56	12.72	6.91	8.66	10.12	11.56	12.72
32_26	Q Street Floodway Basin_32	1717	19.2	40.1	40.1	0.0	0.001	3.12	4.07	4.84	5.61	6.23	3.12	4.07	4.84	5.61	6.23
33_23	Q Street Floodway Basin_33	3105	55.4	52.2	52.2	0.0	0.001	9.63	12.43	14.67	16.90	18.67	9.63	12.43	14.67	16.90	18.67
34_15	Q Street Floodway Basin_34	3573	61.4	39.0	39.0	0.0	0.005	8.97	12.19	14.71	17.20	19.17	8.97	12.19	14.71	17.20	19.17
35_144	Millrace Basin_35	741	18.0	38.8	38.8	0.0	0.003	2.97	3.84	4.56	5.28	5.86	2.97	3.84	4.56	5.28	5.86
35_145	Millrace Basin_35	1454	34.5	64.9	64.9	0.0	0.003	7.00	8.65	10.04	11.42	12.51	7.00	8.65	10.04	11.42	12.51
35_146	Millrace Basin_35	663	33.0	68.4	68.4	0.0	0.000	6.82	8.42	9.74	11.06	12.11	6.82	8.42	9.74	11.06	12.11
35_147	Millrace Basin_35	529	35.1	70.8	70.8	0.0	0.001	7.43	9.11	10.51	11.91	13.03	7.43	9.11	10.51	11.91	13.03
35_148	Millrace Basin_35	1597	16.0	73.1	73.1	0.0	0.001	3.44	4.21	4.85	5.49	6.00	3.44	4.21	4.85	5.49	6.00
35_149	Millrace Basin_35	1560	9.4	78.4	78.4	0.0	0.000	2.11	2.56	2.93	3.31	3.60	2.11	2.56	2.93	3.31	3.60
35_150	Millrace Basin_35	3600	11.2	35.8	35.8	0.0	0.001	1.78	2.33	2.78	3.23	3.59	1.78	2.33	2.78	3.23	3.59
35_151	Millrace Basin_35	3546	19.1	42.3	42.3	0.0	0.002	3.19	4.13	4.89	5.66	6.27	3.19	4.13	4.89	5.66	6.27
35_152	Millrace Basin_35	2708	1.4	56.5	61.9	5.4	0.002	0.28	0.34	0.40	0.46	0.50	0.29	0.36	0.41	0.47	0.52
35_153	Millrace Basin_35	1447	6.8	67.5	67.5	0.0	0.001	1.40	1.73	2.00	2.27	2.48	1.40	1.73	2.00	2.27	2.48
35_154	Millrace Basin_35	2715	16.3	72.4	72.4	0.0	0.001	3.48	4.26	4.91	5.56	6.08	3.48	4.26	4.91	5.56	6.08
35_155	Millrace Basin_35	3671	26.2	8.1	17.3	9.2	0.003	3.05	4.35	5.41	6.46	7.30	3.43	4.72	5.78	6.83	7.67
35_156	Millrace Basin_35	1096	73.3	23.6	29.0	5.4	0.015	10.48	14.03	16.97	19.91	22.25	11.08	14.61	17.56	20.49	22.83
35_157	Millrace Basin_35	521	5.9	37.8	38.5	0.7	0.005	0.99	1.27	1.51	1.75	1.94	0.99	1.28	1.52	1.75	1.94
35_158	Millrace Basin_35	414	9.0	73.1	73.1	0.0	0.002	1.96	2.39	2.75	3.11	3.40	1.96	2.39	2.75	3.11	3.40
35_159	Millrace Basin_35	530	4.2	88.7	88.7	0.0	0.000	1.00	1.20	1.36	1.53	1.66	1.00	1.20	1.36	1.53	1.66
36_37	Millrace Basin_36	2870	48.2	25.5	28.1	2.6	0.023	7.06	9.38	11.31	13.24	14.77	7.25	9.56	11.49	13.42	14.95
37_35	Millrace Basin_37	129	17.4	43.4	46.7	3.3	0.008	3.03	3.86	4.56	5.25	5.81	3.11	3.94	4.64	5.34	5.89
38_34	Millrace Basin_38	3337	39.9	32.7	32.8	0.2	0.005	6.13	8.08	9.69	11.29	12.56	6.15	8.09	9.70	11.30	12.57
39_160	Q Street Floodway Basin_39	987	51.3	63.5	63.5	0.0	0.001	9.41	11.99	14.07	16.13	17.77	9.41	11.99	14.07	16.13	17.77
39_161	Q Street Floodway Basin_39	446	25.2	77.2	77.2	0.0	0.001	5.52	6.73	7.74	8.75	9.55	5.52	6.73	7.74	8.75	9.55
39_162	Q Street Floodway Basin_39	2923	19.8	60.8	60.8	0.0	0.002	3.88	4.83	5.63	6.42	7.05	3.88	4.83	5.63	6.42	7.05
39_163	Q Street Floodway Basin_39	447	92.4	53.5	53.5	0.0	0.001	14.76	19.51	23.29	27.03	29.98	14.76	19.51	23.29	27.03	29.98
39_164	Q Street Floodway Basin_39	1602	4.1	51.6	51.6	0.0	0.004	0.76	0.95	1.11	1.27	1.40	0.76	0.95	1.11	1.27	1.40
39_165	Q Street Floodway Basin_39	1269	51.7	52.2	52.2	0.0	0.001	8.69	11.35	13.46	15.55	17.20	8.69	11.35	13.46	15.55	17.20
4_105	Weyerhaeuser Outfall Basin_4	1077	51.1	39.0	39.0	0.0	0.001	7.84	10.45	12.53	14.59	16.23	7.84	10.45	12.53	14.59	16.23
4_106	Weyerhaeuser Outfall Basin_4	3905	33.6	43.5	43.5	0.0	0.002	5.52	7.20	8.56	9.91	10.99	5.52	7.20	8.56	9.91	10.99
4_107	Weyerhaeuser Outfall Basin_4	3345	35.5	41.1	41.1	0.0	0.001	5.56	7.37	8.82	10.25	11.39	5.56	7.37	8.82	10.25	11.39
4_108	Weyerhaeuser Outfall Basin_4	2903	66.1	24.4	27.6	3.2	0.001	8.44	11.90	14.62	17.30	19.42	8.82	12.26	14.97	17.65	19.78
4_109	Weyerhaeuser Outfall Basin_4	3907	10.2	37.6	37.6	0.0	0.003	1.67	2.16	2.56	2.97	3.30	1.67	2.16	2.56	2.97	3.30
4_110	Weyerhaeuser Outfall Basin_4	3386	41.1	38.6	39.3	0.7	0.002	6.50	8.55	10.22	11.87	13.19	6.54	8.59	10.26	11.91	13.23
4_111	Weyerhaeuser Outfall Basin_4	Node_12	48.2	12.7	12.7	0.0	0.005	5.77	8.20	10.16	12.11	13.65	5.77	8.20	10.16	12.11	13.66
4_277_gw	Weyerhaeuser Outfall Basin_4	1409	28.3	44.1	45.2	1.2	0.001	4.64	6.07	7.22	8.36	9.27	4.70	6.12	7.27	8.41	9.32
4_278_gw	Weyerhaeuser Outfall Basin_4	1078	33.9	12.7	14.5	1.9	0.002	3.84	5.60	6.99	8.36	9.45	3.95	5.70	7.09	8.46	9.55
4_279_gw	Weyerhaeuser Outfall Basin_4	1655	27.4	31.8	32.2	0.4	0.001	3.99	5.38	6.49	7.60	8.48	4.01	5.40	6.51	7.62	8.49

Catchment Name	Subbasin/ Catchment Description	Inlet Node	Catchment Area (acres)	Impervious Area (%)			Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions					Subbasin Peak Flow (cfs) Future Land Use Conditions				
				Existing Land Use	Future Land Use	Increase (%)		2-Year	5-Year	10-Year	25-Year	100-Year	2-Year	5-Year	10-Year	25-Year	100-Year
40_32	Willamette River Basin_40	1602	44.8	26.2	26.3	0.1	0.014	6.57	8.73	10.53	12.32	13.75	6.57	8.73	10.53	12.32	13.75
41_17	West Springfield Q Street Basin_41	4231	47.3	45.0	45.0	0.0	0.001	6.98	9.46	11.41	13.33	14.84	6.98	9.46	11.41	13.33	14.84
42_166	West Springfield Q Street Basin_42	110	14.5	43.6	43.6	0.0	0.005	2.52	3.22	3.80	4.38	4.85	2.52	3.22	3.80	4.38	4.85
42_167	West Springfield Q Street Basin_42	461	39.5	47.1	47.1	0.0	0.004	6.95	8.87	10.45	12.04	13.30	6.95	8.87	10.46	12.04	13.30
43_168	Willamette River Basin_43	2102	39.3	44.4	44.4	0.0	0.018	6.72	8.64	10.22	11.80	13.05	6.72	8.64	10.22	11.80	13.05
43_169	Willamette River Basin_43	124	43.4	47.0	47.4	0.4	0.005	7.46	9.60	11.36	13.10	14.49	7.49	9.63	11.39	13.13	14.52
43_170	Willamette River Basin_43	107	50.3	38.1	38.1	0.0	0.008	8.01	10.49	12.52	14.54	16.15	8.01	10.49	12.52	14.54	16.15
43_171	Willamette River Basin_43	2575	37.7	25.7	26.1	0.4	0.009	5.48	7.30	8.82	10.33	11.53	5.51	7.33	8.84	10.35	11.56
44_14	West Springfield Q Street Basin_44	166	29.2	40.7	40.7	0.0	0.002	4.75	6.20	7.38	8.55	9.48	4.76	6.20	7.38	8.55	9.48
45_183	West Springfield Q Street Basin_45	3567	6.0	32.3	32.3	0.0	0.006	0.94	1.23	1.47	1.70	1.89	0.94	1.23	1.47	1.70	1.89
45_184	West Springfield Q Street Basin_45	243	25.9	37.3	37.4	0.0	0.001	4.01	5.31	6.36	7.40	8.23	4.01	5.31	6.36	7.40	8.23
46_180	West Springfield Q Street Basin_46	381	60.4	42.0	42.3	0.3	0.001	8.60	11.78	14.28	16.74	18.68	8.63	11.81	14.31	16.76	18.70
46_181	West Springfield Q Street Basin_46	333	48.6	36.4	36.8	0.4	0.003	7.68	10.07	12.03	13.98	15.54	7.71	10.10	12.06	14.02	15.57
46_182	West Springfield Q Street Basin_46	3575	8.0	32.4	33.1	0.7	0.005	1.27	1.66	1.98	2.30	2.56	1.28	1.66	1.99	2.31	2.56
47_172	Willamette River Basin_47	1984	33.4	24.4	24.4	0.0	0.002	4.52	6.21	7.57	8.91	9.98	4.52	6.21	7.57	8.91	9.98
47_173	Willamette River Basin_47	2195	16.6	45.8	45.8	0.0	0.001	2.83	3.65	4.32	4.99	5.52	2.83	3.65	4.32	4.99	5.52
47_174	Willamette River Basin_47	1209	38.3	43.0	43.0	0.0	0.001	6.22	8.15	9.70	11.24	12.47	6.22	8.15	9.70	11.24	12.47
47_175	Willamette River Basin_47	934	10.4	28.4	28.9	0.6	0.001	1.51	2.03	2.45	2.87	3.20	1.52	2.04	2.46	2.88	3.21
47_176	Willamette River Basin_47	1241	21.2	39.1	39.3	0.2	0.003	3.45	4.49	5.34	6.19	6.87	3.46	4.49	5.35	6.20	6.87
47_177	Willamette River Basin_47	1296	18.9	2.4	2.4	0.0	0.005	2.07	3.00	3.76	4.52	5.12	2.07	3.00	3.76	4.52	5.12
47_178	Willamette River Basin_47	1246	28.6	12.1	12.1	0.0	0.008	3.58	4.97	6.13	7.27	8.19	3.58	4.97	6.12	7.27	8.19
47_179	Willamette River Basin_47	1247	33.7	26.7	26.7	0.0	0.003	4.86	6.51	7.87	9.22	10.30	4.86	6.51	7.87	9.22	10.30
48_185	West Springfield Q Street Basin_48	3629	23.5	48.4	48.4	0.0	0.001	4.08	5.24	6.19	7.13	7.88	4.08	5.24	6.19	7.13	7.88
48_186	West Springfield Q Street Basin_48	3363	25.3	56.9	57.4	0.5	0.001	4.74	5.98	7.00	8.01	8.82	4.76	6.00	7.01	8.03	8.84
48_187	West Springfield Q Street Basin_48	3815	85.3	56.8	56.8	0.0	0.002	14.99	19.33	22.81	26.24	28.98	14.99	19.33	22.81	26.24	28.98
49_285	West Springfield Q Street Basin_49	2649	47.6	39.2	39.2	0.0	0.002	7.53	9.91	11.85	13.77	15.29	7.53	9.91	11.85	13.77	15.29
49_286	West Springfield Q Street Basin_49	3650	52.4	26.8	26.8	0.0	0.006	7.51	10.09	12.21	14.32	15.99	7.51	10.09	12.21	14.32	16.00
5_100	Weyerhaeuser Outfall Basin_5	967	27.9	43.3	43.6	0.4	0.001	4.59	5.98	7.11	8.24	9.13	4.61	6.00	7.13	8.25	9.15
5_101	Weyerhaeuser Outfall Basin_5	2461	21.1	71.8	71.8	0.0	0.001	4.46	5.48	6.32	7.17	7.84	4.46	5.48	6.32	7.17	7.84
5_102	Weyerhaeuser Outfall Basin_5	963	5.5	37.0	37.0	0.0	0.004	0.91	1.17	1.39	1.61	1.79	0.91	1.17	1.39	1.61	1.79
5_103	Weyerhaeuser Outfall Basin_5	2940	27.1	31.0	31.0	0.0	0.008	4.20	5.50	6.59	7.67	8.54	4.20	5.50	6.59	7.67	8.54
5_104	Weyerhaeuser Outfall Basin_5	964	6.7	38.9	38.9	0.0	0.001	1.09	1.41	1.68	1.95	2.16	1.09	1.41	1.68	1.95	2.16
5_97	Weyerhaeuser Outfall Basin_5	3895	76.6	30.7	31.2	0.5	0.001	10.25	14.30	17.45	20.56	23.02	10.32	14.36	17.51	20.62	23.08
5_98	Weyerhaeuser Outfall Basin_5	415	12.3	37.9	38.5	0.5	0.002	2.00	2.59	3.09	3.58	3.97	2.01	2.60	3.10	3.59	3.98
5_99	Weyerhaeuser Outfall Basin_5	2913	69.4	39.7	39.9	0.2	0.001	10.35	13.96	16.81	19.62	21.85	10.37	13.99	16.83	19.64	21.87
50_287	West Springfield Q Street Basin_50	4197	52.0	29.2	29.2	0.0	0.007	7.80	10.32	12.42	14.50	16.16	7.80	10.32	12.42	14.50	16.17
50_288	West Springfield Q Street Basin_50	1577	53.8	38.3	38.3	0.0	0.001	8.10	10.87	13.07	15.24	16.97	8.10	10.87	13.07	15.24	16.97
51_188	West Springfield Q Street Basin_51	3568	27.7	40.1	41.6	1.5	0.001	4.40	5.79	6.91	8.02	8.91	4.47	5.85	6.98	8.09	8.98
51_189	West Springfield Q Street Basin_51	3739	25.5	48.2	48.2	0.0	0.001	4.44	5.69	6.72	7.75	8.56	4.44	5.69	6.72	7.75	8.56
51_190	West Springfield Q Street Basin_51	3807	15.0	63.3	63.3	0.0	0.002	3.01	3.73	4.33	4.93	5.40	3.01	3.73	4.33	4.93	5.40
51_191	West Springfield Q Street Basin_51	3486	9.9	18.2	18.5	0.3	0.002	1.33	1.81	2.21	2.61	2.93	1.33	1.82	2.22	2.62	2.94
51_192	West Springfield Q Street Basin_51	4120	8.0	26.7	27.4	0.7	0.001	1.16	1.55	1.87	2.19	2.44	1.17	1.56	1.88	2.20	2.45
52_2	West Springfield Q Street Basin_52	1539	78.0	77.4	77.4	0.0	0.002	17.06	20.82	23.94	27.06	29.54	17.06	20.82	23.94	27.06	29.54
53_212	West Springfield Q Street Basin_53	2651	43.2	51.9	51.9	0.0	0.001	7.08	9.31	11.08	12.83	14.21	7.08	9.31	11.08	12.83	14.21
53_213	West Springfield Q Street Basin_53	379	35.0	48.2	48.6	0.4	0.001	5.92	7.68	9.10	10.51	11.63	5.94	7.70	9.12	10.53	11.65
53_214	West Springfield Q Street Basin_53	2892	21.6	69.2	69.2	0.0	0.001	4.49	5.53	6.40	7.26	7.95	4.49	5.53	6.40	7.26	7.95
53_215	West Springfield Q Street Basin_53	3143	29.9	75.5	75.5	0.0	0.002	6.51	7.95	9.14	10.34	11.29	6.51	7.95	9.14	10.33	11.29
53_216	West Springfield Q Street Basin_53	3085	2.9	81.1	81.1	0.0	0.001	0.67	0.81	0.93	1.05	1.14	0.67	0.81	0.93	1.05	1.14
53_217	West Springfield Q Street Basin_53	3155	10.0	89.5	89.5	0.0	0.001	2.40	2.87	3.27	3.67	3.98	2.40	2.87	3.27	3.67	3.98
54_1	North Gateway Basin_54	3374	75.3	61.2	61.2	0.0	0.004	14.71	18.36	21.39	24.40	26.81	14.71	18.36	21.39	24.40	26.81
54_1_gw	North Gateway Basin_54	3098	52.2	38.2	39.4	1.1	0.001	8.06	10.70	12.82	14.92	16.60	8.16	10.80	12.92	15.02	16.69
55_205	West Springfield Q Street Basin_55	1221	20.3	38.2	38.2	0.0	0.001	3.18	4.20	5.02	5.84	6.49	3.18	4.20	5.02	5.84	6.49
55_206	West Springfield Q Street Basin_55	3516	40.6	47.9	49.0	1.0	0.001	6.88	8.92	10.57	12.20	13.50	6.95	8.99	10.63	12.27	13.57
55_207	West Springfield Q Street Basin_55	3505	16.0	55.0	55.0	0.0	0.001	2.98	3.76	4.41	5.05	5.56	2.98	3.76	4.41	5.05	5.56
55_208	West Springfield Q Street Basin_55	3506	9.6	87.1	87.1	0.0	0.001	2.27	2.73	3.11	3.50	3.81	2.27	2.73	3.11	3.50	3.81
55_209	West Springfield Q Street Basin_55	3503	13.4	61.9	61.9	0.0	0.001	2.64	3.28	3.82	4.36	4.78	2.64	3.28	3.82	4.36	4.78
55_210	West Springfield Q Street Basin_55	364	15.5	58.9	58.9	0.0	0.001	2.98	3.73	4.35	4.97	5.46	2.98	3.73	4.35	4.97	5.46
55_211	West Springfield Q Street Basin_55	3639	60.9	59.4	60.7	1.3	0.001	11.47	14.48	16.94	19.38	21.33	11.61	14.61	17.07	19.51	21.46
56_193	West Springfield Q Street Basin_56	3949	6.5	33.4	33.8	0.4	0.001	1.01	1.33	1.59	1.85	2.06	1.02	1.33	1.60	1.86	2.07
56_194	West Springfield Q Street Basin_56	2945	76.8	35.6	36.1	0.5	0.001	11.08	15.07	18.22	21.33	23.80	11.14	15.14	18.28	21.39	23.86

Catchment Name	Subbasin/ Catchment Description	Inlet Node	Catchment Area (acres)	Impervious Area (%)			Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions					Subbasin Peak Flow (cfs) Future Land Use Conditions				
				Existing Land Use	Future Land Use	Increase (%)		2-Year	5-Year	10-Year	25-Year	100-Year	2-Year	5-Year	10-Year	25-Year	100-Year
57_8	West Springfield Q Street Basin_57	1656	34.0	38.9	39.1	0.2	0.001	5.24	6.97	8.36	9.74	10.83	5.25	6.99	8.37	9.75	10.84
58_195	West Springfield Q Street Basin_58	613	31.8	65.8	65.8	0.0	0.004	6.51	8.03	9.31	10.58	11.59	6.51	8.03	9.31	10.58	11.59
58_196	West Springfield Q Street Basin_58	2318	3.1	39.5	39.7	0.2	0.001	0.52	0.67	0.79	0.92	1.02	0.52	0.67	0.79	0.92	1.02
58_197	West Springfield Q Street Basin_58	3315	22.0	51.6	52.5	1.0	0.001	3.95	5.03	5.92	6.81	7.51	3.98	5.07	5.96	6.84	7.55
59_6	West Springfield Q Street Basin_59	642	28.0	44.8	44.8	0.0	0.001	4.63	6.04	7.17	8.30	9.20	4.63	6.04	7.17	8.30	9.20
6_57	Weyerhaeuser Outfall Basin_6	308	45.0	6.8	7.1	0.3	0.025	5.41	7.57	9.38	11.18	12.62	5.43	7.59	9.40	11.20	12.64
6_58	Weyerhaeuser Outfall Basin_6	2111	26.1	18.3	31.5	13.2	0.015	3.58	4.83	5.88	6.92	7.76	4.09	5.34	6.38	7.42	8.26
6_59	Weyerhaeuser Outfall Basin_6	1071	51.3	14.5	16.4	1.9	0.029	6.74	9.20	11.26	13.31	14.95	6.89	9.35	11.40	13.45	15.09
6_85	Weyerhaeuser Outfall Basin_6	1126	42.5	47.1	47.1	0.0	0.001	7.45	9.52	11.23	12.94	14.29	7.45	9.52	11.23	12.94	14.29
6_86	Weyerhaeuser Outfall Basin_6	2252	46.2	26.8	40.5	13.7	0.006	6.88	9.09	10.94	12.78	14.26	7.81	10.02	11.87	13.71	15.18
6_87	Weyerhaeuser Outfall Basin_6	1016	25.4	50.7	50.7	0.0	0.001	4.50	5.75	6.78	7.79	8.61	4.50	5.75	6.78	7.79	8.61
6_88	Weyerhaeuser Outfall Basin_6	3938	16.3	81.5	81.5	0.0	0.001	3.72	4.50	5.15	5.81	6.33	3.72	4.50	5.15	5.81	6.33
6_89	Weyerhaeuser Outfall Basin_6	2406	29.8	42.5	42.7	0.2	0.002	4.96	6.43	7.63	8.83	9.78	4.97	6.44	7.64	8.84	9.79
6_90	Weyerhaeuser Outfall Basin_6	3466	4.1	52.3	52.3	0.0	0.002	0.77	0.97	1.14	1.30	1.43	0.77	0.97	1.14	1.30	1.43
6_91	Weyerhaeuser Outfall Basin_6	2432	9.8	75.2	75.2	0.0	0.001	2.16	2.63	3.02	3.41	3.72	2.16	2.63	3.02	3.41	3.72
6_92	Weyerhaeuser Outfall Basin_6	961	23.3	45.6	46.1	0.5	0.001	3.95	5.10	6.04	6.98	7.72	3.97	5.12	6.06	7.00	7.74
6_93	Weyerhaeuser Outfall Basin_6	542	9.5	53.5	53.6	0.1	0.000	1.78	2.24	2.62	3.00	3.30	1.78	2.24	2.62	3.00	3.30
6_94	Weyerhaeuser Outfall Basin_6	956	29.7	49.2	49.4	0.2	0.001	5.14	6.62	7.82	9.01	9.96	5.15	6.63	7.83	9.02	9.97
6_95	Weyerhaeuser Outfall Basin_6	957	9.7	47.0	50.3	3.3	0.001	1.73	2.20	2.59	2.98	3.29	1.78	2.25	2.64	3.02	3.33
6_96	Weyerhaeuser Outfall Basin_6	2434	32.3	29.1	34.3	5.2	0.003	4.80	6.38	7.68	8.97	10.00	5.06	6.63	7.93	9.22	10.25
60_7	West Springfield Hayden Bridge Basin_60	1295	54.6	41.9	43.2	1.3	0.001	8.85	11.58	13.80	15.99	17.74	8.97	11.70	13.91	16.10	17.85
61_9	West Springfield Hayden Bridge Basin_61	254	61.3	38.5	38.5	0.0	0.001	9.47	12.58	15.07	17.55	19.51	9.47	12.58	15.08	17.55	19.51
62_198	West Springfield Hayden Bridge Basin_62	1290	42.9	33.9	33.9	0.0	0.002	6.43	8.58	10.32	12.05	13.43	6.43	8.58	10.32	12.05	13.43
62_199	West Springfield Hayden Bridge Basin_62	1294	20.1	49.4	49.4	0.0	0.001	3.59	4.57	5.38	6.18	6.82	3.60	4.57	5.38	6.18	6.82
62_52	West Springfield Hayden Bridge Basin_62	3531	35.1	44.1	44.1	0.0	0.001	5.80	7.55	8.98	10.39	11.51	5.80	7.55	8.98	10.39	11.51
62_53	West Springfield Hayden Bridge Basin_62	2847	43.9	33.9	33.9	0.0	0.001	6.48	8.72	10.50	12.28	13.68	6.48	8.72	10.50	12.28	13.69
63_10	West Springfield Q Street Basin_63	739	17.1	44.5	44.5	0.0	0.001	2.87	3.72	4.41	5.10	5.64	2.87	3.72	4.41	5.10	5.64
64_280	Jasper Basin_64	903	35.0	9.0	9.0	0.0	0.003	3.97	5.74	7.16	8.57	9.69	3.97	5.74	7.16	8.57	9.70
64_281	Jasper Basin_64	161	78.2	23.2	24.5	1.4	0.002	10.23	14.24	17.43	20.60	23.11	10.41	14.41	17.61	20.77	23.28
64_282	Jasper Basin_64	2781	60.0	27.4	29.6	2.3	0.006	8.25	11.31	13.76	16.18	18.11	8.49	11.54	13.98	16.40	18.32
65_218	North Gateway Basin_65	3766	69.5	15.1	23.4	8.2	0.002	7.39	11.15	14.03	16.86	19.10	8.46	12.16	15.04	17.86	20.10
65_219	North Gateway Basin_65	3777	39.2	29.7	33.3	3.6	0.003	5.34	7.38	8.98	10.57	11.83	5.59	7.62	9.22	10.80	12.06
65_220	North Gateway Basin_65	3787	29.6	17.2	25.1	7.9	0.002	3.68	5.18	6.39	7.58	8.53	4.07	5.56	6.76	7.95	8.90
65_221	North Gateway Basin_65	3331	14.5	37.7	37.7	0.0	0.001	2.29	3.01	3.59	4.17	4.64	2.29	3.01	3.59	4.17	4.64
65_222	North Gateway Basin_65	3741	26.6	30.5	30.8	0.3	0.001	3.77	5.13	6.21	7.28	8.13	3.79	5.14	6.22	7.30	8.15
65_223	North Gateway Basin_65	247	22.4	36.6	37.0	0.4	0.002	3.55	4.65	5.56	6.46	7.17	3.56	4.66	5.57	6.47	7.19
65_224	North Gateway Basin_65	3896	30.7	5.7	7.0	1.3	0.005	3.55	5.04	6.28	7.51	8.50	3.61	5.10	6.34	7.57	8.55
66_43	Jasper Basin_66	894	11.8	19.6	23.0	3.4	0.002	1.60	2.18	2.66	3.13	3.51	1.66	2.24	2.72	3.19	3.57
67_225	North Gateway Basin_67	1979	10.9	41.9	41.9	0.0	0.002	1.84	2.37	2.81	3.24	3.59	1.84	2.37	2.81	3.24	3.59
67_226	North Gateway Basin_67	3178	40.0	4.4	9.3	4.9	0.003	4.15	6.20	7.84	9.46	10.74	4.48	6.52	8.15	9.77	11.05
67_227	North Gateway Basin_67	1569	27.6	56.5	56.6	0.0	0.003	5.26	6.59	7.70	8.81	9.69	5.26	6.60	7.71	8.81	9.69
67_228	North Gateway Basin_67	1914	44.5	23.5	39.0	15.5	0.004	6.08	8.30	10.11	11.90	13.32	7.20	9.39	11.18	12.97	14.39
68_292	Jasper Basin_68	2417	28.7	29.5	29.8	0.3	0.003	4.26	5.67	6.83	7.98	8.90	4.27	5.68	6.84	8.00	8.92
68_293	Jasper Basin_68	2764	25.5	43.2	43.2	0.0	0.001	4.29	5.54	6.56	7.58	8.40	4.29	5.54	6.56	7.58	8.40
68_66	Jasper Basin_68	3250	16.3	19.0	23.7	4.7	0.001	2.05	2.89	3.55	4.21	4.74	2.19	3.01	3.68	4.34	4.86
68_67	Jasper Basin_68	1416	12.0	24.9	30.1	5.2	0.001	1.68	2.27	2.75	3.23	3.62	1.78	2.37	2.85	3.33	3.71
68_68	Jasper Basin_68	893	12.2	25.0	25.8	0.9	0.001	1.70	2.30	2.80	3.29	3.68	1.72	2.32	2.81	3.30	3.69
68_69	Jasper Basin_68	1442	19.0	9.2	11.2	2.1	0.002	2.17	3.13	3.90	4.66	5.27	2.24	3.19	3.96	4.73	5.33
68_70	Jasper Basin_68	128	24.4	34.5	34.9	0.4	0.001	3.62	4.86	5.86	6.84	7.62	3.64	4.88	5.87	6.86	7.64
68_71	Jasper Basin_68	567	16.5	37.3	37.3	0.0	0.002	2.64	3.45	4.11	4.78	5.30	2.64	3.45	4.11	4.78	5.30
68_72	Jasper Basin_68	1882	17.3	46.8	46.8	0.0	0.001	2.97	3.82	4.52	5.22	5.77	2.97	3.82	4.52	5.22	5.77
68_73	Jasper Basin_68	1361	14.9	40.7	40.9	0.2	0.002	2.48	3.21	3.81	4.41	4.88	2.49	3.21	3.81	4.41	4.89
68_74	Jasper Basin_68	568	30.5	31.7	31.7	0.0	0.001	4.47	6.01	7.25	8.48	9.46	4.47	6.01	7.25	8.48	9.46
68_75	Jasper Basin_68	1366	17.5	33.9	34.1	0.2	0.002	2.70	3.56	4.27	4.97	5.53	2.70	3.57	4.27	4.98	5.54

Catchment Name	Subbasin/ Catchment Description	Inlet Node	Catchment Area (acres)	Impervious Area (%)			Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions					Subbasin Peak Flow (cfs) Future Land Use Conditions				
				Existing Land Use	Future Land Use	Increase (%)		2-Year	5-Year	10-Year	25-Year	100-Year	2-Year	5-Year	10-Year	25-Year	100-Year
69_302	West Springfield Q Street Basin_69	3127	32.0	0.0	4.9	4.9	0.001	2.82	4.53	5.86	7.17	8.20	3.10	4.80	6.13	7.43	8.46
69_303	West Springfield Q Street Basin_69	3461	64.1	29.9	33.5	3.7	0.006	9.66	12.78	15.36	17.93	19.98	10.02	13.13	15.71	18.28	20.33
7_113	Weyerhaeuser Outfall Basin_7	3990	98.0	3.6	17.3	13.7	0.026	10.94	15.74	19.70	23.64	26.78	13.01	17.78	21.72	25.65	28.79
7_114	Weyerhaeuser Outfall Basin_7	2006	72.4	16.9	35.8	18.9	0.018	9.54	13.07	15.99	18.89	21.21	11.64	15.13	18.04	20.94	23.25
7_115	Weyerhaeuser Outfall Basin_7	980	80.4	41.8	41.8	0.0	0.003	12.99	17.02	20.28	23.52	26.10	12.99	17.02	20.28	23.52	26.10
7_116	Weyerhaeuser Outfall Basin_7	949	84.1	30.1	32.6	2.5	0.003	11.93	16.21	19.64	23.03	25.73	12.28	16.55	19.98	23.37	26.07
7_117	Weyerhaeuser Outfall Basin_7	724	53.7	51.3	51.3	0.0	0.001	9.29	11.99	14.17	16.33	18.05	9.29	11.99	14.17	16.33	18.05
7_64	Weyerhaeuser Outfall Basin_7	Node_7	51.9	15.5	31.2	15.7	0.008	6.37	9.00	11.11	13.21	14.88	7.72	10.30	12.40	14.49	16.15
7_65	Weyerhaeuser Outfall Basin_7	3418	41.6	26.6	27.7	1.2	0.006	6.00	8.04	9.72	11.39	12.72	6.08	8.12	9.79	11.47	12.80
70_11	West Springfield Q Street Basin_70	135	108.8	21.4	27.3	5.9	0.004	14.06	19.61	24.05	28.45	31.95	15.15	20.66	25.09	29.48	32.97
71_3	West Springfield Hayden Bridge Basin_71	3447	89.8	14.6	22.8	8.2	0.014	11.44	15.84	19.47	23.08	25.95	12.58	16.96	20.58	24.19	27.06
72_4	West Springfield Hayden Bridge Basin_72	1461	102.5	39.2	39.2	0.0	0.001	15.44	20.74	24.93	29.07	32.36	15.44	20.74	24.93	29.07	32.37
73_5	West Springfield Q Street Basin_73	3557	42.1	41.9	41.9	0.0	0.000	6.65	8.80	10.51	12.21	13.56	6.65	8.80	10.51	12.21	13.56
74_229_gw	West Springfield Hayden Bridge Basin_74	Node_8a	110.2	21.1	23.4	2.3	0.001	12.67	18.61	23.18	27.67	31.22	13.16	19.07	23.64	28.12	31.67
74_230_gw	West Springfield Hayden Bridge Basin_74	10038784	63.0	19.5	32.6	13.0	0.010	8.43	11.52	14.07	16.60	18.62	9.71	12.78	15.32	17.84	19.86
74_230-gw3	West Springfield Hayden Bridge Basin_74	1	117.2	30.8	34.5	3.8	0.005	16.88	22.82	27.59	32.32	36.09	17.63	23.54	28.30	33.03	36.79
75_200	West Springfield Hayden Bridge Basin_75	2630	9.1	14.1	14.1	0.0	0.001	1.12	1.58	1.95	2.31	2.60	1.12	1.58	1.95	2.31	2.60
75_201	West Springfield Hayden Bridge Basin_75	169	25.5	12.0	12.0	0.0	0.004	3.14	4.39	5.42	6.45	7.26	3.14	4.39	5.42	6.45	7.26
75_202	West Springfield Hayden Bridge Basin_75	154	15.1	47.8	47.8	0.0	0.001	2.66	3.39	4.00	4.61	5.09	2.66	3.39	4.00	4.61	5.09
75_203	West Springfield Hayden Bridge Basin_75	4135	28.6	31.9	32.3	0.5	0.003	4.27	5.69	6.84	7.99	8.91	4.29	5.71	6.87	8.01	8.93
75_204	West Springfield Hayden Bridge Basin_75	37	55.0	39.2	39.2	0.0	0.001	8.36	11.19	13.43	15.65	17.42	8.36	11.19	13.43	15.65	17.42
75_263	West Springfield Hayden Bridge Basin_75	1462	35.9	45.3	45.3	0.0	0.002	6.08	7.85	9.30	10.75	11.90	6.08	7.85	9.30	10.75	11.90
75_264_gw	West Springfield Hayden Bridge Basin_75	1333	41.8	32.7	32.7	0.0	0.001	6.04	8.18	9.88	11.57	12.91	6.04	8.18	9.88	11.57	12.91
75_51	West Springfield Hayden Bridge Basin_75	699	53.5	32.4	33.3	0.9	0.002	7.64	10.39	12.57	14.74	16.45	7.72	10.47	12.65	14.81	16.53
76_39	Dorris Ranch Basin_76	1301	122.9	6.6	21.2	14.7	0.015	13.70	19.86	24.85	29.81	33.76	16.61	22.68	27.66	32.60	36.54
77_231	Glenwood Basin_77	2615	26.5	30.2	46.4	16.2	0.005	3.86	5.18	6.26	7.33	8.18	4.56	5.86	6.93	8.00	8.84
77_234_gw	Glenwood Basin_77	1146	116.8	30.5	32.7	2.2	0.002	15.72	21.87	26.67	31.41	35.17	16.19	22.31	27.11	31.85	35.60
77_237	Glenwood Basin_77	53	8.7	50.2	50.2	0.0	0.005	1.60	2.02	2.36	2.71	2.99	1.60	2.02	2.36	2.71	2.99
77_238	Glenwood Basin_77	25	2.6	79.5	79.5	0.0	0.005	0.59	0.71	0.82	0.92	1.00	0.59	0.71	0.82	0.92	1.00
77_239	Glenwood Basin_77	2612	31.7	51.0	51.0	0.0	0.010	5.82	7.34	8.60	9.87	10.87	5.82	7.34	8.60	9.87	10.88
77_240	Glenwood Basin_77	2775	27.2	23.0	23.9	0.9	0.004	3.81	5.14	6.23	7.32	8.19	3.85	5.17	6.27	7.36	8.23
77_240_gw	Glenwood Basin_77	2775	33.6	18.4	19.7	1.3	0.008	4.61	6.22	7.57	8.91	9.98	4.67	6.29	7.63	8.98	10.05
77_241	Glenwood Basin_77	4093	16.3	30.7	32.3	1.6	0.005	2.44	3.25	3.91	4.56	5.08	2.49	3.29	3.95	4.60	5.12
78_0	North Gateway Basin_78	3760	158.8	2.1	10.1	8.0	0.002	12.71	21.40	28.06	34.57	39.70	15.01	23.73	30.36	36.85	41.98
78_0_gw	North Gateway Basin_78	3415	39.5	32.7	34.4	1.7	0.001	5.72	7.74	9.35	10.95	12.21	5.84	7.85	9.46	11.05	12.32
78_0_gw1	North Gateway Basin_78	3766	76.1	3.4	18.3	14.9	0.002	6.64	10.80	13.97	17.08	19.54	8.75	12.81	15.95	19.04	21.50
8_118	Weyerhaeuser Outfall Basin_8	165	38.6	45.5	47.4	1.9	0.001	6.54	8.45	10.01	11.56	12.79	6.67	8.57	10.12	11.67	12.91
8_119	Weyerhaeuser Outfall Basin_8	2898	43.6	31.7	51.8	20.1	0.001	6.26	8.48	10.26	12.02	13.42	7.75	9.91	11.67	13.42	14.81
8_120	Weyerhaeuser Outfall Basin_8	887	33.2	51.8	51.8	0.0	0.001	5.99	7.62	8.96	10.29	11.35	5.99	7.62	8.96	10.29	11.35
8_121	Weyerhaeuser Outfall Basin_8	1731	49.0	30.7	41.0	10.3	0.001	6.75	9.30	11.31	13.29	14.86	7.65	10.15	12.15	14.12	15.69
8_122	Weyerhaeuser Outfall Basin_8	838	23.6	32.6	32.6	0.0	0.002	3.55	4.72	5.68	6.63	7.39	3.55	4.72	5.68	6.63	7.39
8_123	Weyerhaeuser Outfall Basin_8	2671	46.6	37.0	37.5	0.5	0.006	7.52	9.79	11.66	13.53	15.02	7.56	9.82	11.70	13.57	15.06
8_124	Weyerhaeuser Outfall Basin_8	1813	87.5	34.7	35.7	0.9	0.002	12.68	17.21	20.78	24.32	27.13	12.83	17.35	20.92	24.46	27.27
81_308	West Springfield Hayden Bridge Basin_81	89	43.5	27.9	29.7	1.8	0.001	5.77	8.04	9.83	11.59	12.98	5.91	8.18	9.96	11.72	13.12
81_309	West Springfield Hayden Bridge Basin_81	88	40.4	34.8	36.2	1.4	0.002	6.02	8.08	9.72	11.36	12.65	6.12	8.17	9.82	11.45	12.75

Catchment Name	Subbasin/ Catchment Description	Inlet Node	Catchment Area (acres)	Impervious Area (%)			Average Subbasin Slope (ft/ft)	Subbasin Peak Flow (cfs) Existing Land Use Conditions					Subbasin Peak Flow (cfs) Future Land Use Conditions				
				Existing Land Use	Future Land Use	Increase (%)		2-Year	5-Year	10-Year	25-Year	100-Year	2-Year	5-Year	10-Year	25-Year	100-Year
81_310	West Springfield Hayden Bridge Basin_81	87	21.1	32.7	33.5	0.8	0.002	3.21	4.25	5.10	5.94	6.62	3.24	4.27	5.12	5.97	6.65
82_304_gw	Weyerhaeuser Outfall Basin_82	2934	146.2	32.8	36.2	3.4	0.004	21.01	28.52	34.49	40.40	45.10	21.87	29.34	35.31	41.21	45.90
82_304_gw1	Weyerhaeuser Outfall Basin_82	3703	52.0	50.9	51.4	0.5	0.005	9.41	11.93	14.02	16.10	17.76	9.45	11.97	14.06	16.14	17.80
82_304_gw3	Weyerhaeuser Outfall Basin_82	Node_12	95.1	60.7	60.7	0.0	0.003	18.14	22.82	26.66	30.47	33.51	18.14	22.82	26.66	30.47	33.51
82_305	Weyerhaeuser Outfall Basin_82	Node_12	37.5	9.9	9.9	0.0	0.008	2.76	4.68	6.19	7.74	8.96	2.76	4.68	6.19	7.74	8.96
83_38	Millrace Basin_83	3678	343.0	11.8	31.8	20.0	0.015	40.69	57.90	71.85	85.69	96.70	51.83	68.71	82.56	96.34	107.32
84_290	Jasper Basin_84	2601	107.2	17.4	18.8	1.3	0.002	12.25	17.95	22.38	26.74	30.19	12.51	18.20	22.63	26.98	30.43
84_291	Jasper Basin_84	903	147.9	3.9	3.9	0.0	0.002	12.41	20.59	26.78	32.84	37.61	12.41	20.59	26.78	32.83	37.61
84_291_gw	Jasper Basin_84	2809	132.9	11.5	13.5	2.0	0.002	13.23	20.46	25.99	31.41	35.70	13.74	20.95	26.47	31.89	36.17
85_40	Jasper - Natron Basin_85	912	106.2	1.8	25.6	23.9	0.007	10.64	16.09	20.44	24.74	28.16	14.86	20.15	24.46	28.74	32.14
85_40_gw	Jasper - Natron Basin_85	1490	65.0	5.4	16.9	11.5	0.008	7.33	10.54	13.17	15.79	17.88	8.51	11.69	14.32	16.93	19.01
86_42	Jasper - Natron Basin_86	2862	164.0	0.5	18.6	18.1	0.025	16.88	25.09	31.75	38.37	43.64	21.64	29.72	36.35	42.94	48.19
86_42_gw	Jasper - Natron Basin_86	3417	75.8	25.2	28.0	2.8	0.006	10.75	14.48	17.54	20.58	23.00	11.09	14.80	17.86	20.90	23.32
88_289_gw	South Cedar Creek Basin_88	Node_16	216.7	1.0	1.0	0.0	0.026	22.77	33.54	42.33	51.07	58.02	22.77	33.54	42.33	51.07	58.02
88_289-01	South Cedar Creek Basin_88 (?)	Node_16	116.4	1.0	1.0	0.0	0.028	12.57	18.27	22.97	27.65	31.38	12.57	18.27	22.97	27.65	31.38
88_289-02	South Cedar Creek Basin_88 (?)	Node_16	31.7	3.0	3.0	0.0	0.006	3.48	5.04	6.33	7.60	8.62	3.48	5.04	6.33	7.60	8.62
88_300_gw	South Cedar Creek Basin_88	4170	178.2	5.6	12.3	6.7	0.019	20.34	29.08	36.28	43.44	49.15	22.19	30.89	38.08	45.24	50.94
88_300_gw1	South Cedar Creek Basin_88	4170	81.6	6.5	7.3	0.8	0.002	7.63	12.07	15.46	18.79	21.42	7.75	12.18	15.57	18.90	21.53
88_301	South Cedar Creek Basin_88	Node_16	46.1	8.0	14.5	6.5	0.003	3.47	5.84	7.77	9.68	11.17	4.00	6.44	8.38	10.28	11.77
88_61_gw	South Cedar Creek Basin_88	Node_18	327.8	0.9	4.5	3.6	0.023	32.51	49.29	62.70	75.97	86.52	34.49	51.20	64.59	77.86	88.40
88_62	South Cedar Creek Basin_88	2145	59.1	7.4	13.6	6.3	0.026	5.89	9.04	11.48	13.89	15.79	6.56	9.68	12.11	14.51	16.41
88_63	South Cedar Creek Basin_88	1127	89.3	5.5	12.9	7.4	0.030	9.97	14.41	18.03	21.63	24.49	11.02	15.43	19.04	22.63	25.49
89_36	Riverview - Augusta Basin_89	2814	51.7	27.8	28.7	0.9	0.005	6.97	9.66	11.77	13.87	15.53	7.06	9.74	11.85	13.95	15.61
9_252	Q Street Floodway Basin_9	854	24.4	46.6	47.1	0.5	0.002	4.21	5.40	6.39	7.36	8.14	4.23	5.42	6.41	7.38	8.16
9_253	Q Street Floodway Basin_9	1874	40.0	28.3	29.5	1.2	0.001	5.30	7.40	9.04	10.66	11.95	5.39	7.48	9.12	10.74	12.03
9_254	Q Street Floodway Basin_9	2670	23.9	52.2	52.5	0.4	0.002	4.37	5.53	6.49	7.45	8.21	4.38	5.54	6.50	7.46	8.22
9_255	Q Street Floodway Basin_9	1346	10.6	49.6	49.6	0.0	0.001	1.90	2.42	2.84	3.27	3.61	1.90	2.42	2.84	3.27	3.61
9_256	Q Street Floodway Basin_9	3642	3.6	80.3	80.3	0.0	0.002	0.82	0.99	1.13	1.27	1.39	0.82	0.99	1.13	1.27	1.39
9_257	Q Street Floodway Basin_9	1351	9.1	34.8	37.8	2.9	0.002	1.44	1.88	2.25	2.61	2.90	1.48	1.92	2.29	2.65	2.94
9_258	Q Street Floodway Basin_9	2412	9.7	61.4	61.4	0.0	0.002	1.94	2.41	2.80	3.19	3.50	1.94	2.41	2.80	3.19	3.50
9_259	Q Street Floodway Basin_9	2405	5.1	55.7	55.7	0.0	0.004	0.97	1.21	1.41	1.61	1.77	0.97	1.21	1.41	1.61	1.77
9_260	Q Street Floodway Basin_9	2609	13.9	46.3	46.3	0.0	0.004	2.46	3.13	3.69	4.24	4.69	2.46	3.13	3.69	4.24	4.69
9_261	Q Street Floodway Basin_9	1816	13.7	69.8	69.8	0.0	0.003	2.89	3.54	4.08	4.63	5.06	2.89	3.54	4.08	4.63	5.06
9_262	Q Street Floodway Basin_9	1208	14.3	59.0	59.0	0.0	0.003	2.79	3.47	4.04	4.61	5.06	2.79	3.47	4.04	4.61	5.06
9_265	Q Street Floodway Basin_9	853	49.8	34.2	37.3	3.1	0.002	7.55	10.04	12.06	14.07	15.66	7.80	10.28	12.30	14.31	15.90
9_266	Q Street Floodway Basin_9	852	33.7	52.4	52.4	0.0	0.001	6.04	7.71	9.07	10.42	11.50	6.04	7.71	9.07	10.42	11.50
90_45	North Gateway Basin_90	Node_6	316.4	4.6	4.6	0.0	0.003	25.27	42.31	55.64	68.64	78.86	25.27	42.31	55.64	68.64	78.86
95_306	North Gateway Basin_95	Node_6	123.5	1.4	1.4	0.0	0.003	10.42	17.18	22.33	27.38	31.36	10.42	17.18	22.33	27.37	31.36
95_307	North Gateway Basin_95	Node_19	3.4	0.0	0.0	0.0	0.001	0.37	0.54	0.68	0.81	0.92	0.37	0.54	0.68	0.81	0.92
Catchment_2	Glenwood Basin	2824	38.8	58.0	58.0	0.0	0.001	7.26	9.18	10.75	12.30	13.55	7.26	9.18	10.75	12.31	13.55
Catchment_311	Weyerhaeuser Outfall Basin_4	3204	60.0	19.4	22.2	2.9	0.005	6.31	9.59	12.10	14.56	16.49	6.65	9.92	12.42	14.87	16.80
Catchment_4	Glenwood Basin	4058	16.5	12.5	22.2	9.8	0.005	2.10	2.89	3.55	4.21	4.74	2.34	3.13	3.79	4.45	4.97
Catchment_5	Glenwood Basin	4053	84.0	24.2	24.2	0.0	0.009	11.77	15.91	19.30	22.68	25.36	11.77	15.91	19.30	22.68	25.36
Catchment_7	Glenwood Basin	4053	44.9	13.7	30.3	16.6	0.006	5.61	7.82	9.63	11.44	12.88	6.77	8.96	10.77	12.57	14.00
Catchment_8	Glenwood Basin	Node_22	25.1	37.2	47.0	9.7	0.002	4.03	5.25	6.27	7.28	8.08	4.41	5.63	6.64	7.65	8.45
LHGL_1	Laurel Hill Area	2612	97.9	12.0	50.0	38.0	0.017	11.99	16.82	20.78	24.72	27.86	17.77	22.49	26.41	30.33	33.45
LHGL_2	Laurel Hill Area	2615	47.5	15.0	35.0	20.0	0.019	6.23	8.52	10.43	12.33	13.84	7.65	9.92	11.82	13.72	15.23
LHGL_3	Laurel Hill Area	4053	13.7	23.0	46.0	23.0	0.016	1.99	2.64	3.19	3.74	4.17	2.44	3.10	3.65	4.19	4.63
LHRA_1	Laurel Hill Area	2776	39.0	30.0	35.0	5.0	0.016	5.99	7.86	9.42	10.98	12.22	6.28	8.15	9.71	11.26	12.51
LHRA_2	Laurel Hill Area	2814	573.3	20.0	40.0	20.0	0.018	71.17	100.87	124.36	147.57	166.01	91.10	119.89	143.16	166.25	184.63
77_234_gw3	Glenwood Area - direct to Willamette	N/A	155.6	21.1	21.7	0.6	0.048	20.60	28.40	34.73	41.01	46.01	20.75	28.55	34.88	41.16	46.15
87_311_01	Jasper Natron_1	N/A	414.6	1.7	16.4	14.7	0.150	38.40	60.45	77.59	94.47	107.85	49.27	70.80	87.81	104.63	117.97
87_311-02	Jasper Natron_2	N/A	590.5	1.7	16.4	14.7	0.100	47.39	79.92	104.67	128.89	147.99	63.85	95.83	120.37	144.46	163.51
Catchment_1	Glenwood Area - new pipe to Willamette	N/A	69.7	41.8	41.8	0.0	0.008	10.60	14.23	17.09	19.92	22.16	10.60	14.23	17.09	19.92	22.16
Catchment_3	Glenwood Area - new pipe to Willamette	N/A	33.3	40.6	43.5	2.9	0.013	5.32	7.00	8.35	9.69	10.76	5.48	7.15	8.50	9.85	10.91

APPENDIX B

HYDRAULIC SUMMARY TABLES

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1	4087	4086	Circular	24	93	10	14	17	20	22	460.8	457.4	461.5	458.8	461.6	459.1	461.7	459.4	461.9	459.6	461.9	459.8
1_0	1832	886	Circular	48	482	38	48	56	60	60	474.2	472.7	476.2	475.0	476.6	475.6	477.0	476.2	477.7	477.0	478.4	477.7
1_1	4214	4213	Circular	30	119	0	0	0	0	0	445.2	445.0	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1
1_12	1238	2099	Natural Channel		409	221	295	342	382	411	446.6	445.6	454.8	454.9	456.1	456.2	457.0	457.0	457.7	457.8	458.2	458.3
1_3	2962	Node_2	Natural Channel		448	28	40	49	55	58	535.1	533.9	536.5	536.0	536.8	536.0	537.0	536.0	537.1	536.0	537.2	536.0
1_4	2099	204	Natural Channel		30	226	303	351	391	421	445.6	447.0	454.9	454.9	456.2	456.2	457.0	457.0	457.8	457.8	458.3	458.3
1_5	3703	Node_12	Natural Channel		863	230	299	336	368	392	476.5	476.0	483.8	483.2	484.6	483.8	484.9	484.2	485.2	484.4	485.4	484.6
1_6	220	3593	Natural Channel		1408	52	72	88	104	116	510.9	508.3	514.7	510.8	515.3	511.2	515.6	511.4	515.9	511.6	516.2	511.8
1_7	3966	3807	Natural Channel		761	43	49	53	56	58	434.9	432.2	436.8	435.0	436.9	435.3	437.0	435.4	437.0	435.5	437.0	435.6
1_8	1535	3709	Natural Channel		295	63	75	84	94	101	428.0	427.6	432.1	430.3	432.3	430.5	432.5	430.7	432.7	430.9	432.9	431.0
10	4086	4085	Circular	24	52	10	14	17	20	22	457.4	455.6	458.1	456.9	458.3	457.1	458.4	457.3	458.5	457.4	458.6	457.6
100	1184	1183	Circular	42	149	24	34	42	50	57	528.9	524.1	529.9	526.7	530.1	527.2	530.3	527.6	530.4	528.0	530.6	528.3
1001	127	1530	Circular	24	263	9	12	14	15	16	429.1	429.1	431.0	430.6	431.6	430.9	432.2	431.2	433.1	432.0	433.5	432.4
1002	2914	2922	Circular	24	55	9	12	14	15	16	429.5	429.5	431.7	431.6	433.1	432.9	434.3	434.1	435.7	435.4	436.1	435.9
1003	2667	2914	Circular	24	179	9	12	14	15	16	428.9	429.5	432.1	431.8	433.8	433.3	435.4	434.7	436.9	436.1	437.5	436.6
10051562	Corporate_Pond_Inlet_2	Corporate_Pond	Circular	30	40	8	11	13	14	15	418.1	418.0	421.7	421.6	421.8	421.8	421.9	421.9	422.0	421.9	422.0	422.0
10051563	10023868	Node_36	Circular	30	97	5	5	5	5	5	416.0	416.0	418.8	418.8	419.4	419.4	419.8	419.8	420.1	420.1	420.3	420.3
10051581	Corporate_Pond_Inlet_1	Corporate_Pond	Circular	36	110	7	10	10	-12	-13	418.2	417.2	421.6	421.6	421.8	421.8	421.8	421.8	421.9	421.9	421.9	421.9
10053487	10038747	Ambleside_Pond	Circular	21	54	8	11	14	14	14	462.8	462.9	464.2	464.0	465.1	464.9	467.6	467.5	469.4	469.1	469.6	469.3
10053494	10038749	10038745	Circular	12	80	0	0	0	0	0	467.7	465.9	467.7	465.9	467.7	465.9	468.0	468.0	470.3	470.3	470.6	470.6
10053495	10038750	10038746	Circular	12	90	0	0	0	0	0	464.5	463.9	464.7	464.7	465.8	465.8	468.0	468.0	470.3	470.3	470.6	470.6
10053499	10038783	10038748	Circular	21	381	8	11	14	14	14	464.7	463.0	466.3	465.3	468.8	466.8	471.9	468.9	474.3	471.7	474.9	472.1
10053500	10038784	10038783	Circular	21	263	8	11	14	15	15	469.7	467.3	470.7	468.2	471.0	469.6	475.1	473.1	477.5	475.4	478.3	476.1
10053505	10038781	10038784	Circular	10	75	0	0	0	0	1	473.8	470.7	473.8	471.5	473.8	471.8	475.8	475.8	478.2	478.2	479.0	479.1
10053533	10038791	Node_28	Circular	24	30	8	11	11	10	14	462.0	461.9	463.0	462.9	464.5	464.5	466.9	466.8	468.4	468.3	469.0	469.0
10053824	10031888	10038745	Circular	18	192	0	0	0	2	3	466.0	465.5	466.0	465.6	466.0	465.8	468.0	468.0	470.3	470.3	470.6	470.6
10053826	10038746	10038747	Circular	21	173	0	0	0	3	4	463.3	462.9	464.7	464.7	465.8	465.8	468.0	468.0	470.3	470.3	470.6	470.6
10053827	10038748	10038747	Circular	21	49	8	11	14	14	14	462.9	462.8	464.9	464.7	466.1	465.8	468.1	468.0	470.7	470.3	471.0	470.6
10053828	10038745	10038746	Circular	18	274	0	0	0	3	3	465.5	463.5	465.5	464.7	465.8	465.8	468.0	468.0	470.3	470.3	470.6	470.6
10053830	10038755	10038747	Circular	10	10	0	0	0	0	1	464.0	463.6	464.7	464.7	465.8	465.8	468.0	468.0	470.3	470.3	470.6	470.6
10076629	10076553	10076551	Circular	8	80	0	0	0	0	0	505.0	500.9	505.0	500.9	505.0	500.9	505.0	500.9	505.0	500.9	505.0	500.9
10076631	10076551	10076549	Circular	8	96	0	0	0	0	0	500.9	495.9	500.9	495.9	500.9	495.9	500.9	495.9	500.9	495.9	500.9	495.9
10076633	10076549	10076545	Circular	8	20	0	0	0	0	0	495.9	495.0	495.9	495.0	495.9	495.0	495.9	495.0	495.9	495.0	495.9	495.0
101	1188	1187	Circular	24	141	16	23	29	34	38	542.4	536.6	543.2	537.4	543.4	537.6	543.5	537.7	543.7	537.9	543.8	538.0
1012	95	1323	Circular	36	593	15	20	24	28	31	425.9	425.3	427.6	426.5	427.9	426.7	428.2	426.9	428.4	427.0	428.7	427.1
1013	1296	3154	Circular	30	404	2	3	4	5	5	424.8	424.2	425.4	424.7	425.5	424.8	425.6	424.8	425.7	424.9	425.8	424.9
10167673	10076498	10038750	Circular	12	229	0	0	0	0	0	471.7	469.5	471.7	469.5	471.7	469.5	471.7	469.5	471.7	470.3	471.7	470.6
10167722	10076545	10076543	Circular	12	41	0	0	0	0	0	494.5	494.3	494.5	494.3	494.5	494.3	494.5	494.3	494.5	494.3	494.5	494.3
10167724	10076543	10076478	Circular	12	66	0	0	0	0	0	494.3	488.9	494.3	488.9	494.3	488.9	494.3	488.9	494.3	488.9	494.3	488.9
10167739	10076478	10076476	Circular	12	252	0	0	0	0	0	488.9	471.9	488.9	471.9	488.9	471.9	488.9	471.9	488.9	471.9	488.9	471.9
10167750	10076476	10038749	Circular	12	54	0	0	0	0	0	471.9	467.9	471.9	467.9	471.9	467.9	471.9	468.0	471.9	470.3	471.9	470.6
1019	3581	3644	Circular	30	134	24	29	32	34	35	426.4	421.2	427.4	422.1	427.5	422.2	427.5	422.3	427.6	422.3	427.6	422.3
102	1190	1189	Circular	24	274	16	23	29	34	38	583.9	554.9	584.5	556.3	584.7	556.5	584.8	556.7	584.9	556.9	584.9	557.1
1020	1550	1549	Circular	30	479	24	29	32	34	35	430.5	429.2	433.1	431.6	434.3	431.9	435.4	432.4	436.2	432.9	436.6	433.2
1021	1556	3616	Circular	30	402	9	11	14	15	16	433.5	432.5	436.0	435.8	438.6	438.4	440.5	440.3	441.7	441.5	442.2	442.1
1022	3665	3795	Circular	24	117	4	5	6	6	8	436.7	436.3	438.8	438.7	439.2	439.1	441.1	441.0	442.2	442.2	442.7	442.6
1023	3622	503	Circular	18	58	4	5	6	6	7	437.6	436.8	439.0	438.9	439.5	439.3	441.5	441.3	442.7	442.5	443.2	443.0
1024	3843	3141	Circular	18	60	5	6	6	6	6	436.4	436.7	438.7	438.6	439.1	438.9	440.8	440.7	441.9	441.8	442.4	442.3
1025	3846	3801	Circular	18	293	5	6	6	6	6	437.5	437.3	439.7	439.1	440.6	439.8	442.1	441.4	442.6	442.2	442.9	442.6
1026	3846	3830	Circular	18	73	0	0	2	4	5	437.8	437.3	439.8	439.8	440.8	440.8	442.2	442.2	442.5	442.4	442.8	442.6
1027	3778	3846	Circular	30	201	5	6	7	8	9	437.7	437.6	439.9	439.8	440.9	440.8	442.3	442.2	442.7	442.7	443.1	443.0
1028	3629	3622	Circular	24	106	4	5	6	7	7	437.5	437.6	439.1	439.0	439.7	439.6	441.7	441.6	443.0	442.9	443.5	443.4
1029	3795	1645	Circular	24	208	4	5	6	7	9	436.3	436.3	438.7	438.6	439.1	439.0	440.9	440.8	442.1	441.9	442.6	442.5
103	1192	1191	Circular	36	215	15	21	26	30	34	550.4	536.8	551.0	538.5	551.2	538.9	551.2	539.1	551.3	539.4	551.4	539.6
1033	3827	3796	Circular	24	81	0	0	0	0	1	440.9	439.8	441.2	441.2	441.5	441.5	443.0	443.0	443.6	443.6	444.1	444.1
1035	3796	3633	Circular	24	33	5	6	7	8	9	439.8	439.8	441.0	441.0	441.3	441.3	442.8	442.8	443.4	443.4	443.9	443.8
1036	3826	3778	Circular	30	111	5	6	7	8	9	438.4	437.8	439.9	439.9	440.9	440.9	442.4	442.3	442.8	442.8	443.2	443.1
1039	3818	3796	Circular	24	143	5	6	7	8	9	439.8	439.8	441.3	441.2	441.6	441.5	443.1	443.0	443.8	443.6	444.3	444.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
104	1191	1186	Circular	36	138	15	21	26	31	34	536.8	534.7	537.6	535.7	537.8	536.0	537.9	536.1	538.1	536.2	538.2	536.3
1042	106	1532	Rectangular		194	67	86	100	110	119	423.2	423.9	426.0	425.9	426.3	426.1	426.5	426.3	426.7	426.5	426.8	426.6
1052	1584	106	Circular	60	307	35	43	50	56	60	423.1	423.4	426.2	426.0	426.4	426.3	426.7	426.5	426.9	426.7	427.0	426.8
1057	3706	119	Circular	42	361	0	0	0	0	0	425.1	424.6	426.0	426.0	426.3	426.3	426.5	426.5	426.7	426.7	426.8	426.8
1058	3558	1539	Circular	48	506	32	41	48	54	58	424.4	423.4	426.5	426.2	426.9	426.5	427.1	426.7	427.6	426.9	427.4	427.0
1064	109	3175	Circular	18	62	-3	-4	1	-7	-8	426.1	425.9	428.0	428.0	428.3	428.4	428.6	428.8	428.9	429.2	429.2	429.5
1065	109	4042	Circular	30	530	7	10	12	14	16	425.6	426.5	427.9	427.6	428.2	427.8	428.5	427.9	428.7	428.1	428.9	428.1
1066	3143	3354	Circular	30	306	10	12	14	15	16	425.4	425.3	428.0	427.8	428.5	428.2	429.0	428.6	429.5	429.1	429.9	429.5
1067	3422	3431	Circular	36	546	13	15	17	19	20	425.4	425.0	427.6	427.4	428.0	427.7	428.3	427.9	428.6	428.2	428.9	428.5
1068	3354	3422	Circular	30	25	13	15	17	19	20	425.3	425.4	427.7	427.7	428.1	428.0	428.4	428.3	428.8	428.7	429.1	429.1
1069	374	109	Circular	30	710	4	6	6	7	8	426.4	425.8	428.1	428.0	428.4	428.3	428.8	428.6	429.1	428.9	429.5	429.2
1070	3106	3175	Circular	30	665	7	8	10	12	13	426.1	425.7	428.3	428.1	428.9	428.6	429.5	429.1	430.2	429.7	430.8	430.2
1072	3085	3130	Circular	27	27	7	8	10	12	13	426.3	426.5	428.4	428.4	429.2	429.1	429.9	429.8	430.7	430.6	431.4	431.3
1074	372	373	Circular	24	31	7	9	11	13	14	426.7	426.7	428.5	428.5	429.6	429.5	430.7	430.6	432.0	431.9	433.1	433.0
1076	373	3360	Circular	24	91	7	9	11	13	14	426.7	426.6	428.3	428.3	429.3	429.2	430.4	430.1	431.5	431.2	432.5	432.1
1078	3402	3390	Circular	24	472	7	9	11	13	14	426.1	424.9	427.5	427.1	428.2	427.4	428.8	427.6	429.3	427.8	429.9	428.0
1079	3390	3399	Circular	42	291	20	24	28	31	34	424.9	425.0	427.0	426.8	427.3	427.0	427.5	427.2	427.7	427.4	427.9	427.5
1080	3425	3390	Circular	36	41	13	15	17	19	20	425.2	424.9	427.1	427.1	427.4	427.4	427.6	427.6	427.8	427.8	428.0	428.0
1083	3312	3167	Circular	36	534	19	24	30	36	40	424.1	422.4	425.6	423.9	425.8	424.2	426.1	424.4	426.4	424.7	426.9	424.8
1089	3282	3374	Circular	36	499	4	5	8	12	14	426.0	426.1	427.8	427.7	428.1	428.0	428.5	428.4	429.3	429.2	430.4	430.2
109	2026	266	Circular	24	184	10	14	17	21	23	555.9	542.6	556.4	543.3	556.6	543.5	556.6	543.7	556.7	543.8	556.8	543.9
1090	3404	3282	Circular	30	143	6	8	9	11	12	426.7	426.1	427.8	427.8	428.1	428.1	428.5	428.5	429.5	429.4	430.6	430.4
1091	2908	3314	Circular	30	195	6	8	9	11	12	427.3	427.0	428.4	428.2	428.7	428.5	429.0	428.9	430.0	429.8	431.2	431.0
1092	2930	3404	Circular	30	59	6	8	9	11	12	426.8	426.7	428.0	427.9	428.3	428.2	428.7	428.6	429.6	429.6	430.7	430.7
110	320	2026	Circular	24	213	10	14	17	21	23	567.2	555.9	567.8	557.0	567.9	557.2	568.0	557.4	568.1	557.5	568.2	557.6
1104	3489	364	Circular	42	157	23	30	36	40	42	426.7	426.9	429.6	429.5	430.5	430.3	431.9	431.7	433.3	433.0	433.8	433.5
1105	363	3540	Circular	42	194	26	34	40	45	47	426.6	425.8	429.1	429.1	429.8	429.8	430.9	430.6	431.9	431.5	432.3	431.8
1106	3527	3511	Circular	36	127	6	7	8	9	10	426.5	425.8	428.6	428.6	429.1	429.1	429.6	429.6	430.2	430.2	430.4	430.4
1107	3537	3511	Circular	42	242	26	34	40	45	47	426.1	425.8	428.8	428.6	429.4	429.1	429.9	429.6	430.6	430.2	430.9	430.4
1108	3474	3627	Circular	24	327	2	3	3	3	4	428.0	427.4	429.8	429.7	430.7	430.7	432.3	432.2	433.7	433.6	434.3	434.2
111	2574	2893	Circular	24	126	6	9	11	14	16	604.6	593.4	605.0	594.3	605.1	594.5	605.2	594.7	605.2	594.9	605.3	595.0
1110	3539	3489	Circular	42	330	21	28	32	37	39	426.8	426.7	429.9	429.7	430.9	430.6	432.5	432.1	434.0	433.5	434.5	434.1
1111	3509	3539	Circular	42	49	21	28	32	37	39	426.9	426.9	429.9	429.9	431.0	431.0	432.7	432.7	434.3	434.2	434.9	434.8
1112	3530	3639	Circular	42	264	10	13	16	18	20	427.7	427.5	430.4	430.3	431.7	431.7	433.8	433.8	435.7	435.6	436.4	436.4
1113	1221	366	Circular	24	299	3	4	5	6	6	429.2	428.5	430.5	430.5	432.1	432.0	434.3	434.2	436.3	436.1	437.1	436.9
112	2145	2574	Circular	24	232	6	9	11	14	16	632.5	604.6	632.8	605.4	632.9	605.6	633.0	605.7	633.0	605.9	633.1	605.9
1120	354	3527	Circular	24	308	6	7	8	9	10	428.4	426.9	429.2	428.7	429.5	429.1	430.0	429.6	430.8	430.2	431.1	430.5
1121	3559	3503	Circular	24	281	3	4	4	5	6	430.0	429.0	430.7	430.3	430.8	430.5	430.9	430.7	431.6	431.5	432.3	432.1
1126	3627	3519	Circular	24	191	2	3	3	3	4	427.4	426.9	429.7	429.7	430.6	430.6	432.2	432.1	433.6	433.5	434.1	434.1
1138	3551	827	Circular	36	20	42	48	52	54	57	434.7	434.8	437.1	437.0	437.3	437.1	437.4	437.2	437.4	437.2	437.5	437.3
1139	3613	3495	Circular	42	112	33	38	42	45	47	436.6	436.7	441.7	441.6	443.4	443.2	444.5	444.3	445.3	445.1	446.0	445.8
1146	3363	3817	Circular	24	359	5	6	7	8	9	444.1	440.0	444.7	441.5	444.8	441.8	445.0	443.4	445.1	444.2	445.3	444.9
1150	642	2318	Circular	42	205	33	42	43	42	45	438.2	438.1	443.5	443.3	446.2	445.9	447.6	447.3	448.4	448.1	449.1	448.8
1151	Node_5	517	Circular	48	50	33	42	44	43	46	438.0	438.2	442.7	442.6	444.8	444.8	446.1	446.1	446.9	446.9	447.6	447.6
1152	2318	2300	Circular	48	15	33	42	44	43	46	438.1	438.1	443.3	443.2	445.8	445.8	447.2	447.1	448.0	447.9	448.6	448.6
1154	3651	2470	Circular	21	225	6	8	8	9	9	444.0	443.7	445.6	445.2	449.3	448.8	450.4	449.9	451.1	450.6	451.6	451.2
1155	2470	636	Circular	24	349	6	8	8	9	9	443.4	442.9	445.2	444.9	448.7	448.3	449.8	449.5	450.5	450.2	451.1	450.8
1157	612	3306	Circular	27	277	6	7	11	12	15	441.8	441.1	444.5	444.4	447.8	447.6	449.0	448.9	449.7	449.6	450.4	450.2
1158	611	612	Circular	24	45	6	7	9	10	12	442.3	442.1	444.6	444.6	447.9	447.8	449.1	449.0	449.8	449.7	450.4	450.4
1160	3315	3306	Circular	24	177	4	5	6	7	8	441.7	441.1	444.5	444.4	447.7	447.6	448.9	448.9	449.6	449.6	450.3	450.2
117	2583	2107	Circular	36	220	15	21	26	30	34	566.2	557.6	566.9	558.7	567.0	558.9	567.1	559.1	567.2	559.3	567.3	559.4
118	2132	2133	Circular	24	190	5	6	8	9	10	614.3	602.9	614.7	604.2	614.8	604.5	614.8	604.7	614.9	604.8	614.9	605.0
1181	1295	640	Circular	42	170	18	24	26	27	27	439.6	439.5	444.1	444.0	447.2	447.1	448.6	448.5	449.5	449.4	450.0	449.9
1182	641	642	Circular	42	440	18	24	24	24	24	439.1	438.2	443.8	443.7	446.8	446.6	448.2	448.0	449.0	448.8	449.6	449.4
1187	658	1739	Circular	24	70	9	13	15	15	15	440.7	440.9	444.4	444.2	447.7	447.5	449.2	449.0	450.2	449.9	450.7	450.4
1191	3531	3514	Circular	24	341	8	11	12	13	13	452.3	451.4	454.2	453.7	456.7	455.8	458.8	457.9	459.6	458.6	460.0	458.9
1192	3500	3531	Circular	24	81	3	4	4	5	5	452.2	452.3	454.4	454.4	456.9	456.9	459.2	459.1	459.9	459.9	460.4	460.4
1193	430	734	Circular	24	606	8	11	12	12	13	451.1	449.5	453.1	452.3	454.6	453.1	456.5	454.7	457.1	455.3	457.4	455.6
1194	734	735	Circular	24	298	8	11	12	12	13	449.5	450.1	452.0	451.6	452.7	452.0	454.2	453.4	454.8	453.9	455.0	454.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1195	735	737	Circular	24	34	8	11	12	12	13	450.1	449.9	451.4	451.3	451.7	451.6	453.1	453.0	453.6	453.5	453.8	453.7
1196	739	740	Circular	27	40	3	4	4	5	5	454.3	453.6	454.8	454.6	457.3	457.2	459.5	459.5	460.4	460.3	460.8	460.8
1206	2740	908	Circular	24	172	8	11	14	16	19	481.4	480.8	482.8	482.5	483.6	483.2	485.2	484.5	489.1	488.4	490.5	489.9
1208	163	164	Circular	42	150	18	26	31	35	37	476.2	476.1	478.3	478.2	479.0	478.9	480.6	480.4	482.3	482.1	483.5	483.3
1209	1490	912	Circular	66	553	26	36	44	51	54	474.2	473.7	477.4	477.4	478.5	478.5	479.8	479.7	481.3	481.2	482.4	482.3
121	2133	2900	Circular	36	199	15	21	26	30	34	602.9	594.0	603.6	595.0	603.7	595.2	603.8	595.3	603.9	595.4	603.9	595.5
1210	912	1396	Circular	66	493	36	52	65	76	82	473.7	473.5	477.4	477.3	478.4	478.3	479.6	479.4	481.0	480.7	482.1	481.8
1213	1396	1432	Circular	66	502	36	52	65	76	82	473.5	473.2	477.2	477.2	478.2	478.1	479.3	479.1	480.6	480.3	481.6	481.3
1214	1432	903	Circular	66	501	36	52	65	76	82	473.2	473.0	477.1	477.1	478.1	477.9	479.0	478.9	480.2	479.9	481.1	480.8
1215	903	904	Circular	66	502	52	78	99	117	130	473.0	472.9	476.9	476.8	477.7	477.5	478.6	478.1	479.5	478.9	480.3	479.5
1216	1413	2647	Circular	66	275	52	78	99	117	130	472.4	472.3	476.1	476.0	476.2	476.0	476.3	476.0	476.4	476.0	476.5	476.0
122	322	2194	Circular	36	232	10	14	18	22	24	638.6	615.4	639.0	616.4	639.1	616.6	639.1	616.7	639.2	616.8	639.2	616.9
1220	1569	3094	Circular	36	20	14	19	21	23	24	417.6	417.9	421.2	421.2	422.1	422.1	422.7	422.7	423.2	423.2	423.7	423.6
1225	135	3447	Circular	60	264	20	28	33	39	40	464.1	464.1	466.3	466.2	466.8	466.7	467.2	467.1	467.7	467.6	468.2	468.2
1236	1206	1209	Circular	30	264	4	6	7	8	9	429.9	429.2	431.1	431.1	431.4	431.4	431.8	431.8	432.7	432.7	434.1	434.0
1238	995	996	Circular	42	195	20	28	37	38	44	495.1	494.9	497.8	497.8	505.1	505.0	506.2	506.0	506.9	506.8	507.4	507.3
1239	996	3900	Circular	42	130	20	28	37	38	44	495.0	494.8	497.7	497.7	504.8	504.8	505.9	505.9	506.7	506.6	507.2	507.1
1246	3532	3615	Circular	36	283	7	9	11	12	14	428.4	427.8	430.4	430.4	431.9	431.8	434.0	434.0	436.0	435.9	436.7	436.6
1255	2552	2283	Circular	54	275	92	130	143	148	151	523.7	522.4	527.1	526.3	528.5	527.3	529.2	527.7	529.5	528.0	529.7	528.1
1269	1910	1184	Circular	42	116	24	34	42	51	57	530.6	528.9	531.9	530.8	532.2	531.3	532.4	531.6	532.7	532.0	532.9	532.2
1270	2107	1192	Circular	36	110	15	21	26	30	34	557.5	550.6	558.1	551.7	558.2	551.9	558.3	552.1	558.4	552.2	558.4	552.3
1271	1186	1185	Circular	42	273	7	10	12	15	16	534.7	528.8	535.2	529.9	535.3	530.1	535.4	530.3	535.5	530.4	535.5	530.5
1274	2194	2133	Circular	36	160	10	14	18	22	24	615.4	603.8	615.9	604.3	616.0	604.5	616.0	604.7	616.1	604.8	616.2	605.0
1279	1167	2831	Circular	30	108	10	14	18	22	24	730.4	720.3	730.9	721.3	731.0	721.5	731.1	721.7	731.1	721.8	731.2	721.9
1282	314	1166	Circular	36	43	10	14	18	22	24	663.6	660.0	664.1	661.0	664.2	661.2	664.3	661.3	664.3	661.5	664.4	661.5
1287	1424	1423	Circular	24	60	10	14	18	22	24	765.5	765.0	766.5	766.0	766.7	766.3	767.0	766.5	767.2	766.7	767.4	766.7
1294	1981	1149	Circular	36	58	7	10	12	13	14	499.7	499.6	501.9	501.9	502.5	502.5	503.9	503.9	506.8	506.8	509.0	509.0
1296	158	2039	Circular	30	430	7	10	11	13	14	506.0	501.8	506.8	503.0	506.9	503.2	507.0	504.3	507.6	507.4	510.2	509.7
1299	3176	1415	Circular	24	210	8	12	14	15	15	485.7	486.1	488.4	488.1	489.0	488.5	489.5	488.7	489.7	488.8	489.8	488.8
13	4092	Node_15	Circular	72	580	31	41	44	36	33	429.2	428.5	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.9	445.9
1300	3204	3703	Circular	36	120	33	45	52	56	62	485.7	486.6	488.8	488.5	489.3	488.8	489.6	488.9	489.9	489.0	490.1	489.1
1301	3265	3286	Circular	42	180	37	45	47	48	49	482.0	482.0	486.1	485.9	488.0	487.7	488.8	488.5	489.4	489.0	489.8	489.3
1303	1617	1073	Circular	24	80	12	16	19	20	21	494.9	494.9	497.7	497.4	501.5	501.3	502.5	502.3	503.1	502.9	503.5	503.3
1304	1078	1079	Circular	24	191	8	12	11	13	13	497.0	496.8	500.8	500.6	504.7	504.5	505.3	505.1	505.9	505.6	506.7	506.4
1305	1409	1628	Circular	24	52	12	16	17	17	17	495.9	495.8	499.5	499.3	503.4	503.2	504.1	504.0	504.6	504.5	505.3	505.1
1307	3905	1551	Circular	36	561	25	29	29	31	33	490.8	489.1	493.5	492.7	498.3	497.3	499.8	498.7	500.6	499.5	501.0	500.0
1311	2917	1400	Circular	33	340	12	17	20	23	23	490.9	489.6	492.1	491.2	492.3	491.5	492.5	491.7	494.6	494.0	495.7	495.1
1313	1404	2913	Circular	30	345	2	3	3	4	5	493.6	492.4	494.1	494.1	494.4	494.4	494.7	494.7	496.4	496.4	497.6	497.6
1314	1861	2894	Circular	30	185	10	14	16	16	17	498.3	496.9	499.2	497.8	499.4	498.0	499.5	498.1	499.5	498.1	499.5	498.1
1315	1853	1004	Circular	27	130	10	14	16	16	17	499.6	499.3	501.5	501.3	502.4	502.1	502.9	502.5	503.1	502.8	503.4	503.0
1316	3914	1862	Circular	27	280	10	14	16	16	17	501.0	500.3	502.6	502.2	504.2	503.6	505.1	504.4	505.5	504.7	506.0	505.1
1317	1899	1925	Circular	42	270	24	30	36	40	45	486.4	485.5	488.0	487.2	488.3	487.6	489.1	488.7	490.3	489.8	491.4	490.9
1318	1867	1493	Circular	48	400	19	24	25	27	28	485.1	484.0	486.5	485.9	486.8	486.7	487.3	487.3	487.8	487.8	488.3	488.2
1319	958	1922	Circular	48	195	19	23	25	27	29	487.3	486.7	488.8	488.4	488.9	488.6	489.0	488.7	489.2	488.8	489.3	489.0
1322	832	767	Circular	54	170	64	82	88	94	98	483.3	481.7	486.1	485.8	487.0	486.7	487.5	487.2	488.0	487.7	488.4	488.0
1323	2432	1009	Circular	48	410	14	15	16	17	18	494.7	493.9	495.9	495.3	496.0	495.4	496.1	495.5	496.1	495.5	496.1	495.5
1325	2458	1008	Circular	42	310	17	22	25	29	32	491.6	491.1	493.3	492.9	493.6	493.2	493.8	493.5	494.1	493.9	496.4	496.1
1326	2341	1005	Circular	48	390	14	15	16	17	18	493.0	491.5	494.1	492.9	494.1	493.0	494.2	493.1	494.2	493.1	494.2	493.1
1327	1060	1057	Circular	30	395	7	9	11	13	14	501.7	500.6	502.7	501.8	502.8	502.0	503.0	502.2	503.1	502.3	503.3	502.7
1328	1056	1053	Circular	30	204	7	9	11	13	14	498.5	497.6	499.5	498.9	499.7	499.2	499.8	499.4	500.0	499.7	501.5	501.3
1329	1055	1052	Circular	42	410	22	27	29	30	31	501.1	499.5	502.6	501.5	502.8	501.7	502.9	501.8	502.9	501.8	502.9	501.9
1332	2252	1125	Circular	27	220	22	27	29	30	31	510.9	510.0	513.9	512.8	516.2	514.4	517.0	515.1	517.7	515.6	518.1	515.9
1333	1856	1823	Circular	27	50	16	19	22	23	23	514.3	513.3	516.9	516.7	520.3	520.1	521.4	521.2	522.2	522.0	522.7	522.5
1334	1124	2389	Circular	27	195	7	10	11	13	14	507.3	506.4	508.4	507.8	508.5	508.0	508.7	508.2	508.9	508.4	509.1	508.7
1335	1044	2150	Circular	24	472	12	17	21	24	26	619.0	579.5	619.6	580.8	619.7	581.0	619.8	581.2	619.8	581.3	619.9	581.4
1337	2027	2142	Circular	18	35	5	8	9	11	13	730.2	727.2	730.6	728.3	730.7	728.5	730.8	728.8	732.6	732.2	733.4	733.0
1341	1092	1091	Circular	24	53	5	8	9	11	13	766.4	759.9	766.8	761.2	766.8	761.5	766.9	761.7	767.0	761.9	767.0	762.0
1343	979	978	Circular	42	330	38	48	51	53	54	492.0	491.3	495.1	494.7	501.4	500.7	502.5	501.8	503.3	502.6	503.8	503.1
1344	2103	977	Circular	42	510	38	48	52	55	56	490.5	490.0	493.9	493.2	499.2	498.1	500.3	499.2	501.1	500.0	501.6	500.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1345	2065	724	Circular	42	20	38	48	52	55	56	488.5	488.3	492.6	492.6	497.0	497.0	498.2	498.1	499.0	499.0	499.5	499.5
1348	2006	3908	Circular	24	125	10	12	12	14	16	497.1	496.4	498.7	498.5	506.4	506.1	507.4	507.1	508.2	507.9	508.8	508.4
1349	992	990	Circular	42	280	26	34	40	41	45	495.2	494.1	497.1	496.5	504.2	504.0	505.4	505.1	506.1	505.8	506.6	506.4
135	1165	1164	Circular	36	82	10	14	18	22	24	649.1	643.2	649.6	644.3	649.7	644.6	649.8	644.8	649.8	644.9	649.9	645.0
1353	3458	200	Circular	30	155	11	14	18	21	23	544.8	544.2	545.9	545.3	546.1	545.5	546.3	545.6	546.4	545.7	546.5	545.8
1354	3417	3464	Circular	30	360	11	14	18	21	23	548.4	546.9	549.6	548.3	549.8	548.6	550.0	548.9	550.2	549.1	550.5	549.4
1358	886	884	Circular	60	305	25	32	39	46	47	472.7	471.9	475.0	475.0	475.6	475.7	476.2	476.2	477.0	477.0	477.7	477.6
1359	935	2308	Circular	24	495	7	8	10	12	12	480.8	479.6	481.9	480.5	482.1	480.7	482.3	481.1	483.8	482.5	484.8	483.4
136	2863	314	Circular	36	63	10	14	18	22	24	683.9	663.6	684.2	664.6	684.3	664.8	684.3	664.9	684.3	665.0	684.4	665.1
1361	2480	2507	Circular	42	260	20	27	32	38	40	475.1	475.0	478.1	478.0	478.8	478.7	479.5	479.3	480.4	480.1	481.2	480.8
1362	887	1832	Circular	48	60	32	43	51	59	63	474.8	474.2	476.9	476.8	477.2	477.1	477.6	477.4	478.1	478.0	478.7	478.6
1363	1832	886	Circular	60	482	1	3	6	12	21	476.6	472.9	476.8	475.0	477.0	475.6	477.2	476.2	477.4	477.0	477.7	477.7
1366	926	930	Circular	42	20	20	27	32	38	40	476.1	476.1	478.8	478.7	479.8	479.8	481.1	481.1	482.6	482.6	483.7	483.6
137	2831	2840	Circular	30	126	10	14	18	22	24	720.3	710.3	720.8	711.7	720.9	712.0	721.0	712.3	721.1	712.5	721.1	712.6
1370	1813	1810	Circular	36	201	13	17	21	24	26	478.7	478.7	480.4	480.3	480.8	480.6	482.4	482.2	484.5	484.2	485.8	485.5
1372	1874	849	Circular	24	95	5	7	9	11	12	464.2	464.0	465.1	464.8	465.3	465.0	465.4	465.1	465.5	465.2	465.6	465.2
1373	2361	2378	Circular	54	317	5	7	9	12	12	461.5	461.1	462.6	462.5	462.9	462.9	463.1	463.1	463.3	463.3	463.4	463.4
1374	852	853	Circular	24	656	6	8	9	10	11	469.3	467.9	470.4	469.4	470.6	469.7	470.9	469.9	472.0	470.6	473.7	472.0
1378	841	2413	Circular	24	117	10	13	14	16	17	465.9	466.0	470.3	470.1	473.6	473.2	474.8	474.3	475.8	475.3	476.3	475.8
1379	892	842	Circular	24	434	10	13	14	15	16	469.7	468.4	472.2	471.4	476.8	475.5	478.4	476.9	480.1	478.2	481.0	479.0
138	1168	1167	Circular	30	25	10	14	18	22	24	731.9	730.4	732.5	731.4	732.6	731.6	732.7	731.7	732.8	731.8	732.9	731.9
1380	551	446	Circular	24	330	9	12	14	16	18	445.2	444.1	446.6	446.0	447.1	446.2	447.7	446.5	448.6	446.9	449.9	447.8
1383	446	445	Circular	30	350	15	19	22	25	27	444.1	442.5	445.4	444.4	445.7	444.6	445.9	444.8	446.5	445.2	447.3	445.7
1384	2256	2923	Circular	36	332	15	19	22	25	27	441.2	440.5	442.8	442.3	443.0	442.6	443.2	442.8	443.4	443.0	443.7	443.1
1401	1580	484	Circular	36	169	7	9	10	12	13	437.6	437.3	438.7	438.4	438.8	438.6	438.9	438.7	439.1	438.8	439.1	438.9
1403	2750	2763	Circular	30	61	14	18	19	21	21	431.3	431.2	435.8	435.7	438.7	438.5	439.5	439.4	440.2	440.1	440.8	440.7
1404	2751	2721	Circular	30	122	14	18	19	21	21	431.0	430.9	435.3	435.2	437.9	437.7	438.7	438.5	439.4	439.2	439.9	439.7
1412	333	334	Circular	24	10	16	22	26	29	30	424.3	422.5	425.1	423.7	425.3	424.1	425.5	424.5	425.7	425.0	426.0	425.4
1416	2922	127	Circular	24	307	9	12	14	15	16	429.5	429.1	431.5	431.1	432.7	431.8	433.8	432.5	435.0	433.6	435.4	434.0
1419	1209	1210	Circular	30	284	11	14	16	19	21	429.2	428.8	430.7	430.4	431.0	430.7	431.4	430.9	432.2	431.5	433.3	432.6
142	1166	313	Circular	36	65	10	14	18	22	24	660.0	655.1	660.5	656.1	660.6	656.3	660.7	656.4	660.7	656.6	660.8	656.7
1425	3815	1550	Circular	30	488	24	29	32	34	35	431.5	430.6	435.1	433.5	437.3	434.9	439.1	436.1	440.3	437.0	440.9	437.5
1426	3633	3797	Circular	24	25	5	6	7	8	9	439.7	439.7	440.9	440.9	441.2	441.2	442.7	442.7	443.3	443.2	443.7	443.6
1427	3805	3827	Circular	24	44	0	0	0	0	0	440.9	441.0	441.2	441.2	441.5	441.5	443.0	443.0	443.6	443.6	444.1	444.1
1428	3661	3844	Circular	30	61	5	6	7	8	9	439.4	439.0	440.3	440.2	441.0	441.0	442.5	442.5	443.0	443.0	443.4	443.4
1429	3817	3818	Circular	27	266	5	6	7	8	9	440.0	439.8	441.5	441.4	441.8	441.7	443.4	443.2	444.2	444.0	444.8	444.6
143	315	2863	Circular	36	118	10	14	18	22	24	706.6	683.9	707.0	684.5	707.1	684.7	707.1	684.8	707.2	684.8	707.2	684.9
1439	375	374	Circular	30	20	4	6	6	7	8	426.3	426.4	428.1	428.1	428.5	428.5	428.8	428.8	429.2	429.2	429.5	429.5
1440	3245	375	Circular	27	46	4	6	6	7	8	426.5	426.4	428.1	428.1	428.5	428.5	428.9	428.9	429.3	429.2	429.6	429.6
1441	2651	372	Circular	24	74	7	9	11	13	14	427.1	426.9	428.7	428.6	429.8	429.7	431.1	430.9	432.5	432.3	433.8	433.5
1443	2408	723	Circular	36	283	12	17	21	21	25	465.4	464.9	471.6	471.5	475.3	475.2	476.3	476.2	476.9	476.9	477.4	477.3
1444	639	722	Circular	36	55	12	16	20	21	25	466.2	466.0	471.9	471.9	475.6	475.6	476.6	476.6	477.2	477.2	477.6	477.6
1445	872	209	Circular	33	36	8	13	18	19	23	467.7	467.5	472.6	472.6	476.5	476.5	477.4	477.4	477.9	477.9	478.3	478.3
1447	1879	207	Circular	30	335	8	10	12	16	20	468.8	467.9	472.9	472.7	476.9	476.8	477.8	477.6	478.3	478.1	478.7	478.5
1449	662	1750	Circular	42	331	18	23	27	31	35	467.6	467.5	469.4	468.8	469.7	469.2	470.8	470.6	472.4	472.0	473.5	473.1
1451	1470	1472	Circular	27	265	8	10	11	13	16	473.6	472.9	474.9	474.5	475.3	474.9	476.3	475.9	479.2	478.8	480.1	479.7
1453	878	876	Circular	36	300	14	18	21	23	26	471.7	471.2	473.3	472.8	473.5	473.1	473.7	473.3	475.0	474.6	476.9	476.5
1455	1802	2717	Circular	24	226	3	3	4	5	5	473.7	473.2	474.4	474.2	474.6	474.3	474.7	474.5	476.5	476.4	478.0	477.9
1456	2640	2627	Circular	24	26	8	10	11	13	15	475.1	474.9	476.4	476.3	476.8	476.8	478.0	477.9	481.3	481.2	482.1	482.0
1462	599	787	Circular	42	300	33	46	52	56	59	453.6	453.3	457.8	457.5	459.1	458.5	459.9	459.2	460.6	459.7	461.2	460.2
1463	763	189	Circular	48	215	5	7	7	10	10	459.1	456.7	459.8	459.1	461.9	461.9	463.5	463.5	464.4	464.4	465.1	465.1
1464	1564	3113	Circular	48	224	5	7	8	10	10	461.5	461.0	462.4	462.2	462.5	462.4	463.5	463.5	464.4	464.4	465.1	465.1
1467	1767	1766	Circular	48	346	5	7	8	9	10	463.7	463.2	464.5	464.1	464.6	464.2	464.7	464.3	464.8	464.5	465.1	465.1
1470	3538	191	Circular	33	480	11	12	13	13	12	457.5	457.1	459.4	459.3	462.3	462.1	464.0	463.7	464.8	464.6	465.4	465.2
1471	770	3488	Circular	33	11	9	10	10	10	10	457.8	457.9	459.7	459.7	462.5	462.5	464.2	464.2	465.0	465.0	465.5	465.5
1476	3259	760	Circular	30	456	13	16	17	17	17	459.0	459.0	461.1	460.6	463.6	462.9	465.4	464.7	466.2	465.5	466.7	466.0
1483	1762	1311	Circular	42	359	6	6	7	7	8	452.9	452.2	455.8	455.8	456.7	456.7	457.4	457.4	458.0	458.0	458.5	458.5
1488	2395	1328	Circular	24	246	1	1	1	1	1	455.9	455.4	457.1	457.1	457.2	457.2	457.6	457.6	458.3	458.3	458.9	458.8
1489	3700	751	Circular	72	515	51	71	86	99	110	453.1	452.3	456.0	456.0	457.0	457.0	457.9	457.8	458.8	458.6	459.5	459.2

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
149	1423	2126	Circular	24	107	10	14	18	22	24	764.7	750.3	765.1	751.2	765.2	751.4	765.3	751.6	765.4	751.7	765.4	751.8
1491	603	665	Circular	24	188	7	8	9	11	12	455.7	454.7	456.7	456.0	457.2	456.9	458.4	458.1	459.6	459.2	460.5	460.0
1497	3662	3676	Circular	24	305	13	14	16	17	17	453.5	452.6	459.7	458.8	462.1	461.3	463.9	462.8	465.6	464.2	467.0	465.4
1499	3676	2282	Circular	27	60	13	14	16	20	20	452.0	450.4	458.6	458.5	461.0	461.0	462.5	462.4	463.8	463.7	464.9	464.7
150	1420	1424	Circular	24	123	10	14	18	22	24	775.3	765.7	775.9	767.5	776.0	768.0	776.1	768.5	776.2	768.9	776.3	769.2
1501	2921	3553	Circular	48	391	25	30	32	31	30	452.5	452.3	459.0	459.0	461.7	461.6	463.2	463.1	464.2	464.1	465.0	465.0
1504	3784	2282	Circular	36	82	19	22	27	29	29	452.1	450.4	458.6	458.5	461.0	461.0	462.5	462.4	463.7	463.7	464.8	464.7
1509	602	344	Circular	36	244	5	6	6	7	8	448.0	447.6	458.8	458.8	461.4	461.4	463.0	462.9	464.3	464.2	465.4	465.4
151	1134	1420	Circular	24	70	10	14	18	22	24	777.0	775.5	777.8	776.5	777.9	776.7	778.1	776.9	778.3	777.1	778.4	777.2
1525	1271	3000	Circular	18	61	0	0	0	0	0	438.4	434.6	438.8	438.8	439.3	439.3	439.6	439.6	439.8	439.8	440.0	440.0
1527	386	3571	Circular	18	47	9	10	11	11	12	441.8	441.5	444.0	443.7	445.0	444.5	445.6	445.1	446.2	445.7	446.7	446.1
1532	530	1565	Circular	30	207	19	20	21	21	22	451.3	450.8	454.5	454.1	455.3	454.8	455.8	455.2	456.3	455.7	456.6	456.1
1535	661	3848	Circular	24	250	7	10	10	11	13	457.2	456.8	463.4	463.1	465.2	465.0	465.8	465.6	466.4	466.1	466.9	466.7
1538	1212	1177	Circular	24	37	14	16	18	20	21	461.4	461.5	471.4	471.2	473.2	473.0	475.4	475.2	477.6	477.4	479.5	479.3
1539	660	659	Circular	24	63	16	18	21	24	26	461.1	460.7	467.2	467.1	468.9	468.7	469.8	469.7	471.2	471.0	472.4	472.2
1540	1177	1176	Circular	24	116	14	15	16	18	19	461.5	461.7	470.9	470.5	472.7	472.3	474.8	474.4	477.0	476.4	478.8	478.2
1546	438	431	Circular	36	8	23	31	34	36	38	434.6	434.4	437.6	437.5	438.3	438.2	438.7	438.6	439.1	439.0	439.5	439.4
1547	455	438	Circular	36	141	23	31	34	36	38	436.1	435.4	438.0	437.7	438.9	438.6	439.4	439.1	439.9	439.5	440.4	440.0
1549	3148	3333	Circular	30	59	9	13	14	14	15	421.1	421.2	422.8	422.7	423.2	423.1	424.0	423.9	424.5	424.5	425.1	425.1
1551	3300	2931	Circular	24	233	9	13	14	14	15	424.6	424.1	426.1	425.7	427.1	426.3	427.9	427.0	428.8	427.8	429.8	428.8
1552	3256	3148	Circular	24	262	9	13	14	14	15	423.0	421.5	424.1	423.0	424.5	423.5	425.2	424.2	425.8	424.8	426.6	425.4
1554	3649	3509	Circular	42	240	21	28	32	36	38	427.0	426.9	430.1	430.0	431.3	431.1	433.1	432.9	434.8	434.5	435.5	435.1
1555	3615	3530	Circular	42	120	10	13	16	18	19	427.7	427.7	430.4	430.4	431.8	431.8	433.9	433.9	435.8	435.8	436.5	436.5
1570	2693	2732	Circular	48	176	31	38	38	39	40	437.5	438.7	442.2	442.1	444.0	443.9	445.2	445.1	446.0	445.9	446.7	446.6
1573	1713	3651	Circular	21	166	6	8	9	9	10	444.3	444.0	446.0	445.7	449.9	449.5	451.0	450.6	451.7	451.3	452.2	451.8
1582	3514	3512	Circular	24	38	8	11	12	12	13	451.4	451.5	453.6	453.6	455.6	455.5	457.6	457.5	458.3	458.2	458.6	458.5
1585	2781	2756	Circular	24	324	8	11	14	16	19	483.2	482.0	484.4	483.6	485.4	484.6	487.8	486.6	492.1	490.7	493.5	492.0
1586	2756	2740	Circular	24	187	8	11	14	16	19	482.0	481.4	483.4	483.1	484.3	483.9	486.3	485.6	490.3	489.5	491.6	490.9
1587	908	161	Circular	24	163	8	11	14	16	19	480.8	480.4	482.3	482.1	483.0	482.6	484.2	483.6	487.9	487.3	489.5	489.0
1588	1414	1413	Circular	66	502	52	78	99	117	130	472.6	472.4	476.4	476.2	476.8	476.5	477.2	476.7	477.6	477.0	477.9	477.1
1595	1231	Node_8	Circular	30	80	33	40	44	49	52	540.6	539.0	547.2	546.6	548.5	547.7	549.3	548.4	550.2	549.1	551.0	549.7
1596	2232	2247	Circular	24	241	12	18	23	28	32	594.4	578.1	595.1	580.0	595.2	580.5	595.3	580.9	595.6	586.2	595.7	588.5
160	1887	1912	Circular	42	545	39	51	62	72	79	495.5	494.0	497.7	495.9	498.1	496.2	498.7	496.4	499.4	496.6	500.1	496.7
1600r	240	3457	Circular	66	110	133	176	190	199	204	511.8	510.9	514.6	514.0	514.9	514.0	515.0	514.1	515.1	514.2	515.1	514.2
1601	1233	2552	Circular	54	530	92	130	143	148	151	525.6	523.7	528.8	527.6	531.6	529.3	533.2	530.4	533.8	530.8	534.2	531.1
161	1904	1887	Circular	42	535	29	38	44	51	56	496.7	495.5	498.8	498.2	499.5	498.8	500.4	499.3	501.7	500.3	502.8	501.2
1616	1219	220	Circular	54	56	27	37	44	52	58	511.3	511.0	514.7	514.7	515.3	515.3	515.7	515.6	516.0	515.9	516.2	516.2
1617	183	2042	Circular	54	100	25	35	45	52	58	511.0	511.3	514.8	514.8	515.3	515.3	515.7	515.7	516.1	516.1	516.4	516.3
1622	2000	175	Circular	54	235	16	21	26	30	34	515.9	515.2	517.5	517.5	517.8	517.8	518.0	518.0	518.2	518.2	518.3	518.3
1624	2225	1997	Circular	36	27	0	0	0	4	3	522.8	521.7	523.0	523.0	523.4	523.4	523.6	523.6	523.9	523.9	524.0	524.0
1625	1507	2000	Circular	66	276	43	60	74	87	98	516.0	516.2	518.3	518.0	518.7	518.3	519.0	518.5	519.2	518.8	519.4	518.9
1626	1226	1224	Circular	60	415	16	24	30	34	38	519.2	516.8	520.2	519.5	520.4	520.0	520.6	520.4	520.8	520.8	521.0	521.1
1628	1989	2225	Circular	42	265	7	10	12	14	16	523.8	523.3	524.6	524.1	524.8	524.2	524.9	524.3	525.0	524.4	525.1	524.5
1629	1109	1145	Circular	18	336	4	4	5	6	6	523.0	522.5	532.2	532.0	534.4	534.1	536.3	536.0	538.4	538.1	540.2	539.8
163	1151	1981	Circular	36	383	7	10	12	13	14	500.6	499.7	501.9	502.0	502.5	502.5	504.1	503.9	507.0	506.9	509.2	509.1
1631	1187	1910	Circular	24	15	16	23	29	34	38	535.2	531.6	535.8	533.1	536.0	533.7	536.2	534.2	536.4	534.7	536.5	534.9
1633	1185	1989	Circular	42	280	7	10	12	14	16	528.8	523.8	529.3	524.8	529.5	525.0	529.5	525.2	529.6	525.3	529.7	525.4
1635	1822	2202	Circular	24	20	6	9	11	14	16	577.4	577.2	578.2	578.0	578.4	578.2	578.6	578.4	578.7	578.5	578.8	578.6
1637	266	2074	Circular	24	88	10	14	17	21	23	542.3	533.7	542.8	535.1	542.9	535.3	543.0	535.5	543.0	535.7	543.1	535.8
1638	2202	320	Circular	24	222	6	9	11	14	16	576.8	568.8	577.3	569.3	577.4	569.5	577.5	569.6	577.6	569.6	577.6	569.7
1639	2893	1198	Circular	24	220	6	9	11	14	16	593.4	583.2	593.8	584.3	593.9	584.6	594.0	584.8	594.1	585.0	594.2	585.2
164	3068	1904	Circular	42	460	29	38	44	51	56	496.8	496.7	499.6	499.1	500.3	499.7	501.5	500.6	503.3	502.1	504.8	503.4
1644	1205	1190	Circular	24	252	16	23	29	34	38	603.5	583.9	604.2	585.2	604.3	585.4	604.4	585.6	604.5	585.8	604.6	586.0
1655	1164	322	Circular	36	125	10	14	18	22	24	643.2	638.6	643.8	639.4	643.9	639.6	644.0	639.7	644.1	639.9	644.1	639.9
1656	2840	315	Circular	36	291	10	14	18	22	24	710.3	706.6	711.0	707.4	711.1	707.5	711.3	707.6	711.4	707.7	711.4	707.8
1659	313	1165	Circular	36	87	10	14	18	22	24	655.1	649.1	655.6	650.1	655.7	650.3	655.8	650.4	655.8	650.6	655.9	650.7
1662	2126	1168	Circular	24	125	10	14	18	22	24	750.3	731.9	750.8	733.1	750.9	733.4	750.9	733.6	751.0	733.8	751.0	733.9
167	3438	3395	Circular	42	310	29	38	44	51	56	499.1	499.0	501.7	501.3	502.1	501.6	503.4	502.8	506.1	505.3	508.1	507.1
1676	2777	3438	Circular	42	475	16	21	25	29	32	500.0	499.1	501.9	501.9	502.4	502.4	504.1	503.8	507.1	506.7	509.3	508.8

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1677	2566	1115	Circular	42	50	16	21	25	29	32	503.6	503.6	505.5	505.5	505.9	505.8	506.0	505.9	507.6	507.6	510.0	510.0
1678	2554	2566	Circular	42	360	16	21	25	29	32	505.8	503.6	506.9	505.6	507.1	506.0	507.2	506.1	507.8	507.7	510.5	510.2
168	1149	3438	Circular	36	183	7	10	12	13	16	499.6	499.1	501.9	501.9	502.4	502.4	503.9	503.8	506.7	506.7	508.9	508.8
1680	2539	2549	Circular	24	200	7	9	10	12	13	507.4	506.9	508.8	508.6	509.7	509.4	510.4	510.0	511.1	510.6	513.8	513.2
1691	2903	1991	Circular	24	399	8	12	14	15	16	489.2	488.2	490.6	489.9	493.0	491.9	495.0	493.5	496.0	494.2	496.5	494.6
1692	2486	1854	Circular	30	305	8	12	14	15	15	486.9	486.0	489.0	489.0	490.5	490.2	491.5	491.1	492.0	491.6	492.2	491.8
1693	1991	1988	Circular	24	253	8	12	14	15	15	488.2	486.9	489.7	489.2	491.6	490.9	493.1	492.1	493.8	492.7	494.1	493.0
1694	167	3536	Circular	42	65	37	45	47	48	49	479.2	478.7	484.8	484.7	486.0	485.9	486.5	486.4	486.9	486.8	487.2	487.0
1695	3386	176	Circular	42	450	37	45	47	48	49	484.6	482.4	487.0	486.7	489.9	489.0	490.9	489.9	491.6	490.6	492.1	491.0
1700	1620	1617	Circular	24	90	12	16	18	18	19	495.5	494.8	498.2	497.9	502.0	501.8	503.0	502.7	503.6	503.3	504.0	503.7
1702	2021	2427	Circular	24	129	0	1	1	4	4	495.5	495.2	496.9	496.9	500.8	500.8	501.9	501.9	502.6	502.6	502.9	502.9
1703	1079	1080	Circular	24	75	8	12	12	14	14	496.8	496.8	500.5	500.4	504.3	504.3	505.0	504.9	505.5	505.5	506.3	506.2
1705	1087	1078	Circular	24	50	4	9	8	12	12	497.2	497.1	501.0	500.9	504.8	504.8	505.4	505.4	506.0	506.0	506.8	506.8
1706	3919	3913	Circular	36	442	20	23	25	27	27	492.3	490.7	494.2	493.9	499.3	498.8	500.7	500.3	501.5	501.1	501.9	501.5
1707	1084	1083	Circular	27	35	12	16	19	20	21	493.7	493.7	495.4	495.4	499.8	499.8	501.2	501.1	501.9	501.9	502.3	502.3
1709	1551	1504	Circular	36	360	25	29	30	32	33	489.0	488.4	492.6	492.0	497.0	496.3	498.4	497.8	499.2	498.6	499.7	499.0
171	1115	2777	Circular	42	320	16	21	26	29	32	503.6	500.0	504.6	502.0	504.7	502.5	505.0	504.2	507.5	507.2	509.8	509.5
1713	963	964	Circular	27	267	-1	-4	0	-10	-11	485.3	485.2	485.8	485.8	486.3	486.4	486.7	486.9	487.3	487.6	487.7	488.1
1714	965	2062	Circular	36	124	17	22	26	30	31	484.8	484.2	486.6	486.4	487.1	487.0	487.9	487.7	488.9	488.6	489.5	489.2
1715	2112	1963	Circular	36	222	17	22	26	30	31	486.1	485.5	487.8	487.5	488.2	487.9	489.1	488.7	490.5	490.0	491.3	490.8
1717	2324	966	Circular	24	453	5	6	7	8	9	488.2	486.6	489.0	487.9	489.1	488.0	489.2	488.1	489.3	488.4	489.7	489.1
1720	2905	415	Circular	30	10	0	0	0	0	-3	496.1	496.1	496.7	496.7	496.8	496.8	496.9	496.9	497.0	497.0	497.6	497.6
1722	1862	1853	Circular	27	358	10	14	16	16	17	500.5	499.6	502.0	501.6	503.4	502.6	504.1	503.2	504.4	503.4	504.8	503.7
1723	3912	3914	Circular	27	410	10	14	16	16	17	501.7	501.0	503.3	502.8	505.3	504.4	506.5	505.4	507.0	505.8	507.6	506.3
1725	1050	3923	Circular	24	584	10	14	16	16	17	503.2	502.2	505.2	504.0	508.4	506.1	510.4	507.5	511.2	508.1	512.1	508.8
1727	1927	1867	Circular	48	280	19	23	25	27	29	485.9	485.1	487.4	486.8	487.5	487.0	487.7	487.3	488.1	487.9	488.4	488.3
1729	1869	831	Circular	42	420	23	30	35	40	45	483.6	482.0	485.5	485.5	486.5	486.3	487.3	486.8	487.8	487.1	488.2	487.4
173	2549	2562	Circular	24	155	7	9	10	12	13	506.8	506.4	508.5	508.4	509.3	509.0	509.9	509.6	510.4	510.0	512.9	512.4
1730	1493	767	Circular	48	390	19	23	25	27	28	484.0	481.7	485.7	485.8	486.7	486.7	487.3	487.2	487.8	487.7	488.2	488.0
1731	152	831	Circular	24	370	5	6	8	9	10	483.6	479.9	485.7	485.5	486.6	486.3	487.1	486.8	487.7	487.1	488.1	487.4
1733	2398	2432	Circular	48	405	12	13	13	14	14	495.5	494.7	496.7	496.2	496.7	496.2	496.8	496.3	496.8	496.4	496.8	496.4
1737	542	2657	Circular	42	240	18	24	28	32	35	489.7	489.4	491.5	491.3	491.9	491.6	492.1	491.8	492.9	492.6	494.9	494.6
1738	2658	960	Circular	42	335	18	24	28	32	35	488.9	488.3	490.6	490.3	490.9	490.6	491.2	490.9	492.2	491.9	494.0	493.5
1739	540	957	Circular	48	268	18	20	22	24	25	488.8	487.9	490.2	489.7	490.3	489.8	490.4	489.9	490.5	490.0	490.6	490.1
174	2562	2551	Circular	24	100	7	9	10	12	13	506.4	506.2	508.4	508.3	508.9	508.8	509.4	509.2	509.7	509.5	512.1	511.7
1741	1062	1059	Circular	42	490	22	27	29	30	31	504.0	503.1	505.9	505.1	506.1	505.3	506.2	505.4	506.2	505.4	506.3	505.5
1742	1057	1054	Circular	30	370	7	9	11	13	14	500.6	499.5	501.6	500.7	501.7	500.9	501.9	501.1	502.0	501.2	502.5	502.1
1743	1054	1056	Circular	30	305	7	9	11	13	14	499.5	498.5	500.5	499.7	500.6	499.9	500.7	500.1	500.9	500.3	502.0	501.6
1744	3938	2680	Circular	30	280	4	4	5	6	6	497.3	496.9	499.2	499.2	499.5	499.5	499.7	499.6	499.8	499.7	499.9	499.8
1745	1014	2406	Circular	36	410	12	15	18	21	23	493.7	492.8	495.1	494.7	495.4	495.0	495.6	495.2	495.9	495.5	498.3	497.8
1748	1126	2243	Circular	24	275	7	10	11	13	14	508.8	508.3	510.2	509.8	510.5	510.1	511.3	510.6	512.2	511.3	513.1	512.0
1749	1128	2252	Circular	27	275	16	19	22	23	24	511.9	510.9	515.2	514.5	518.0	517.0	519.0	518.0	519.7	518.8	520.2	519.3
1750	2478	1123	Circular	36	380	22	27	29	30	31	507.9	507.2	509.9	509.2	510.2	509.4	510.3	509.5	510.4	509.6	510.5	509.6
1751	1068	1064	Circular	42	355	22	27	29	30	31	505.7	505.1	507.5	507.0	507.8	507.2	507.9	507.3	507.9	507.4	508.0	507.4
1752	1438	1855	Circular	24	345	16	19	21	22	23	516.1	514.7	519.6	517.9	524.3	521.9	526.2	523.3	527.5	524.3	528.5	525.0
1753	1043	1044	Circular	24	97	12	17	21	24	26	628.0	618.7	628.6	620.2	628.7	620.4	628.8	620.5	628.8	620.7	628.9	620.7
1754	2125	2027	Circular	18	225	5	8	9	11	13	757.7	730.2	758.1	731.1	758.2	731.3	758.2	731.5	758.3	733.3	758.3	734.3
176	2542	2539	Circular	24	150	0	0	0	0	0	511.1	507.4	511.1	509.0	511.1	509.8	511.1	510.6	511.4	511.4	514.2	514.2
1763	2641	944	Circular	54	645	59	74	78	80	80	484.8	483.4	489.1	488.5	490.6	489.7	491.4	490.4	492.1	491.1	492.6	491.6
1765	949	948	Circular	54	252	59	74	78	80	80	485.6	484.9	490.1	489.8	492.3	492.0	493.3	492.9	494.1	493.7	494.7	494.3
1771	978	855	Circular	42	41	38	48	51	53	54	491.3	491.1	494.5	494.4	500.3	500.2	501.4	501.3	502.2	502.1	502.7	502.6
1772	977	2065	Circular	42	115	38	48	52	55	56	490.1	488.6	493.0	492.8	497.7	497.4	498.8	498.6	499.6	499.4	500.1	499.9
1773	732	952	Circular	48	358	47	58	60	63	65	488.9	486.7	491.5	491.3	495.4	494.8	496.5	495.9	497.4	496.8	497.8	497.2
1777	3930	995	Circular	42	470	20	28	37	38	44	494.6	495.3	498.2	497.9	505.5	505.3	506.6	506.4	507.4	507.1	507.9	507.6
1778	3908	3939	Circular	42	80	20	28	36	37	43	495.8	495.7	498.4	498.4	505.9	505.9	507.0	507.0	507.7	507.7	508.3	508.2
1780	990	1774	Circular	42	320	26	35	42	41	47	493.9	493.4	496.4	496.2	503.8	503.5	504.9	504.6	505.7	505.4	506.2	505.9
1792	1048	1049	Circular	36	291	11	16	20	24	27	502.7	501.2	507.1	507.0	508.8	508.7	510.3	510.1	511.6	511.3	512.4	511.9
1794a	836	838	Circular	36	27	19	25	30	35	38	471.0	470.9	474.7	474.6	475.2	475.1	475.6	475.5	475.9	475.8	476.4	476.3
1794b	836	838	Circular	36	27	19	25	30	35	38	471.0	470.9	474.7	474.6	475.2	475.1	475.6	475.5	475.9	475.8	476.4	476.3

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1794c	836	838	Circular	24	27	8	10	13	15	16	471.0	470.9	474.7	474.6	475.2	475.1	475.6	475.5	476.0	475.8	476.5	476.3
1795	1367	902	Circular	48	450	14	19	22	26	29	472.8	471.9	474.9	474.9	475.6	475.5	476.1	476.1	476.8	476.7	477.5	477.3
1798	1692	1689	Circular	27	330	6	8	10	12	13	481.2	480.1	482.1	481.3	482.3	481.5	482.4	481.6	482.6	481.8	482.7	481.9
1800	2080	2060	Circular	36	390	6	8	10	12	13	478.0	477.0	478.9	477.9	479.0	478.1	479.1	478.2	479.2	478.3	479.4	478.8
1802	2507	2505	Circular	42	270	20	27	32	38	40	475.0	475.1	478.0	477.9	478.6	478.4	479.1	478.9	479.8	479.5	480.5	480.1
1811	2671	926	Circular	42	110	20	27	32	38	40	476.1	476.1	478.9	478.8	480.0	479.9	481.4	481.3	483.0	482.9	484.2	484.0
1821	3242	799	Circular	42	264	29	37	44	51	57	461.4	459.7	463.1	462.3	463.5	462.8	463.8	463.1	464.1	463.4	464.5	463.6
1823	848	845	Circular	36	310	10	14	16	18	20	466.3	465.3	467.4	466.8	467.7	467.4	468.3	468.3	469.5	469.3	470.6	470.3
1825	849	850	Circular	54	333	5	7	9	11	12	462.9	462.6	463.8	463.5	464.0	463.7	464.1	463.8	464.2	463.9	464.3	464.0
1827	3227	834	Circular	36	207	20	25	27	27	30	464.1	463.7	470.0	469.8	473.0	472.7	473.9	473.6	474.7	474.4	475.1	474.9
1830	842	4007	Circular	24	14	10	13	14	15	16	468.4	468.4	471.2	471.1	475.1	475.0	476.5	476.4	477.8	477.7	478.5	478.3
1831	2072	892	Circular	24	471	10	13	14	15	17	470.4	469.7	473.2	472.3	478.7	477.2	480.5	478.8	482.6	480.5	484.0	481.5
1833	2430	2416	Circular	36	374	10	13	14	16	17	465.0	463.8	469.9	469.8	473.0	472.8	474.1	473.9	475.0	474.8	475.5	475.4
1834	2401	2408	Circular	36	34	12	16	20	21	25	465.6	465.5	471.7	471.7	475.4	475.3	476.3	476.3	477.0	477.0	477.4	477.4
1835	722	2401	Circular	36	254	12	16	20	21	25	466.0	465.6	471.8	471.7	475.5	475.4	476.5	476.4	477.1	477.0	477.6	477.5
1837	209	244	Circular	33	220	12	16	20	21	24	467.5	467.1	472.5	472.4	476.4	476.3	477.3	477.1	477.8	477.7	478.2	478.1
1842	1759	721	Circular	27	347	7	9	10	12	13	467.0	466.9	468.5	468.1	468.7	468.3	469.1	468.7	470.1	469.6	470.9	470.3
1843	2178	742	Circular	36	35	19	25	30	34	35	466.6	465.7	468.4	468.4	469.0	468.9	470.1	470.1	471.4	471.3	472.3	472.2
1844	1583	1572	Circular	27	59	6	7	8	10	11	469.4	469.3	470.7	470.7	471.0	471.0	472.5	472.5	474.6	474.6	475.8	475.7
1845	1671	1694	Circular	27	217	6	7	8	10	11	471.3	470.6	472.3	471.8	472.5	472.0	473.1	473.0	475.5	475.3	476.8	476.6
1847	1512	1572	Circular	30	389	10	14	16	18	19	470.1	468.8	471.3	470.7	471.6	471.0	473.0	472.5	475.3	474.6	476.4	475.7
1848	1379	1470	Circular	27	140	8	10	11	13	16	474.1	473.6	475.3	475.1	475.6	475.4	476.6	476.4	479.6	479.4	480.4	480.2
1851	2309	2402	Circular	27	392	5	6	7	8	9	475.0	473.6	475.8	474.8	475.9	475.0	476.0	475.2	476.2	476.1	478.8	478.5
1852	882	2309	Circular	24	127	5	6	7	8	9	476.8	475.0	477.4	476.0	477.4	476.1	477.5	476.3	477.6	476.4	479.0	478.8
1855	1736	1743	Circular	42	281	18	23	27	31	35	469.1	468.1	470.6	470.0	470.9	470.4	471.5	471.2	473.2	472.9	474.6	474.3
1857	2716	2695	Circular	27	123	3	3	4	5	5	473.2	472.8	474.0	474.0	474.2	474.2	474.4	474.4	476.3	476.3	477.8	477.8
1859	2396	2399	Circular	24	103	3	4	4	5	5	476.8	476.8	477.7	477.7	477.9	477.8	478.5	478.4	482.0	481.9	482.7	482.7
1862	670	2396	Circular	24	197	3	4	4	5	5	477.0	476.8	477.9	477.8	478.1	477.9	478.5	478.5	482.1	482.0	482.8	482.7
1865	857	881	Circular	27	312	9	12	14	16	18	474.7	474.0	476.0	475.5	476.3	475.8	476.6	476.0	477.8	477.0	480.5	479.5
1870	783	657	Circular	24	313	7	9	10	10	10	462.6	463.0	464.8	464.6	465.6	465.2	466.3	465.7	466.7	466.0	466.9	466.2
1871	786	785	Circular	24	360	7	9	10	10	11	463.8	463.3	466.1	465.8	467.9	467.3	469.1	468.5	469.8	469.1	470.2	469.4
1881	189	769	Circular	36	493	18	24	28	32	37	456.7	455.6	459.0	458.8	461.7	461.1	463.2	462.5	464.0	463.3	464.6	463.8
1882	1266	3066	Circular	48	219	5	7	8	10	10	461.1	460.2	461.8	461.1	462.1	462.0	463.5	463.5	464.4	464.4	465.1	465.1
1885	190	189	Circular	30	320	1	9	10	10	10	457.3	456.7	459.1	459.1	462.1	461.9	463.7	463.5	464.5	464.4	465.2	465.1
1891	3292	190	Circular	30	385	1	9	10	10	10	458.2	457.3	459.1	459.1	462.3	462.1	463.9	463.7	464.8	464.6	465.4	465.2
1892	3538	3496	Circular	18	22	0	-5	0	-6	-6	457.5	460.6	459.5	460.6	462.4	462.5	464.1	464.2	464.9	465.0	465.5	465.6
1893	3488	3493	Circular	33	26	10	10	10	10	10	457.9	457.8	459.7	459.7	462.5	462.5	464.2	464.2	465.0	465.0	465.5	465.5
1894	404	3563	Circular	30	9	8	8	8	9	8	458.5	459.6	460.4	460.4	462.5	462.5	464.3	464.3	465.1	465.1	465.6	465.6
1898	3308	3241	Circular	30	231	7	8	9	10	10	461.7	461.0	463.0	462.7	464.6	464.5	466.6	466.5	467.4	467.3	468.0	467.9
19	4069	4070	Circular	30	188	63	75	84	91	97	423.0	421.6	428.1	423.6	430.0	423.6	431.5	423.7	433.2	423.8	434.5	423.9
1904	2352	1558	Circular	36	359	2	3	3	4	4	455.0	456.0	457.1	457.1	457.3	457.2	457.7	457.6	458.3	458.3	458.9	458.8
1906	1558	1325	Circular	42	92	2	3	3	4	4	456.0	454.7	457.1	457.1	457.2	457.2	457.6	457.6	458.3	458.3	458.8	458.8
1910	804	3700	Circular	60	383	47	66	79	91	103	454.2	453.3	456.4	456.2	457.3	457.2	458.3	458.1	459.5	459.0	460.3	459.7
1911	1841	804	Circular	36	290	8	10	12	15	16	457.3	454.2	458.1	456.9	458.4	457.8	458.8	458.6	459.9	459.9	460.9	460.8
1912	751	1238	Circular	78	986	50	71	86	99	110	452.0	446.6	455.8	455.8	456.8	456.6	457.5	457.3	458.3	457.9	458.9	458.4
1915	1849	1836	Circular	30	370	6	8	10	12	13	460.6	458.8	461.4	460.0	461.5	460.2	461.6	460.4	461.7	460.6	461.9	461.7
1916	1803	1833	Circular	36	390	8	10	12	14	16	458.2	457.3	459.3	458.8	459.5	459.1	459.6	459.3	460.1	460.1	461.3	461.1
1917	2353	1900	Circular	24	278	6	8	10	12	13	463.7	463.9	465.4	465.2	465.8	465.4	466.1	465.5	466.4	465.7	466.7	465.8
1922	1610	2099	Circular	24	247	7	8	9	11	12	453.4	452.3	455.0	454.9	456.4	456.2	457.4	457.0	458.2	457.8	458.8	458.3
1929	1807	2322	Circular	24	183	12	14	15	16	18	451.9	451.5	456.0	455.6	457.7	457.0	458.6	457.8	459.6	458.6	460.4	459.3
1936	2348	2321	Circular	24	412	13	15	17	20	22	454.4	454.0	462.3	461.2	465.3	463.9	467.8	466.0	470.5	468.2	472.9	470.1
1941	3553	3247	Circular	48	351	25	30	31	29	28	452.3	452.4	458.9	458.9	461.6	461.5	463.1	463.0	464.0	464.0	465.0	464.9
1942	3851	3822	Circular	48	55	25	29	30	28	27	451.3	451.6	458.7	458.7	461.2	461.2	462.8	462.8	463.8	463.8	464.9	464.9
1943	3835	3656	Circular	48	111	25	29	30	28	27	452.0	451.2	458.6	458.6	461.0	461.0	462.6	462.5	463.7	463.7	464.8	464.8
1947	694	3784	Circular	36	447	19	22	27	29	29	452.9	452.1	459.0	458.7	461.4	461.2	462.8	462.6	464.1	463.9	465.1	464.9
1948	2271	1749	Circular	3	314	0	0	0	0	0	448.2	447.2	453.3	452.4	453.7	453.2	454.0	453.5	454.1	453.7	454.3	453.8
1949	3504	686	Circular	24	446	7	8	9	18	18	455.1	454.5	460.5	460.1	462.8	462.4	463.8	463.5	465.1	464.9	466.1	465.9
196	1854	821	Circular	30	206	8	12	14	15	15	486.0	486.0	488.9	488.8	490.1	489.9	491.0	490.8	491.4	491.1	491.6	491.3
1961	577	1717	Cross section		191	69	72	74	78	81	443.5	441.9	452.0	451.8	453.5	453.3	454.5	454.3	455.5	455.4	456.2	456.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
197	1988	2486	Circular	30	291	8	12	14	15	15	486.9	486.9	489.2	489.1	490.8	490.6	492.0	491.6	492.5	492.1	492.8	492.4
1979	1706	1716	Cross section		255	71	75	78	82	84	441.0	441.1	448.0	446.5	449.2	447.7	449.9	448.3	450.8	449.0	451.3	449.5
198	821	819	Circular	30	69	8	12	14	15	15	486.0	486.0	488.8	488.7	489.8	489.8	490.6	490.5	490.9	490.8	491.1	491.0
1985	387	386	Circular	18	8	9	10	11	11	12	441.8	441.9	444.7	444.5	446.0	445.6	446.7	446.3	447.4	447.0	447.9	447.5
1986	1665	2976	Circular	24	99	0	0	0	0	0	442.9	442.8	442.9	442.8	442.9	442.8	442.9	442.8	442.9	442.8	442.9	442.8
199	819	3176	Circular	30	159	8	12	14	15	15	486.0	485.8	488.7	488.6	489.7	489.5	490.3	490.1	490.6	490.4	490.8	490.6
1994	1075	985	Circular	24	365	4	5	6	6	7	449.8	449.1	452.0	451.9	452.4	452.2	452.7	452.5	453.1	452.9	453.5	453.1
1995	413	412	Circular	30	280	19	20	21	21	22	450.2	449.0	453.2	452.7	453.8	453.1	454.2	453.4	454.6	453.8	454.9	454.1
1996	1006	414	Circular	24	345	2	3	3	3	4	450.6	450.3	452.2	452.2	452.7	452.6	453.1	453.1	453.6	453.6	454.1	454.0
1997	1021	1006	Circular	24	361	2	3	3	3	4	450.6	450.9	452.2	452.2	452.7	452.7	453.2	453.1	453.7	453.7	454.2	454.1
1998	1560	1544	Circular	24	330	2	3	3	3	4	454.9	454.2	455.5	454.7	455.6	454.8	455.6	454.8	455.7	454.8	455.7	454.9
20	4084	4083	Circular	30	91	10	14	17	20	22	450.4	446.8	451.0	448.2	451.1	448.4	451.2	448.6	451.3	448.8	451.4	448.9
200	3536	3601	Circular	48	335	37	45	47	48	49	478.7	477.9	484.5	484.3	485.6	485.3	486.1	485.7	486.5	486.1	486.7	486.3
2002	134	130	Circular	24	224	1	1	2	2	2	448.9	449.9	450.8	450.8	451.0	451.0	451.1	451.1	451.3	451.3	451.4	451.3
2009	663	2342	Circular	24	605	7	8	8	9	10	458.9	457.7	464.4	463.9	466.4	465.8	467.1	466.4	467.8	467.0	468.4	467.6
201	3601	1976	Circular	48	460	37	45	47	48	49	477.9	477.2	484.2	483.9	485.1	484.7	485.5	485.1	485.9	485.3	486.1	485.5
2011	3600	2752	Circular	24	550	5	5	6	6	7	459.0	458.3	466.0	465.8	467.8	467.7	468.9	468.8	469.9	469.8	470.8	470.7
2013	2708	2748	Circular	24	9	6	8	9	12	11	457.5	457.7	465.6	465.6	467.4	467.4	468.6	468.6	469.7	469.7	470.6	470.6
2014	2715	2738	Circular	24	534	8	12	13	14	12	456.6	457.5	465.7	465.6	467.5	467.5	468.7	468.6	469.8	469.7	470.7	470.7
2015	1629	2715	Circular	24	548	5	10	11	11	11	455.7	456.6	465.7	465.7	467.5	467.5	468.7	468.7	469.8	469.8	470.8	470.8
2021	1174	1181	Circular	24	186	16	18	19	20	20	460.9	461.1	468.9	468.4	470.4	469.9	472.1	471.5	473.9	473.2	475.4	474.6
2022	659	3660	Circular	24	336	16	18	21	26	28	460.7	460.0	466.9	466.2	468.6	468.0	469.5	469.0	470.7	469.9	471.9	471.0
203	1019	1440	Circular	36	238	31	36	38	40	41	487.4	486.2	489.6	488.9	492.9	492.2	494.1	493.4	494.9	494.1	495.3	494.6
2036	434	1261	Circular	24	341	15	19	21	23	23	444.1	440.9	445.3	443.0	448.5	445.9	450.4	447.5	451.8	448.6	453.0	449.4
2037	432	431	Circular	36	430	19	23	27	31	34	438.0	434.6	439.3	437.5	439.5	438.2	439.7	438.6	439.9	439.0	440.4	439.4
2038	433	2856	Circular	27	205	15	19	21	23	24	438.3	437.4	440.1	439.6	441.8	441.0	442.9	442.0	443.6	442.7	444.1	443.2
2039	2844	455	Circular	36	191	23	31	34	36	38	436.3	436.1	438.6	438.3	439.5	439.1	440.3	439.8	440.9	440.3	441.3	440.8
204	1440	1378	Circular	36	52	31	36	38	40	41	486.2	485.9	488.6	488.5	491.8	491.6	492.9	492.8	493.6	493.5	494.1	493.9
205	2287	1019	Circular	36	30	31	36	38	40	41	487.3	487.4	490.1	490.0	493.4	493.3	494.7	494.6	495.5	495.4	495.9	495.8
2050	445	2256	Circular	30	303	15	19	22	25	27	442.5	441.2	443.9	443.0	444.1	443.2	444.4	443.5	444.8	443.7	445.2	443.9
206	176	3265	Circular	42	55	37	45	47	48	49	482.4	482.0	486.5	486.4	488.6	488.5	489.5	489.3	490.0	489.9	490.4	490.3
2069	2897	Node_14	Circular	18	276	0	0	2	4	5	436.8	436.2	437.3	437.3	437.8	437.8	438.1	438.0	438.5	438.3	439.0	438.4
207	3286	167	Circular	42	340	37	45	47	48	49	482.0	479.2	485.5	485.0	487.0	486.4	487.7	487.0	488.2	487.4	488.5	487.7
2071	110	166	Circular	36	165	9	12	14	16	18	434.4	433.9	437.1	437.1	437.5	437.5	437.8	437.8	438.1	438.0	438.2	438.1
2076	461	3310	Circular	24	281	7	9	10	12	13	439.1	438.3	440.2	439.7	440.5	440.0	440.7	440.1	441.1	440.3	441.5	440.5
2081	1723	124	Circular	24	81	7	9	12	13	13	434.0	433.8	436.7	436.6	440.0	439.9	440.9	440.8	441.7	441.6	442.3	442.2
2084	2560	2545	Circular	30	271	14	18	19	21	21	430.1	429.1	434.6	434.3	436.8	436.3	437.6	437.1	438.3	437.8	438.9	438.4
2085	2015	500	Circular	36	213	22	28	30	32	33	427.8	428.5	432.8	432.5	433.9	433.6	434.5	434.1	435.0	434.6	435.5	434.9
2088	500	501	Circular	36	26	22	28	30	32	33	428.5	428.5	432.4	432.3	433.3	433.3	433.8	433.7	434.2	434.2	434.6	434.5
2099	2312	2299	Circular	30	266	4	5	6	7	8	430.6	430.3	433.3	433.3	433.8	433.8	434.1	434.0	434.3	434.2	434.5	434.4
21	4083	4089	Circular	30	124	10	14	17	20	22	446.8	444.2	447.5	444.9	447.6	445.0	447.7	445.1	447.8	445.2	447.8	445.9
2100	2299	3567	Circular	30	146	4	5	6	7	8	430.3	430.2	433.3	433.3	433.7	433.7	434.0	434.0	434.2	434.2	434.3	434.3
2101	243	2727	Circular	24	12	4	5	6	7	8	431.7	431.1	433.4	433.4	433.9	433.8	434.2	434.1	434.4	434.4	434.7	434.6
2103	334	443	Circular	36	90	16	22	26	29	30	421.6	421.1	423.3	423.1	423.7	423.6	424.2	424.0	424.6	424.5	425.0	424.8
2106	381	2667	Circular	24	318	9	12	14	16	17	429.6	428.9	432.7	432.2	434.9	434.1	437.1	435.8	438.8	437.4	439.6	437.9
2110	2195	1200	Circular	24	180	3	4	4	5	6	429.9	430.4	431.4	431.3	431.7	431.6	432.0	431.9	433.0	432.9	434.4	434.3
2111	1984	95	Circular	36	643	15	20	24	28	31	426.5	425.9	428.4	427.8	428.8	428.1	429.2	428.4	429.8	428.7	430.3	428.9
2117	3616	3815	Circular	30	453	9	11	14	15	16	432.4	431.6	435.7	435.5	438.3	438.0	440.2	439.9	441.4	441.2	442.0	441.9
2118	503	3665	Circular	24	80	4	5	6	6	6	436.8	436.7	438.8	438.8	439.3	439.3	441.2	441.2	442.4	442.4	442.9	442.8
2119	3801	3843	Circular	18	90	5	6	6	6	6	437.3	436.4	439.0	438.8	439.5	439.3	441.2	441.0	442.1	442.0	442.5	442.5
2120	3830	3237	Circular	18	19	0	0	2	4	5	437.3	437.0	439.8	439.8	440.8	440.8	442.2	442.2	442.4	442.3	442.5	442.4
2121	1645	3153	Circular	24	101	4	5	6	7	9	436.3	435.7	438.6	438.6	438.9	438.9	440.7	440.7	441.9	441.8	442.4	442.3
2124	3844	3826	Circular	30	224	5	6	7	8	9	439.0	438.4	440.1	439.9	441.0	440.9	442.5	442.4	443.0	442.9	443.3	443.2
2128	3620	3486	Circular	27	421	2	3	3	4	4	431.4	431.0	433.8	433.8	434.0	434.0	434.2	434.2	434.4	434.3	434.5	434.4
2129	3739	3620	Circular	27	256	4	6	7	8	9	431.9	431.5	433.8	433.8	434.1	434.0	434.3	434.2	434.5	434.4	434.7	434.5
2137	3175	3143	Circular	30	176	4	4	4	5	5	425.7	425.6	428.1	428.1	428.6	428.6	429.1	429.1	429.7	429.7	430.2	430.2
2138	3155	3354	Circular	24	247	2	3	3	4	4	425.9	425.6	427.8	427.8	428.3	428.2	428.7	428.6	429.1	429.1	429.5	429.5
2139	3219	3085	Circular	27	152	6	8	9	10	12	426.5	426.3	428.6	428.5	429.4	429.3	430.2	430.1	431.1	431.0	431.9	431.7
214	3345	1500	Circular	24	487	6	7	9	10	10	489.5	488.5	491.2	490.9	495.3	494.8	496.9	496.2	497.8	497.0	498.4	497.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2141	2892	3245	Circular	24	58	4	6	6	7	8	427.2	426.5	428.3	428.2	428.6	428.6	429.0	429.0	429.4	429.4	429.8	429.7
2144	3360	3402	Circular	24	367	7	9	11	13	14	426.6	426.1	428.1	427.6	429.0	428.4	429.8	429.0	430.8	429.6	431.7	430.2
2145	3431	3425	Circular	36	76	13	15	17	19	20	425.0	425.2	427.3	427.2	427.6	427.5	427.8	427.7	428.0	428.0	428.2	428.2
2146	3399	3497	Circular	42	97	20	24	28	32	34	424.9	424.4	426.4	426.4	426.6	426.7	426.8	426.8	427.0	427.0	427.1	427.1
2149	3167	112	Circular	42	371	19	24	30	36	40	422.2	421.0	423.5	422.3	423.7	422.5	423.9	422.7	424.1	422.8	424.3	423.0
2151	3382	3282	Circular	24	58	-1	-2	0	-3	-3	427.0	426.0	427.8	427.8	428.1	428.1	428.5	428.5	429.4	429.4	430.4	430.4
2153	3415	2908	Circular	30	43	6	8	9	11	12	427.3	427.3	428.6	428.5	428.8	428.8	429.1	429.1	430.1	430.1	431.3	431.3
2158	3540	3537	Circular	42	46	26	34	40	45	47	425.8	426.1	429.0	428.9	429.6	429.6	430.3	430.2	431.1	431.0	431.4	431.3
2159	3511	3550	Circular	48	388	32	41	48	54	57	425.7	425.8	428.5	428.2	429.0	428.6	429.4	428.9	430.0	429.4	430.1	429.5
216	1073	2426	Circular	24	50	12	16	19	20	21	495.0	495.0	497.1	496.9	500.9	500.8	502.1	501.9	502.7	502.6	503.0	502.9
2160	3639	3649	Circular	42	244	21	28	32	37	38	427.5	427.1	430.2	430.2	431.6	431.4	433.6	433.3	435.4	435.0	436.1	435.7
2165	3503	354	Circular	24	283	6	7	8	9	10	429.0	428.4	430.1	429.6	430.2	429.7	430.5	430.1	431.4	430.9	431.9	431.3
2166	3505	3534	Circular	24	73	3	4	4	5	6	431.3	431.0	431.9	431.6	432.0	431.7	432.1	431.8	432.2	432.0	432.6	432.5
217	1074	1084	Circular	27	235	12	16	19	20	21	494.4	493.7	496.1	495.6	500.3	499.9	501.5	501.3	502.2	502.0	502.5	502.4
2174	3584	3551	Circular	36	348	42	48	52	54	57	436.4	434.7	439.1	437.8	439.9	438.1	440.3	438.2	440.7	438.4	441.0	438.5
2180	2707	2693	Circular	48	105	31	38	38	39	39	437.2	437.5	442.3	442.3	444.2	444.2	445.5	445.4	446.3	446.2	447.0	446.9
2181	1661	2707	Circular	48	128	31	38	39	38	39	437.4	437.3	442.5	442.4	444.5	444.4	445.8	445.7	446.6	446.5	447.3	447.2
2182	3305	642	Circular	27	164	10	12	13	14	15	440.1	439.3	443.9	443.7	446.8	446.6	448.2	448.0	449.0	448.8	449.6	449.4
2183	517	1679	Circular	48	20	33	42	44	43	46	438.2	437.8	442.5	442.5	444.5	444.5	445.8	445.8	446.6	446.6	447.3	447.3
2185	613	1713	Circular	24	40	6	8	9	10	10	444.4	444.4	446.1	446.1	450.1	450.1	451.3	451.2	452.0	451.9	452.4	452.4
219	2427	2426	Circular	24	45	0	2	1	4	4	495.2	495.0	496.9	496.9	500.8	500.8	501.9	501.9	502.6	502.6	502.9	502.9
2199	640	641	Circular	42	290	18	24	25	25	25	439.3	439.1	444.0	443.9	447.0	446.9	448.4	448.3	449.3	449.1	449.8	449.7
220	1681	2021	Circular	24	147	0	1	0	2	2	495.8	495.5	496.9	496.9	500.8	500.8	501.9	501.9	502.6	502.6	502.9	502.9
2204	3512	430	Circular	24	162	8	11	12	12	13	451.3	451.1	453.5	453.2	455.3	454.9	457.2	456.7	457.9	457.4	458.2	457.7
2211	161	163	Circular	24	60	18	26	31	35	37	480.4	476.2	481.2	478.4	481.5	479.1	482.0	480.8	484.0	482.5	485.4	483.8
2213	904	1414	Circular	66	502	52	78	99	117	130	472.9	472.6	476.7	476.5	477.3	477.0	477.9	477.5	478.6	477.9	479.1	478.3
222	1655	1643	Circular	24	130	4	5	6	6	7	497.7	497.5	501.1	501.1	505.0	504.9	505.6	505.6	506.2	506.2	507.0	507.0
2221	4023	4026	Circular	24	19	6	7	7	7	8	434.2	433.6	444.9	444.9	446.3	446.2	447.5	447.5	449.4	449.4	451.0	451.0
2225	2900	1217	Circular	36	168	15	21	26	30	34	594.0	573.0	594.5	574.0	594.6	574.3	594.6	574.5	594.7	574.6	594.7	574.7
2226	3516	3532	Circular	36	324	7	9	11	12	13	428.4	428.4	430.5	430.4	432.0	431.9	434.2	434.1	436.1	436.0	436.9	436.8
2229	2229	1231	Circular	24	187	14	16	21	24	27	542.5	541.0	549.3	548.6	551.3	550.4	552.4	551.6	553.9	553.1	555.2	554.3
223	1643	1410	Circular	24	70	4	6	6	8	8	497.4	497.5	501.1	501.0	504.9	504.9	505.5	505.5	506.2	506.1	506.9	506.9
2232	2000	1934	Circular	54	520	28	39	49	58	66	515.7	514.0	517.2	515.8	517.5	516.0	517.8	516.2	518.0	516.4	518.2	516.6
2234	1189	1188	Circular	24	127	16	23	29	34	38	554.9	543.5	555.6	544.2	555.7	544.4	555.8	544.7	555.9	544.9	556.0	545.2
2237	2039	1151	Circular	33	420	7	10	11	13	14	501.5	501.4	502.9	502.3	503.1	502.5	504.3	504.1	507.3	507.1	509.6	509.3
224	1080	1623	Circular	24	160	8	12	13	14	15	496.7	496.3	500.3	500.1	504.1	504.0	504.8	504.6	505.3	505.2	506.1	505.9
2243	1500	2287	Circular	36	138	31	36	38	40	40	487.4	487.4	490.6	490.3	494.3	493.9	495.6	495.2	496.4	496.0	496.9	496.4
2244	1410	1087	Circular	24	60	4	8	7	11	11	497.4	497.2	501.0	501.0	504.9	504.8	505.5	505.5	506.1	506.1	506.9	506.9
2246	964	2457	Circular	36	50	22	25	27	29	31	483.6	483.2	485.4	485.3	486.2	486.1	486.8	486.7	487.4	487.3	487.9	487.8
2247	831	1809	Circular	60	30	-69	-72	77	82	86	479.0	480.2	485.5	485.5	486.3	486.3	486.8	486.7	487.1	487.1	487.4	487.4
2248	1008	1007	Circular	42	258	17	22	25	29	32	491.1	490.7	492.8	492.4	493.1	492.7	493.3	493.0	493.7	493.5	496.0	495.7
225	1623	1409	Circular	24	160	8	12	13	14	15	496.2	495.9	500.0	499.8	503.9	503.7	504.5	504.4	505.1	504.9	505.8	505.6
2250	2127	1438	Circular	24	168	16	22	24	24	26	520.4	516.3	521.6	520.0	526.4	525.0	528.5	527.0	530.1	528.4	531.3	529.5
2251	1071	1042	Circular	24	288	12	17	21	24	26	672.5	634.8	673.0	635.9	673.1	636.1	673.2	636.2	673.2	636.4	673.3	636.4
2254	3464	3451	Circular	30	239	11	14	18	21	23	546.8	545.8	548.0	547.3	548.3	547.6	548.5	547.8	548.7	548.1	549.0	548.3
2256	1698	1692	Circular	27	330	6	8	10	12	13	482.2	481.2	483.1	482.4	483.3	482.6	483.5	482.8	483.6	482.9	483.8	483.1
2258	2898	2924	Circular	24	200	6	8	10	12	13	483.8	483.1	484.9	484.3	485.1	484.6	485.3	484.7	485.5	484.9	485.8	485.1
2259	799	3847	Circular	42	34	29	37	44	51	57	459.7	459.6	461.4	461.2	461.6	461.4	461.8	461.6	461.9	461.8	462.1	461.9
2265	2545	2537	Circular	30	146	14	18	19	21	21	428.8	428.3	434.1	433.9	436.1	435.8	436.9	436.7	437.6	437.4	438.2	437.9
2266	107	2044	Circular	36	32	22	28	30	31	33	428.4	428.3	433.5	433.5	435.1	435.1	435.9	435.9	436.6	436.5	437.2	437.1
2268	3246	3268	Circular	36	288	16	22	26	29	30	420.9	420.2	422.6	422.3	423.1	422.7	423.5	423.0	423.8	423.3	424.0	423.4
2272	1549	3581	Circular	30	512	24	29	32	34	35	429.2	426.7	430.9	428.3	431.2	428.5	431.8	428.6	432.1	428.7	432.3	428.7
2273	3734	3706	Circular	30	121	0	0	0	0	0	428.9	425.1	428.9	426.0	428.9	426.3	428.9	426.5	428.9	426.7	428.9	426.8
2274	3130	3106	Circular	27	66	7	8	10	12	13	426.2	426.3	428.3	428.3	429.0	429.0	429.7	429.6	430.4	430.4	431.1	431.0
2276	2413	2430	Circular	36	244	10	13	14	16	17	465.4	465.0	470.0	470.0	473.1	473.0	474.2	474.1	475.2	475.1	475.7	475.6
2278	2399	2624	Circular	24	19	3	4	4	5	6	476.8	476.8	477.6	477.6	477.7	477.7	478.4	478.4	481.9	481.9	482.6	482.6
2279	787	162	Circular	42	147	33	46	52	56	59	453.3	453.0	457.3	457.2	458.2	457.9	458.7	458.3	459.2	458.7	459.6	459.1
2280	1766	3713	Circular	48	102	5	7	8	10	10	463.1	463.0	464.0	463.9	464.2	464.0	464.2	464.1	464.4	464.4	465.1	465.1
2281	560	3338	Circular	27	298	8	11	12	12	12	459.5	458.9	460.9	460.6	463.3	462.9	465.1	464.7	466.0	465.6	466.6	466.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2283	3563	770	Circular	33	174	3	7	7	8	8	459.6	457.9	460.2	459.8	462.5	462.5	464.2	464.2	465.0	465.0	465.6	465.5
2284	3729	3003	Circular	30	509	12	13	14	15	13	458.2	456.9	460.0	459.7	462.7	462.4	464.4	464.1	465.2	464.9	465.8	465.5
2285	1835	806	Circular	24	20	6	10	13	15	16	457.2	455.2	458.2	458.2	459.0	458.9	459.8	459.7	461.6	461.5	463.0	462.9
2289	687	326	Circular	36	288	19	22	27	29	29	454.4	453.9	459.8	459.6	462.1	461.9	463.2	463.1	464.6	464.5	465.7	465.5
2292	2604	2616	Circular	42	119	-2	-2	1	1	2	436.6	436.8	440.5	440.5	440.9	440.9	441.2	441.2	441.4	441.4	441.6	441.6
2295	529	528	Circular	24	354	14	15	16	16	17	455.3	455.3	462.3	461.0	464.1	462.6	464.7	463.2	465.4	463.8	465.9	464.3
2296	1269	1270	Circular	24	104	9	11	13	15	16	437.1	437.1	439.4	439.2	440.6	440.4	441.8	441.4	442.7	442.2	443.2	442.7
2297	3314	2930	Circular	30	98	6	8	9	11	12	426.8	426.8	428.1	428.1	428.4	428.4	428.8	428.7	429.8	429.7	430.9	430.8
230	1503	1500	Circular	36	110	25	29	30	32	33	487.7	487.5	491.1	490.9	495.0	494.8	496.4	496.2	497.2	497.0	497.7	497.5
2304	254	253	Circular	24	285	9	13	15	16	17	441.8	441.6	446.1	445.6	450.8	449.9	453.4	452.2	454.7	453.4	455.5	454.1
2305	164	1490	Circular	42	220	18	25	31	35	37	476.1	474.9	477.8	477.5	478.6	478.6	480.2	479.9	481.7	481.4	482.9	482.6
231	1504	1503	Circular	36	140	25	29	30	32	33	488.2	487.7	491.6	491.4	495.8	495.5	497.2	496.9	498.0	497.7	498.4	498.2
2312	1516	1507	Circular	66	25	43	60	74	87	98	516.0	516.0	518.7	518.6	519.1	519.1	519.5	519.4	519.8	519.8	520.0	520.0
2313	1217	2583	Circular	36	112	15	21	26	30	34	572.8	566.3	573.4	567.6	573.5	567.9	573.6	568.0	573.7	568.2	573.8	568.4
2317	3506	3474	Circular	24	109	2	3	3	3	4	428.4	428.1	429.8	429.8	430.7	430.7	432.3	432.3	433.7	433.7	434.3	434.3
2319	1077	3919	Circular	24	440	8	10	13	15	16	493.2	493.3	495.3	494.7	500.6	499.6	502.3	501.0	503.5	501.8	504.2	502.2
2321	521	1292	Circular	24	318	1	1	2	2	2	451.6	449.7	451.9	450.8	451.9	451.0	452.0	451.2	452.0	451.3	452.0	451.4
2325	1042	1043	Circular	24	55	12	17	21	24	26	634.8	628.2	635.3	629.2	635.4	629.4	635.5	629.5	635.6	629.7	635.6	629.8
2326	3597	945	Circular	54	10	6	9	11	13	14	485.0	484.6	488.1	488.1	488.9	488.9	489.5	489.5	490.2	490.2	490.7	490.7
2327	945	3604	Circular	54	450	65	82	88	91	94	484.3	483.4	487.5	487.0	488.4	487.6	488.9	488.0	489.5	488.5	489.9	488.9
2328	2503	2489	Circular	36	100	11	15	17	20	20	497.9	498.1	506.0	505.9	506.6	506.5	507.5	507.5	508.3	508.2	508.9	508.8
2329	3709	3763	Cross section		53	63	75	84	94	101	427.6	427.5	430.2	430.2	430.4	430.4	430.5	430.6	430.7	430.7	430.8	430.8
2331	1534	1535	Circular	60	50	63	75	84	94	100	428.1	428.2	432.8	432.7	432.9	432.9	433.0	432.9	433.0	433.0	433.0	433.0
2332	1576	1577	Circular	60	50	55	65	72	79	84	428.8	428.8	433.0	433.0	433.3	433.2	433.4	433.3	433.5	433.4	433.5	433.5
2339	2961	2605	Circular	60	156	0	0	0	0	0	468.9	468.6	469.1	469.1	469.3	469.3	469.5	469.5	469.6	469.6	469.8	469.8
2340	2523	2511	Circular	60	53	8	12	14	16	18	462.5	462.4	469.0	469.0	469.1	469.1	469.2	469.2	469.2	469.2	469.3	469.3
2341	3456	3465	Circular	42	494	8	12	14	16	18	464.6	464.3	469.1	469.0	469.2	469.2	469.4	469.3	469.5	469.4	469.6	469.4
2342	3730	3461	Circular	60	172	-2	-6	3	-5	-5	464.5	464.0	469.1	469.1	469.3	469.3	469.5	469.5	469.6	469.6	469.8	469.8
2343	3892	3915	Rectangular		35	90	116	131	143	152	459.6	459.6	463.4	463.4	463.9	463.9	464.1	464.1	464.3	464.3	464.4	464.4
2344	1824	3253	Circular	72	251	84	109	122	134	142	460.9	461.0	464.4	464.2	464.9	464.6	465.1	464.8	465.3	465.0	465.4	465.1
2346	3501	3030	Rectangular		331	101	131	149	164	175	459.4	458.9	461.7	461.5	462.1	461.9	462.3	462.1	462.5	462.3	462.6	462.4
2349	1847	1816	Rectangular		70	132	171	196	217	235	452.9	452.8	457.8	457.8	458.5	458.5	458.8	458.8	459.2	459.2	459.5	459.5
2350	3151	3266	Rectangular		181	166	219	250	276	297	451.9	452.3	457.2	457.1	457.8	457.8	458.3	458.2	458.7	458.6	459.1	459.0
2351	3133	1556	Circular	36	12	9	11	13	15	16	434.2	434.0	436.0	436.0	438.7	438.7	440.6	440.6	441.8	441.8	442.3	442.3
2352	1738	179	Rectangular		161	245	325	376	418	450	440.6	440.8	444.5	444.3	445.1	444.9	445.4	445.2	445.7	445.5	445.9	445.6
2355	3486	3811	Circular	48	29	36	43	50	56	61	431.0	430.9	433.8	433.8	434.0	434.0	434.2	434.2	434.3	434.3	434.4	434.4
2356	3348	3379	Circular	30	66	26	29	28	30	31	432.2	431.8	434.3	434.3	434.8	434.5	434.9	434.6	435.1	434.7	435.2	434.8
2357	3807	3820	Circular	60	42	29	38	43	47	50	432.6	432.3	435.0	435.0	435.3	435.3	435.4	435.4	435.5	435.5	435.6	435.6
236	1828	2093	Circular	36	130	22	25	27	29	31	481.4	480.8	484.3	484.2	485.1	485.0	485.5	485.3	485.9	485.6	486.1	485.8
2363	2273	3382	Circular	24	458	0	0	0	0	0	431.2	427.2	431.3	427.8	431.3	428.1	431.3	428.5	431.3	429.4	431.3	430.5
2367	2329	3707	Circular	24	253	3	4	4	5	5	453.4	453.0	454.5	454.4	457.2	457.1	459.4	459.3	460.2	460.1	460.7	460.6
2368	3707	3500	Circular	24	429	3	4	4	5	5	453.0	452.2	454.4	454.4	457.1	457.0	459.3	459.2	460.1	460.0	460.6	460.4
237	963	817	Circular	27	415	2	5	9	12	13	485.2	483.9	485.6	484.8	486.1	485.7	486.5	486.2	487.1	486.6	487.6	486.9
2375	1241	1242	Circular	24	212	3	4	5	6	7	429.5	429.3	430.6	430.4	430.7	430.6	430.9	430.7	431.0	430.8	431.1	430.9
2376	1242	1243	Circular	27	120	3	4	5	6	7	429.3	429.3	430.3	430.2	430.4	430.3	430.5	430.4	430.6	430.5	430.7	430.6
2377	1245	1244	Circular	27	133	3	4	5	6	7	428.4	428.1	429.4	429.4	429.6	429.6	429.8	429.7	429.9	429.8	430.0	429.9
2378	1244	290	Circular	27	32	3	4	5	6	7	428.1	427.7	429.3	429.3	429.5	429.5	429.7	429.7	429.8	429.8	429.8	429.8
238	2062	964	Circular	36	196	17	22	26	30	31	484.2	483.7	486.1	485.8	486.6	486.4	487.3	487.0	488.1	487.7	488.7	488.3
2381	2891	3300	Circular	24	450	8	11	13	15	17	426.0	424.7	427.2	426.5	428.7	427.7	429.9	428.5	431.4	429.4	432.9	430.5
2382	222	3837	Circular	24	278	7	8	10	10	11	463.8	463.2	465.2	464.9	465.6	465.3	467.9	467.4	468.8	468.3	469.4	468.9
239	966	964	Circular	24	410	5	6	7	8	9	486.8	483.7	487.5	485.8	487.6	486.4	487.7	487.0	488.2	487.7	488.9	488.3
240	2457	1828	Circular	36	440	22	25	27	29	31	483.2	481.6	485.0	484.4	485.9	485.4	486.5	485.8	487.1	486.2	487.5	486.5
242	2934	2940	Circular	60	127	65	85	97	107	114	478.8	477.8	484.4	484.3	485.2	485.1	485.7	485.5	486.0	485.8	486.3	486.0
2421	2189	2232	Circular	24	210	12	18	23	28	32	613.2	594.4	613.8	595.7	613.9	596.0	614.0	596.2	614.1	596.7	614.2	597.1
2428	1347	1516	Circular	66	20	43	60	74	88	98	516.5	516.0	518.8	518.8	519.3	519.3	519.7	519.6	520.0	520.0	520.3	520.2
2429	1198	1822	Circular	24	227	6	9	11	14	16	583.2	577.4	583.8	578.7	583.9	579.0	584.0	579.2	584.1	579.4	584.2	579.6
243	2461	2112	Circular	36	339	17	22	26	30	31	487.1	486.1	488.7	488.3	489.1	488.7	489.9	489.5	491.7	491.0	492.7	491.9
2440	2426	1074	Circular	24	50	12	16	19	20	21	495.0	494.9	496.5	496.4	500.6	500.4	501.8	501.7	502.4	502.3	502.7	502.6
2441	1628	1620	Circular	24	193	12	16	17	18	18	495.9	495.5	499.1	498.5	502.9	502.3	503.7	503.2	504.3	503.8	504.8	504.2

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2442	2934	2940	Circular	60	127	65	85	97	107	113	478.4	477.9	484.4	484.3	485.2	485.1	485.7	485.5	486.0	485.8	486.3	486.0
2443	831	1809	Circular	60	30	146	151	159	145	151	479.9	479.8	485.5	485.5	486.3	486.3	486.8	486.7	487.1	487.1	487.4	487.4
2445	2657	2658	Circular	42	211	18	24	28	32	35	489.4	488.9	491.1	490.8	491.4	491.1	491.7	491.4	492.5	492.3	494.4	494.1
2446	1059	1058	Circular	42	335	22	27	29	30	31	503.1	502.2	504.8	504.1	505.0	504.3	505.1	504.4	505.1	504.5	505.1	504.5
2447	2680	2676	Circular	42	120	26	32	34	36	37	496.9	496.4	499.0	498.8	499.3	499.1	499.4	499.2	499.5	499.3	499.5	499.4
2449	1064	1062	Circular	42	350	22	27	29	30	31	505.1	504.0	506.7	506.1	506.9	506.3	507.0	506.4	507.1	506.5	507.1	506.5
2452	944	945	Circular	54	347	59	74	78	80	80	483.3	484.4	488.4	488.1	489.4	488.9	490.1	489.5	490.8	490.2	491.2	490.7
2459	2622	2499	Circular	42	235	20	27	32	38	40	476.1	475.1	478.4	478.4	479.4	479.3	480.4	480.2	481.7	481.3	482.6	482.3
246	1963	965	Circular	36	193	17	22	26	30	31	485.5	484.8	487.2	487.0	487.7	487.5	488.5	488.2	489.7	489.4	490.5	490.1
2460	2505	887	Circular	48	290	27	35	42	49	52	475.1	474.8	477.7	477.5	478.2	478.0	478.6	478.4	479.2	478.8	479.7	479.4
2461	1810	1506	Circular	36	302	13	17	21	24	26	478.7	477.4	479.9	479.1	480.3	480.2	482.1	481.8	484.0	483.6	485.3	484.8
2463	165	3699	Circular	24	385	7	8	10	12	12	483.3	481.6	484.2	483.1	484.4	483.8	485.3	484.6	487.7	486.7	489.2	488.1
2464	845	2670	Circular	36	293	10	14	16	18	20	465.3	464.6	466.7	466.4	467.3	467.1	468.2	468.1	469.2	469.0	470.2	470.0
2468	1875	639	Circular	36	111	12	16	20	21	25	466.2	466.2	472.0	472.0	475.8	475.7	476.7	476.7	477.3	477.3	477.7	477.7
2471	822	2178	Circular	36	70	19	25	30	34	35	466.8	466.6	468.8	468.7	469.3	469.2	470.6	470.4	472.0	471.9	473.0	472.8
2472	889	2440	Circular	66	164	44	57	67	77	83	463.7	463.5	467.0	467.0	467.7	467.6	468.1	468.1	468.7	468.6	469.1	469.0
2474	1743	662	Circular	42	281	18	23	27	31	35	468.1	467.6	469.9	469.6	470.2	469.9	471.1	470.9	472.8	472.5	474.1	473.7
2475	2627	2642	Circular	24	41	8	10	11	13	15	474.2	474.2	476.2	476.1	476.6	476.5	477.6	477.5	480.9	480.8	481.6	481.5
2479	781	783	Circular	24	207	7	9	10	10	10	463.4	462.6	465.0	464.9	466.0	465.7	466.8	466.5	467.2	466.8	467.5	467.1
2483	404	771	Circular	24	186	6	6	6	6	6	458.2	458.8	460.3	460.1	462.5	462.5	464.3	464.2	465.1	465.0	465.6	465.6
2485	3837	745	Circular	24	56	7	8	10	10	11	463.2	462.3	464.1	463.8	465.0	465.0	467.1	467.0	468.0	467.9	468.6	468.5
2486	1325	1328	Circular	42	148	2	3	3	4	4	456.0	454.4	457.1	457.1	457.2	457.2	457.6	457.6	458.3	458.3	458.8	458.8
2487	2854	2467	Circular	60	78	39	57	68	81	94	454.5	454.2	457.4	457.4	458.2	458.2	459.1	459.1	460.5	460.4	461.6	461.5
249	967	2324	Circular	24	110	5	6	7	8	9	489.0	488.4	489.8	489.4	490.0	489.6	490.1	489.8	490.2	489.9	490.4	490.1
2491	3863	3851	Circular	48	114	25	29	30	28	27	451.4	451.3	458.8	458.8	461.3	461.3	462.8	462.8	463.8	463.8	464.9	464.9
2495	3187	577	Circular	48	621	70	74	76	78	79	444.4	443.7	453.6	452.2	455.3	453.7	456.3	454.7	457.5	455.8	458.3	456.5
2500	312	1271	Circular	18	241	0	0	0	0	0	440.2	438.5	440.3	438.8	440.3	439.3	440.3	439.6	440.3	439.8	440.4	440.0
2503	262	1021	Circular	24	377	2	3	3	3	4	452.1	450.6	452.7	452.2	452.8	452.7	453.2	453.2	453.8	453.8	454.3	454.2
2505	2752	2708	Circular	24	436	5	5	5	7	8	458.3	457.5	465.8	465.6	467.6	467.5	468.8	468.6	469.8	469.7	470.7	470.6
2508	1181	1179	Circular	24	32	16	18	21	22	22	460.6	460.9	468.0	467.9	469.5	469.5	470.8	470.7	472.5	472.3	473.8	473.7
252	1400	337	Circular	33	426	12	17	20	23	23	489.6	488.2	490.8	489.7	491.1	490.1	491.4	490.8	493.7	493.0	494.8	494.0
2520	507	111	Circular	36	52	7	9	10	12	13	434.8	434.5	437.1	437.1	437.6	437.6	437.9	437.9	438.2	438.2	438.4	438.4
2521	484	506	Circular	36	313	7	9	10	12	13	437.3	436.2	438.2	437.1	438.3	437.6	438.4	438.0	438.6	438.3	438.7	438.6
2522	2721	2560	Circular	30	240	14	18	19	21	21	430.9	430.1	435.0	434.7	437.4	437.0	438.3	437.9	439.0	438.5	439.5	439.1
2523	2575	1278	Circular	36	150	28	35	39	42	44	428.8	429.1	431.7	431.5	432.2	431.8	432.5	432.0	432.7	432.1	432.9	432.2
2530	3797	3661	Circular	30	121	5	6	7	8	9	439.7	439.4	440.6	440.4	441.0	441.0	442.6	442.6	443.1	443.1	443.5	443.5
2531	3568	3230	Circular	24	346	4	6	7	8	9	432.3	431.1	434.1	434.0	434.6	434.4	434.9	434.6	435.2	434.8	435.5	435.0
2532	379	3219	Circular	24	440	6	8	9	10	12	427.4	426.6	428.9	428.6	430.0	429.5	431.1	430.4	432.3	431.4	433.3	432.2
2533	390	3611	Circular	30	275	9	13	14	14	15	420.6	417.7	421.8	421.8	422.4	422.4	423.3	423.0	423.8	423.5	424.4	424.0
2535	2931	3256	Circular	24	266	9	13	14	14	15	424.1	423.1	425.4	424.8	426.1	425.2	426.7	425.7	427.5	426.4	428.4	427.2
2537	3534	3559	Circular	24	218	3	4	4	5	6	430.6	430.2	431.4	431.0	431.5	431.1	431.6	431.2	431.9	431.7	432.5	432.3
254	3036	1404	Circular	30	170	2	3	3	4	4	493.8	493.6	494.4	494.3	494.6	494.5	494.8	494.7	496.4	496.4	497.6	497.6
2542	3306	3305	Circular	27	280	10	12	13	14	15	441.0	440.1	444.3	444.0	447.4	447.0	448.7	448.3	449.4	449.1	450.1	449.7
2543	253	658	Circular	24	524	9	13	15	16	16	441.6	440.7	445.4	444.5	449.6	448.0	451.7	449.5	452.9	450.5	453.6	451.2
2547	740	2329	Circular	24	125	3	4	4	5	5	453.6	453.4	454.6	454.5	457.2	457.2	459.5	459.5	460.3	460.3	460.8	460.7
2554	2551	2554	Circular	24	150	7	9	10	12	13	506.2	505.9	508.2	508.1	508.6	508.4	509.0	508.7	509.2	508.9	511.4	510.9
2555	143	158	Circular	30	110	7	10	11	13	14	506.0	506.0	507.5	507.5	507.8	507.7	507.9	507.8	508.0	507.9	510.5	510.4
2557	415	997	Circular	30	365	2	3	3	4	4	496.1	495.1	496.6	495.7	496.7	495.8	496.7	495.9	496.8	496.5	497.6	497.6
256	2913	2917	Circular	30	371	12	17	20	23	23	492.4	491.0	493.6	492.5	493.9	492.7	494.1	493.0	496.0	494.8	497.2	496.0
2560	3939	3930	Circular	42	130	20	28	37	38	44	495.7	495.6	498.3	498.2	505.7	505.7	506.8	506.7	507.6	507.5	508.1	508.0
2566	1511	1512	Circular	30	129	10	14	16	18	19	471.1	470.1	472.2	471.6	472.4	471.9	473.4	473.2	475.7	475.5	476.8	476.6
2568	385	3538	Circular	33	99	9	10	10	10	10	457.5	457.5	459.5	459.5	462.4	462.4	464.1	464.1	464.9	464.9	465.5	465.5
2572	2889	2921	Circular	48	341	25	30	32	33	32	454.5	453.4	459.1	459.1	461.9	461.8	463.4	463.3	464.3	464.2	465.1	465.0
2574	1544	262	Circular	24	380	2	3	3	3	4	453.0	452.2	453.6	452.8	453.7	452.9	453.8	453.3	453.9	453.8	454.4	454.3
2575	2342	2379	Circular	24	122	7	9	9	10	12	457.7	457.6	463.8	463.7	465.7	465.6	466.3	466.2	466.9	466.8	467.5	467.3
2576	3374	3312	Circular	36	598	19	24	30	36	40	425.6	424.4	427.3	426.0	427.6	426.3	427.9	426.6	428.7	426.9	429.5	427.3
258	2894	2905	Circular	30	280	0	0	0	0	-3	496.9	496.1	496.9	496.7	496.9	496.8	496.9	496.9	497.0	497.0	497.5	497.6
2581	2924	1698	Circular	24	200	6	8	10	12	13	483.1	482.2	484.0	483.4	484.2	483.6	484.4	483.8	484.6	483.9	484.8	484.1
2582	3232	3228	Circular	60	126	49	64	76	86	94	462.5	461.4	466.0	466.0	466.8	466.8	467.2	467.2	467.8	467.6	468.1	467.9

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
259	997	998	Circular	30	41	2	3	3	4	4	495.1	494.9	495.6	495.5	495.7	495.6	495.7	495.6	496.4	496.4	497.6	497.6
2590	1200	1206	Circular	24	52	3	4	4	5	6	430.4	429.9	431.2	431.1	431.5	431.5	431.8	431.8	432.8	432.8	434.2	434.2
2591	3098	2925	Circular	24	182	8	11	13	15	17	426.7	426.2	428.2	428.0	429.9	429.5	431.8	431.2	433.9	433.1	436.0	435.0
2595	3528	3516	Circular	27	376	0	0	0	0	-1	429.3	428.6	430.5	430.5	432.0	432.0	434.2	434.2	436.2	436.2	436.9	436.9
260	998	3036	Circular	30	350	2	3	3	4	4	494.8	493.8	495.3	494.5	495.4	494.6	495.5	494.8	496.4	496.4	497.6	497.6
2604	2386	2370	Circular	42	114	12	16	20	23	24	466.5	466.2	469.9	469.8	470.2	470.2	470.6	470.5	470.9	470.9	471.1	471.1
2605	2083	2386	Circular	24	115	2	3	4	4	5	467.8	466.5	469.9	469.9	470.3	470.3	470.7	470.7	471.1	471.1	471.4	471.3
2606	2376	2386	Circular	30	27	10	13	16	18	20	467.5	466.5	469.9	469.9	470.3	470.3	470.7	470.7	471.1	471.1	471.4	471.3
2609	1366	2392	Circular	42	478	15	20	24	28	30	466.2	465.4	469.7	469.6	469.9	469.7	470.1	469.9	470.3	470.0	470.5	470.0
2610	1524	2394	Circular	42	70	36	48	58	68	75	464.1	463.8	465.9	465.6	466.2	465.9	466.5	466.1	466.7	466.3	466.8	466.4
2611	2392	2390	Circular	54	214	15	20	24	28	30	465.4	464.8	469.6	469.6	469.7	469.7	469.8	469.8	469.9	469.9	470.0	470.0
2612	1361	2083	Circular	24	393	2	3	4	4	5	468.8	467.8	469.9	469.9	470.4	470.4	470.9	470.7	471.3	471.2	471.6	471.5
2613	2370	1366	Circular	42	477	12	16	20	23	24	466.2	466.2	469.8	469.7	470.1	470.0	470.4	470.2	470.7	470.4	470.9	470.6
2615	1373	2366	Circular	30	262	10	13	16	18	20	468.4	467.9	470.2	470.2	471.3	471.0	472.1	471.8	473.1	472.5	473.6	473.0
2616	2366	2365	Circular	30	117	10	13	16	18	20	467.9	467.8	470.2	470.1	470.9	470.8	471.6	471.4	472.3	472.1	472.7	472.5
2617	2365	2376	Circular	30	142	10	13	16	18	20	467.8	467.5	470.0	470.0	470.6	470.4	471.1	470.9	471.6	471.4	472.0	471.7
2618	1089	1373	Circular	30	206	10	13	16	18	20	468.7	468.4	470.5	470.3	471.6	471.4	472.6	472.3	473.7	473.3	474.4	473.9
2619	1090	1089	Circular	30	200	10	13	16	18	20	469.0	468.7	470.8	470.6	472.0	471.7	473.1	472.8	474.4	474.0	475.1	474.7
2620	567	1390	Circular	24	263	3	3	4	5	5	472.7	471.0	473.2	471.8	473.4	472.8	474.3	474.3	476.2	476.1	477.1	477.0
2622	1882	1390	Circular	30	44	3	4	5	5	6	470.6	470.5	471.8	471.8	472.8	472.8	474.4	474.3	476.1	476.1	477.0	477.0
2623	1390	1389	Circular	30	40	6	7	9	10	11	470.5	470.4	471.7	471.6	472.7	472.7	474.3	474.3	476.0	475.9	476.9	476.9
2624	1389	1760	Circular	30	226	6	7	9	10	11	470.4	469.7	471.5	471.3	472.7	472.6	474.2	474.1	475.9	475.7	476.8	476.6
2625	1760	568	Circular	30	282	6	7	9	10	11	469.7	469.4	471.3	471.2	472.6	472.5	474.1	473.9	475.7	475.5	476.6	476.4
2626	568	1090	Circular	30	293	10	13	16	18	20	469.4	469.0	471.1	470.9	472.4	472.1	473.7	473.3	475.2	474.6	476.1	475.4
263	1837	1861	Circular	27	205	10	14	16	16	17	498.9	498.3	500.3	499.9	500.7	500.2	500.9	500.3	501.0	500.4	501.1	500.4
2631	308	303	Circular	24	303	5	8	9	11	13	830.8	799.2	831.2	799.9	831.2	800.0	831.3	800.1	831.3	800.2	831.4	800.2
2632	303	304	Circular	24	112	5	8	9	11	13	799.2	781.8	799.5	783.2	799.6	783.5	799.6	783.7	799.7	783.9	799.7	784.1
2634	1431	1092	Circular	24	83	5	8	9	11	13	781.5	766.4	781.8	767.1	781.9	767.3	781.9	767.4	782.0	767.5	782.0	767.6
2635	304	1431	Circular	24	53	5	8	9	11	13	781.8	781.8	782.8	782.6	782.9	782.8	783.1	782.9	783.2	783.0	783.3	783.1
2637	1996	1995	Circular	24	99	2	2	3	3	4	419.3	419.4	421.2	421.2	422.1	422.1	422.7	422.7	423.2	423.2	423.6	423.6
2638	1952	1983	Circular	24	147	2	2	3	3	4	421.7	421.1	422.2	421.7	422.4	422.1	422.7	422.7	423.3	423.3	423.8	423.7
2639	1971	1996	Circular	24	94	2	2	3	3	4	419.4	419.3	421.2	421.2	422.1	422.1	422.7	422.7	423.2	423.2	423.7	423.6
264	1004	1837	Circular	27	230	10	14	16	16	17	499.3	498.9	501.0	500.7	501.7	501.2	502.0	501.4	502.2	501.5	502.4	501.6
2640	1979	1952	Circular	24	91	2	2	3	3	4	421.9	421.7	422.5	422.3	422.6	422.5	422.8	422.8	423.3	423.3	423.8	423.8
2642	1983	1971	Circular	24	96	2	2	3	3	4	421.1	419.4	421.6	421.2	422.1	422.1	422.7	422.7	423.3	423.2	423.7	423.7
2647	3331	3366	Circular	24	203	2	3	4	4	5	423.6	423.0	424.2	423.8	424.3	423.9	424.4	424.0	424.5	424.1	424.5	424.1
2649	3366	157	Circular	24	177	2	3	4	4	5	423.0	421.3	423.5	422.1	423.6	422.3	423.6	422.5	423.7	422.7	423.8	422.9
265	3923	3912	Circular	27	80	10	14	16	16	17	502.1	501.7	503.6	503.5	505.6	505.5	507.0	506.8	507.5	507.3	508.1	507.9
2650	157	3220	Circular	24	165	2	3	4	4	5	421.1	420.1	422.0	422.0	422.3	422.3	422.5	422.5	422.6	422.6	422.9	422.8
2651	3220	1279	Circular	60	256	11	16	19	22	25	420.1	420.6	422.0	421.9	422.2	422.1	422.4	422.2	422.5	422.4	422.7	422.6
2652	1279	245	Circular	60	158	11	16	19	23	26	420.6	420.0	421.7	421.7	421.9	421.9	422.0	422.0	422.1	422.1	422.4	422.2
2653	245	1265	Circular	60	22	18	19	25	33	31	420.0	419.3	421.7	421.7	421.9	421.8	422.0	421.9	422.1	422.0	422.1	422.1
2654	1265	Corporate_Pond_Inlet_1	Circular	72	584	15	20	24	29	32	418.5	418.2	421.7	421.6	421.8	421.8	421.9	421.8	421.9	421.9	422.0	421.9
2657	247	1265	Circular	24	145	4	5	6	6	7	422.6	422.0	423.3	422.6	423.4	422.7	423.5	422.8	423.5	422.9	423.6	422.9
2658	3184	3896	Circular	72	275	17	27	33	38	42	416.8	416.0	418.8	418.8	419.4	419.4	419.8	419.8	420.1	420.1	420.3	420.3
2659	3787	1280	Circular	60	485	9	13	15	18	20	421.8	421.1	422.8	422.3	423.0	422.6	423.2	422.7	423.3	422.8	423.4	423.0
2660	1280	3220	Circular	60	489	9	12	15	18	20	421.1	420.5	422.2	422.0	422.5	422.3	422.6	422.5	422.7	422.6	422.9	422.8
2662	3765	3761	Circular	48	366	30	49	58	66	69	420.3	419.6	422.3	422.3	423.3	423.1	424.2	423.6	424.8	424.0	425.1	424.2
2663	3791	3741	Circular	42	196	26	43	52	60	62	421.6	421.3	424.3	424.2	426.5	426.1	428.7	428.2	430.8	430.1	431.6	430.9
2664	3760	3791	Circular	42	200	26	43	52	59	62	421.8	421.9	424.6	424.5	427.3	426.9	429.8	429.3	432.3	431.6	433.2	432.5
2665	3776	3760	Circular	36	282	14	22	27	33	41	422.1	421.8	424.9	424.8	428.0	427.7	430.8	430.4	433.5	433.0	434.5	434.1
2666	3742	3776	Circular	36	179	14	22	27	33	39	422.2	422.3	425.1	425.0	428.3	428.1	431.3	431.1	434.1	433.8	435.2	434.9
2667	3783	3742	Circular	36	214	14	22	27	33	36	422.3	422.4	425.2	425.1	428.7	428.5	431.9	431.6	434.8	434.4	436.0	435.6
2668	3741	3775	Circular	42	232	30	48	58	66	69	421.2	421.1	423.9	423.7	425.7	425.2	427.5	426.7	429.2	428.2	429.9	428.8
2669	3775	3752	Circular	42	152	30	48	58	66	69	421.1	420.6	423.5	423.3	424.8	424.4	426.1	425.6	427.4	426.7	427.9	427.2
2670	3752	3765	Circular	42	70	30	48	58	66	69	420.5	420.4	423.1	423.0	424.1	423.9	425.0	424.8	425.9	425.6	426.3	426.0
2671	3761	1268	Circular	48	335	30	48	59	66	69	419.6	419.4	422.2	421.9	422.9	422.4	423.3	422.8	423.7	423.0	423.9	423.1
2672	1268	Corporate_Pond_Inlet_2	Circular	60	346	30	48	58	66	69	419.3	418.4	421.7	421.7	421.9	421.9	422.0	422.0	422.1	422.1	422.1	422.1
2673	3750	3743	Circular	60	113	23	37	46	53	56	416.8	416.1	418.8	418.8	419.4	419.4	419.8	419.8	420.1	420.1	420.3	420.3

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2676	3094	3096	Circular	42	51	14	19	21	23	24	417.9	417.5	421.2	421.2	422.1	422.0	422.6	422.6	423.1	423.1	423.5	423.5
2677	1995	3039	Circular	24	71	2	2	3	3	4	419.4	418.8	421.2	421.2	422.1	422.1	422.6	422.6	423.1	423.1	423.6	423.6
2678	3096	3081	Circular	42	32	16	21	24	25	27	417.5	417.5	421.2	421.1	422.0	422.0	422.5	422.5	423.0	422.9	423.4	423.4
268	3895	1050	Circular	24	447	10	14	16	18	19	504.0	503.2	506.5	505.6	510.9	509.1	513.4	511.2	514.7	512.2	515.9	513.1
2681	3081	1960	Circular	48	290	16	21	24	25	27	417.5	417.4	421.1	421.1	421.9	421.8	422.4	422.3	422.9	422.8	423.3	423.2
2682	1960	2055	Circular	48	164	16	21	24	25	27	417.4	417.3	421.1	421.1	421.8	421.8	422.3	422.3	422.7	422.7	423.1	423.1
2684	288	1914	Circular	48	165	16	21	24	25	27	417.2	417.2	421.0	421.0	421.7	421.6	422.1	422.1	422.5	422.4	422.8	422.8
2685	1914	3170	Circular	48	196	22	29	33	36	39	417.2	417.1	420.9	420.9	421.5	421.5	421.9	421.8	422.3	422.2	422.6	422.5
2686	3170	3224	Circular	48	406	22	29	33	36	39	417.1	416.7	420.9	420.8	421.4	421.2	421.8	421.5	422.1	421.8	422.3	422.0
2687	3224	3201	Circular	48	89	22	29	33	36	39	416.6	417.0	420.7	420.7	421.1	421.1	421.4	421.4	421.6	421.6	421.8	421.8
2692	3333	390	Circular	30	299	9	13	14	14	15	421.2	420.7	422.5	422.1	423.0	422.6	423.8	423.4	424.3	424.0	424.9	424.5
2698	3773	3787	Circular	60	402	5	8	9	11	12	422.5	422.0	423.4	423.2	423.5	423.4	423.7	423.6	423.8	423.8	423.9	423.9
2705	3766	3783	Circular	36	369	14	22	27	33	36	423.0	422.4	425.5	425.3	429.4	429.0	432.9	432.3	436.0	435.3	437.4	436.6
2709	3913	3905	Circular	36	20	20	23	25	27	28	490.8	490.7	493.8	493.7	498.7	498.6	500.1	500.1	500.9	500.9	501.3	501.3
2712	1405	2045	Circular	24	193	2	3	4	4	5	473.1	472.8	473.8	473.5	473.9	473.7	474.0	473.8	474.1	473.9	474.2	473.9
2713	2045	2061	Circular	24	195	2	3	4	4	5	472.8	472.5	473.4	473.0	473.5	473.1	473.6	473.2	473.7	473.3	473.8	473.4
2714	695	2061	Circular	24	37	2	2	3	3	4	472.8	472.3	473.2	472.9	473.3	473.1	473.4	473.2	473.5	473.3	473.5	473.4
2715	1416	1407	Circular	24	300	2	2	3	3	4	474.5	473.5	475.0	474.0	475.1	474.1	475.1	474.2	475.2	474.3	475.2	474.3
2716	1407	695	Circular	24	218	2	2	3	3	4	473.4	472.8	473.9	473.4	474.0	473.5	474.1	473.6	474.1	473.7	474.2	473.7
2724	2061	1408	Circular	36	213	4	5	6	7	8	472.0	470.9	472.6	471.7	472.7	471.9	472.8	472.0	472.9	472.1	472.9	472.1
2725	1408	1469	Circular	36	121	4	5	6	7	8	470.9	470.5	471.5	471.1	471.6	471.2	471.7	471.3	471.8	471.4	471.8	471.4
2728	154	1729	Circular	24	212	3	3	4	5	5	436.8	430.0	437.2	432.5	437.2	432.7	437.3	432.9	437.3	433.0	437.3	433.1
273	1925	1435	Circular	42	320	23	30	36	40	45	485.0	484.3	487.0	486.7	487.5	487.1	488.6	488.2	489.6	489.1	490.5	489.9
274	1435	1857	Circular	42	32	23	30	36	40	45	484.3	484.2	486.6	486.6	487.0	487.0	488.0	488.0	488.8	488.8	489.6	489.5
2746	3058	2720	Circular	48	194	15	20	23	25	26	440.3	440.0	441.8	441.6	442.1	441.9	442.2	442.0	442.3	442.1	442.4	442.2
2749	2724	2681	Circular	48	469	15	20	23	24	26	439.3	438.8	441.0	440.6	441.3	440.9	441.4	441.1	441.6	441.2	441.7	441.3
275	1922	1927	Circular	48	285	19	23	25	27	29	486.7	485.9	488.2	487.6	488.3	487.7	488.4	487.9	488.6	488.2	488.8	488.5
2750	1294	3561	Circular	48	265	18	24	28	31	33	438.4	438.3	440.2	440.0	440.5	440.3	440.7	440.4	440.8	440.6	440.9	440.7
2751	3561	3587	Circular	48	430	18	24	28	31	33	438.3	437.1	439.7	439.1	440.0	439.5	440.1	439.7	440.3	439.9	440.4	440.1
2753	3591	3602	Circular	48	290	18	24	28	31	33	436.9	436.7	438.6	438.3	439.0	438.7	439.2	438.9	439.4	439.1	439.6	439.3
2754	3602	1290	Circular	48	322	18	24	28	31	33	436.6	435.8	438.1	438.1	438.5	438.5	438.8	438.8	439.0	439.0	439.2	439.2
2756	1290	295	Circular	48	502	25	33	38	43	46	435.7	435.3	437.8	437.3	438.2	437.6	438.4	437.8	438.6	438.0	438.8	438.1
2757	104	512	Circular	48	541	25	33	38	43	46	434.5	433.6	436.3	435.1	436.6	435.3	436.8	435.4	436.9	435.5	437.0	435.6
276	1857	1869	Circular	42	320	23	30	35	40	45	484.5	483.6	486.2	485.7	486.8	486.6	487.8	487.4	488.5	488.0	489.2	488.5
2762	699	621	Circular	24	163	8	10	13	15	16	444.1	443.6	445.4	445.1	446.2	445.9	447.7	447.2	449.8	449.1	451.6	450.8
2763	621	1336	Circular	24	479	8	10	13	15	16	443.6	442.7	445.0	444.2	445.7	444.7	446.9	445.4	448.7	446.7	450.3	447.8
2764	1336	1337	Circular	24	224	8	10	13	15	16	442.7	442.0	444.1	443.7	444.5	444.0	445.1	444.4	446.3	445.3	447.3	446.1
2765	1337	1338	Circular	24	70	8	10	13	15	16	442.0	441.5	443.2	443.0	443.5	443.3	443.9	443.7	444.6	444.3	445.2	444.9
2766	1339	199	Circular	24	100	8	10	13	15	16	440.7	440.6	441.9	441.6	442.1	441.8	442.2	441.9	442.4	442.0	442.6	442.0
277	767	831	Circular	60	60	83	104	112	117	121	481.7	479.9	485.6	485.5	486.4	486.3	486.9	486.8	487.3	487.1	487.5	487.4
2778	1333	1334	Circular	36	306	18	21	24	26	27	443.1	442.2	446.7	446.5	447.3	447.0	447.9	447.5	448.4	448.0	448.8	448.3
2779	1334	1335	Circular	36	300	18	21	24	26	27	442.2	441.1	446.4	446.2	446.8	446.5	447.3	446.9	447.7	447.3	448.1	447.6
278	2434	152	Circular	24	295	5	6	8	9	10	484.3	483.6	485.7	485.7	486.9	486.6	487.6	487.3	488.3	487.8	488.9	488.3
2780	1335	198	Circular	36	1399	18	21	24	26	27	441.1	439.8	446.1	445.0	446.4	445.0	446.7	445.0	447.1	445.0	447.3	445.0
2781	3686	3716	Circular	18	307	13	14	15	17	18	449.8	447.0	453.4	448.8	454.4	448.8	455.5	448.9	456.8	449.0	457.8	449.3
2787	1338	1339	Circular	24	220	8	10	13	15	16	441.5	440.7	442.7	442.2	443.0	442.5	443.4	442.7	443.9	442.9	444.3	443.1
2792	287	1321	Circular	42	358	6	9	10	12	14	441.6	441.1	442.6	442.2	442.8	442.5	442.9	442.7	443.1	442.8	443.1	442.9
2793	1321	3058	Circular	42	111	6	9	10	12	14	441.1	440.9	442.2	442.1	442.4	442.4	442.6	442.5	442.7	442.6	442.8	442.7
2794	2720	2724	Circular	48	321	15	20	23	24	26	440.0	439.5	441.5	441.0	441.7	441.3	441.9	441.5	442.0	441.6	442.1	441.7
2797	2681	1294	Circular	48	307	15	20	23	25	26	438.8	438.4	440.5	440.3	440.8	440.6	441.0	440.8	441.2	441.0	441.3	441.1
2798	3587	3591	Circular	48	71	18	24	28	31	33	437.0	436.9	438.8	438.8	439.2	439.1	439.4	439.4	439.6	439.6	439.8	439.7
2800	295	104	Circular	48	243	25	33	38	43	46	435.3	434.5	437.0	436.5	437.3	436.8	437.5	437.0	437.6	437.2	437.8	437.3
2804	1246	1247	Circular	24	190	4	5	6	7	8	425.9	424.8	426.7	426.4	427.0	426.7	427.2	427.0	427.5	427.3	428.0	427.8
2805	1247	294	Circular	24	150	8	11	14	16	18	424.8	424.5	426.0	425.5	426.2	425.7	426.4	425.8	426.7	425.9	427.0	426.0
2807	1243	1245	Circular	27	120	3	4	5	6	7	429.3	428.4	429.9	429.5	430.1	429.7	430.2	429.8	430.3	430.0	430.4	430.1
2815	499	350	Circular	24	44	1	2	2	2	3	433.4	432.9	433.7	433.2	433.7	433.2	433.7	433.2	433.8	433.3	433.8	433.3
2816	350	1288	Circular	30	142	1	2	2	2	3	432.4	431.5	432.8	432.5	432.9	432.7	433.0	432.9	433.1	433.0	433.1	433.1
2817	1288	349	Circular	30	71	1	2	2	3	3	431.3	431.0	432.5	432.5	432.7	432.7	432.8	432.8	433.0	433.0	433.1	433.1
2822	2808	169	Circular	60	158	9	12	15	18	20	430.6	430.5	432.5	432.5	432.7	432.7	432.8	432.8	433.0	433.0	433.1	433.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2823	2808	169	Circular	60	158	7	9	11	13	14	430.5	430.7	432.5	432.5	432.7	432.7	432.8	432.8	433.0	433.0	433.1	433.1
2827	934	1199	Circular	24	102	2	2	2	3	3	430.6	430.4	431.3	431.2	431.5	431.5	431.9	431.9	432.9	432.9	434.3	434.2
2828	1199	1201	Circular	30	255	2	2	2	3	3	430.4	429.9	431.2	431.2	431.5	431.5	431.9	431.9	432.9	432.9	434.2	434.2
2829	1201	1203	Circular	18	60	1	1	1	1	2	429.9	429.8	431.2	431.2	431.5	431.5	431.9	431.9	432.8	432.8	434.2	434.2
283	2406	2458	Circular	36	380	17	22	25	29	32	492.8	491.6	494.3	493.4	494.5	493.7	494.8	494.0	495.0	494.3	497.5	496.6
2830	1201	1203	Circular	18	60	0	1	1	1	2	430.8	430.2	431.2	431.2	431.5	431.5	431.9	431.9	432.8	432.8	434.2	434.2
2831	1203	1206	Circular	30	243	2	2	2	3	3	429.9	429.9	431.2	431.1	431.5	431.5	431.9	431.8	432.8	432.8	434.2	434.2
2832	2440	3303	Circular	72	397	50	66	78	90	98	463.5	463.0	466.9	466.9	467.5	467.5	468.0	467.9	468.5	468.4	468.9	468.8
2833	337	3083	Circular	36	113	12	17	20	23	23	488.0	487.6	489.6	489.5	490.0	489.9	490.7	490.6	492.8	492.7	493.8	493.7
2834	3083	2439	Circular	36	235	12	17	20	23	23	487.7	487.1	489.3	489.1	489.7	489.5	490.5	490.3	492.5	492.2	493.5	493.2
2835	2439	2461	Circular	36	46	12	17	20	23	23	487.1	487.1	489.0	489.0	489.4	489.4	490.2	490.2	492.1	492.0	493.0	493.0
285	1009	2341	Circular	48	465	14	15	16	17	18	493.9	493.0	495.2	494.4	495.2	494.5	495.3	494.6	495.3	494.6	495.3	494.6
2854	2230	2698	Circular	24	370	14	16	17	19	20	547.4	543.9	551.8	550.4	554.5	552.7	555.9	554.0	557.8	555.6	559.4	556.9
2858	1378	3386	Circular	36	312	31	36	38	40	41	485.9	484.6	488.0	487.4	491.2	490.2	492.3	491.3	493.0	492.0	493.4	492.5
2875	1301	1302	Circular	24	190	14	20	25	30	34	471.3	467.0	472.3	469.1	472.5	469.6	472.9	470.4	475.0	471.7	477.2	473.0
288	1007	542	Circular	42	480	17	22	25	29	32	490.7	489.7	492.2	491.7	492.5	492.0	492.8	492.3	493.3	493.0	495.6	495.1
289	1005	961	Circular	48	370	14	15	16	17	18	491.5	490.5	492.7	492.2	492.8	492.3	492.8	492.4	492.9	492.5	492.9	492.6
2892	3418	984	Circular	24	135	6	8	10	11	13	516.5	510.7	517.0	511.9	517.1	512.1	517.2	512.3	517.2	512.5	517.3	512.7
2893	2347	1849	Circular	30	271	6	8	10	12	13	461.9	460.6	462.7	461.8	462.9	461.9	463.0	462.1	463.1	462.2	463.2	462.3
2894	2357	2347	Circular	24	144	6	8	10	12	13	462.5	462.0	463.5	463.0	463.7	463.2	463.8	463.4	464.0	463.5	464.1	463.6
2896	259	1683	Circular	60	306	29	40	48	58	66	462.2	461.7	464.9	464.9	465.4	465.4	465.7	465.7	466.1	466.1	466.4	466.4
2897	1683	1608	Circular	60	158	34	48	57	67	77	462.2	461.3	464.5	464.5	464.9	464.9	465.1	465.2	465.4	465.4	465.6	465.6
29	4085	4084	Circular	30	145	10	14	17	20	22	455.6	450.4	456.3	451.7	456.4	451.9	456.5	452.1	456.5	452.2	456.6	452.4
291	960	956	Circular	42	295	18	24	28	32	35	488.3	487.7	490.1	489.8	490.4	490.1	490.7	490.4	491.8	491.5	493.4	493.0
2910	3110	1295	Circular	42	149	9	12	14	14	16	440.0	439.6	444.1	444.1	447.3	447.3	448.8	448.7	449.6	449.6	450.2	450.1
292	956	1899	Circular	42	460	24	30	36	40	45	487.7	486.4	489.4	488.4	489.7	488.7	490.0	489.3	491.2	490.5	492.6	491.7
293	957	958	Circular	48	240	19	23	25	27	29	487.9	487.3	489.5	489.0	489.6	489.2	489.7	489.3	489.8	489.4	489.9	489.5
294	959	540	Circular	48	420	18	20	22	24	25	489.9	488.8	491.3	490.4	491.4	490.5	491.5	490.6	491.5	490.7	491.6	490.8
2942	2612	2636	Circular	48	234	18	24	29	35	39	457.5	451.6	458.3	453.3	458.4	453.6	458.5	453.8	458.6	454.0	458.7	454.2
2945	2824	3243	Circular	36	511	7	9	9	8	8	426.8	427.6	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.9	445.9
2947	2814	2787	Circular	72	261	78	111	136	161	181	438.3	435.7	440.1	437.9	440.5	438.2	440.8	440.3	443.7	443.7	446.7	446.6
295	961	959	Circular	48	190	18	20	22	24	25	490.5	489.9	491.9	491.5	492.0	491.7	492.1	491.7	492.2	491.8	492.2	491.9
2953	2636	4046	Circular	48	674	18	24	29	35	39	451.6	441.3	452.5	446.5	452.6	446.7	452.7	446.9	452.8	447.1	452.9	447.2
2954	3034	3044	Circular	48	249	15	19	20	18	17	423.4	422.9	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
2955	3034	3044	Circular	48	249	15	19	20	17	17	423.0	422.9	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
2958	3466	3476	Circular	42	85	1	1	1	1	1	497.1	496.8	497.4	497.1	497.4	497.1	497.4	497.2	497.5	497.2	497.5	497.2
296	1058	1055	Circular	42	330	22	27	29	30	31	502.2	501.1	503.8	503.0	504.0	503.2	504.0	503.3	504.1	503.4	504.1	503.4
2960	3476	3886	Circular	42	306	1	1	1	1	1	496.7	495.4	497.0	497.0	497.1	497.1	497.1	497.1	497.1	497.1	497.1	497.1
2962	3226	3577	Circular	24	190	8	12	14	15	15	486.5	485.8	487.6	486.8	487.8	487.0	488.0	487.1	488.0	487.1	488.1	487.1
2964	130	133	Circular	24	237	1	1	2	2	2	449.9	449.6	450.8	450.8	451.0	451.0	451.1	451.1	451.2	451.2	451.3	451.3
2969	3230	3001	Circular	30	638	4	6	7	8	9	430.8	431.1	434.0	433.9	434.3	434.2	434.5	434.3	434.7	434.5	434.9	434.6
297	1061	1060	Circular	30	380	7	9	11	13	14	502.7	501.7	503.7	502.9	503.9	503.1	504.0	503.3	504.2	503.4	504.3	503.5
2970	1210	3376	Circular	30	295	11	14	16	19	21	428.8	428.5	430.2	429.6	430.5	429.7	430.7	430.0	431.3	430.7	432.3	431.5
2975	3519	3489	Circular	42	54	2	3	3	3	4	426.9	426.8	429.7	429.7	430.6	430.6	432.1	432.1	433.5	433.5	434.1	434.1
2979	1910	1186	Circular	42	260	-8	-11	0	-19	-21	534.7	530.6	535.6	535.7	535.7	535.9	535.8	536.0	536.0	536.2	536.0	536.2
2980	2725	2735	Circular	42	106	24	24	27	32	32	457.6	457.7	465.8	465.8	467.7	467.6	468.8	468.7	469.7	469.7	470.7	470.7
2981	2735	2722	Circular	42	342	24	24	27	34	35	457.1	457.0	465.7	465.6	467.6	467.5	468.7	468.6	469.7	469.6	470.6	470.6
2982	2722	1446	Circular	42	406	24	24	28	37	37	457.0	456.4	465.5	465.4	467.4	467.3	468.6	468.5	469.6	469.6	470.6	470.6
2983	2748	1446	Circular	24	23	11	20	21	25	24	457.7	456.4	465.4	465.4	467.3	467.3	468.5	468.5	469.6	469.6	470.6	470.6
2984	2738	2748	Circular	24	90	8	12	13	14	12	457.5	457.8	465.6	465.6	467.4	467.4	468.6	468.6	469.7	469.7	470.6	470.6
2985	1446	1447	Circular	48	244	30	43	46	57	59	456.4	456.2	465.3	465.3	467.3	467.2	468.5	468.4	469.6	469.5	470.5	470.5
2986	1447	3708	Circular	48	147	31	44	47	58	59	456.2	455.6	465.2	465.2	467.2	467.2	468.4	468.4	469.5	469.5	470.5	470.5
2987	3708	3678	Circular	48	15	31	44	47	58	59	455.6	455.6	465.1	465.1	467.1	467.1	468.4	468.4	469.5	469.5	470.5	470.5
2988	3678	3714	Circular	48	432	62	67	71	74	76	455.6	455.2	464.4	463.6	466.2	465.3	467.4	466.4	468.8	467.7	469.7	468.5
2989	3714	3671	Circular	48	453	62	67	71	74	76	455.2	454.9	463.2	462.3	464.8	463.8	465.8	464.8	467.1	465.9	467.9	466.6
299	1053	1016	Circular	30	380	7	10	11	13	14	497.6	496.7	498.8	498.4	499.0	498.7	499.2	498.9	499.5	499.2	501.1	500.7
2990	3671	1699	Circular	48	449	64	71	75	79	82	454.9	454.7	461.9	461.0	463.3	462.2	464.2	463.0	465.2	463.8	465.9	464.4
2991	1699	1668	Circular	48	534	64	71	75	79	82	454.7	454.4	460.7	459.6	461.7	460.4	462.4	461.0	463.2	461.6	463.7	462.0
2992	1668	1678	Circular	48	25	64	71	75	79	82	454.4	454.3	459.2	459.2	459.9	459.8	460.4	460.3	460.9	460.8	461.3	461.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2993	1678	1619	Circular	48	358	64	71	75	79	82	454.3	454.1	458.8	458.1	459.4	458.5	459.7	458.8	460.1	459.0	460.4	459.3
2994	1619	1452	Circular	48	242	64	71	75	79	82	454.1	453.9	457.9	457.4	458.2	457.6	458.4	457.8	458.6	457.9	458.8	458.0
2995	1452	1096	Circular	48	235	64	71	75	79	82	453.9	453.7	456.7	456.1	456.9	456.2	457.0	456.3	457.1	456.3	457.2	456.4
2996	2786	3724	Circular	30	352	7	8	9	9	10	461.7	461.3	466.7	466.6	468.5	468.4	469.4	469.4	470.3	470.2	471.4	471.4
2997	3724	3717	Circular	30	336	7	8	9	10	11	461.3	460.9	466.5	466.4	468.4	468.3	469.3	469.3	470.2	470.1	471.3	471.2
2998	2769	2786	Circular	30	218	7	8	9	10	10	461.9	461.7	466.8	466.7	468.6	468.6	469.5	469.5	470.4	470.3	471.5	471.5
2999	1454	2769	Circular	24	472	7	9	10	11	12	463.0	462.1	467.3	466.8	469.2	468.7	470.2	469.6	471.1	470.4	472.1	471.6
30	366	3615	Circular	24	287	3	4	5	6	6	428.4	428.1	430.5	430.4	431.9	431.8	434.1	434.0	436.1	435.9	436.8	436.6
300	1051	2680	Circular	42	305	22	27	29	30	31	498.7	496.9	500.2	499.2	500.4	499.5	500.5	499.6	500.6	499.7	500.6	499.8
3000	3660	3546	Circular	42	509	22	23	25	31	31	458.3	457.9	466.1	466.0	468.0	467.9	469.0	468.9	469.9	469.9	471.0	470.9
3001	2405	3242	Circular	42	82	27	35	41	48	53	463.2	463.0	464.9	464.6	465.1	464.8	465.3	465.0	465.5	465.2	465.9	465.6
3002	1352	2405	Circular	42	58	26	34	40	46	51	462.3	463.2	465.5	465.4	465.8	465.8	466.1	466.0	466.4	466.3	466.7	466.5
3003	1351	1352	Circular	42	31	26	34	40	46	51	462.4	462.5	465.6	465.6	466.0	466.0	466.4	466.4	466.8	466.7	467.2	467.1
3004	3264	3715	Circular	36	512	9	12	14	17	19	464.5	463.2	465.8	465.8	466.5	466.4	467.2	467.0	468.0	467.7	468.7	468.3
3005	3715	3642	Circular	36	168	9	12	14	17	19	463.1	462.7	465.8	465.8	466.4	466.3	466.9	466.9	467.6	467.4	468.1	468.0
3006	3642	1351	Circular	36	52	10	13	16	19	21	462.4	462.4	465.7	465.7	466.3	466.2	466.7	466.7	467.3	467.2	467.8	467.7
3007	2739	1346	Circular	30	355	7	10	12	14	16	466.6	465.8	467.8	467.8	468.1	468.1	468.3	468.3	468.9	468.7	469.9	469.4
3008	1346	214	Circular	36	240	9	12	14	17	19	465.9	466.3	467.8	467.7	468.0	467.9	468.2	468.0	468.6	468.4	469.3	469.1
3009	214	3264	Circular	36	318	9	12	15	17	19	466.3	464.5	467.2	466.0	467.4	466.6	467.5	467.3	468.2	468.1	469.0	468.8
301	1052	1051	Circular	42	240	22	27	29	30	31	499.5	498.7	501.2	500.6	501.4	500.8	501.5	500.9	501.5	500.9	501.6	501.0
3015	853	2744	Circular	27	337	7	10	12	14	16	467.8	467.3	469.1	468.6	469.3	468.8	469.5	469.0	470.2	469.5	471.5	470.6
3016	2744	2739	Circular	30	238	7	10	12	14	16	467.3	466.6	468.4	468.0	468.6	468.2	468.8	468.4	469.3	469.0	470.4	470.1
302	1016	3897	Circular	30	240	12	15	18	21	23	496.7	495.9	498.1	497.6	498.4	497.8	498.6	498.0	498.8	498.2	500.3	499.6
3046	2959	2858	Circular	18	121	7	10	11	13	14	425.1	427.8	429.8	429.2	430.4	429.4	430.9	429.5	431.4	429.6	431.7	429.7
3047	2858	2877	Circular	30	238	1	2	3	4	5	427.7	428.9	429.2	429.1	429.4	429.3	429.5	429.4	429.6	429.5	429.7	429.6
3048	2858	2927	Circular	30	227	10	12	14	15	16	427.4	427.1	428.9	428.9	428.9	428.9	428.9	428.9	429.0	428.9	429.0	428.9
305	1015	1014	Circular	36	380	12	15	18	21	23	494.4	493.7	495.8	495.3	496.0	495.5	496.2	495.8	496.5	496.0	498.9	498.4
3053	2397	2390	Circular	72	187	21	29	35	41	45	464.0	463.0	469.6	469.6	469.7	469.7	469.8	469.8	469.9	469.9	470.0	470.0
3054	2417	2397	Circular	72	625	21	29	35	41	45	464.6	464.0	469.6	469.6	469.7	469.7	469.9	469.8	470.0	469.9	470.1	470.0
3057	3733	2417	Circular	72	410	17	23	28	33	37	465.1	464.6	469.6	469.6	469.8	469.8	469.9	469.9	470.0	470.0	470.1	470.1
306	3886	2398	Circular	48	220	12	13	13	14	14	495.5	495.4	497.0	496.8	497.1	496.9	497.1	496.9	497.1	497.0	497.1	497.0
3060	1146	283	Circular	36	136	16	22	27	31	35	430.2	424.1	430.9	425.3	431.0	425.6	431.1	425.7	431.2	425.9	431.3	426.0
3061	283	1422	Circular	36	127	16	22	27	31	35	424.1	416.8	424.7	417.4	424.8	417.6	424.9	417.6	425.0	417.7	425.0	417.8
3067	1714	3159	Cross section		984	63	67	69	70	71	446.0	447.6	458.2	456.9	460.5	459.1	462.0	460.4	463.2	461.8	464.3	462.7
307	2676	1601	Circular	48	382	26	32	34	36	37	496.4	496.1	498.7	498.4	499.0	498.6	499.1	498.7	499.2	498.8	499.3	498.9
3071	291	1234	Circular	54	450	87	122	136	139	141	529.1	526.5	531.8	530.1	535.6	533.9	538.2	536.0	539.1	536.9	539.6	537.4
3075	1433	2230	Circular	24	200	14	18	20	23	25	550.5	547.4	552.9	552.2	556.0	554.9	557.7	556.4	559.9	558.4	561.8	560.1
3077	1601	3886	Circular	48	70	26	32	34	36	37	496.2	495.4	497.5	497.0	497.6	497.1	497.6	497.1	497.7	497.1	497.7	497.1
3082	1127	1134	Circular	24	118	10	14	18	22	24	790.0	777.2	790.5	778.5	790.6	778.9	790.7	779.2	790.8	779.5	790.8	779.8
3085	3546	2725	Circular	42	312	24	24	26	32	32	457.8	457.6	466.0	465.9	467.8	467.8	468.9	468.8	469.8	469.8	470.8	470.7
3087	3677	3660	Circular	36	368	7	8	9	13	14	459.0	458.5	466.2	466.2	468.0	468.0	469.1	469.0	470.0	469.9	471.0	471.0
3088	3735	3677	Circular	36	352	7	8	9	13	14	459.6	459.0	466.2	466.2	468.1	468.1	469.1	469.1	470.0	470.0	471.1	471.0
3089	1453	3735	Circular	36	369	7	8	9	12	13	460.1	459.6	466.3	466.3	468.2	468.1	469.2	469.1	470.0	470.0	471.1	471.1
3090	3717	1453	Circular	30	193	7	8	9	11	12	460.9	460.1	466.4	466.3	468.2	468.2	469.2	469.2	470.1	470.0	471.2	471.1
31	2123	1231	Circular	24	7	20	26	32	38	38	543.2	542.3	548.8	548.6	550.8	550.4	552.2	551.6	553.9	553.1	555.2	554.3
310	2243	1124	Circular	24	555	7	10	11	13	14	508.3	507.3	509.6	508.6	509.9	508.8	510.4	509.0	511.0	509.2	511.6	509.4
3100	235	3334	Circular	42	75	8	12	14	16	18	463.1	464.4	469.1	469.1	469.3	469.3	469.4	469.4	469.6	469.6	469.7	469.7
3101	3197	3100	Circular	30	69	2	3	4	5	5	471.0	470.7	471.5	471.3	471.7	471.5	471.8	471.6	471.9	471.8	472.0	471.9
3102	3100	128	Circular	36	246	2	3	4	5	5	470.6	470.1	471.3	471.2	471.4	471.4	471.6	471.6	471.7	471.7	471.8	471.9
3103	128	1401	Circular	36	113	6	8	10	11	13	470.1	469.8	471.1	470.9	471.3	471.1	471.4	471.2	471.5	471.4	471.6	471.5
3104	1401	688	Circular	36	83	6	8	10	11	13	469.8	469.6	470.6	470.4	470.8	470.6	470.9	470.7	471.1	470.9	471.1	470.9
3105	688	1402	Circular	42	76	6	8	10	11	13	469.4	469.1	470.2	470.1	470.4	470.3	470.6	470.5	470.7	470.6	470.8	470.7
3106	1402	1445	Circular	48	202	6	8	10	11	13	469.1	468.6	470.0	469.8	470.2	470.1	470.4	470.2	470.5	470.4	470.6	470.6
3107	1445	1449	Circular	48	71	6	8	10	11	13	468.6	468.4	469.8	469.8	470.0	470.0	470.1	470.2	470.3	470.3	470.5	470.5
311	1125	2478	Circular	27	400	22	27	29	30	31	510.0	507.9	512.3	510.2	513.6	510.5	514.1	510.6	514.5	510.7	514.8	510.7
3117	2085	2942	Circular	54	364	29	40	48	58	66	462.6	463.1	465.7	465.5	466.2	466.0	466.6	466.3	467.0	466.7	467.4	467.0
3118	2942	2333	Circular	54	35	29	40	48	58	66	463.3	462.8	465.3	465.3	465.8	465.8	466.1	466.1	466.5	466.4	466.8	466.8
312	1823	1128	Circular	27	390	16	19	22	23	24	513.3	511.9	516.5	515.5	519.8	518.4	520.8	519.3	521.5	520.1	522.0	520.5
313	1855	1856	Circular	24	40	16	19	22	22	23	514.7	514.3	517.3	517.1	521.0	520.8	522.2	521.9	523.1	522.8	523.7	523.3

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
314	2389	1069	Circular	27	480	7	10	11	13	14	506.4	505.5	507.6	506.8	507.8	507.0	508.0	507.2	508.2	507.3	508.5	507.5
3149	2102	3097	Circular	24	198	7	9	10	11	12	435.5	434.8	437.2	437.0	440.8	440.5	441.9	441.6	442.7	442.3	443.3	443.0
315	1123	1070	Circular	42	345	22	27	29	30	31	507.2	506.2	508.9	508.3	509.1	508.5	509.2	508.6	509.2	508.7	509.3	508.8
3150	3097	1730	Circular	24	89	7	8	9	10	10	434.8	434.4	437.0	436.9	440.4	440.3	441.4	441.3	442.2	442.1	442.9	442.7
3151	1730	1723	Circular	24	38	7	8	11	12	11	434.4	434.0	436.8	436.7	440.1	440.1	441.1	441.1	441.9	441.8	442.5	442.5
3156	2925	2891	Circular	24	118	8	11	13	15	17	426.2	426.1	427.8	427.7	429.3	429.1	430.9	430.5	432.6	432.1	434.5	433.9
316	1069	1063	Circular	27	480	7	10	11	13	14	505.5	504.3	506.6	505.5	506.8	505.7	506.9	505.9	507.1	506.0	507.2	506.1
317	1070	1068	Circular	42	270	22	27	29	30	31	506.2	505.7	508.1	507.7	508.4	508.0	508.5	508.1	508.5	508.2	508.6	508.2
3174	3347	3663	Circular	27	57	14	16	18	20	21	449.1	448.5	457.8	457.7	459.7	459.6	461.9	461.7	464.4	464.2	466.5	466.3
3175	3663	3686	Circular	18	17	13	14	16	17	19	449.6	449.6	455.7	455.2	457.2	456.6	458.9	458.1	460.8	459.9	462.4	461.4
3178	1461	1462	Circular	27	320	13	17	20	23	25	451.2	450.8	459.9	459.4	462.4	461.6	465.1	464.3	468.3	467.4	471.1	470.0
318	1063	1061	Circular	30	525	7	9	11	13	14	504.3	502.7	505.3	504.0	505.4	504.2	505.5	504.3	505.7	504.4	505.7	504.6
319	2105	2127	Circular	24	68	16	22	26	27	29	523.2	519.7	524.2	522.8	528.0	527.4	530.3	529.5	532.0	531.2	533.4	532.6
3191	1488	3733	Circular	72	722	17	23	28	33	37	465.5	465.1	469.6	469.6	469.8	469.8	469.9	469.9	470.1	470.0	470.2	470.1
3199	2764	1488	Circular	72	523	17	23	28	33	37	466.2	465.7	469.6	469.6	469.8	469.8	470.0	469.9	470.1	470.1	470.2	470.2
320	2159	2111	Circular	24	246	12	17	21	24	26	574.0	554.6	574.6	555.2	574.7	555.4	574.8	555.4	574.9	555.5	574.9	555.5
3200	2071	2764	Circular	72	408	13	18	22	26	29	467.3	466.2	469.6	469.6	469.8	469.8	470.0	470.0	470.1	470.1	470.3	470.3
3201	2369	2071	Circular	72	87	13	18	21	25	28	467.5	467.4	469.7	469.7	469.8	469.8	470.0	470.0	470.2	470.2	470.3	470.3
3202	2393	2369	Circular	54	120	7	10	12	14	16	467.8	467.6	469.7	469.7	469.9	469.9	470.1	470.1	470.2	470.2	470.4	470.4
3203	1486	2393	Circular	54	644	7	10	12	14	16	468.3	467.8	469.7	469.7	469.9	469.9	470.1	470.1	470.3	470.2	470.4	470.4
3204	1469	1486	Circular	54	300	7	10	12	14	16	468.8	468.3	469.9	469.7	470.1	469.9	470.3	470.2	470.4	470.3	470.6	470.5
3205	1468	1469	Circular	24	60	3	4	5	6	7	470.0	469.7	470.6	470.3	470.7	470.4	470.8	470.5	470.9	470.6	470.9	470.7
3209	1449	2369	Circular	48	51	6	8	10	11	13	468.4	468.2	469.7	469.7	469.9	469.9	470.1	470.1	470.2	470.2	470.4	470.4
321	2150	2159	Circular	24	77	12	17	21	24	26	579.5	574.5	580.1	575.2	580.2	575.4	580.3	575.6	580.4	575.7	580.5	575.8
3212	894	893	Circular	24	218	2	2	3	3	4	471.6	471.1	472.3	472.1	472.4	472.2	472.5	472.4	472.6	472.5	472.7	472.6
3213	893	1380	Circular	24	292	3	4	5	6	7	471.1	470.6	471.9	471.5	472.1	471.7	472.2	471.8	472.4	471.9	472.5	472.0
3214	1380	1468	Circular	24	249	3	4	5	6	7	470.6	470.0	471.4	470.8	471.5	471.0	471.6	471.1	471.7	471.2	471.8	471.3
3242	3123	3092	Circular	24	339	6	9	11	13	15	463.8	462.9	465.1	465.0	466.0	465.5	466.7	465.9	467.5	466.4	468.2	466.8
3245	3092	2336	Circular	36	249	6	9	11	13	15	462.8	462.6	464.9	464.9	465.5	465.5	465.9	465.8	466.3	466.2	466.7	466.6
3246	2345	1683	Circular	36	57	5	9	11	13	15	462.5	462.2	464.9	464.9	465.4	465.4	465.7	465.7	466.1	466.1	466.4	466.4
3247	2336	2345	Circular	36	138	6	9	11	13	15	462.6	462.6	464.9	464.9	465.5	465.4	465.8	465.8	466.2	466.1	466.5	466.4
3251	1442	1441	Circular	24	231	2	3	4	5	5	476.3	474.6	476.8	475.4	476.9	475.5	477.0	475.6	477.0	475.7	477.1	475.8
3252	1441	1437	Circular	24	156	2	3	4	5	5	474.6	473.0	475.0	473.8	475.1	473.9	475.2	474.0	475.3	474.1	475.3	474.2
3253	1437	1664	Circular	30	240	2	3	4	5	5	473.0	472.0	473.5	472.8	473.6	473.0	473.7	473.1	473.8	473.2	473.9	473.3
3290	3886	3933	Circular	48	35	19	20	22	24	25	495.2	494.3	496.3	496.0	496.5	496.3	496.6	496.5	496.7	496.6	496.8	496.7
3291	3933	3887	Circular	48	40	19	20	22	24	25	494.3	494.2	496.0	495.9	496.3	496.2	496.4	496.4	496.5	496.5	496.6	496.6
3292	3887	3922	Circular	48	450	15	20	22	24	25	494.2	493.7	495.8	495.5	496.1	495.8	496.3	496.0	496.4	496.1	496.5	496.2
3293	3922	2894	Circular	48	810	15	20	22	24	25	493.7	492.8	495.4	495.1	495.8	495.5	495.9	495.6	496.0	495.7	496.2	495.9
3294	2894	3917	Circular	60	350	25	34	38	40	44	492.8	491.8	494.9	494.9	495.3	495.3	495.4	495.4	495.5	495.5	495.6	495.6
3295	3917	3907	Circular	60	250	25	34	38	40	44	491.8	492.2	494.9	494.8	495.2	495.1	495.4	495.3	495.5	495.3	495.6	495.5
3296	3426	2503	Circular	36	189	11	16	18	20	20	498.8	498.3	506.1	506.0	506.7	506.7	507.7	507.6	508.5	508.4	509.2	509.1
33	2247	2220	Circular	24	246	20	30	37	42	44	578.1	567.9	579.0	569.5	579.3	570.0	579.5	570.4	582.9	574.7	584.9	576.0
3300	2216	2201	Circular	36	208	1	2	3	3	3	560.0	554.3	560.2	554.8	560.3	554.9	560.3	555.0	560.4	555.0	560.4	555.1
3301	2201	2197	Circular	36	60	1	2	3	3	3	554.3	552.6	554.5	553.1	554.6	553.3	554.6	553.4	554.7	553.4	554.7	553.5
3302	2197	2221	Circular	36	88	1	2	3	3	3	552.6	550.3	552.8	551.2	552.9	551.5	553.0	551.8	553.0	551.9	553.0	552.0
3303	2221	2188	Circular	36	24	1	2	3	3	4	550.3	549.7	551.1	551.2	551.5	551.5	551.8	551.8	551.9	551.9	552.0	552.0
3304	2188	200	Circular	42	224	17	25	31	35	36	549.7	540.7	550.4	543.4	550.6	544.1	550.7	544.9	550.8	545.4	550.9	545.8
3305	2862	3449	Circular	24	55	17	25	31	35	36	562.0	561.7	564.0	563.7	565.5	564.9	567.0	566.0	567.9	566.6	568.4	567.0
3311	2481	2484	Circular	24	218	3	5	6	7	8	505.6	504.7	507.1	507.0	507.1	507.1	507.1	507.1	507.4	507.2	507.5	507.2
3312	2538	2240	Circular	24	209	1	1	1	1	2	509.0	508.4	509.4	509.1	509.5	509.3	509.6	509.5	509.6	509.6	509.7	509.7
3313	2240	2795	Circular	24	100	2	3	4	5	5	508.3	507.8	508.9	508.7	509.1	508.9	509.2	509.1	509.4	509.2	509.5	509.4
3314	2795	2765	Circular	24	175	3	5	6	7	8	507.7	507.0	508.4	508.0	508.6	508.2	508.8	508.4	508.9	508.6	509.1	508.7
3315	2765	2219	Circular	24	60	3	5	6	7	8	507.0	506.9	507.9	507.8	508.1	508.0	508.2	508.1	508.4	508.3	508.5	508.5
3318	2219	2761	Circular	24	229	3	5	6	7	8	506.9	505.8	507.6	507.1	507.8	507.2	507.9	507.4	508.1	507.7	508.3	507.8
3319	2761	2481	Circular	24	10	3	5	6	7	8	505.8	505.7	507.1	507.1	507.1	507.1	507.2	507.2	507.5	507.5	507.7	507.6
3321	2785	2446	Circular	24	18	1	2	2	2	3	504.9	504.9	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.0
3322	2156	2785	Circular	24	202	1	2	2	2	3	505.6	504.9	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.1	507.1	507.1
3323	2487	2156	Circular	24	60	1	2	2	2	3	505.9	505.6	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.1	507.1	507.1
3324	2498	2487	Circular	24	141	1	2	2	2	3	506.5	505.9	507.0	507.0	507.0	507.0	507.0	507.1	507.1	507.1	507.1	507.1

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3325	2260	2498	Circular	24	60	1	2	2	2	3	506.7	506.5	507.2	507.1	507.3	507.1	507.3	507.2	507.4	507.3	507.5	507.3
3326	2191	2260	Circular	24	50	1	2	2	2	3	507.1	506.9	507.5	507.3	507.6	507.4	507.6	507.5	507.7	507.6	507.7	507.6
3327	2231	2191	Circular	24	200	1	2	2	2	3	507.8	507.1	508.2	507.6	508.3	507.7	508.4	507.8	508.4	507.9	508.5	507.9
3337	3129	2619	Circular	24	234	0	0	0	-1	-1	442.9	442.9	444.2	444.2	447.3	447.3	448.8	448.8	449.7	449.7	450.2	450.2
3338	2619	3110	Circular	24	22	0	0	0	-2	-2	442.9	441.9	444.2	444.2	447.3	447.3	448.8	448.8	449.7	449.7	450.2	450.2
334	1091	2125	Circular	36	365	5	8	9	11	13	759.9	758.1	760.6	758.8	760.7	758.9	760.8	759.0	760.9	759.1	761.0	759.1
3367	1213	2609	Circular	24	211	3	4	4	5	5	457.5	455.7	458.3	458.1	458.7	458.8	459.2	459.2	459.6	459.5	460.0	459.9
3380	2776	2775	Circular	66	142	84	111	133	152	170	427.6	427.0	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.9	445.8
3382	3807	3820	Circular	60	42	17	17	17	17	18	432.6	432.3	435.0	435.0	435.3	435.3	435.4	435.4	435.5	435.5	435.6	435.6
3384	741	3902	Circular	24	465	15	20	24	28	31	463.2	462.3	474.3	472.4	477.6	474.5	480.7	476.8	484.7	479.3	487.9	481.6
3385	2609	2540	Circular	24	25	5	7	8	9	10	455.4	455.1	458.0	458.0	458.7	458.7	459.1	459.0	459.4	459.4	459.7	459.7
3388	2490	2509	Rectangular		83	131	172	198	221	238	436.3	436.7	440.4	440.3	440.9	440.8	441.2	441.1	441.5	441.3	441.7	441.5
3389	2490	2509	Rectangular		83	125	169	196	219	236	436.4	436.7	440.4	440.3	440.9	440.8	441.2	441.1	441.5	441.3	441.7	441.5
3390	2870	2861	Circular	96	334	27	31	34	37	39	447.4	448.2	451.4	451.3	451.6	451.5	451.7	451.7	451.9	451.8	452.0	451.9
3391	2870	2861	Circular	96	334	27	31	34	37	39	447.4	448.2	451.4	451.3	451.6	451.5	451.7	451.7	451.9	451.8	452.0	451.9
3392	2870	2861	Circular	96	334	27	31	34	37	39	447.4	448.2	451.4	451.3	451.6	451.5	451.7	451.7	451.9	451.8	452.0	451.9
3393	3348	3379	Circular	30	66	20	26	28	30	31	432.1	431.9	434.3	434.3	434.8	434.5	434.9	434.6	435.1	434.7	435.2	434.8
34	2211	2189	Circular	24	80	12	18	23	28	32	637.5	613.2	638.0	614.3	638.1	614.6	638.1	614.8	638.2	615.0	638.2	615.2
3404	3454	3439	Circular	18	90	1	3	5	-9	-9	465.5	464.8	465.7	465.0	466.0	465.3	466.6	466.7	467.6	467.9	468.2	468.6
3405	237	318	Circular	36	13	13	18	21	26	30	462.8	462.8	465.9	465.9	466.5	466.4	466.8	466.8	467.3	467.3	467.8	467.7
3410	2621	2536	Circular	30	63	16	22	26	31	34	464.7	464.7	466.2	466.0	466.5	466.3	466.7	466.4	466.9	466.5	467.1	466.6
3411	2621	2536	Circular	30	63	6	11	14	18	22	465.5	465.2	466.3	466.0	466.6	466.3	466.8	466.5	467.0	466.7	467.1	466.8
3412	2617	2614	Circular	30	68	15	20	24	28	30	465.1	466.4	467.8	467.7	468.1	467.9	468.3	468.0	468.5	468.2	468.6	468.2
3413	2617	2614	Circular	30	68	7	12	17	21	25	466.5	466.7	467.7	467.6	468.0	467.8	468.2	468.0	468.4	468.2	468.6	468.3
3414	2607	2601	Circular	30	28	11	17	21	25	29	468.6	468.5	469.7	469.6	470.0	469.8	470.2	470.0	470.3	470.2	470.5	470.3
342	950	951	Circular	54	148	47	58	60	63	67	486.0	485.7	490.5	490.4	493.2	493.1	494.3	494.1	495.1	495.0	495.7	495.5
3420	2995	2987	Circular	36	100	5	6	8	13	14	467.8	474.2	475.0	474.9	475.1	475.0	475.2	475.1	475.2	475.2	475.3	475.2
3421	3014	3025	Circular	30	35	5	6	8	9	10	478.1	477.8	478.7	478.5	478.8	478.6	478.9	478.6	478.9	478.7	479.0	478.7
3426	2581	2582	Circular	42	355	8	12	14	16	18	466.2	465.4	469.0	469.0	469.1	469.1	469.2	469.2	469.3	469.2	469.3	469.3
3428	2975	3174	Circular	84	30	48	64	78	91	98	471.9	471.9	473.8	473.7	474.0	474.0	474.2	474.2	474.4	474.3	474.5	474.4
343	951	949	Circular	54	289	47	58	60	63	67	485.7	485.6	490.4	490.2	492.9	492.7	493.9	493.7	494.8	494.6	495.4	495.1
3438	2963	2962	Circular	30	32	14	20	24	27	29	535.9	535.1	536.9	536.5	537.1	536.8	537.3	537.0	537.4	537.1	537.5	537.2
3439	2963	2962	Circular	30	32	14	20	24	27	29	535.9	535.1	536.9	536.5	537.1	536.8	537.3	537.0	537.4	537.1	537.5	537.2
344	948	2641	Circular	54	90	59	74	78	80	80	484.9	484.8	489.5	489.4	491.3	491.2	492.2	492.1	493.0	492.9	493.5	493.4
3443	3411	3436	Circular	18	15	0	0	1	3	4	508.1	508.0	508.2	508.1	508.2	508.1	508.6	508.5	508.8	508.7	509.1	509.1
3444	2220	2594	Circular	24	132	20	30	37	42	42	567.8	559.6	568.7	561.3	568.9	561.9	569.1	562.6	571.6	567.4	572.8	568.5
3445	2594	2123	Circular	24	230	20	30	37	42	42	559.5	543.1	560.4	549.7	560.7	552.3	561.1	554.4	564.3	557.1	565.5	558.4
3448	2446	2569	Circular	24	15	1	2	2	2	3	504.6	504.6	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
3449	3269	3297	Circular	42	183	5	8	10	12	13	503.6	503.2	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
3450	2484	3349	Circular	24	35	3	5	6	7	8	504.6	504.3	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.0	507.1	507.0
3451	3470	3381	Circular	18	30	5	10	17	27	36	517.7	516.8	518.4	518.2	519.0	518.6	520.0	519.0	522.3	519.5	524.6	519.8
3452	3470	3381	Circular	18	30	5	10	17	27	36	517.7	516.9	518.5	518.2	518.9	518.6	520.0	519.0	522.3	519.5	524.6	519.8
3453	3470	3381	Circular	18	30	5	10	17	27	36	517.6	516.8	518.4	518.2	519.0	518.6	520.0	519.0	522.2	519.5	524.6	519.8
3463	3127	3128	Circular	24	299	3	5	6	7	8	471.3	470.5	472.0	471.3	472.2	471.6	472.3	471.7	472.5	471.8	472.6	471.9
3464	3128	3126	Circular	30	186	3	5	6	7	8	470.5	469.7	471.1	470.5	471.3	470.7	471.4	470.9	471.5	471.0	471.6	471.1
3465	3126	3193	Circular	30	284	3	5	6	7	8	469.7	469.1	470.4	469.9	470.5	470.1	470.7	470.2	470.8	470.4	470.9	470.5
3466	3193	3166	Circular	30	326	3	5	6	7	8	469.1	468.4	469.7	469.2	469.9	469.4	470.0	469.6	470.2	469.7	470.3	469.8
3467	3166	3209	Circular	42	70	3	5	6	7	8	468.3	467.9	468.8	468.3	468.9	468.5	469.0	468.5	469.0	468.6	469.1	468.6
3469	2947	2965	Circular	30	20	14	23	30	37	42	546.6	545.8	547.5	546.7	547.7	547.0	547.9	547.1	548.1	547.3	548.2	547.5
3470	2947	2965	Circular	30	20	18	27	33	39	44	546.2	545.6	547.3	546.7	547.5	546.9	547.7	547.1	547.9	547.3	548.1	547.4
3480	3317	3337	Circular	42	183	55	62	68	73	77	430.6	429.3	432.7	431.6	432.9	431.8	433.1	431.9	433.2	432.1	433.3	432.2
3487	4012	2945	Circular	42	43	34	40	44	47	51	436.3	436.2	441.4	441.4	443.1	443.0	444.1	444.1	444.9	444.8	445.5	445.5
3488	2945	3043	Circular	42	5	42	48	52	55	57	436.2	436.2	441.1	441.0	442.6	442.5	443.5	443.4	444.2	444.1	444.8	444.7
3489	3043	4018	Circular	42	18	42	48	52	55	57	436.2	436.2	440.8	440.7	442.1	442.0	443.0	442.9	443.6	443.5	444.2	444.1
3490	3221	575	Circular	36	136	2	4	4	7	8	444.0	443.0	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3491	575	577	Circular	36	487	2	4	4	8	8	443.0	443.6	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3492	1716	3105	Circular	50	444	71	75	78	82	84	441.1	439.2	446.2	445.4	447.3	446.4	447.9	447.1	448.5	447.7	449.0	448.1
3493	3105	3838	Circular	50	248	77	82	85	88	90	439.2	438.3	445.0	444.4	445.9	445.3	446.5	445.8	447.0	446.3	447.5	446.7
3494	204	2845	Rectangular		122	226	302	351	391	421	447.3	446.7	454.9	454.9	456.1	456.1	456.9	456.9	457.6	457.5	458.1	458.0

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3495	2845	3290	Rectangular		38	230	307	355	396	427	446.7	446.6	454.9	454.9	456.0	456.0	456.8	456.7	457.4	457.3	457.8	457.8
3496	760	2835	Circular	36	49	13	15	16	16	17	459.0	458.2	460.3	460.2	462.8	462.8	464.6	464.6	465.4	465.4	465.9	465.9
3497	2835	3729	Circular	36	46	13	14	14	16	13	458.2	458.2	460.2	460.2	462.8	462.8	464.5	464.5	465.3	465.3	465.9	465.9
3498	3693	3116	Circular	42	191	18	24	28	32	37	454.9	454.7	458.4	458.3	460.2	460.1	461.4	461.2	462.1	462.0	462.7	462.6
3499	3116	3157	Circular	42	307	18	24	28	32	37	454.7	454.4	458.3	458.2	460.0	459.9	461.1	460.9	461.9	461.7	462.5	462.3
35	2146	2211	Circular	24	302	12	18	23	28	32	680.8	637.5	681.3	638.4	681.4	638.6	681.5	638.7	681.6	638.8	681.7	638.9
3501	902	901	Circular	48	185	14	19	22	26	29	471.9	471.4	474.9	474.9	475.5	475.5	476.1	476.0	476.6	476.6	477.3	477.2
3502	901	899	Circular	48	124	14	19	22	26	29	471.4	471.3	474.8	474.8	475.5	475.5	476.0	476.0	476.5	476.5	477.1	477.1
3503	3777	955	Circular	60	225	5	7	9	11	12	422.9	422.6	423.8	423.6	423.9	423.7	424.0	423.9	424.2	424.0	424.3	424.1
3504	955	3773	Circular	60	58	5	7	9	11	12	422.6	422.5	423.5	423.4	423.7	423.6	423.8	423.8	423.9	423.9	424.0	424.0
3505	1182	1232	Circular	54	336	24	37	43	50	57	519.5	519.0	521.5	521.3	521.8	521.5	522.0	521.6	522.2	521.8	522.4	521.9
3506	1232	1223	Circular	54	4	26	45	47	53	59	519.0	518.1	520.1	519.8	520.6	520.3	520.8	520.6	521.1	521.0	521.4	521.3
3507	1664	1439	Circular	30	224	2	3	4	5	5	472.0	472.0	472.8	472.7	473.0	472.8	473.1	472.9	473.2	473.0	473.2	473.1
3508	1439	3197	Circular	30	202	2	3	4	5	5	472.0	471.0	472.5	471.7	472.6	471.8	472.7	471.9	472.7	472.0	472.8	472.1
351	1774	980	Circular	42	220	26	35	42	41	47	493.4	492.9	496.1	496.1	503.3	503.1	504.5	504.3	505.2	505.0	505.7	505.6
3511	3593	3429	Circular	60	102	29	39	48	57	64	508.3	507.9	510.8	510.8	511.2	511.2	511.4	511.4	511.6	511.6	511.8	511.8
3512	2880	3694	Circular	48	124	22	29	33	36	39	416.9	416.6	420.6	420.6	421.0	420.9	421.2	421.1	421.4	421.3	421.5	421.4
3513	3694	3178	Circular	48	20	22	29	33	36	39	416.6	416.8	420.6	420.6	420.9	420.9	421.0	421.0	421.2	421.2	421.3	421.3
3514	1710	3684	Rectangular		1185	2	4	3	3	4	446.1	445.7	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3515	3684	576	Rectangular		54	2	4	4	3	5	445.7	444.4	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3516	4041	3824	Circular	42	40	11	18	31	32	40	496.2	496.0	498.5	498.5	506.2	506.1	507.2	507.2	508.0	507.9	508.5	508.5
3517	3824	3873	Circular	42	16	11	18	31	33	40	496.0	495.9	498.5	498.5	506.1	506.1	507.2	507.2	507.9	507.9	508.5	508.5
3518	3897	3927	Circular	36	10	12	15	18	21	23	495.9	495.9	497.4	497.4	497.6	497.6	497.8	497.8	498.0	497.9	499.5	499.5
3519	3927	1015	Circular	36	288	12	15	18	21	23	495.9	494.5	497.0	495.9	497.2	496.2	497.3	496.4	497.5	496.6	499.3	499.0
352	980	979	Circular	42	410	39	48	51	53	54	492.9	491.9	495.9	495.3	502.7	501.8	503.9	503.0	504.6	503.7	505.1	504.2
3524	3250	1405	Circular	24	321	2	3	4	4	5	473.6	473.1	474.2	473.9	474.4	474.0	474.5	474.1	474.6	474.2	474.7	474.3
3527	1277	1086	Circular	36	90	28	35	39	42	44	427.1	425.8	428.3	427.0	428.5	427.1	428.6	427.2	428.6	427.3	428.7	427.3
3528	1302	3926	Circular	24	142	14	20	25	30	34	467.0	465.9	468.2	467.1	468.6	467.5	469.3	467.5	470.0	467.6	470.8	467.7
3529	1941	3926	Circular	48	30	0	0	0	0	0	464.8	465.9	467.0	467.0	467.3	467.3	467.4	467.4	467.6	467.6	467.7	467.7
353	855	2103	Circular	42	93	38	48	51	53	54	491.2	490.6	494.3	494.1	499.8	499.6	500.9	500.7	501.7	501.5	502.2	502.0
3530	3926	1905	Circular	48	43	14	20	25	30	34	465.9	463.6	466.5	464.2	466.6	464.4	466.7	464.6	466.7	464.7	466.8	464.8
3533	1891	3010	Circular	42	60	28	40	49	55	58	540.5	539.8	541.7	541.0	541.9	541.2	542.1	541.4	542.2	541.5	542.3	541.6
354	724	732	Circular	48	560	48	58	60	63	64	488.3	488.9	492.4	491.7	496.6	495.7	497.8	496.8	498.6	497.7	499.1	498.2
3545	2615	4108	Circular	42	190	10	14	17	20	22	491.5	490.2	492.3	491.1	492.5	491.2	492.6	491.3	492.7	491.4	492.7	491.5
355	952	2340	Circular	54	90	47	58	60	63	65	486.7	486.4	491.3	491.2	494.6	494.5	495.7	495.6	496.5	496.5	497.0	497.0
3550	4032	4033	Circular	24	106	1	2	2	2	3	435.0	434.3	435.3	434.8	435.4	434.9	435.5	434.9	435.5	435.0	435.5	435.0
3551	4033	499	Circular	24	88	1	2	2	2	3	434.2	433.4	434.5	433.9	434.6	434.1	434.7	434.1	434.7	434.2	434.7	434.2
3552	4031	4032	Circular	24	261	1	2	2	2	3	436.2	435.2	436.6	435.6	436.6	435.7	436.7	435.8	436.7	435.9	436.8	436.0
3554	2630	4031	Circular	24	278	1	2	2	2	3	438.3	436.9	438.6	437.3	438.7	437.3	438.8	437.4	438.8	437.4	438.8	437.5
3556	3201	2880	Circular	48	18	22	29	33	36	39	416.9	416.9	420.6	420.6	421.0	421.0	421.3	421.2	421.5	421.4	421.6	421.6
3559	3376	3666	Circular	36	161	10	14	16	19	21	427.5	427.5	429.1	429.0	429.5	429.4	429.8	429.7	430.5	430.3	431.2	431.1
356	2340	2167	Circular	54	81	47	58	60	63	66	486.4	486.3	491.0	491.0	494.1	494.0	495.2	495.1	496.1	496.0	496.6	496.5
3560	3666	1984	Circular	36	273	10	14	16	19	21	427.5	426.5	428.9	428.6	429.2	429.0	429.6	429.4	430.3	430.0	430.9	430.7
3562	3744	3308	Circular	30	289	7	8	10	10	10	462.3	461.7	463.4	463.1	464.8	464.7	466.8	466.6	467.6	467.5	468.2	468.1
3563	745	3744	Circular	30	220	7	8	10	10	10	462.3	462.3	463.7	463.6	464.9	464.8	466.9	466.8	467.8	467.7	468.4	468.3
3564	3902	1211	Rectangular		165	15	20	24	26	27	462.1	461.8	472.4	472.3	474.4	474.3	476.7	476.6	479.2	479.1	481.5	481.3
3567	2847	287	Circular	42	197	6	9	10	12	14	442.0	441.6	443.0	442.7	443.2	442.9	443.3	443.1	443.4	443.2	443.5	443.3
357	2167	950	Circular	54	270	47	58	60	63	67	486.3	486.0	490.7	490.6	493.6	493.4	494.7	494.5	495.6	495.3	496.1	495.9
3571	1208	1213	Circular	24	68	3	3	4	5	5	457.9	457.9	458.6	458.5	458.8	458.8	459.2	459.2	459.7	459.7	460.1	460.0
3572	3395	3261	Circular	42	176	29	38	44	51	56	499.0	496.4	500.6	499.8	501.2	500.7	502.6	502.2	504.8	504.4	506.6	506.0
3573	3261	3068	Circular	42	30	29	38	44	51	56	496.4	496.4	499.7	499.7	500.6	500.5	501.9	501.8	503.9	503.8	505.4	505.3
3574	2653	3426	Circular	36	122	11	16	18	20	20	499.2	499.7	506.2	506.2	507.0	506.9	508.0	507.9	508.8	508.7	509.4	509.3
3584	3998	4003	Circular	36	31	18	22	23	24	25	462.6	462.2	466.1	466.1	466.8	466.8	467.3	467.2	467.7	467.6	468.0	467.9
3585	3999	4003	Circular	36	37	18	22	23	24	25	462.7	462.0	466.1	466.1	466.9	466.8	467.3	467.2	467.7	467.6	468.0	467.9
3604	1656	2261	Circular	48	27	35	44	46	45	45	437.8	437.4	442.0	442.0	443.7	443.7	445.0	444.9	445.7	445.7	446.4	446.4
3605	2261	Node_11	Circular	48	48	35	44	46	45	45	437.4	437.8	441.9	441.9	443.6	443.6	444.8	444.7	445.5	445.5	446.2	446.2
3606	3039	3096	Circular	24	107	2	3	3	3	4	418.7	418.0	421.2	421.2	422.0	422.0	422.6	422.6	423.1	423.1	423.5	423.5
3607	1584	106	Circular	60	307	34	42	49	55	59	423.1	423.4	426.2	426.0	426.4	426.3	426.7	426.5	426.9	426.7	427.0	426.8
3608	119	106	Circular	42	572	-1	-1	0	-1	-1	424.6	423.4	426.0	426.0	426.3	426.3	426.5	426.5	426.7	426.7	426.8	426.8

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
363	2489	1517	Circular	36	64	11	15	17	19	19	497.9	497.5	505.9	505.9	506.5	506.4	507.4	507.4	508.1	508.1	508.7	508.7
3632	2950	4037	Circular	42	259	11	12	12	15	15	425.3	424.8	426.5	426.0	426.5	426.0	426.5	426.0	426.6	426.0	426.6	426.0
3633	2950	4010	Circular	42	260	-25	-25	0	-25	-25	425.4	424.8	427.0	427.0	427.0	427.0	427.0	427.0	427.1	427.0	427.1	427.0
3634	3941	3940	Circular	36	56	7	10	12	14	16	425.8	425.8	427.5	427.5	427.7	427.7	427.8	427.8	427.9	427.9	428.0	428.0
3635	2111	2105	Circular	24	235	16	22	27	31	33	553.4	523.2	554.0	525.2	554.1	528.9	554.2	531.6	554.3	533.2	554.4	534.7
3637	2249	4008	Circular	27	85	6	8	10	10	11	448.1	447.4	454.8	454.8	455.9	455.9	456.6	456.5	457.1	457.0	457.5	457.4
3638	2626	4008	Rectangular		166	229	306	355	395	426	446.1	446.1	454.8	454.8	455.9	455.9	456.6	456.5	457.1	457.0	457.5	457.4
3639	4000	2967	Circular	60	43	19	25	31	36	40	430.2	429.4	430.9	430.2	431.1	430.3	431.2	430.4	431.2	430.5	431.3	430.6
364	3873	3908	Circular	42	50	11	18	31	33	40	495.9	495.4	498.5	498.5	506.1	506.1	507.1	507.1	507.9	507.9	508.4	508.4
3641	364	363	Circular	42	240	26	34	40	45	47	426.9	426.7	429.4	429.2	430.2	429.9	431.5	431.1	432.7	432.2	433.1	432.6
3642	3987	3779	Circular	60	153	83	107	120	132	140	461.4	461.5	465.5	465.3	466.0	465.8	466.4	466.0	466.6	466.2	466.8	466.4
365	4039	4041	Circular	42	188	11	18	31	32	40	496.6	496.2	498.6	498.6	506.2	506.2	507.3	507.2	508.0	508.0	508.6	508.6
3652	4029	4028	Circular	24	69	1	1	2	2	2	435.4	435.1	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.0	437.0
3653	4030	4029	Circular	24	117	1	1	2	2	2	435.7	435.4	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.0	437.0
3654	3949	4030	Circular	24	301	1	1	2	2	2	436.3	435.7	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.1	437.1
3656	4028	3966	Circular	24	31	1	1	2	2	2	434.9	435.0	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.0	437.0
3657	3429	3953	Circular	60	30	29	39	48	57	64	507.9	507.9	510.8	510.8	511.1	511.1	511.3	511.3	511.6	511.5	511.7	511.7
366	4040	4039	Circular	42	16	11	17	17	17	19	504.1	496.6	504.5	498.6	506.2	506.3	507.3	507.3	508.1	508.1	508.6	508.6
3664	1	3967	Circular	24	45	21	21	19	20	21	457.8	456.0	461.1	460.9	463.8	463.6	466.2	465.9	467.9	467.7	468.6	468.4
3665	3968	3022	Circular	24	25	21	20	19	20	21	457.2	456.5	460.3	460.2	463.0	462.9	465.3	465.2	467.1	466.9	467.9	467.8
3666	712	3999	Circular	36	364	18	22	23	24	25	462.4	462.7	466.5	466.3	467.5	467.1	468.0	467.6	468.5	468.0	468.8	468.3
3667	712	3998	Circular	36	352	18	22	23	24	25	462.4	462.6	466.5	466.3	467.5	467.1	468.0	467.6	468.5	468.0	468.8	468.3
3668	4013	4017	Circular	42	44	42	48	52	55	57	436.2	436.0	440.4	440.3	441.6	441.5	442.4	442.3	442.9	442.8	443.4	443.3
3669	4017	3032	Circular	42	35	42	48	52	55	57	436.0	436.0	440.0	439.9	441.0	440.9	441.6	441.5	442.1	442.0	442.5	442.4
3670	3032	3080	Circular	42	73	42	48	52	55	57	436.0	436.3	439.7	439.6	440.5	440.4	441.1	440.9	441.5	441.3	441.8	441.6
3676	49	3	Circular	34	109	2	3	3	-8	-8	428.2	418.1	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
368	3900	992	Circular	42	35	26	34	40	41	45	494.8	495.1	497.4	497.4	504.4	504.4	505.6	505.5	506.3	506.2	506.8	506.8
3681	53	49	Circular	24	124	2	2	2	-3	-3	429.1	428.2	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
3683	25	4	Circular	24	191	1	-3	2	-4	-5	427.0	424.2	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
371	3910	3890	Circular	24	200	6	8	10	11	13	505.5	502.1	506.1	503.2	506.4	505.2	506.8	506.4	507.6	507.2	508.4	507.8
372	984	3910	Circular	24	265	6	8	10	11	13	510.7	505.5	511.3	506.7	511.4	507.0	511.5	507.1	511.6	507.8	511.7	508.7
3727	88	89	Circular	18	24	12	13	15	16	17	408.8	408.1	441.0	440.6	443.4	443.0	444.7	444.3	446.1	445.7	447.6	447.1
3728	87	88	Circular	18	671	10	11	12	13	13	428.5	408.8	444.1	441.9	445.6	444.2	446.8	445.6	448.6	447.0	450.2	448.4
3729	89	13	Circular	18	454	18	19	20	20	21	408.1	394.7	438.7	426.0	440.8	426.0	441.9	426.0	443.1	426.0	444.4	426.0
373	3890	3900	Circular	24	290	6	8	10	11	13	502.1	495.0	502.7	497.7	505.1	504.8	506.2	505.9	507.0	506.6	507.6	507.1
3730	90	87	Circular	18	24	8	10	10	11	11	429.2	428.5	444.4	444.4	445.9	445.8	447.0	447.0	448.9	448.9	450.6	450.5
3734	12	90	Circular	18	4	7	9	9	9	10	429.4	429.2	444.6	444.6	446.0	446.0	447.3	447.2	449.1	449.1	450.8	450.7
3745	2602	34	Circular	24	88	22	27	30	33	35	449.7	450.4	456.1	455.2	458.2	457.0	460.0	458.6	461.9	460.2	463.4	461.5
3746	34	35	Circular	24	437	22	26	28	31	33	450.4	448.2	454.1	449.9	455.5	449.9	456.7	449.9	458.0	449.9	459.0	449.9
3747	36	4135	Circular	27	370	9	11	13	16	17	435.0	433.8	436.2	435.6	436.4	435.8	436.6	436.0	437.0	436.1	437.4	436.2
3750	37	36	Circular	24	168	8	11	13	16	17	443.3	435.0	443.9	436.6	444.0	436.9	444.1	437.2	444.2	437.5	444.2	437.9
3753	4107	4088	Circular	30	168	10	14	17	20	22	472.7	469.0	473.4	470.3	473.5	470.5	473.6	470.7	473.7	470.9	473.8	471.1
3754	4088	4087	Circular	24	214	10	14	17	20	22	469.0	460.8	469.6	462.2	469.7	462.5	469.8	462.7	469.9	462.9	470.0	463.1
3756	4093	4096	Circular	36	56	11	15	19	23	26	440.4	440.8	442.5	442.4	442.7	442.6	442.8	442.7	443.2	443.2	445.9	445.9
3759	1739	4098	Circular	42	411	9	13	15	15	15	440.9	440.2	444.2	444.2	447.5	447.4	448.9	448.9	449.8	449.8	450.4	450.3
3760	4098	3110	Circular	42	353	9	12	14	14	15	440.2	440.0	444.2	444.2	447.4	447.3	448.8	448.8	449.7	449.7	450.3	450.2
3761	3593	4044	Circular	60	102	31	44	53	62	69	508.8	507.9	510.8	510.8	511.2	511.2	511.4	511.4	511.6	511.7	511.8	511.8
3763	886	1367	Circular	48	305	14	19	22	26	29	472.9	472.8	475.0	474.9	475.6	475.6	476.2	476.2	477.0	476.9	477.7	477.6
3767	1733	591	Circular	48	176	0	0	0	0	0	441.9	441.9	442.1	442.0	442.1	442.0	442.1	442.0	442.1	442.0	442.1	442.0
3768	591	1727	Circular	48	12	0	0	0	0	0	441.9	441.5	442.0	441.5	442.0	441.5	442.0	441.5	442.0	441.5	442.0	441.6
3770	1717	1706	Cross section		151	71	75	78	81	83	445.0	440.2	450.0	449.1	451.3	450.3	452.2	451.1	453.1	452.0	453.7	452.6
3773	2055	4097	Circular	48	42	16	21	24	25	27	417.2	417.2	421.0	421.0	421.7	421.7	422.2	422.2	422.6	422.6	423.0	423.0
3774	4097	288	Circular	48	108	16	21	24	25	27	417.2	417.2	421.0	421.0	421.7	421.7	422.2	422.1	422.6	422.5	422.9	422.9
3781	3557	4023	Circular	24	42	6	7	8	10	11	435.4	434.2	445.0	445.0	446.3	446.3	447.6	447.6	449.5	449.5	451.1	451.1
3795	1462	3704	Circular	27	274	18	21	25	28	31	450.8	449.1	459.1	458.4	461.2	460.5	463.9	462.9	466.8	465.6	469.3	467.9
3796	3704	3347	Circular	27	50	16	19	22	25	27	449.1	449.1	458.2	458.1	460.2	460.1	462.6	462.4	465.2	465.0	467.4	467.2
38	1234	1233	Circular	54	125	86	122	135	138	140	526.5	525.6	529.8	529.5	533.1	532.6	535.1	534.5	535.8	535.2	536.3	535.7
3810	4089	Node_4	Natural Channel		88	10	14	17	20	23	442.3	435.7	443.1	439.5	443.2	439.7	443.3	440.3	443.4	443.2	445.9	445.9
3842	4026	12	Circular	24	0	6	7	6	7	7	433.6	429.4	444.9	444.8	446.2	446.1	447.5	447.4	449.3	449.3	451.0	450.9

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS
386	3451	3458	Circular	30	231	11	14	18	21	23	545.8	544.8
396	3990	1048	Circular	36	222	11	16	20	24	27	503.0	502.7
398	633	3208	Circular	72	520	48	64	78	91	98	470.4	469.1
399	838	633	Circular	72	520	49	64	78	91	98	470.9	470.4
40	2283	2869	Circular	54	125	92	130	143	148	151	522.4	522.5
401	899	836	Circular	72	270	45	60	72	84	91	471.1	471.0
402	1731	899	Circular	60	420	31	41	51	59	62	471.9	471.3
404	884	1731	Circular	60	345	25	32	39	46	47	471.9	471.9
405	3699	935	Circular	21	434	7	8	10	12	12	481.6	480.8
406	1689	1688	Circular	27	332	6	8	10	12	13	480.1	478.6
408	2308	2411	Circular	24	475	7	8	10	12	12	478.4	478.0
409	2411	2505	Circular	24	480	7	8	10	12	12	478.0	475.1
41	2698	2229	Circular	24	110	14	16	17	18	23	543.8	542.9
410	2060	1832	Circular	36	570	6	8	10	12	13	476.8	474.2
411	1688	2080	Circular	36	270	6	8	10	12	13	478.6	478.0
413	2499	2480	Circular	42	160	20	27	32	38	40	475.1	475.1
429	1506	2671	Circular	42	375	13	17	21	24	26	477.4	476.1
430	930	2622	Circular	42	78	20	27	32	38	40	476.1	476.1
450	2412	2410	Circular	24	146	2	2	3	3	3	462.9	462.5
452	3280	1351	Circular	36	649	15	19	22	25	28	463.2	462.5
453	2410	3242	Circular	30	170	2	2	3	3	3	462.5	462.0
454	2670	3280	Circular	36	319	15	19	22	25	28	464.6	463.2
457	850	851	Circular	54	272	5	7	9	11	12	462.6	462.1
459	851	2361	Circular	54	212	5	7	9	12	12	462.1	461.5
460	2762	848	Circular	36	285	10	14	16	18	20	467.2	466.3
461	853	854	Circular	24	47	6	8	9	10	12	467.9	467.6
462	854	2762	Circular	36	326	10	14	16	18	20	467.4	467.2
465	3038	3351	Circular	24	125	0	0	0	0	0	459.8	459.0
466	2378	800	Circular	54	281	5	7	9	11	12	461.1	460.3
467	800	3499	Circular	54	57	5	7	9	11	12	460.3	460.1
468	709	712	Circular	36	448	35	44	46	48	49	462.8	462.4
470	3336	709	Circular	36	233	35	44	46	48	49	463.2	462.8
471	3215	3336	Circular	36	195	15	20	22	24	25	463.4	463.2
472	3239	3227	Circular	36	121	20	25	27	27	30	464.2	464.1
473	834	3336	Circular	36	238	20	25	27	27	30	463.7	463.2
475	4007	841	Circular	24	148	10	13	14	15	17	467.1	465.9
478	552	1875	Circular	33	301	12	16	20	21	24	467.1	466.2
480	2416	3215	Circular	36	228	15	20	22	24	25	463.6	463.4
484	723	2418	Circular	36	348	20	25	27	27	30	464.9	464.6
485	2418	3239	Circular	36	173	20	25	27	27	30	464.6	464.2
491	244	552	Circular	33	46	12	16	20	21	24	467.1	467.1
492	207	872	Circular	30	251	8	13	18	19	23	467.8	467.7
495	869	1879	Circular	24	293	8	10	11	16	20	469.7	468.9
501	721	889	Circular	27	550	7	9	10	12	13	466.9	463.7
502	2910	1759	Circular	24	498	5	6	7	8	9	468.3	467.0
503	1750	742	Circular	42	551	19	23	27	31	35	466.9	465.7
504	742	820	Circular	48	570	37	49	57	65	70	465.7	464.1
505	824	822	Circular	36	310	19	25	30	34	35	467.6	466.8
506	1572	824	Circular	36	319	16	21	24	27	28	468.8	467.6
507	829	1583	Circular	27	237	6	7	8	10	11	470.2	469.4
508	1694	829	Circular	27	86	6	7	8	10	11	470.6	470.3
509	2447	1671	Circular	27	213	6	7	9	10	11	472.3	471.4
512	820	889	Circular	48	60	37	49	57	65	70	464.1	463.7
514	1473	1511	Circular	27	240	10	14	16	18	19	471.8	471.1
516	1472	1473	Circular	27	339	10	14	16	18	19	472.9	471.9
517	1353	1379	Circular	27	149	8	10	11	13	16	474.4	474.1
522	1782	878	Circular	36	297	14	18	21	23	26	472.6	471.9
523	2424	1782	Circular	27	281	5	6	7	8	9	473.6	472.6
524	2402	2424	Circular	27	126	5	6	7	8	9	473.6	473.6

Segment ID	Water Surface Elevations Under Existing Conditions									
	2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS	US	DS	US	DS	US	DS	US	DS
386	547.0	546.3	547.2	546.6	547.4	546.8	547.7	547.0	547.9	547.1
396	507.2	507.1	509.0	508.9	510.7	510.5	512.1	511.8	513.0	512.7
398	474.5	474.5	474.9	474.9	475.2	475.2	475.5	475.5	475.8	475.6
399	474.5	474.5	475.0	474.9	475.3	475.3	475.6	475.5	476.1	475.8
40	526.0	525.7	526.7	526.1	526.9	526.3	527.0	526.3	527.1	526.4
401	474.8	474.8	475.4	475.4	475.9	475.8	476.4	476.3	477.0	476.9
402	474.8	474.8	475.5	475.5	476.0	476.0	476.7	476.5	477.3	477.1
404	475.0	474.9	475.6	475.6	476.2	476.1	476.9	476.8	477.6	477.4
405	483.0	482.1	483.6	482.3	484.3	482.5	486.3	484.0	487.6	485.1
406	480.9	479.7	481.1	479.9	481.2	480.0	481.3	480.1	481.4	480.2
408	479.9	479.3	480.2	479.5	480.8	479.9	482.2	480.9	483.1	481.7
409	478.8	477.9	479.1	478.4	479.7	478.9	480.7	479.5	481.5	480.1
41	550.1	549.6	552.2	551.7	553.5	552.9	555.1	554.5	556.4	555.7
410	477.6	476.8	477.7	477.1	477.9	477.4	478.0	478.0	478.7	478.6
411	479.5	479.1	479.7	479.3	479.8	479.4	479.9	479.5	480.1	479.6
413	478.3	478.3	479.2	479.1	480.0	479.9	481.1	480.9	482.0	481.7
429	478.9	479.0	480.1	480.1	481.7	481.6	483.5	483.3	484.7	484.5
430	478.6	478.6	479.7	479.6	480.8	480.7	482.2	482.1	483.3	483.1
450	464.2	464.2	464.6	464.6	464.9	464.9	465.3	465.3	465.6	465.6
452	466.0	465.7	466.8	466.2	467.4	466.7	468.1	467.2	468.9	467.7
453	464.2	464.2	464.6	464.6	464.9	464.9	465.2	465.2	465.6	465.6
454	466.1	466.1	467.0	466.9	467.9	467.6	468.8	468.4	469.7	469.1
457	463.4	463.0	463.5	463.2	463.7	463.3	463.8	463.4	463.8	463.5
459	462.9	462.6	463.1	462.9	463.3	463.1	463.4	463.3	463.4	463.4
460	468.4	467.7	468.6	467.9	468.9	468.4	469.8	469.6	471.0	470.7
461	469.2	469.2	469.5	469.5	469.8	469.7	470.4	470.3	471.7	471.6
462	468.9	468.6	469.2	468.8	469.4	469.1	470.1	469.9	471.4	471.1
465	461.5	461.5	461.9	461.9	462.1	462.1	462.2	462.2	462.3	462.3
466	462.5	462.5	462.9	462.9	463.1	463.1	463.3	463.3	463.4	463.4
467	462.5	462.5	462.9	462.9	463.1	463.1	463.3	463.3	463.4	463.4
468	467.8	466.6	469.6	467.7	470.3	468.2	470.9	468.7	471.3	469.0
470	468.9	468.3	471.3	470.3	472.2	471.1	472.9	471.8	473.4	472.2
471	469.6	469.5	472.3	472.2	473.3	473.1	474.1	473.9	474.6	474.4
472	470.4	470.3	473.5	473.3	474.5	474.3	475.2	475.1	475.7	475.5
473	469.7	469.5	472.5	472.2	473.4	473.1	474.2	473.9	474.7	474.4
475	470.7	470.5	474.4	473.9	475.6	475.1	476.8	476.2	477.4	476.7
478	472.2	472.1	476.0	475.8	476.9	476.8	477.5	477.4	477.9	477.8
480	469.8	469.7	472.7	472.5	473.7	473.5	474.6	474.3	475.2	474.8
484	471.3	470.9	474.8	474.3	475.8	475.3	476.5	476.0	476.9	476.5
485	470.7	470.5	473.9	473.7	474.9	474.7	475.6	475.4	476.1	475.9
491	472.3	472.3	476.2	476.1	477.1	477.0	477.6	477.6	478.0	478.0
492	472.7	472.6	476.7	476.6	477.5	477.4	478.1	477.9	478.5	478.3
495	473.3	472.9	477.5	477.0	478.3	477.8	478.8	478.3	479.2	478.7
501	467.8	467.1	468.0	467.7	468.6	468.2	469.5	468.8	470.1	469.2
502	469.2	468.6	469.4	468.8	469.7	469.2	471.0	470.3	471.9	471.1
503	468.6	468.4	469.1	468.9	470.5	470.1	471.9	471.3	472.9	472.2
504	467.8	467.4	468.5	468.1	469.7	468.8	470.8	469.6	471.6	470.2
505	469.4	469.0	470.0	469.6	471.5	470.9	473.3	472.5	474.3	473.5
506	470.2	469.6	470.6	470.2	472.2	471.8	474.2	473.7	475.3	474.8
507	471.2	470.8	471.5	471.1	472.8	472.6	475.0	474.7	476.2	475.9
508	471.6	471.4	471.8	471.6	472.9	472.8	475.2	475.1	476.4	476.3
509	473.1	472.5	473.3	472.7	473.6	473.2	475.8	475.6	477.2	477.0
512	467.1	467.1	467.7	467.7	468.3	468.2	468.9	468.8	469.3	469.2
514	473.2	472.6	473.4	472.9	474.2	473.6	476.7	475.9	477.7	477.0
516	474.2	473.7	474.7	474.1	475.6	474.7	478.4	477.4	479.4	478.4
517	475.7	475.5	476.0	475.8	476.9	476.7	480.0	479.8	480.8	480.6
522	474.0	473.4	474.2	473.7	474.4	473.9	475.5	475.1	477.6	477.2
523	474.4	474.5	474.7	474.7	474.9	474.9	475.9	475.7	478.2	478.0
524	474.7	474.6	475.0	474.8	475.1	475.0	476.0	476.0	478.4	478.3

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
525	881	1782	Circular	27	375	9	12	14	16	18	474.0	473.0	475.2	474.5	475.5	474.7	475.7	474.9	476.7	475.7	479.2	478.0
527	875	830	Circular	36	280	14	18	21	23	26	470.5	469.3	471.9	471.2	472.1	471.5	472.4	471.9	473.9	473.6	475.6	475.1
528	876	875	Circular	36	310	14	18	21	23	26	471.1	470.7	472.7	472.1	472.9	472.4	473.1	472.6	474.5	474.1	476.3	475.8
531	830	1736	Circular	42	297	14	18	21	23	26	469.3	469.1	471.1	470.9	471.4	471.2	471.9	471.7	473.5	473.3	475.0	474.8
533	2695	2447	Circular	27	259	6	7	9	10	11	472.8	472.3	473.8	473.4	474.0	473.6	474.2	473.8	476.2	475.9	477.7	477.4
535	2717	2716	Circular	24	31	3	3	4	5	5	473.2	473.2	474.1	474.1	474.3	474.3	474.4	474.4	476.4	476.3	477.9	477.9
536	1870	1802	Circular	24	325	3	3	4	5	5	474.4	474.0	475.1	474.5	475.2	474.7	475.3	474.8	476.7	476.5	478.3	478.1
537	2624	815	Circular	24	212	3	3	4	5	7	476.8	476.2	477.4	476.9	477.6	477.1	478.3	478.3	481.8	481.8	482.6	482.5
538	815	2640	Circular	24	325	3	4	4	5	8	476.1	475.1	476.8	476.6	477.0	477.1	478.3	478.2	481.7	481.6	482.5	482.3
539	2642	1353	Circular	27	267	8	10	11	13	16	474.2	474.8	476.1	475.9	476.4	476.2	477.4	477.0	480.6	480.2	481.4	481.0
542	671	670	Circular	24	292	0	0	0	0	1	477.2	477.0	478.0	478.0	478.1	478.1	478.6	478.6	482.1	482.1	482.8	482.8
556	784	3236	Circular	24	181	7	9	10	10	10	461.3	460.0	463.7	463.6	464.3	464.0	464.6	464.3	464.8	464.5	465.0	464.6
557	657	784	Circular	24	288	7	9	10	10	10	463.0	461.3	464.0	463.8	464.9	464.5	465.4	464.9	465.7	465.2	465.9	465.3
558	731	783	Circular	24	296	0	0	0	2	2	466.1	462.6	466.1	464.9	466.1	465.7	466.5	466.5	466.8	466.8	467.1	467.1
559	780	781	Circular	24	312	7	9	10	10	10	462.8	463.4	465.4	465.1	466.6	466.2	467.5	467.0	468.0	467.4	468.3	467.7
560	785	780	Circular	24	330	7	9	10	10	10	463.3	462.8	465.8	465.5	467.2	466.7	468.3	467.7	468.9	468.2	469.2	468.5
562	756	786	Circular	24	409	7	9	10	11	11	464.2	463.8	466.6	466.2	468.6	468.0	470.0	469.3	470.8	470.0	471.3	470.4
564	572	599	Circular	42	11	18	24	28	32	37	453.6	453.6	458.0	458.0	459.5	459.5	460.5	460.5	461.3	461.3	461.9	461.9
568	792	3693	Circular	42	179	18	24	28	32	37	455.4	454.9	458.5	458.4	460.4	460.3	461.6	461.5	462.4	462.3	463.0	462.8
569	3157	572	Circular	42	362	18	24	28	32	37	454.4	453.7	458.2	458.1	459.8	459.6	460.8	460.6	461.6	461.4	462.2	462.0
570	189	188	Circular	48	331	-3	-13	5	-23	-26	457.6	457.6	459.1	459.1	461.9	462.0	463.5	463.5	464.4	464.4	465.1	465.1
571	769	792	Circular	36	364	18	24	28	32	37	455.6	455.4	458.7	458.5	460.9	460.5	462.2	461.7	463.0	462.5	463.6	463.1
574	3713	1564	Circular	48	189	5	7	8	10	10	463.0	461.5	463.6	462.4	463.7	462.6	463.9	463.5	464.4	464.4	465.1	465.1
575	3066	763	Circular	48	239	5	7	7	10	10	460.2	459.1	460.9	460.0	461.9	461.9	463.5	463.5	464.4	464.4	465.1	465.1
578	191	189	Circular	33	294	11	12	13	13	13	457.1	456.7	459.2	459.1	462.1	461.9	463.7	463.5	464.5	464.4	465.2	465.1
583	777	776	Circular	24	290	8	11	12	13	14	460.7	460.1	462.1	461.6	464.6	463.9	466.6	465.9	467.6	466.8	468.4	467.4
586	776	560	Circular	27	317	8	11	12	12	13	460.1	459.6	461.5	461.1	463.8	463.4	465.7	465.3	466.6	466.2	467.2	466.7
590	1642	3292	Circular	30	72	1	9	10	10	9	459.7	458.2	460.0	459.1	462.4	462.3	464.0	464.0	464.9	464.8	465.4	465.4
591	3538	1642	Circular	30	12	-1	-3	0	-3	7	458.4	459.7	459.5	460.0	462.4	462.4	464.1	464.1	464.9	464.9	465.5	465.5
592	3496	2835	Circular	30	290	0	-5	1	-6	-6	458.5	458.2	460.2	460.2	462.7	462.8	464.5	464.5	465.3	465.3	465.8	465.9
593	3493	385	Circular	33	71	9	10	10	10	10	457.5	457.5	459.6	459.6	462.4	462.4	464.1	464.1	465.0	464.9	465.5	465.5
594	770	1642	Circular	30	202	-1	6	6	7	7	458.6	459.7	459.8	460.2	462.5	462.4	464.2	464.1	465.0	464.9	465.5	465.5
595	771	770	Circular	33	14	6	7	6	6	6	458.8	458.5	459.9	459.8	462.5	462.5	464.2	464.2	465.0	465.0	465.5	465.5
596	772	404	Circular	30	24	2	-2	1	2	-2	459.1	458.4	460.4	460.4	462.6	462.6	464.3	464.3	465.1	465.1	465.7	465.7
597	3338	404	Circular	30	286	8	11	12	12	12	458.9	458.4	460.4	460.4	462.8	462.6	464.5	464.3	465.4	465.1	465.9	465.7
601	1519	2889	Circular	48	231	4	-12	8	-22	-25	456.0	454.5	459.2	459.2	461.9	461.9	463.5	463.5	464.4	464.4	465.1	465.1
602	188	1519	Circular	48	348	5	-12	8	-22	-25	457.6	456.0	459.2	459.2	461.9	461.9	463.5	463.5	464.4	464.4	465.1	465.1
603	3003	2889	Circular	30	510	14	15	15	17	15	456.9	454.5	459.6	459.2	462.3	461.9	464.0	463.5	464.8	464.4	465.4	465.1
607	3241	3259	Circular	30	451	13	16	17	18	18	461.0	459.5	462.3	461.2	464.4	463.7	466.3	465.6	467.1	466.4	467.7	466.9
609	2306	225	Circular	24	493	7	8	10	11	11	465.7	464.6	466.9	466.0	467.1	466.3	469.6	468.7	470.7	469.7	471.3	470.3
611	225	222	Circular	24	226	7	8	10	11	11	464.6	463.8	465.8	465.3	466.1	465.7	468.5	468.1	469.5	469.0	470.1	469.6
615	807	2352	Circular	36	100	2	3	3	4	4	455.1	455.0	457.1	457.1	457.3	457.3	457.7	457.7	458.3	458.3	458.9	458.9
616	808	807	Circular	30	300	2	3	3	4	4	454.7	455.1	457.1	457.1	457.3	457.3	457.7	457.7	458.4	458.3	458.9	458.9
620	1328	1327	Circular	42	8	5	6	7	8	9	454.3	454.9	457.1	457.1	457.2	457.2	457.6	457.6	458.3	458.3	458.8	458.8
621	1327	1571	Circular	24	146	5	6	7	8	9	454.5	454.6	457.0	456.9	457.1	457.0	457.5	457.4	458.2	458.0	458.7	458.5
624	2095	1762	Circular	42	343	5	6	7	7	8	454.5	453.0	455.8	455.8	456.7	456.7	457.4	457.4	458.0	458.0	458.5	458.5
629	2467	804	Circular	60	56	39	57	68	81	94	454.2	454.2	457.0	456.9	457.8	457.8	458.7	458.6	459.9	459.9	460.9	460.8
630	806	2854	Circular	60	343	39	57	69	81	94	455.3	454.5	457.4	457.4	458.3	458.3	459.2	459.2	461.0	460.7	462.3	461.9
631	1811	1835	Circular	24	270	6	10	13	15	16	458.0	457.3	459.1	458.6	459.5	459.1	460.7	460.0	462.9	461.9	464.6	463.4
632	1833	1841	Circular	36	310	8	10	12	15	16	457.3	457.3	458.8	458.5	459.0	458.7	459.2	459.0	460.0	459.9	461.1	461.0
635	1311	1238	Circular	42	117	7	8	9	10	11	452.2	451.8	455.8	455.8	456.6	456.6	457.3	457.3	458.0	457.9	458.4	458.4
639	1836	1803	Circular	30	300	6	8	10	11	13	458.8	458.2	459.8	459.5	460.0	459.7	460.2	459.8	460.4	460.2	461.6	461.4
640	1798	1811	Circular	24	280	6	10	13	15	16	458.8	458.2	459.9	459.3	460.4	459.8	461.7	460.9	464.3	463.3	466.3	465.0
644	1900	2357	Circular	24	216	6	8	10	12	13	463.9	462.5	464.8	463.7	465.0	464.0	465.1	464.1	465.2	464.3	465.4	464.5
650	665	1610	Circular	24	316	7	8	9	11	12	454.7	453.4	455.7	455.1	456.8	456.5	457.9	457.5	459.0	458.3	459.8	459.0
657	2224	2249	Circular	27	138	12	14	17	18	20	451.3	448.3	455.0	454.9	456.2	456.0	456.9	456.6	457.5	457.1	457.9	457.5
658	2249	4008	Circular	27	85	6	8	10	10	11	448.4	447.4	454.8	454.8	455.9	455.9	456.6	456.5	457.1	457.0	457.5	457.4
659	2322	2224	Circular	24	83	12	14	17	18	18	451.5	451.3	455.4	455.2	456.7	456.4	457.4	457.1	458.2	457.7	458.7	458.2
663	1801	1807	Circular	24	206	12	15	16	18	20	453.1	452.0	456.8	456.2	458.8	458.0	459.9	459.0	461.2	460.0	462.3	460.9

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
678	2321	3662	Circular	24	378	13	14	15	16	18	454.0	453.5	460.9	459.9	463.6	462.4	465.6	464.2	467.8	466.0	469.6	467.5
682	3247	3863	Circular	48	143	25	29	30	28	27	452.3	451.4	458.8	458.8	461.4	461.4	462.9	462.9	463.9	463.9	464.9	464.9
684	3822	3835	Circular	48	276	25	29	30	28	27	451.6	452.0	458.7	458.6	461.1	461.1	462.7	462.6	463.8	463.8	464.8	464.8
685	3656	2282	Circular	48	137	25	29	30	28	27	451.0	450.4	458.6	458.5	461.0	461.0	462.5	462.4	463.7	463.7	464.7	464.7
693	326	694	Circular	36	386	19	22	27	29	29	453.9	453.6	459.4	459.2	461.8	461.5	463.0	462.8	464.4	464.2	465.4	465.2
694	2282	2279	Circular	3	188	0	0	0	0	0	450.4	449.5	458.4	454.4	460.7	455.0	462.2	455.3	463.4	455.5	464.4	455.6
695	2279	2271	Circular	3	121	0	0	0	0	0	449.5	448.2	454.4	453.3	455.0	453.8	455.2	454.0	455.4	454.2	455.6	454.3
696	1749	1710	Circular	3	342	0	0	0	0	0	447.2	446.4	452.4	452.2	453.2	453.7	453.5	454.7	453.7	455.7	453.8	456.4
698	689	3504	Circular	24	464	7	8	9	15	15	456.4	455.1	461.0	460.6	463.4	462.9	464.2	463.8	465.5	465.2	466.5	466.2
701	686	687	Circular	36	32	19	22	21	23	24	454.5	454.4	459.9	459.9	462.2	462.2	463.3	463.3	464.7	464.7	465.8	465.7
711	344	1621	Circular	36	219	15	15	18	22	25	447.6	447.3	458.8	458.7	461.3	461.2	462.8	462.7	464.1	464.0	465.3	465.1
712	1621	1714	Circular	36	368	14	17	17	20	22	447.3	446.0	458.6	458.5	461.1	461.0	462.6	462.4	463.9	463.7	465.0	464.7
72	2042	220	Circular	54	50	25	35	45	52	58	511.4	510.9	514.7	514.7	515.3	515.3	515.6	515.6	516.0	515.9	516.2	516.2
721	576	3221	Circular	36	172	2	4	4	4	5	444.0	444.1	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
722	3410	3187	Circular	48	175	70	75	77	79	80	446.8	444.5	454.5	454.1	456.3	455.8	457.4	456.9	458.7	458.2	459.5	459.0
724	3195	3410	Circular	42	14	70	77	79	80	82	447.4	446.8	455.0	454.9	456.9	456.7	458.1	457.9	459.4	459.2	460.2	460.0
73	183	1219	Circular	54	90	27	37	44	52	58	511.1	511.3	514.8	514.8	515.3	515.3	515.7	515.7	516.1	516.1	516.4	516.3
757	3838	2616	Circular	42	464	77	82	85	87	89	438.2	434.1	443.1	440.5	443.9	440.9	444.3	441.2	444.7	441.4	445.1	441.6
766	495	493	Circular	24	39	9	11	12	13	14	442.2	442.7	445.9	445.9	447.6	447.6	448.5	448.4	449.4	449.3	450.1	450.0
767	3573	495	Circular	24	145	9	11	13	15	16	443.0	442.2	446.4	446.2	448.3	448.0	449.3	448.9	450.3	449.8	451.1	450.6
769	493	387	Circular	24	184	9	10	11	11	12	442.7	441.9	445.7	445.5	447.4	447.0	448.2	447.8	449.1	448.6	449.7	449.2
773	3571	3102	Circular	18	358	9	10	11	11	12	441.5	438.1	442.6	439.3	443.3	439.8	443.8	440.0	444.3	440.3	444.6	440.4
78	1228	2225	Circular	36	310	10	14	17	21	23	523.8	523.0	524.9	524.0	525.1	524.2	525.3	524.3	525.4	524.4	525.5	524.5
797	985	986	Circular	24	145	4	5	6	6	7	448.9	449.2	451.8	451.8	452.1	452.1	452.4	452.3	452.7	452.6	453.0	452.8
798	986	129	Circular	30	334	23	25	26	28	29	449.0	448.2	451.0	449.9	451.3	450.0	451.6	450.1	451.8	450.2	451.9	450.3
799	412	986	Circular	30	320	19	20	21	21	22	449.0	449.0	452.4	451.8	452.8	452.1	453.1	452.3	453.5	452.6	453.7	452.8
80	2074	1228	Circular	36	460	10	14	17	21	23	533.8	523.8	534.4	525.1	534.6	525.4	534.6	525.6	534.7	525.8	534.8	525.9
800	414	1075	Circular	24	332	4	5	6	6	7	450.2	449.9	452.1	452.0	452.6	452.4	453.0	452.8	453.5	453.2	453.9	453.6
803	1565	413	Circular	30	185	19	20	21	21	22	450.8	450.2	453.8	453.5	454.5	454.1	454.9	454.5	455.4	454.9	455.7	455.2
806	263	1597	Circular	30	310	14	15	16	16	17	453.8	453.3	457.8	457.5	459.2	458.8	459.9	459.5	460.5	460.2	461.0	460.6
807	1597	1611	Circular	30	386	18	19	19	20	20	453.3	452.7	457.3	456.5	458.5	457.7	459.2	458.3	459.9	459.0	460.3	459.4
812	1611	522	Circular	30	401	18	19	19	20	20	452.7	451.9	456.3	455.6	457.5	456.6	458.1	457.2	458.7	457.7	459.1	458.1
814	522	530	Circular	30	358	18	19	19	20	20	451.7	451.3	455.4	454.7	456.3	455.6	456.9	456.1	457.4	456.6	457.8	457.0
816	1292	134	Circular	24	74	1	1	2	2	2	449.7	449.2	450.8	450.8	451.0	451.0	451.2	451.2	451.3	451.3	451.4	451.4
829	2379	661	Circular	24	162	7	9	10	11	13	457.6	457.2	463.6	463.4	465.5	465.3	466.1	465.9	466.7	466.5	467.2	467.0
830	3848	529	Circular	24	352	7	10	11	12	14	456.8	455.3	463.0	462.7	464.9	464.6	465.5	465.2	466.1	465.8	466.6	466.3
833	528	263	Circular	24	664	14	15	16	16	17	455.3	453.9	460.6	458.0	462.2	459.4	462.8	460.0	463.4	460.7	463.9	461.2
834	2519	1629	Circular	24	620	2	-1	7	6	6	461.4	458.5	465.7	465.7	467.5	467.5	468.7	468.7	469.8	469.8	470.8	470.8
844	1179	660	Circular	24	95	16	18	21	24	25	460.9	461.2	467.7	467.5	469.3	469.1	470.4	470.1	471.9	471.6	473.2	472.8
845	3660	3600	Circular	24	582	4	4	4	-5	5	462.4	459.0	466.1	466.0	468.0	467.9	469.0	468.9	469.9	469.9	471.0	470.9
846	1176	1175	Circular	24	107	15	16	15	16	17	461.7	461.9	470.2	469.9	471.9	471.5	474.0	473.6	476.0	475.6	477.7	477.2
847	1175	1174	Circular	24	133	16	17	17	17	17	461.9	461.0	469.6	469.3	471.2	470.8	473.2	472.7	475.2	474.6	476.8	476.2
848	1211	1212	Circular	24	70	14	18	21	23	24	461.8	461.5	472.0	471.7	473.8	473.5	476.1	475.8	478.5	478.1	480.6	480.1
85	175	1934	Circular	54	300	19	26	31	36	40	515.8	514.0	517.0	515.8	517.2	516.0	517.3	516.2	517.5	516.4	517.6	516.6
86	1224	1347	Circular	66	90	43	60	74	88	98	516.9	516.5	519.2	519.1	519.8	519.7	520.2	520.1	520.5	520.4	520.8	520.7
87	1496	1224	Circular	66	200	26	36	46	54	61	517.5	516.9	519.4	519.5	520.0	520.0	520.4	520.4	520.8	520.8	521.1	521.1
872	1263	433	Circular	24	34	15	19	21	23	24	439.1	438.4	440.6	440.4	442.5	442.2	443.6	443.4	444.4	444.1	445.0	444.7
873	2856	2844	Circular	27	158	15	19	21	23	24	437.4	436.7	439.3	439.0	440.6	440.0	441.5	440.8	442.2	441.5	442.7	442.0
874	1261	1263	Circular	24	275	15	19	21	23	24	440.9	439.1	442.4	441.2	445.2	443.2	446.7	444.4	447.7	445.3	448.4	445.8
876	2923	432	Circular	36	575	19	23	27	31	34	440.4	438.0	441.8	440.0	442.0	440.2	442.1	440.4	442.3	440.5	442.5	440.8
879	1270	2844	Circular	24	42	9	11	13	15	16	437.1	436.3	439.0	439.0	440.1	440.0	441.0	440.8	441.7	441.5	442.2	442.0
88	1223	1496	Circular	60	60	26	43	47	55	62	517.9	517.5	519.7	519.6	520.2	520.1	520.6	520.5	520.9	520.9	521.2	521.2
880	431	97	Circular	36	159	42	54	61	67	70	434.3	430.9	435.9	433.9	436.2	434.4	436.5	434.7	436.7	435.0	436.8	435.1
881	97	1602	Circular	36	169	42	54	61	67	70	430.9	427.4	432.4	429.7	432.7	429.9	432.8	430.1	432.9	430.2	433.0	430.3
89	1997	1223	Circular	36	379	0	0	0	1	2	523.3	519.6	523.3	519.8	523.3	520.3	523.5	520.6	523.6	521.0	523.6	521.3
898	987	551	Circular	24	378	9	12	14	16	18	447.1	445.4	448.2	446.9	448.5	447.4	449.5	448.1	451.0	449.1	452.8	450.4
90	2225	1226	Circular	60	75	16	24	29	34	38	521.4	519.2	522.2	521.1	522.4	521.5	522.5	521.7	522.7	522.0	522.7	522.0
902	447	434	Circular	24	330	15	19	21	23	25	444.8	444.1	447.6	446.2	451.6	449.2	454.1	451.3	456.0	452.7	457.6	454.0
938	506	507	Circular	36	348	7	9	10	12	13	435.7	434.8	437.1	437.1	437.6	437.6	438.0	437.9	438.3	438.2	438.6	438.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
939	111	110	Circular	36	54	7	9	10	12	13	434.5	434.4	437.1	437.1	437.6	437.6	437.9	437.9	438.1	438.1	438.3	438.3
94	2009	1085	Circular	24	285	5	7	8	9	10	564.2	562.7	565.0	563.9	565.1	564.1	565.2	564.2	565.3	564.3	565.4	564.4
944	468	2520	Circular	36	147	7	9	10	12	13	438.3	437.9	439.4	439.2	439.5	439.4	439.7	439.5	439.8	439.6	439.9	439.7
945	3310	468	Circular	24	47	7	9	10	12	13	438.3	438.3	439.6	439.5	439.8	439.7	439.9	439.8	440.1	439.9	440.2	440.0
946	2520	1580	Circular	36	305	7	9	10	12	13	437.9	437.6	439.1	438.8	439.3	439.0	439.4	439.1	439.5	439.2	439.6	439.3
95	1085	1065	Circular	24	198	5	7	8	9	10	562.7	561.7	563.5	562.4	563.6	562.5	563.7	562.6	563.8	562.7	563.9	562.8
955	2763	2751	Circular	30	126	14	18	19	21	21	431.2	431.0	435.6	435.4	438.3	438.1	439.2	439.0	439.9	439.6	440.4	440.2
958	124	2750	Circular	24	35	14	18	19	20	21	433.8	433.7	436.2	436.1	439.3	439.1	440.2	440.0	440.9	440.7	441.5	441.3
96	1412	1109	Circular	24	195	5	7	8	9	10	544.6	522.6	545.0	532.2	545.1	534.4	545.1	536.4	545.2	538.5	545.3	540.3
961	2537	107	Circular	36	438	14	18	19	21	21	428.3	428.4	433.9	433.7	435.7	435.4	436.5	436.2	437.3	437.0	437.8	437.6
962	2044	2015	Circular	36	355	22	28	30	32	33	428.3	427.8	433.3	432.9	434.8	434.2	435.5	434.8	436.2	435.4	436.7	435.8
969	501	2575	Circular	36	233	22	28	30	32	33	428.5	428.8	432.2	431.9	433.0	432.6	433.4	433.0	433.8	433.3	434.1	433.6
97	1065	1412	Circular	24	187	5	7	8	9	10	561.4	544.8	561.8	545.4	561.9	545.5	561.9	545.7	561.9	545.8	562.0	545.9
970	1278	1277	Circular	36	172	28	35	39	42	44	429.1	428.5	430.9	430.2	431.1	430.4	431.3	430.5	431.4	430.6	431.5	430.6
99	1183	1182	Circular	42	107	24	34	42	50	57	524.1	523.4	525.4	524.7	525.7	524.9	525.9	525.1	526.1	525.3	526.2	525.5
991	2727	2312	Circular	30	198	4	5	6	7	8	431.0	430.6	433.4	433.4	433.8	433.8	434.1	434.1	434.4	434.3	434.6	434.5
992	3575	3650	Circular	24	236	1	2	2	2	3	424.8	424.3	425.2	424.7	425.3	424.8	425.4	424.8	425.4	424.9	425.4	424.9
993	1555	2843	Circular	36	544	16	22	26	29	30	420.0	419.0	421.5	420.2	421.8	420.5	422.1	420.8	422.3	421.1	422.4	421.3
994	443	3246	Circular	36	63	16	22	26	29	30	421.1	420.9	422.9	422.9	423.4	423.3	423.8	423.7	424.2	424.1	424.5	424.3
995	331	333	Circular	24	602	9	12	14	15	16	427.0	424.3	428.1	425.9	428.3	426.3	429.0	426.7	429.7	427.1	430.2	427.7
996	1530	331	Circular	24	260	9	12	14	15	16	429.1	427.0	430.1	428.9	430.4	429.3	430.7	429.7	431.6	430.5	432.0	430.9
997	3268	1555	Circular	36	94	16	22	26	29	30	420.2	420.0	422.0	421.9	422.4	422.3	422.7	422.6	422.9	422.8	423.1	422.9
998	200	1891	Circular	12	28	3	4	4	5	5	540.7	540.4	543.1	542.9	543.7	543.4	544.2	543.8	544.6	544.0	544.8	544.1
Link_10	3577	Node_12	Natural Channel		415	8	12	14	15	15	485.8	476.0	486.5	484.4	486.6	484.4	486.7	484.5	486.7	484.5	486.7	484.6
Link_100	4	2775	Natural Channel		1251	35	48	54	59	64	424.2	422.4	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
Link_101	3	4	Natural Channel		230	28	40	44	50	54	418.1	424.2	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
Link_102	2775	4067	Natural Channel		93	63	75	84	91	97	422.4	424.6	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
Link_103	Node_12	4184	Natural Channel		3797	262	343	390	430	459	476.0	462.8	483.2	465.0	483.8	465.2	484.2	465.4	484.4	465.5	484.6	465.5
Link_104	1096	2870	Natural Channel		821	75	85	92	99	104	453.7	447.4	455.4	451.4	455.6	451.6	455.6	451.7	455.7	451.9	455.8	452.0
Link_105	133	129	Natural Channel		240	83	95	104	113	120	447.9	448.2	450.8	449.9	451.0	450.0	451.1	450.1	451.2	450.2	451.3	450.3
Link_106	2843	3650	Natural Channel		270	532	674	766	854	915	413.4	414.3	420.0	419.5	420.5	420.0	420.8	420.3	421.1	420.6	421.3	420.8
Link_107	2564	2843	Natural Channel		395	517	654	745	828	886	415.8	413.4	420.0	420.0	420.5	420.5	420.8	420.8	421.0	421.1	421.2	421.3
Link_108	3650	4117	Natural Channel		1875	535	681	777	862	923	414.3	411.8	419.5	418.0	420.0	418.0	420.3	418.0	420.6	418.0	420.8	418.0
Link_109	3567	2564	Natural Channel		925	360	460	523	579	621	428.4	415.8	433.3	420.0	433.7	420.5	434.0	420.8	434.2	421.0	434.3	421.2
Link_11	Node_17	3300	Circular	18	171	1	2	3	3	3	425.6	424.6	426.5	426.5	427.8	427.7	428.5	428.5	429.4	429.4	430.5	430.5
Link_110	Node_14	166	Natural Channel		426	346	440	499	551	590	432.4	431.6	437.3	437.1	437.8	437.5	438.0	437.8	438.3	438.0	438.4	438.1
Link_111	4231	Node_14	Natural Channel		949	346	440	498	548	585	433.5	432.4	438.8	437.3	439.3	437.8	439.6	438.0	439.8	438.3	440.0	438.4
Link_112	166	3567	Natural Channel		2131	357	455	517	571	612	431.6	428.4	437.1	433.3	437.5	433.7	437.8	434.0	438.0	434.2	438.1	434.3
Link_113	3102	4231	Natural Channel		416	340	431	487	535	572	435.3	433.5	439.3	438.8	439.8	439.3	440.0	439.6	440.3	439.8	440.4	440.0
Link_116	1415	3226	Natural Channel		141	8	12	14	15	15	486.1	486.5	488.1	488.0	488.5	488.4	488.7	488.6	488.8	488.7	488.8	488.7
Link_117	4046	4093	Natural Channel		378	18	24	29	35	39	441.3	440.4	446.1	442.5	446.3	442.8	446.4	442.9	446.4	443.2	446.5	445.9
Link_119	3243	3034	Natural Channel		44	7	9	9	8	8	427.6	423.0	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.9	445.9
Link_12	4093	4096	Circular	30	56	9	12	14	17	18	440.4	440.8	442.5	442.4	442.7	442.6	442.8	442.7	443.2	443.2	445.9	445.9
Link_120	290	2858	Natural Channel		286	3	4	5	6	7	427.7	427.4	429.3	429.2	429.5	429.4	429.6	429.5	429.8	429.6	429.8	429.7
Link_121	3644	2567	Natural Channel		30	157	197	225	251	268	419.0	418.8	421.4	420.8	421.6	421.1	421.8	421.3	421.9	421.4	422.1	421.5
Link_123	Node_34	3102	Natural Channel		1338	332	421	477	524	560	435.7	435.3	440.4	439.3	440.9	439.8	441.2	440.0	441.4	440.3	441.6	440.4
Link_124	129	Node_10	Natural Channel		851	108	123	135	145	154	448.2	434.9	449.9	436.1	450.0	436.2	450.1	436.5	450.2	436.7	450.3	436.7
Link_125	2509	Node_34	Natural Channel		171	256	341	394	439	473	436.5	435.7	440.3	440.4	440.8	440.9	441.1	441.2	441.3	441.4	441.5	441.6
Link_126	4008	1738	Natural Channel		2753	240	319	368	410	441	446.1	439.9	454.7	445.0	455.7	445.8	456.3	446.2	456.8	446.6	457.2	446.8
Link_127	3915	3499	Natural Channel		644	90	117	131	143	152	459.1	459.3	463.4	462.5	463.9	462.9	464.1	463.1	464.3	463.3	464.4	463.4
Link_128	3236	3892	Natural Channel		191	90	116	131	143	152	459.5	459.2	463.6	463.4	464.0	463.9	464.3	464.1	464.5	464.3	464.6	464.4
Link_129	3499	3501	Natural Channel		283	95	123	139	153	162	459.3	459.3	462.5	461.7	462.9	462.1	463.1	462.3	463.3	462.5	463.4	462.6
Link_13	3159	3195	Circular	42	34	73	79	82	82	83	447.5	447.5	455.9	455.8	458.0	457.8	459.2	459.0	460.5	460.3	461.4	461.2
Link_130	3253	3236	Natural Channel		129	84	109	122	134	142	460.8	459.5	464.1	463.6	464.5	464.0	464.8	464.3	465.0	464.5	465.1	464.6
Link_132	2861	133	Natural Channel		401	82	93	102	111	118	448.2	447.9	451.3	450.8	451.5	451.0	451.7	451.1	451.8	451.2	451.9	451.3
Link_133	Node_10	4179	Natural Channel		329	53	61	67	73	77	434.9	430.0	436.1	430.5	436.2	430.6	436.2	430.7	436.3	430.7	436.3	430.8
Link_134	179	2490	Natural Channel		1785	251	334	386	430	463	439.8	436.3	444.3	440.4	444.9	440.9	445.2	441.2	445.5	441.5	445.6	441.7
Link_135	3351	3847	Natural Channel		282	101	131	149	164	175	455.7	456.8	461.4	461.0	461.8	461.4	462.0	461.5	462.1	461.7	462.2	461.8
Link_136	2540	1847	Natural Channel		552	132	171	196	217	235	452.8	452.9	458.0	457.8	458.7	458.5	459.0	458.8	459.4	459.2	459.7	459.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Link_138	3266	1238	Natural Channel		1205	166	218	249	274	293	452.3	446.6	457.1	455.8	457.8	456.6	458.2	457.3	458.6	457.9	459.0	458.4
Link_139	3847	2540	Natural Channel		1071	127	166	189	210	227	456.8	452.8	459.7	458.0	460.0	458.7	460.1	459.0	460.2	459.4	460.3	459.7
Link_14	Node_17	3382	Circular	18	117	-1	-2	0	-3	-3	425.6	427.0	426.6	427.4	427.8	427.9	428.5	428.5	429.4	429.4	430.5	430.5
Link_140	3379	3001	Natural Channel		70	46	52	56	60	63	431.8	425.2	434.3	433.9	434.5	434.2	434.6	434.3	434.7	434.5	434.8	434.6
Link_141	1816	162	Natural Channel		581	134	174	199	221	238	452.8	451.9	457.8	457.2	458.5	457.9	458.8	458.3	459.2	458.7	459.5	459.1
Link_143	162	3151	Natural Channel		76	166	219	250	276	297	451.9	451.9	457.2	457.2	457.9	457.9	458.3	458.3	458.7	458.7	459.1	459.1
Link_145	3349	3269	Natural Channel		438	4	6	8	9	11	504.3	503.6	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
Link_146	1976	3703	Natural Channel		595	189	243	272	297	314	477.2	476.5	483.9	483.8	484.7	484.6	485.1	484.9	485.3	485.2	485.5	485.4
Link_147	2940	2093	Natural Channel		580	133	175	199	220	235	477.8	476.6	484.3	484.2	485.1	485.0	485.5	485.3	485.8	485.6	486.0	485.8
Link_148	149	3014	Natural Channel		497	5	6	8	9	10	479.9	478.1	480.3	479.2	480.4	479.3	480.5	479.5	480.5	479.6	480.5	479.7
Link_149	3604	832	Natural Channel		866	64	82	88	94	98	483.4	483.3	487.0	486.4	487.6	487.2	488.0	487.8	488.5	488.3	488.9	488.8
Link_15	Node_20	Node_29	Circular	36	147	11	16	18	20	21	501.3	501.1	506.8	506.8	508.2	508.2	509.6	509.5	510.6	510.5	511.2	511.1
Link_150	3010	2963	Natural Channel		362	28	40	49	55	58	539.8	535.9	540.6	537.6	540.8	537.8	541.0	537.9	541.1	538.0	541.1	538.0
Link_151	1517	4040	Natural Channel		393	11	16	16	17	17	497.5	504.1	505.9	504.9	506.4	506.3	507.4	507.3	508.1	508.1	508.7	508.7
Link_152	1934	183	Natural Channel		398	46	65	79	94	105	514.0	511.0	515.8	514.8	516.0	515.3	516.2	515.7	516.4	516.1	516.6	516.4
Link_154	2033	3411	Natural Channel		30	0	0	1	3	4	508.8	508.0	508.9	508.2	508.9	508.2	509.1	508.7	509.2	509.0	509.2	509.2
Link_155	3953	4191	Natural Channel		625	62	85	104	122	136	507.9	504.0	510.8	508.0	511.1	508.0	511.3	508.0	511.5	508.0	511.7	508.0
Link_156	3178	Node_6	Natural Channel		813	26	35	42	46	50	416.2	416.0	420.6	418.7	420.9	419.3	421.0	419.7	421.2	420.1	421.3	420.3
Link_157	4042	3941	Natural Channel		77	7	10	12	14	16	426.1	425.8	427.6	427.5	427.8	427.7	427.9	427.9	428.1	428.0	428.1	428.1
Link_158	827	3966	Natural Channel		30	42	48	52	54	57	434.8	434.9	437.0	436.8	437.1	436.9	437.2	437.0	437.2	437.0	437.3	437.0
Link_159	3820	3348	Natural Channel		566	46	52	57	61	64	432.3	432.1	435.0	434.3	435.3	434.8	435.4	434.9	435.5	435.1	435.6	435.2
Link_16	4214	4213	Circular	30	119	0	0	0	0	0	445.2	445.0	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1
Link_160	3611	1569	Natural Channel		688	9	13	15	17	18	417.7	417.6	421.8	421.4	422.4	422.4	423.0	423.0	423.5	423.5	424.0	424.0
Link_161	3763	4197	Natural Channel		683	63	75	84	94	100	427.5	420.0	430.2	424.9	430.4	425.2	430.6	425.5	430.7	425.7	430.8	425.8
Link_162	1577	1534	Natural Channel		887	63	75	84	94	100	428.6	428.1	433.0	432.8	433.2	433.0	433.3	433.1	433.4	433.1	433.5	433.1
Link_163	4120	4118	Natural Channel		708	1	2	2	2	2	434.0	429.8	434.1	433.3	434.2	433.5	434.2	433.6	434.2	433.8	434.2	433.9
Link_165	3779	1824	Natural Channel		400	84	109	122	134	142	461.4	460.9	465.3	464.7	465.8	465.2	466.0	465.5	466.2	465.8	466.4	465.9
Link_166	Node_11	3613	Natural Channel		1076	33	39	42	44	46	437.8	436.6	441.9	441.8	443.6	443.6	444.7	444.7	445.5	445.5	446.2	446.2
Link_167	3208	2975	Natural Channel		331	48	64	78	91	98	469.1	471.9	474.5	474.4	474.9	474.7	475.2	475.0	475.5	475.3	475.6	475.4
Link_168	3461	235	Natural Channel		251	8	12	14	16	18	464.0	463.1	469.1	469.1	469.3	469.3	469.5	469.5	469.6	469.6	469.8	469.8
Link_169	2333	259	Natural Channel		462	29	40	48	58	66	462.8	462.2	465.3	465.0	465.8	465.5	466.1	465.9	466.4	466.2	466.8	466.6
Link_17	1145	Node_21	Circular	8	195	2	2	3	3	3	522.5	524.5	530.8	525.2	532.6	525.3	534.1	525.3	535.8	525.4	537.2	525.5
Link_170	3495	4012	Natural Channel		89	34	38	43	46	49	436.7	436.3	441.6	441.6	443.2	443.2	444.3	444.3	445.1	445.1	445.8	445.8
Link_171	2732	1656	Natural Channel		144	30	37	38	39	40	438.7	437.8	442.1	442.1	443.9	443.9	445.1	445.1	445.9	445.9	446.6	446.6
Link_172	4018	4013	Natural Channel		30	42	48	52	55	57	436.2	436.1	440.7	440.7	442.0	442.0	442.9	442.9	443.5	443.5	444.1	444.1
Link_173	3967	3968	Natural Channel		30	21	20	19	20	21	456.0	457.2	460.9	460.9	463.6	463.6	465.9	465.9	467.7	467.7	468.4	468.4
Link_174	3022	3048	Natural Channel		1130	15	18	19	19	20	455.1	451.4	460.2	460.2	462.9	462.8	465.2	465.2	466.9	466.9	467.8	467.8
Link_175	3080	3584	Natural Channel		73	42	48	52	55	57	436.3	436.4	439.6	439.5	440.4	440.4	440.9	440.9	441.3	441.3	441.6	441.6
Link_177	1608	1820	Natural Channel		1155	34	48	57	67	77	461.3	459.6	464.4	463.0	464.9	463.5	465.1	463.7	465.4	464.0	465.6	464.4
Link_178	2511	135	Natural Channel		1625	9	14	17	18	20	462.4	464.1	469.0	466.4	469.1	466.9	469.2	467.3	469.2	467.8	469.3	468.3
Link_179	3334	3456	Natural Channel		361	8	12	14	16	18	463.5	463.6	469.1	469.1	469.3	469.3	469.4	469.4	469.6	469.6	469.7	469.7
Link_18	Node_29	Node_37	Circular	36	259	11	16	18	20	21	501.1	500.6	506.7	506.7	508.1	507.9	509.3	509.2	510.4	510.1	511.0	510.7
Link_180	3465	2581	Natural Channel		329	8	12	14	16	18	463.0	462.5	469.0	469.0	469.2	469.2	469.3	469.3	469.4	469.4	469.4	469.4
Link_181	1679	1661	Natural Channel		311	32	40	42	41	42	437.8	437.4	442.5	442.5	444.5	444.5	445.8	445.8	446.6	446.6	447.3	447.3
Link_182	2616	Node_34	Natural Channel		153	77	82	84	87	89	434.1	435.7	440.4	440.4	440.9	440.9	441.2	441.2	441.4	441.4	441.6	441.6
Link_183	2976	312	Natural Channel		21	0	0	0	0	0	442.8	440.2	442.8	440.4	442.8	440.4	442.8	440.4	442.8	440.4	442.8	440.4
Link_184	3237	2897	Natural Channel		117	0	0	2	4	5	437.0	436.8	442.0	440.0	442.0	440.0	442.1	440.0	442.2	440.0	442.3	440.0
Link_185	2582	2523	Natural Channel		31	8	12	14	16	18	462.4	462.5	469.0	469.0	469.1	469.1	469.2	469.2	469.2	469.2	469.3	469.3
Link_186	2093	1976	Natural Channel		1580	154	199	226	249	265	476.6	477.2	484.2	483.9	485.0	484.7	485.3	485.1	485.6	485.3	485.8	485.5
Link_187	1727	2604	Natural Channel		562	-2	-1	1	-1	1	441.5	436.6	441.5	440.5	441.5	440.9	441.5	441.2	441.5	441.4	441.6	441.6
Link_188	573	4214	Natural Channel		274	0	0	0	0	0	446.5	445.2	446.5	445.4	446.5	445.4	446.5	445.4	446.5	445.4	446.5	445.4
Link_189	4185	2605	Natural Channel		340	0	-2	0	-1	-1	469.7	465.3	469.8	469.1	469.8	469.3	469.8	469.5	469.8	469.6	469.8	469.8
Link_19	Node_23	1232	Circular	8	12	2	2	3	3	3	521.7	519.0	522.2	521.3	522.5	521.5	522.8	521.6	523.2	521.8	523.5	521.9
Link_190	3896	Node_6	Natural Channel		2367	48	72	90	104	113	411.5	416.0	418.8	418.7	419.4	419.3	419.8	419.7	420.1	420.1	420.3	420.3
Link_191	2605	3730	Natural Channel		968	-2	-6	3	-4	-5	465.3	463.4	469.1	469.1	469.3	469.3	469.5	469.5	469.6	469.6	469.8	469.8
Link_192	4070	4073	Natural Channel		115	63	75	84	91	97	421.6	409.7	422.7	410.1	422.8	410.2	422.9	410.2	422.9	410.2	423.0	410.3
Link_193	4096	3034	Natural Channel		915	19	25	30	35	38	440.8	423.0	442.2	432.8	442.3	436.8	442.4	439.9	443.2	443.2	445.9	445.9
Link_194	4058	4092	Natural Channel		754	2	3	3	3	3	437.6	429.2	439.1	432.8	439.2	436.8	439.9	439.9	443.2	443.2	445.9	445.9
Link_195	4065	4069	Natural Channel		95	63	75	84	91	97	424.6	422.3	431.5	431.5	434.9	434.9	437.6	437.6	440.4	440.4	442.7	442.7

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Link_196	Node_8a	2602	Natural Channel		489	22	27	30	33	35	450.9	449.7	457.1	457.1	459.5	459.5	461.6	461.6	463.9	463.9	465.6	465.6
Link_197	3454	237	Natural Channel		88	26	36	42	53	61	461.3	462.8	466.0	466.0	466.6	466.6	467.0	467.0	467.6	467.6	468.2	468.1
Link_198	Node_28	1	Natural Channel		1018	8	12	13	13	-17	460.7	457.8	461.9	461.8	464.5	464.5	466.8	466.8	468.3	468.3	469.0	469.0
Link_199	817	2934	Natural Channel		478	110	144	162	176	185	478.4	478.4	484.8	484.5	485.7	485.4	486.2	485.9	486.6	486.4	486.9	486.7
Link_2	1049	2033	Circular	12	176	0	0	1	3	4	501.1	509.1	507.0	509.1	508.7	509.1	510.0	509.6	510.8	509.8	511.3	509.9
Link_20	Node_30	Node_26	Circular	12	298	0	0	0	0	0	522.0	519.2	522.0	519.4	522.0	520.8	522.0	521.9	522.8	522.8	523.3	523.3
Link_200	1809	817	Natural Channel		1969	109	139	153	165	173	479.8	478.4	485.5	484.8	486.3	485.7	486.7	486.2	487.1	486.6	487.4	486.9
Link_201	3447	3454	Natural Channel		1900	27	38	46	50	53	464.1	461.3	466.1	466.0	466.7	466.6	467.1	467.0	467.6	467.6	468.2	468.2
Link_203	2536	2394	Natural Channel		1799	22	33	42	50	57	462.5	456.4	464.7	463.4	464.9	463.7	465.1	463.8	465.2	464.0	465.3	464.1
Link_204	2809	2628	Natural Channel		3238	11	17	21	25	29	466.3	466.2	471.9	470.9	472.2	471.4	472.4	471.9	472.6	472.3	472.9	472.6
Link_205	2394	4149	Natural Channel		587	53	77	96	114	128	456.4	459.7	463.4	462.9	463.7	463.1	463.8	463.2	464.0	463.3	464.1	463.4
Link_206	2874	2607	Natural Channel		420	11	17	21	25	29	466.3	464.5	470.7	470.7	471.3	471.3	471.7	471.7	472.1	472.0	472.3	472.3
Link_207	4213	1733	Natural Channel		675	0	0	0	0	0	445.0	441.9	445.0	442.1	445.0	442.1	445.0	442.1	445.0	442.1	445.0	442.1
Link_208	2601	2617	Natural Channel		508	22	33	41	49	55	466.9	464.1	468.0	468.0	468.5	468.5	468.9	469.0	469.4	469.4	469.7	469.7
Link_209	3025	2995	Natural Channel		385	5	6	8	12	13	477.8	467.8	478.4	475.0	478.4	475.1	478.5	475.2	478.5	475.3	478.5	475.3
Link_21	Node_26	Node_27	Circular	12	208	0	0	0	0	1	519.4	519.1	519.4	519.1	520.8	520.8	521.9	521.9	522.8	522.8	523.3	523.3
Link_210	2965	4170	Natural Channel		441	32	49	62	76	86	545.2	535.4	546.3	538.8	546.5	539.3	546.6	539.7	546.7	540.5	546.8	541.0
Link_211	2649	4115	Natural Channel		385	7	10	11	13	15	430.3	425.5	431.2	430.2	431.4	431.2	432.0	432.0	432.7	432.7	433.2	433.2
Link_213	2282	1714	Natural Channel		1211	45	54	52	52	57	450.4	446.0	458.5	458.5	461.0	461.0	462.4	462.4	463.7	463.7	464.7	464.7
Link_214	1905	Node_3	Natural Channel		863	14	20	25	30	34	462.5	429.1	463.9	430.1	464.1	430.3	464.2	430.4	464.3	430.5	464.4	430.6
Link_215	4175	1941	Natural Channel		1186	0	0	0	0	0	504.8	464.8	504.8	467.0	504.8	467.3	504.8	467.4	504.8	467.6	504.8	467.7
Link_216	3290	2626	Natural Channel		910	229	306	355	395	426	446.6	446.1	454.9	454.9	456.0	456.0	456.7	456.7	457.3	457.3	457.8	457.8
Link_217	2614	2621	Natural Channel		319	22	32	41	49	55	465.0	463.8	466.7	466.7	467.1	467.1	467.4	467.4	467.7	467.7	467.9	467.9
Link_218	3940	2950	Natural Channel		267	7	10	12	14	16	425.6	425.1	427.5	427.0	427.7	427.0	427.8	427.0	427.9	427.1	428.0	427.1
Link_219	Node_10	3317	Natural Channel		232	55	62	69	74	78	434.9	430.6	436.1	434.9	436.2	435.3	436.2	435.5	436.3	435.7	436.3	435.9
Link_22	Node_27	Node_25	Circular	12	140	0	0	1	-1	1	519.1	516.8	519.1	517.1	520.8	520.8	521.9	521.9	522.8	522.8	523.3	523.3
Link_220	3381	4173	Natural Channel		222	15	30	50	81	107	516.8	513.3	518.2	514.1	518.6	514.5	519.0	514.9	519.5	515.4	519.8	515.7
Link_221	4170	3470	Natural Channel		1444	15	30	50	87	115	535.4	517.6	538.8	518.8	539.3	519.4	539.7	521.3	540.5	525.6	541.0	530.4
Link_222	2216	2188	Natural Channel		383	16	23	29	31	33	560.0	549.7	560.5	551.2	560.6	551.5	560.7	551.8	560.7	551.9	560.7	552.0
Link_224	3436	2503	Natural Channel		1311	0	1	3	4	6	508.0	497.9	508.1	506.0	508.1	506.7	508.5	507.6	508.7	508.4	509.1	509.1
Link_225	169	4000	Natural Channel		427	19	26	31	36	41	430.5	430.2	432.5	431.7	432.7	432.0	432.8	432.2	433.0	432.3	433.1	432.5
Link_226	318	2085	Natural Channel		175	26	36	43	53	61	462.8	462.6	465.9	465.8	466.4	466.4	466.8	466.8	467.3	467.2	467.7	467.7
Link_227	3269	2569	Natural Channel		244	-1	-2	0	-2	-3	503.6	504.6	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
Link_228	Node_6	4129	Natural Channel		3092	103	160	200	235	262	416.0	406.0	418.7	407.8	419.3	408.0	419.7	408.1	420.1	408.2	420.3	408.2
Link_229	Node_36	3896	Natural Channel		224	26	39	50	57	61	410.2	411.5	418.8	418.8	419.4	419.4	419.8	419.8	420.1	420.1	420.3	420.3
Link_23	Node_25	Node_24	Circular	15	348	0	2	3	3	3	516.8	515.1	517.1	517.1	520.8	520.8	521.9	521.9	522.8	522.8	523.3	523.3
Link_231	Node_19	3743	Natural Channel		342	1	2	2	3	-3	421.2	412.1	421.3	418.8	421.3	419.4	421.3	419.8	421.3	420.1	421.3	420.3
Link_233	3001	3486	Natural Channel		276	49	60	65	70	73	425.2	430.8	433.9	433.8	434.2	434.0	434.3	434.2	434.5	434.3	434.6	434.4
Link_24	Node_24	1856	Circular	15	220	0	2	3	3	3	515.1	514.3	517.1	517.1	520.8	520.8	521.9	521.9	522.8	522.8	523.3	523.3
Link_25	3716	1333	Circular	36	0	13	14	16	17	18	446.9	443.1	447.9	446.8	448.0	447.5	448.1	448.1	448.7	448.6	449.2	449.1
Link_26	2142	Node_31	Circular	12	97	5	8	9	11	11	727.2	719.7	727.7	720.6	727.9	720.9	728.0	721.0	729.7	721.2	730.1	721.2
Link_27	Node_31	Node_32	Circular	12	143	5	8	9	11	11	719.7	703.0	720.2	703.9	720.3	704.1	720.4	704.3	720.4	704.5	720.4	704.5
Link_28	Node_32	Node_33	Circular	12	168	5	8	9	11	11	703.0	683.0	703.5	683.9	703.6	684.2	703.7	684.3	703.7	684.5	703.7	684.5
Link_29	Node_33	1071	Circular	12	89	5	8	9	11	11	683.0	672.5	683.5	673.5	683.6	673.7	683.7	673.9	683.7	674.0	683.8	674.0
Link_3	636	611	Circular	24	193	6	8	8	9	9	442.8	442.3	444.8	444.7	448.2	448.0	449.3	449.2	450.0	449.9	450.7	450.5
Link_30	Node_18	Node_3-E	Natural Channel		483	33	49	63	76	86	588.2	559.3	589.5	561.8	589.6	561.9	589.7	562.0	589.8	562.1	589.9	562.1
Link_31	2300	Node_13	Circular	48	50	33	42	44	43	46	438.1	438.0	443.1	443.1	445.5	445.4	446.8	446.8	447.6	447.6	448.3	448.3
Link_32	3048	Node_8a	Circular	12	44	7	9	10	10	10	451.4	450.9	458.6	457.1	460.9	459.5	463.2	461.6	465.1	463.9	466.6	465.6
Link_33	3048	Node_8a	Circular	12	44	7	9	10	10	10	451.4	450.9	458.6	457.1	460.9	459.5	463.2	461.6	465.1	463.9	466.6	465.6
Link_34	Node_37	Node_39	Circular	36	382	11	16	18	20	20	500.6	500.0	506.6	506.5	507.9	507.6	509.0	508.8	510.0	509.7	510.6	510.3
Link_35	4067	4065	Circular	30	87	32	38	42	46	49	424.9	424.6	432.0	431.5	435.6	434.9	438.5	437.6	441.5	440.4	443.9	442.7
Link_36	4067	4065	Circular	30	87	32	38	42	46	49	424.9	424.6	432.0	431.5	435.6	434.9	438.5	437.6	441.5	440.4	443.9	442.7
Link_37	Node_39	Node_40	Circular	36	332	11	16	18	20	20	500.0	499.4	506.5	506.4	507.6	507.4	508.6	508.4	509.6	509.3	510.2	509.9
Link_38	Node_9	3558	Circular	48	447	32	41	48	54	57	425.1	424.4	427.3	426.7	427.7	427.1	428.0	427.3	428.4	427.8	428.4	427.7
Link_39	3620	3486	Circular	27	421	2	3	3	4	4	431.4	431.0	433.8	433.8	434.0	434.0	434.2	434.2	434.4	434.3	434.5	434.4
Link_3-E	Node_3-E	Node_5-E	Circular	32	40	15	23	30	37	42	559.4	557.7	560.1	558.5	560.3	558.7	560.5	558.8	560.6	558.9	560.7	559.0
Link_4	Node_8	170	Circular	30	80	33	40	44	48	51	539.0	538.1	545.8	545.2	546.5	545.7	546.9	546.0	547.4	546.3	547.7	546.5
Link_40	Node_40	2653	Circular	36	150	11	16	18	20	20	499.4	499.2	506.3	506.3	507.2	507.1	508.2	508.1	509.1	509.0	509.7	509.6
Link_41	2567	2564	Rectangular		220	79	98	113	125	134	418.8	417.6	420.4	420.0	420.8	420.5	421.1	420.8	421.4	421.0	421.5	421.2

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
EXISTING CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Existing Conditions									
													2-Year Storm		5-Year Storm		10-Year Storm		25-Year Storm		100-Year Storm	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Link_42	3030	3351	Rectangular		53	101	131	149	164	175	458.9	458.8	461.5	461.5	461.9	461.9	462.1	462.1	462.3	462.2	462.4	462.3
Link_43	Node_13	Node_5	Circular	48	55	33	42	44	43	46	430.4	428.9	442.9	442.9	445.1	445.1	446.5	446.4	447.3	447.2	448.0	447.9
Link_44	2567	2564	Rectangular		220	79	98	113	125	134	418.8	417.6	420.4	420.0	420.8	420.5	421.1	420.8	421.4	421.0	421.5	421.2
Link_45	3486	3811	Circular	48	29	19	22	22	22	22	431.0	430.9	433.8	433.8	434.0	434.0	434.2	434.2	434.3	434.3	434.4	434.4
Link_46	3034	3044	Circular	48	249	15	19	20	17	17	423.0	422.9	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
Link_47	Node_4	4091	Circular	42	36	10	14	17	20	24	438.4	437.3	438.9	437.9	439.0	438.0	439.9	439.9	443.2	443.2	445.9	445.9
Link_48	4044	3953	Circular	60	30	31	44	53	62	69	507.9	508.0	510.8	510.8	511.1	511.1	511.4	511.3	511.6	511.5	511.7	511.7
Link_49	737	Node_35	Circular	24	509	8	11	12	12	13	449.8	448.0	451.0	449.0	451.3	450.1	452.8	451.3	453.2	451.7	453.5	451.9
Link_4-E	Node_3-E	Node_5-E	Circular	32	40	17	26	32	39	44	559.3	557.9	560.1	558.7	560.3	558.9	560.5	559.1	560.6	559.2	560.7	559.3
Link_5	1083	3919	Circular	36	295	12	16	19	20	21	493.7	493.0	495.2	494.7	499.7	499.6	501.1	501.0	501.8	501.8	502.2	502.2
Link_50	Node_35	3058	Circular	18	487	8	11	12	12	13	445.9	442.0	447.0	443.1	448.7	443.2	449.7	443.2	450.0	443.2	450.2	443.2
Link_51	237	318	Circular	36	0	13	18	21	26	30	462.8	462.8	465.9	465.9	466.5	466.4	466.8	466.8	467.3	467.3	467.8	467.7
Link_52	Node_21	Node_23	Circular	21	320	2	2	3	3	3	524.5	521.7	524.9	522.7	524.9	523.3	525.0	523.8	525.0	524.4	525.0	525.0
Link_53	200	1891	Circular	36	28	25	36	45	50	53	540.7	540.4	542.9	542.9	543.5	543.4	543.9	543.8	544.2	544.0	544.3	544.1
Link_54	3439	Node_28	Natural Channel		783	-3	5	5	-11	-14	463.2	460.7	463.4	461.9	464.5	464.5	466.8	466.8	468.3	468.3	469.0	469.0
Link_55	3550	Node_9	Circular	48	440	32	41	48	54	57	425.8	425.1	428.1	427.6	428.5	428.0	428.8	428.3	429.3	428.7	429.4	428.7
Link_56	3743	Node_36	Natural Channel		308	22	36	46	54	57	412.1	410.2	418.8	418.8	419.4	419.4	419.8	419.8	420.1	420.1	420.3	420.3
Link_6	3113	1266	Circular	48	306	5	7	8	10	10	460.9	461.1	462.1	462.0	462.3	462.2	463.5	463.5	464.4	464.4	465.1	465.1
Link_61	3449	2216	Circular	24	80	17	25	31	35	36	561.0	560.3	562.3	561.7	562.9	561.9	563.5	561.9	563.8	561.9	564.0	561.9
Link_62	2390	1524	Circular	6	14	2	2	2	2	2	464.1	464.1	468.2	466.7	468.5	467.2	468.8	467.6	469.0	467.9	469.1	468.2
Link_64	4091	4092	Natural Channel		107	10	14	17	19	23	436.6	429.2	437.4	435.2	437.5	436.8	439.9	439.9	443.2	443.2	445.9	445.9
Link_65	3153	3141	Natural Channel		30	4	5	6	7	9	435.7	436.4	438.6	438.6	438.9	438.9	440.7	440.7	441.8	441.8	442.3	442.3
Link_66	4197	3644	Natural Channel		2600	135	168	193	217	234	420.0	419.0	424.9	421.4	425.2	421.6	425.5	421.8	425.7	421.9	425.8	422.1
Link_67	3141	3133	Natural Channel		447	9	11	13	15	16	436.4	432.9	438.5	436.1	438.9	438.8	440.7	440.7	441.8	441.8	442.3	442.3
Link_68	4123	4197	Natural Channel		716	67	84	98	111	119	422.1	420.0	425.8	424.9	426.1	425.2	426.3	425.5	426.4	425.7	426.6	425.8
Link_69	4115	2959	Natural Channel		73	7	10	11	13	14	425.5	425.1	430.2	430.2	431.2	431.2	432.0	432.0	432.7	432.7	433.2	433.2
Link_6-E	Node_5-E	2947	Natural Channel		375	32	49	63	76	86	556.0	546.2	557.6	548.3	557.8	548.8	558.0	549.2	558.1	549.6	558.3	549.9
Link_7	3000	4231	Natural Channel		75	1	1	1	1	1	434.6	433.5	438.8	438.8	439.3	439.3	439.6	439.6	439.8	439.8	440.0	440.0
Link_70	4116	4115	Natural Channel		646	0	0	1	1	2	428.0	425.5	432.5	430.2	432.5	431.2	432.5	432.0	432.7	432.7	433.2	433.2
Link_71	1532	4123	Natural Channel		30	68	85	99	111	119	423.9	422.1	425.9	425.8	426.1	426.1	426.3	426.3	426.5	426.4	426.6	426.6
Link_72	4229	4123	Natural Channel		220	0	0	0	0	0	428.3	422.1	428.4	425.8	428.4	426.1	428.4	426.3	428.4	426.4	428.4	426.6
Link_73	3337	1602	Natural Channel		1038	61	70	77	84	89	429.3	427.4	431.6	429.7	431.8	429.9	431.9	430.1	432.1	430.2	432.2	430.3
Link_74_1	1834	Node_74	Natural Channel		1261	34	48	57	68	78	459.8	458.3	462.8	461.1	463.2	461.4	463.4	461.6	463.7	462.0	464.0	463.1
Link_74_2	Node_74	806	Natural Channel		893	35	48	58	72	86	458.3	455.2	461.0	458.2	461.4	458.9	461.6	459.7	462.0	461.5	463.1	462.9
Link_75	4003	3987	Natural Channel		448	34	44	48	50	52	462.0	461.4	466.1	466.0	466.8	466.7	467.2	467.2	467.6	467.6	467.9	467.9
Link_77	1602	4194	Natural Channel		1037	110	134	149	164	174	427.4	421.0	429.7	422.4	429.9	422.6	430.1	422.7	430.2	422.9	430.3	422.9
Link_78	3987	3228	Natural Channel		113	-49	-64	0	-86	-94	461.4	461.4	466.0	466.0	466.7	466.8	467.2	467.2	467.6	467.6	467.9	467.9
Link_79	1729	2808	Natural Channel		485	15	20	24	28	31	430.0	430.1	432.5	432.5	432.7	432.7	432.9	432.8	433.0	433.0	433.1	433.1
Link_8	Node_7	3597	Natural Channel		4198	6	9	11	13	14	499.6	485.0	501.1	488.1	501.2	488.9	501.3	489.5	501.4	490.2	501.4	490.7
Link_80	4135	1729	Natural Channel		1233	13	17	20	24	26	433.8	430.0	435.5	432.6	435.6	432.7	435.8	432.9	435.9	433.0	435.9	433.1
Link_81	3303	3232	Natural Channel		1806	49	64	76	86	94	462.0	462.4	466.9	466.1	467.5	466.9	467.9	467.4	468.4	468.0	468.8	468.4
Link_82	1539	1584	Natural Channel		104	65	78	82	84	86	423.4	421.5	426.2	426.2	426.5	426.5	426.7	426.7	426.9	426.9	427.0	427.0
Link_83	349	2808	Natural Channel		363	1	2	2	2	3	430.1	430.1	432.5	432.5	432.7	432.7	432.8	432.8	433.0	433.0	433.1	433.1
Link_84	3497	1584	Natural Channel		2143	28	31	33	33	36	424.4	421.5	426.4	426.2	426.7	426.5	426.8	426.7	427.0	426.9	427.1	427.0
Link_85	3811	4118	Natural Channel		657	55	64	70	77	81	430.8	429.8	433.8	433.3	434.0	433.5	434.2	433.6	434.3	433.8	434.4	433.9
Link_87	2787	2776	Natural Channel		1020	78	104	124	142	158	435.3	422.8	437.5	432.9	437.8	437.0	440.3	440.3	443.7	443.7	446.6	446.6
Link_88	Node_22	2775	Natural Channel		1577	-32	-42	21	-46	-51	425.9	422.4	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
Link_89	4170	291	Natural Channel		764	82	115	133	135	135	535.4	528.2	538.8	533.1	539.3	536.6	539.7	539.4	540.5	540.3	541.0	540.9
Link_9	1049	Node_20	Circular	36	142	11	16	18	21	23	501.6	501.3	506.9	506.9	508.5	508.4	509.9	509.8	511.0	510.9	511.6	511.5
Link_90r	2869	240	Natural Channel		1526	133	172	186	194	199	522.5	511.8	525.7	516.3	526.1	517.5	526.3	517.8	526.3	518.0	526.4	518.1
Link_91r	170	2869	Natural Channel		653	33	40	44	48	51	538.1	522.5	545.0	525.7	545.4	526.1	545.7	526.3	546.0	526.3	546.1	526.4
Link_92	Node_16	4170	Natural Channel		5031	40	61	74	90	103	537.0	535.4	541.9	538.8	542.3	539.3	542.6	539.7	542.8	540.5	543.0	541.0
Link_93	4118	1576	Natural Channel		368	55	65	72	79	84	429.8	428.6	433.3	433.1	433.5	433.3	433.6	433.5	433.8	433.6	433.9	433.7
Link_94	4053	4092	Natural Channel		1543	20	26	27	23	21	435.1	429.2	436.3	434.8	436.8	436.8	439.9	439.9	443.2	443.2	445.9	445.9
Link_95	3044	3	Natural Channel		922	26	34	39	43	47	422.9	418.1	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.8	445.8
Link_96	1571	2095	Natural Channel		252	5	7	8	8	8	454.6	454.5	456.8	456.1	456.8	456.7	457.4	457.4	458.0	458.0	458.5	458.5
Link_97	3907	3204	Natural Channel		2628	27	36	40	42	46	491.9	485.7	494.8	489.1	495.1	490.1	495.3	490.7	495.3	491.2	495.5	491.7
Link_98	Node_15	3034	Natural Channel		595	20	25	26	23	24	428.5	423.0	432.8	432.8	436.8	436.8	439.9	439.9	443.2	443.2	445.9	445.9
Link_99	4108	4107	Natural Channel		222	10	14	17	20	22	485.6	472.7	486.3	474.1	486.4	474.4	486.4	474.6	486.5	474.8	486.5	474.9

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS			(ft)	2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1	4087	4086	Circular	24	93	12	16	19	22	24	460.8	457.4	461.6	459.0	461.7	459.3	461.8	459.5	461.9	459.8	462.0	460.0
1_0	1832	886	Circular	48	482	40	49	57	60	60	474.2	472.7	476.2	475.1	476.6	475.8	477.1	476.3	478.1	477.3	478.6	478.0
1_1	4214	4213	Circular	30	119	0	0	0	0	0	445.2	445.0	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1
1_12	1238	2099	Natural Channel		409	227	300	346	386	415	446.6	445.6	454.9	455.0	456.1	456.2	457.0	457.1	457.8	457.8	458.3	458.4
1_3	2962	Node_2	Natural Channel		448	33	44	52	56	60	535.1	533.9	536.7	536.0	536.9	536.0	537.1	536.0	537.1	536.0	537.2	536.0
1_4	2099	204	Natural Channel		30	233	307	354	395	425	445.6	447.0	455.0	455.0	456.2	456.2	457.1	457.1	457.8	457.8	458.4	458.4
1_5	3703	Node_12	Natural Channel		863	239	303	340	371	395	476.5	476.0	483.9	483.2	484.6	483.9	485.0	484.2	485.3	484.5	485.5	484.7
1_6	220	3593	Natural Channel		1408	54	74	90	106	119	510.9	508.3	514.8	510.9	515.3	511.2	515.7	511.4	516.0	511.6	516.2	511.8
1_7	3966	3807	Natural Channel		761	43	49	53	56	58	434.9	432.2	436.8	435.0	436.9	435.3	437.0	435.4	437.0	435.5	437.0	435.6
1_8	1535	3709	Natural Channel		295	63	75	84	94	101	428.0	427.6	432.1	430.3	432.3	430.5	432.5	430.7	432.7	430.9	432.9	431.0
10	4086	4085	Circular	24	52	12	16	19	22	24	457.4	455.6	458.2	457.0	458.3	457.2	458.5	457.4	458.6	457.5	458.7	457.7
100	1184	1183	Circular	42	149	26	36	44	52	58	528.9	524.1	529.9	526.8	530.1	527.3	530.3	527.7	530.5	528.1	530.6	528.4
1001	127	1530	Circular	24	263	9	12	14	15	16	429.1	429.1	431.0	430.6	431.6	430.9	432.2	431.2	433.2	432.0	433.5	432.4
1002	2914	2922	Circular	24	55	9	12	14	15	16	429.5	429.5	431.7	431.6	433.1	432.9	434.4	434.1	435.7	435.4	436.1	435.9
1003	2667	2914	Circular	24	179	9	12	14	15	16	428.9	429.5	432.1	431.8	433.8	433.3	435.4	434.7	436.9	436.1	437.5	436.6
10051562	Corporate_Pond_Inlet_2	Corporate_Pond	Circular	30	40	9	12	13	14	15	418.1	418.0	421.7	421.7	421.9	421.8	421.9	421.9	422.0	422.0	422.0	422.0
10051563	10023868	Node_36	Circular	30	97	5	5	5	5	5	416.0	416.0	418.9	418.9	419.5	419.5	419.9	419.9	420.2	420.2	420.4	420.3
10051581	Corporate_Pond_Inlet_1	Corporate_Pond	Circular	36	110	6	-9	-11	-13	-13	418.2	417.2	421.7	421.7	421.8	421.8	421.8	421.9	421.9	421.9	421.9	422.0
10053487	10038747	Ambleside_Pond	Circular	21	54	10	13	15	14	14	462.8	462.9	464.5	464.3	466.0	465.9	468.3	468.2	469.5	469.2	469.7	469.4
10053494	10038749	10038745	Circular	12	80	0	0	0	0	0	467.7	465.9	467.7	465.9	467.7	466.5	468.9	468.9	470.5	470.5	470.7	470.7
10053495	10038750	10038746	Circular	12	90	0	0	0	0	0	464.5	463.9	465.0	465.0	466.5	466.5	468.9	468.9	470.5	470.5	470.7	470.7
10053499	10038783	10038748	Circular	21	381	10	13	15	14	14	464.7	463.0	467.2	465.8	470.2	467.8	473.2	470.2	474.7	471.9	475.3	472.2
10053500	10038784	10038783	Circular	21	263	10	13	15	15	16	469.7	467.3	470.7	468.3	472.9	471.2	476.7	474.4	478.0	475.8	478.8	476.5
10053505	10038781	10038784	Circular	10	75	0	0	0	1	2	473.8	470.7	473.8	471.7	473.8	473.5	477.4	477.4	478.7	478.7	479.5	479.5
10053533	10038791	Node_28	Circular	24	30	9	12	11	12	14	462.0	461.9	463.1	462.9	465.4	465.4	467.3	467.3	468.6	468.6	469.2	469.2
10053824	10031888	10038745	Circular	18	192	0	0	0	3	2	466.0	465.5	466.0	465.6	466.5	466.5	468.9	468.9	470.5	470.5	470.7	470.7
10053826	10038746	10038747	Circular	21	173	0	0	0	4	3	463.3	462.9	465.0	465.0	466.5	466.5	468.9	468.9	470.5	470.5	470.7	470.7
10053827	10038748	10038747	Circular	21	49	10	13	15	14	14	462.9	462.8	465.2	465.0	466.8	466.5	469.2	468.9	470.9	470.5	471.1	470.7
10053828	10038745	10038746	Circular	18	274	0	0	0	3	3	465.5	463.5	465.5	465.0	466.5	466.5	468.9	468.9	470.5	470.5	470.7	470.7
10053830	10038755	10038747	Circular	10	10	0	0	0	1	0	464.0	463.6	465.0	465.0	466.5	466.5	468.9	468.9	470.5	470.5	470.7	470.7
10076629	10076553	10076551	Circular	8	80	0	0	0	0	0	505.0	500.9	505.0	500.9	505.0	500.9	505.0	500.9	505.0	500.9	505.0	500.9
10076631	10076551	10076549	Circular	8	96	0	0	0	0	0	500.9	495.9	500.9	495.9	500.9	495.9	500.9	495.9	500.9	495.9	500.9	495.9
10076633	10076549	10076545	Circular	8	20	0	0	0	0	0	495.9	495.0	495.9	495.0	495.9	495.0	495.9	495.0	495.9	495.0	495.9	495.0
101	1188	1187	Circular	24	141	17	24	30	35	39	542.4	536.6	543.2	537.4	543.4	537.6	543.5	537.8	543.7	537.9	543.8	538.0
1012	95	1323	Circular	36	593	15	20	24	28	31	425.9	425.3	427.6	426.5	427.9	426.7	428.2	426.9	428.4	427.0	428.7	427.1
1013	1296	3154	Circular	30	404	2	3	4	5	5	424.8	424.2	425.4	424.7	425.5	424.8	425.6	424.8	425.7	424.9	425.8	424.9
10167673	10076498	10038750	Circular	12	229	0	0	0	0	0	471.7	469.5	471.7	469.5	471.7	469.5	471.7	469.5	471.7	470.5	471.7	470.7
10167722	10076545	10076543	Circular	12	41	0	0	0	0	0	494.5	494.3	494.5	494.3	494.5	494.3	494.5	494.3	494.5	494.3	494.5	494.3
10167724	10076543	10076478	Circular	12	66	0	0	0	0	0	494.3	488.9	494.3	488.9	494.3	488.9	494.3	488.9	494.3	488.9	494.3	488.9
10167739	10076478	10076476	Circular	12	252	0	0	0	0	0	488.9	471.9	488.9	471.9	488.9	471.9	488.9	471.9	488.9	471.9	488.9	471.9
10167750	10076476	10038749	Circular	12	54	0	0	0	0	0	471.9	467.9	471.9	467.9	471.9	467.9	471.9	468.9	471.9	470.5	471.9	470.7
1019	3581	3644	Circular	30	134	24	29	32	34	35	426.4	421.2	427.4	422.1	427.5	422.2	427.5	422.3	427.6	422.3	427.6	422.3
102	1190	1189	Circular	24	274	17	24	30	35	39	583.9	554.9	584.6	556.3	584.7	556.6	584.8	556.8	584.9	557.0	584.9	557.1
1020	1550	1549	Circular	30	479	24	29	32	34	35	430.5	429.2	433.1	431.6	434.3	431.9	435.4	432.4	436.2	432.9	436.6	433.2
1021	1556	3616	Circular	30	402	9	11	14	15	16	433.5	432.5	436.0	435.8	438.6	438.4	440.5	440.3	441.7	441.5	442.2	442.1
1022	3665	3795	Circular	24	117	4	5	6	6	8	436.7	436.3	438.8	438.7	439.2	439.1	441.1	441.0	442.2	442.2	442.7	442.6
1023	3622	503	Circular	18	58	4	5	6	6	7	437.6	436.8	439.0	438.9	439.5	439.4	441.5	441.3	442.7	442.5	443.2	443.0
1024	3843	3141	Circular	18	60	5	6	6	6	6	436.4	436.7	438.7	438.6	439.1	438.9	440.8	440.7	441.9	441.8	442.4	442.3
1025	3846	3801	Circular	18	293	5	6	6	6	6	437.5	437.3	439.7	439.1	440.6	439.8	442.1	441.4	442.6	442.2	442.9	442.6
1026	3846	3830	Circular	18	73	0	0	2	4	5	437.8	437.3	439.8	439.8	440.8	440.8	442.2	442.2	442.5	442.4	442.8	442.6
1027	3778	3846	Circular	30	201	5	6	7	8	9	437.7	437.6	439.9	439.8	440.9	440.8	442.3	442.2	442.8	442.7	443.1	443.0
1028	3629	3622	Circular	24	106	4	5	6	7	7	437.5	437.6	439.1	439.1	439.7	439.6	441.7	441.7	443.0	442.9	443.5	443.4
1029	3795	1645	Circular	24	208	4	5	6	7	9	436.3	436.3	438.7	438.6	439.1	439.0	440.9	440.8	442.1	441.9	442.6	442.5
103	1192	1191	Circular	36	215	16	22	27	32	35	550.4	536.8	551.1	538.6	551.2	538.9	551.3	539.2	551.3	539.4	551.4	539.6
1033	3827	3796	Circular	24	81	0	0	0	0	0	440.9	439.8	441.2	441.2	441.5	441.5	443.0	443.0	443.6	443.6	444.1	444.1
1035	3796	3633	Circular	24	33	5	6	7	8	9	439.8	439.8	441.0	441.0	441.3	441.3	442.8	442.8	443.4	443.4	443.9	443.8
1036	3826	3778	Circular	30	111	5	6	7	8	9	438.4	437.8	439.9	439.9	440.9	440.9	442.4	442.3	442.8	442.8	443.2	443.1
1039	3818	3796	Circular	24	143	5	6	7	8	9	439.8	439.8	441.3	441.2	441.6	441.5	443.1	443.0	443.8	443.6	444.4	444.1
104	1191	1186	Circular	36	138	16	22	27	31	36	536.8	534.7	537.7	535.8	537.8	536.0	538.0	536.1	538.1	536.3	538.2	536.4
1042	106	1532	Rectangular		194	67	84	100	111	118	423.2	423.9	426.0	425.9	426.3	426.1	426.5	426.3	426.7	426.5	426.8	426.6
1052	1584	106	Circular	60	307	35	44	51	56	59	423.1	423.4	426.2	426.0	426.5	426.3	426.7	426.5	426.9	426.7	427.0	426.8

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1057	3706	119	Circular	42	361	0	0	0	0	0	425.1	424.6	426.0	426.0	426.3	426.3	426.5	426.5	426.7	426.7	426.8	426.8
1058	3558	1539	Circular	48	506	32	41	49	54	56	424.4	423.4	426.5	426.2	426.9	426.5	427.1	426.7	427.6	426.9	427.7	427.0
1064	109	3175	Circular	18	62	-3	-4	-6	-7	-8	426.1	425.9	428.0	428.0	428.3	428.4	428.6	428.8	428.9	429.2	429.2	429.5
1065	109	4042	Circular	30	530	7	10	12	14	16	425.6	426.5	427.9	427.6	428.2	427.8	428.5	427.9	428.7	428.1	428.9	428.1
1066	3143	3354	Circular	30	306	10	12	14	15	16	425.4	425.3	428.0	427.8	428.5	428.2	429.0	428.6	429.5	429.1	429.9	429.5
1067	3422	3431	Circular	36	546	13	15	17	19	20	425.4	425.0	427.6	427.4	428.0	427.7	428.3	427.9	428.6	428.2	428.9	428.5
1068	3354	3422	Circular	30	25	13	15	17	19	20	425.3	425.4	427.7	427.7	428.1	428.0	428.4	428.3	428.8	428.7	429.1	429.1
1069	374	109	Circular	30	710	4	6	6	7	8	426.4	425.8	428.1	428.0	428.4	428.3	428.8	428.6	429.1	428.9	429.5	429.2
1070	3106	3175	Circular	30	665	7	9	10	12	13	426.1	425.7	428.3	428.1	428.9	428.6	429.5	429.1	430.2	429.7	430.8	430.2
1072	3085	3130	Circular	27	27	7	9	10	12	13	426.3	426.5	428.4	428.4	429.2	429.1	429.9	429.8	430.7	430.6	431.4	431.3
1074	372	373	Circular	24	31	7	9	11	13	14	426.7	426.7	428.5	428.5	429.6	429.5	430.7	430.6	432.0	431.9	433.1	433.0
1076	373	3360	Circular	24	91	7	9	11	13	14	426.7	426.6	428.3	428.3	429.3	429.2	430.4	430.1	431.5	431.2	432.5	432.1
1078	3402	3390	Circular	24	472	7	9	11	13	14	426.1	424.9	427.5	427.1	428.2	427.4	428.8	427.6	429.3	427.8	429.9	428.0
1079	3390	3399	Circular	42	291	20	24	28	31	34	424.9	425.0	427.0	426.8	427.3	427.0	427.5	427.2	427.7	427.4	427.9	427.5
1080	3425	3390	Circular	36	41	13	15	17	19	20	425.2	424.9	427.1	427.1	427.4	427.4	427.6	427.6	427.8	427.8	428.0	428.0
1083	3312	3167	Circular	36	534	19	24	30	36	41	424.1	422.4	425.6	424.0	425.8	424.2	426.1	424.4	426.4	424.7	426.9	424.8
1089	3282	3374	Circular	36	499	5	5	9	12	14	426.0	426.1	427.8	427.7	428.1	428.0	428.5	428.4	429.4	429.2	430.4	430.2
109	2026	266	Circular	24	184	10	15	18	21	24	555.9	542.6	556.5	543.3	556.6	543.5	556.7	543.7	556.7	543.8	556.8	543.9
1090	3404	3282	Circular	30	143	6	8	9	11	12	426.7	426.1	427.8	427.8	428.1	428.1	428.6	428.6	429.6	429.5	430.6	430.5
1091	2908	3314	Circular	30	195	6	8	9	11	12	427.3	427.0	428.4	428.2	428.7	428.5	429.0	428.9	430.1	429.9	431.3	431.1
1092	2930	3404	Circular	30	59	6	8	9	11	12	426.8	426.7	428.0	427.9	428.3	428.2	428.7	428.7	429.7	429.6	430.8	430.8
110	320	2026	Circular	24	213	10	15	18	21	24	567.2	555.9	567.8	557.0	567.9	557.2	568.0	557.4	568.1	557.5	568.2	557.7
1104	3489	364	Circular	42	157	24	30	36	40	42	426.7	426.9	429.7	429.6	430.7	430.5	432.0	431.8	433.3	433.0	433.9	433.6
1105	363	3540	Circular	42	194	27	34	40	45	46	426.6	425.8	429.1	429.1	430.0	429.8	430.9	430.6	431.9	431.5	432.4	432.0
1106	3527	3511	Circular	36	127	6	7	8	9	10	426.5	425.8	428.6	428.6	429.1	429.1	429.6	429.6	430.2	430.2	430.6	430.5
1107	3537	3511	Circular	42	242	27	34	40	45	46	426.1	425.8	428.8	428.6	429.4	429.1	430.0	429.6	430.6	430.2	431.1	430.5
1108	3474	3627	Circular	24	327	2	3	3	3	4	428.0	427.4	429.8	429.8	430.9	430.9	432.3	432.2	433.7	433.6	434.4	434.3
111	2574	2893	Circular	24	126	7	10	12	15	16	604.6	593.4	605.0	594.4	605.1	594.6	605.2	594.7	605.2	594.9	605.3	595.0
1110	3539	3489	Circular	42	330	21	28	33	37	39	426.8	426.7	429.9	429.7	431.1	430.8	432.5	432.2	434.0	433.6	434.7	434.2
1111	3509	3539	Circular	42	49	21	28	33	37	39	426.9	426.9	430.0	429.9	431.2	431.2	432.8	432.7	434.3	434.2	435.0	434.9
1112	3530	3639	Circular	42	264	10	13	16	18	20	427.7	427.5	430.4	430.4	432.0	431.9	433.9	433.8	435.8	435.7	436.5	436.4
1113	1221	366	Circular	24	299	3	4	5	6	6	429.2	428.5	430.5	430.5	432.3	432.2	434.4	434.2	436.3	436.2	437.2	437.0
112	2145	2574	Circular	24	232	7	10	12	15	16	632.5	604.6	632.8	605.5	632.9	605.6	633.0	605.8	633.0	605.9	633.1	606.0
1120	354	3527	Circular	24	308	6	7	8	9	10	428.4	426.9	429.2	428.7	429.5	429.1	430.0	429.6	430.8	430.2	431.3	430.6
1121	3559	3503	Circular	24	281	3	4	4	5	6	430.0	429.0	430.7	430.3	430.8	430.5	430.9	430.7	431.6	431.6	432.4	432.3
1126	3627	3519	Circular	24	191	2	3	3	3	4	427.4	426.9	429.8	429.7	430.8	430.8	432.2	432.2	433.6	433.6	434.2	434.2
1138	3551	827	Circular	36	20	42	49	52	54	57	434.7	434.8	437.1	437.0	437.3	437.1	437.4	437.2	437.4	437.2	437.5	437.3
1139	3613	3495	Circular	42	112	33	38	42	45	47	436.6	436.7	441.7	441.6	443.4	443.3	444.5	444.3	445.3	445.1	446.0	445.8
1146	3363	3817	Circular	24	359	5	6	7	8	9	444.1	440.0	444.7	441.5	444.8	441.8	445.0	443.4	445.1	444.3	445.3	444.9
1150	642	2318	Circular	42	205	33	42	43	42	45	438.2	438.1	443.5	443.4	446.3	446.0	447.6	447.3	448.4	448.1	449.1	448.8
1151	Node_5	517	Circular	48	50	33	42	44	43	46	438.0	438.2	442.7	442.7	444.8	444.8	446.1	446.1	446.9	446.9	447.6	447.6
1152	2318	2300	Circular	48	15	33	42	44	43	46	438.1	438.1	443.3	443.3	445.8	445.8	447.2	447.1	448.0	448.0	448.6	448.6
1154	3651	2470	Circular	21	225	6	8	8	9	9	444.0	443.7	445.6	445.3	449.4	448.9	450.4	449.9	451.1	450.6	451.6	451.2
1155	2470	636	Circular	24	349	6	8	8	9	9	443.4	442.9	445.2	445.0	448.7	448.4	449.8	449.5	450.5	450.2	451.1	450.8
1157	612	3306	Circular	27	277	6	7	11	12	15	441.8	441.1	444.6	444.5	447.8	447.7	449.0	448.9	449.7	449.6	450.4	450.3
1158	611	612	Circular	24	45	6	7	9	10	12	442.3	442.1	444.7	444.6	447.9	447.9	449.1	449.1	449.8	449.7	450.5	450.4
1160	3315	3306	Circular	24	177	4	5	6	7	8	441.7	441.1	444.5	444.5	447.7	447.7	448.9	448.9	449.6	449.6	450.3	450.3
117	2583	2107	Circular	36	220	16	22	27	32	35	566.2	557.6	566.9	558.7	567.1	559.0	567.2	559.1	567.2	559.3	567.3	559.4
118	2132	2133	Circular	24	190	5	6	8	9	10	614.3	602.9	614.7	604.3	614.8	604.5	614.8	604.7	614.9	604.9	614.9	605.0
1181	1295	640	Circular	42	170	18	24	26	27	27	439.6	439.5	444.1	444.1	447.2	447.1	448.6	448.6	449.5	449.4	450.0	449.9
1182	641	642	Circular	42	440	18	24	24	24	25	439.1	438.2	443.9	443.7	446.8	446.6	448.2	448.0	449.0	448.8	449.6	449.4
1187	658	1739	Circular	24	70	9	13	15	15	15	440.7	440.9	444.4	444.3	447.8	447.6	449.2	449.0	450.2	449.9	450.8	450.5
1191	3531	3514	Circular	24	341	8	11	12	13	13	452.3	451.4	454.2	453.7	456.7	455.8	458.8	457.9	459.6	458.6	460.0	458.9
1192	3500	3531	Circular	24	81	3	4	4	5	5	452.2	452.3	454.4	454.4	456.9	456.9	459.2	459.1	459.9	459.9	460.4	460.4
1193	430	734	Circular	24	606	8	11	12	12	13	451.1	449.5	453.1	452.3	454.6	453.1	456.5	454.7	457.1	455.3	457.4	455.6
1194	734	735	Circular	24	298	8	11	12	12	13	449.5	450.1	452.0	451.6	452.7	452.0	454.2	453.4	454.8	453.9	455.0	454.1
1195	735	737	Circular	24	34	8	11	12	12	13	450.1	449.9	451.4	451.3	451.7	451.6	453.1	453.0	453.6	453.5	453.9	453.7
1196	739	740	Circular	27	40	3	4	4	5	5	454.3	453.6	454.8	454.6	457.3	457.2	459.5	459.5	460.4	460.3	460.8	460.8
1206	2740	908	Circular	24	172	8	12	14	17	20	481.4	480.8	482.9	482.6	483.8	483.3	486.2	485.5	489.4	488.8	490.9	490.3
1208	163	164	Circular	42	150	19	26	32	35	37	476.2	476.1	478.4	478.3	479.3	479.2	481.1	480.9	482.8	482.6	484.1	483.9
1209	1490	912	Circular	66	553	27	37	46	52	55	474.2	473.7	477.7	477.7	478.9	478.8	480.3	480.2	481.8	481.7	483.0	482.8
121	2133	2900	Circular	36	199	16	22	27	32	35	602.9	594.0	603.6	595.0	603.7	595.2	603.8	595.3	603.9	595.4	604.0	595.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1361	2480	2507	Circular	42	260	20	27	33	38	40	475.1	475.0	478.2	478.1	478.9	478.7	479.6	479.3	480.6	480.2	481.3	480.9
1362	887	1832	Circular	48	60	33	43	52	59	63	474.8	474.2	476.9	476.8	477.3	477.2	477.6	477.5	478.4	478.3	478.8	478.7
1363	1832	886	Circular	60	482	1	3	6	16	26	476.6	472.9	476.8	475.1	477.0	475.8	477.2	476.3	477.6	477.3	477.9	478.0
1366	926	930	Circular	42	20	20	27	33	38	40	476.1	476.1	478.8	478.8	479.9	479.8	481.2	481.1	482.8	482.7	483.8	483.7
137	2831	2840	Circular	30	126	11	15	19	23	25	720.3	710.3	720.8	711.8	720.9	712.1	721.0	712.3	721.1	712.5	721.1	712.7
1370	1813	1810	Circular	36	201	13	17	21	24	26	478.7	478.7	480.4	480.3	480.8	480.6	482.5	482.3	484.6	484.4	485.9	485.6
1372	1874	849	Circular	24	95	5	7	9	11	12	464.2	464.0	465.1	464.8	465.3	465.0	465.4	465.1	465.5	465.2	465.6	465.2
1373	2361	2378	Circular	54	317	6	7	9	12	12	461.5	461.1	462.6	462.5	462.9	462.9	463.1	463.1	463.3	463.3	463.4	463.4
1374	852	853	Circular	24	656	6	8	9	10	11	469.3	467.9	470.4	469.4	470.6	469.7	470.9	469.9	472.0	470.7	473.8	472.1
1378	841	2413	Circular	24	117	10	13	14	16	17	465.9	466.0	470.4	470.2	473.6	473.3	474.8	474.4	475.8	475.4	476.3	475.9
1379	892	842	Circular	24	434	10	13	14	15	16	469.7	468.4	472.4	471.6	476.9	475.5	478.5	476.9	480.2	478.3	481.1	479.0
138	1168	1167	Circular	30	25	11	15	19	23	25	731.9	730.4	732.5	731.4	732.6	731.6	732.7	731.7	732.8	731.9	732.9	732.0
1380	551	446	Circular	24	330	9	12	14	16	18	445.2	444.1	446.6	446.0	447.1	446.2	447.7	446.5	448.6	446.9	449.9	447.8
1383	446	445	Circular	30	350	15	19	22	25	27	444.1	442.5	445.4	444.4	445.7	444.6	445.9	444.8	446.5	445.2	447.3	445.7
1384	2256	2923	Circular	36	332	15	19	22	25	27	441.2	440.5	442.8	442.3	443.0	442.6	443.2	442.8	443.4	443.0	443.7	443.1
1401	1580	484	Circular	36	169	7	9	10	12	13	437.6	437.3	438.7	438.4	438.8	438.6	438.9	438.7	439.1	438.8	439.1	438.9
1403	2750	2763	Circular	30	61	14	18	19	21	21	431.3	431.2	435.8	435.8	438.7	438.6	439.5	439.4	440.3	440.1	440.8	440.7
1404	2751	2721	Circular	30	122	14	18	19	21	21	431.0	430.9	435.3	435.2	437.9	437.7	438.7	438.5	439.4	439.2	439.9	439.7
1412	333	334	Circular	24	10	16	22	26	29	30	424.3	422.5	425.1	423.7	425.3	424.1	425.5	424.5	425.7	425.0	426.0	425.4
1416	2922	127	Circular	24	307	9	12	14	15	16	429.5	429.1	431.5	431.1	432.7	431.8	433.8	432.6	435.0	433.6	435.4	434.0
1419	1209	1210	Circular	30	284	11	14	16	19	21	429.2	428.8	430.7	430.4	431.0	430.7	431.4	430.9	432.2	431.5	433.4	432.6
142	1166	313	Circular	36	65	11	15	19	23	25	660.0	655.1	660.5	656.1	660.6	656.3	660.7	656.5	660.7	656.6	660.8	656.7
1425	3815	1550	Circular	30	488	24	29	32	34	35	431.5	430.6	435.1	433.5	437.3	434.9	439.1	436.1	440.3	437.0	440.9	437.5
1426	3633	3797	Circular	24	25	5	6	7	8	9	439.7	439.7	440.9	440.9	441.2	441.2	442.7	442.7	443.3	443.2	443.7	443.7
1427	3805	3827	Circular	24	44	0	0	0	0	0	440.9	441.0	441.2	441.2	441.5	441.5	443.0	443.0	443.6	443.6	444.1	444.1
1428	3661	3844	Circular	30	61	5	6	7	8	9	439.4	439.0	440.3	440.2	441.0	441.0	442.5	442.5	443.0	443.0	443.4	443.4
1429	3817	3818	Circular	27	266	5	6	7	8	9	440.0	439.8	441.5	441.4	441.8	441.7	443.4	443.2	444.2	444.0	444.8	444.6
143	315	2863	Circular	36	118	11	15	19	23	25	706.6	683.9	707.0	684.6	707.1	684.7	707.1	684.8	707.2	684.9	707.2	684.9
1439	375	374	Circular	30	20	4	6	6	7	8	426.3	426.4	428.1	428.1	428.5	428.5	428.8	428.8	429.2	429.2	429.5	429.5
1440	3245	375	Circular	27	46	4	6	6	7	8	426.5	426.4	428.1	428.1	428.5	428.5	428.9	428.9	429.3	429.2	429.6	429.6
1441	2651	372	Circular	24	74	7	9	11	13	14	427.1	426.9	428.7	428.6	429.8	429.7	431.1	430.9	432.5	432.3	433.8	433.5
1443	2408	723	Circular	36	283	12	17	21	21	25	465.4	464.9	471.8	471.7	475.3	475.2	476.3	476.2	476.9	476.9	477.4	477.3
1444	639	722	Circular	36	55	12	17	20	21	25	466.2	466.0	472.0	472.0	475.7	475.7	476.6	476.6	477.2	477.2	477.6	477.6
1445	872	209	Circular	33	36	8	13	18	19	23	467.7	467.5	472.7	472.7	476.5	476.5	477.4	477.4	477.9	477.9	478.3	478.3
1447	1879	207	Circular	30	335	8	10	12	16	20	468.8	467.9	473.0	472.9	476.9	476.8	477.8	477.6	478.3	478.1	478.7	478.5
1449	662	1750	Circular	42	331	18	23	27	31	35	467.6	467.5	469.4	468.8	469.8	469.2	471.0	470.7	472.5	472.2	473.6	473.2
1451	1470	1472	Circular	27	265	8	10	11	13	16	473.6	472.9	474.9	474.5	475.3	474.9	476.4	476.1	479.3	478.9	480.2	479.8
1453	878	876	Circular	36	300	14	18	21	23	26	471.7	471.2	473.3	472.8	473.5	473.1	473.8	473.3	475.2	474.8	477.0	476.6
1455	1802	2717	Circular	24	226	3	3	4	5	5	473.7	473.2	474.4	474.2	474.6	474.3	474.7	474.5	476.7	476.6	478.2	478.0
1456	2640	2627	Circular	24	26	8	10	11	13	15	475.1	474.9	476.4	476.3	476.8	476.8	478.1	478.1	481.4	481.3	482.1	482.0
1462	599	787	Circular	42	300	33	46	52	56	59	453.6	453.3	457.9	457.6	459.1	458.5	460.0	459.2	460.7	459.8	461.2	460.2
1463	763	189	Circular	48	215	5	7	7	10	10	459.1	456.7	459.8	459.2	462.0	462.0	463.5	463.5	464.4	464.4	465.1	465.1
1464	1564	3113	Circular	48	224	5	7	8	10	10	461.5	461.0	462.4	462.2	462.5	462.4	463.5	463.5	464.4	464.4	465.1	465.1
1467	1767	1766	Circular	48	346	5	7	8	9	10	463.7	463.2	464.5	464.1	464.6	464.2	464.7	464.3	464.8	464.5	465.1	465.1
1470	3538	191	Circular	33	480	11	12	13	13	12	457.5	457.1	459.5	459.3	462.3	462.1	464.0	463.7	464.8	464.6	465.4	465.2
1471	770	3488	Circular	33	11	9	10	10	10	10	457.8	457.9	459.8	459.7	462.5	462.5	464.2	464.2	465.0	465.0	465.6	465.5
1476	3259	760	Circular	30	456	13	16	17	17	17	459.0	459.0	461.1	460.6	463.6	462.9	465.4	464.7	466.2	465.5	466.7	466.0
1483	1762	1311	Circular	42	359	6	6	6	7	8	452.9	452.2	455.8	455.8	456.7	456.7	457.4	457.4	458.0	458.0	458.5	458.5
1488	2395	1328	Circular	24	246	1	1	1	1	1	455.9	455.4	457.1	457.1	457.2	457.2	457.7	457.7	458.4	458.4	458.9	458.9
1489	3700	751	Circular	72	515	55	74	88	101	112	453.1	452.3	456.1	456.1	457.1	457.0	458.0	457.8	458.9	458.6	459.6	459.3
149	1423	2126	Circular	24	107	11	15	19	23	25	764.7	750.3	765.2	751.3	765.3	751.5	765.3	751.6	765.4	751.7	765.4	751.8
1491	603	665	Circular	24	188	7	8	9	11	12	455.7	454.7	456.7	456.0	457.2	457.0	458.5	458.2	459.7	459.3	460.6	460.1
1497	3662	3676	Circular	24	305	13	14	16	17	17	453.5	452.6	459.7	458.9	462.2	461.3	463.9	462.8	465.6	464.2	467.0	465.4
1499	3676	2282	Circular	27	60	13	14	16	20	20	452.0	450.4	458.6	458.6	461.1	461.0	462.6	462.5	463.8	463.7	464.9	464.7
150	1420	1424	Circular	24	123	11	15	19	23	25	775.3	765.7	775.9	767.6	776.0	768.1	776.1	768.6	776.2	769.0	776.3	769.4
1501	2921	3553	Circular	48	391	25	30	32	31	30	452.5	452.3	459.1	459.0	461.7	461.6	463.2	463.1	464.2	464.1	465.0	465.0
1504	3784	2282	Circular	36	82	19	22	27	29	29	452.1	450.4	458.6	458.6	461.0	461.0	462.5	462.5	463.7	463.7	464.8	464.7
1509	602	344	Circular	36	244	5	6	6	7	8	448.0	447.6	458.8	458.8	461.4	461.4	463.0	463.0	464.3	464.3	465.4	465.4
151	1134	1420	Circular	24	70	11	15	19	23	25	777.0	775.5	777.8	776.5	778.0	776.8	778.1	776.9	778.3	777.1	778.4	777.3
1525	1271	3000	Circular	18	61	0	0	0	0	0	438.4	434.6	438.8	438.8	439.3	439.3	439.6	439.6	439.8	439.8	440.0	440.0
1527	386	3571	Circular	18	47	9	10	11	11	12	441.8	441.5	444.0	443.7	445.0	444.5	445.6	445.1	446.3	445.7	446.7	446.1
1532	530	1565	Circular	30	207	19	20	21	21	22	451.3	450.8	454.5	454.1	455.3	454.8	455.8	455.3	456.3	455.7	456.7	456.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1210	912	1396	Circular	66	493	42	57	70	81	87	473.7	473.5	477.6	477.5	478.7	478.6	480.1	479.8	481.5	481.2	482.6	482.2
1213	1396	1432	Circular	66	502	42	57	70	80	87	473.5	473.2	477.5	477.4	478.5	478.4	479.7	479.5	481.0	480.7	482.0	481.7
1214	1432	903	Circular	66	501	42	57	70	80	87	473.2	473.0	477.3	477.2	478.3	478.2	479.4	479.1	480.5	480.2	481.5	481.1
1215	903	904	Circular	66	502	58	83	104	122	134	473.0	472.9	477.1	476.9	478.0	477.6	478.8	478.3	479.8	479.1	480.6	479.8
1216	1413	2647	Circular	66	275	58	83	104	122	134	472.4	472.3	476.1	476.0	476.2	476.0	476.4	476.0	476.5	476.0	476.5	476.0
122	322	2194	Circular	36	232	11	15	19	23	25	638.6	615.4	639.0	616.4	639.1	616.6	639.2	616.7	639.2	616.8	639.3	616.9
1220	1569	3094	Circular	36	20	14	19	21	23	24	417.6	417.9	421.4	421.3	422.2	422.2	422.8	422.8	423.3	423.3	423.8	423.7
1225	135	3447	Circular	60	264	22	29	34	39	41	464.1	464.1	466.4	466.3	466.9	466.8	467.3	467.2	467.9	467.8	468.4	468.4
1236	1206	1209	Circular	30	264	4	6	7	8	9	429.9	429.2	431.1	431.1	431.4	431.4	431.8	431.8	432.8	432.7	434.1	434.0
1238	995	996	Circular	42	195	24	34	38	42	47	495.1	494.9	500.5	500.4	505.5	505.3	506.4	506.3	507.1	507.0	507.6	507.5
1239	996	3900	Circular	42	130	24	35	38	42	47	495.0	494.8	500.3	500.2	505.2	505.1	506.2	506.1	506.9	506.8	507.4	507.3
1246	3532	3615	Circular	36	283	7	9	11	12	14	428.4	427.8	430.4	430.4	432.1	432.0	434.1	434.0	436.0	435.9	436.8	436.7
1255	2552	2283	Circular	54	275	96	132	144	148	151	523.7	522.4	527.2	526.4	528.6	527.4	529.2	527.8	529.5	528.0	529.7	528.1
1269	1910	1184	Circular	42	116	26	36	44	52	58	530.6	528.9	531.9	530.9	532.2	531.3	532.5	531.7	532.7	532.0	532.9	532.3
1270	2107	1192	Circular	36	110	16	22	27	32	35	557.5	550.6	558.1	551.7	558.2	551.9	558.3	552.1	558.4	552.3	558.4	552.4
1271	1186	1185	Circular	42	273	7	10	13	15	17	534.7	528.8	535.2	529.9	535.4	530.2	535.4	530.3	535.5	530.4	535.5	530.5
1274	2194	2133	Circular	36	160	11	15	19	23	25	615.4	603.8	615.9	604.3	616.0	604.5	616.1	604.7	616.1	604.9	616.2	605.0
1279	1167	2831	Circular	30	108	11	15	19	23	25	730.4	720.3	730.9	721.4	731.0	721.6	731.1	721.7	731.1	721.9	731.2	722.0
1282	314	1166	Circular	36	43	11	15	19	23	25	663.6	660.0	664.1	661.0	664.2	661.2	664.3	661.4	664.3	661.5	664.4	661.6
1287	1424	1423	Circular	24	60	11	15	19	23	25	765.5	765.0	766.5	766.1	766.8	766.3	767.0	766.6	767.3	766.7	767.4	766.7
1294	1981	1149	Circular	36	58	7	10	12	13	14	499.7	499.6	501.9	501.9	502.5	502.5	504.0	504.0	506.9	506.9	509.0	509.0
1296	158	2039	Circular	30	430	7	10	11	13	14	506.0	501.8	506.8	503.0	506.9	503.2	507.0	504.4	507.7	507.5	510.3	509.8
1299	3176	1415	Circular	24	210	9	12	14	15	15	485.7	486.1	488.5	488.2	489.1	488.5	489.5	488.7	489.7	488.8	489.8	488.8
13	4092	Node_15	Circular	72	580	34	38	33	33	37	429.2	428.5	435.7	435.7	439.6	439.6	442.8	442.8	446.3	446.2	449.0	449.0
1300	3204	3703	Circular	36	120	35	46	52	57	62	485.7	486.6	488.8	488.5	489.4	488.8	489.7	488.9	489.9	489.0	490.1	489.1
1301	3265	3286	Circular	42	180	37	45	47	48	49	482.0	482.0	486.3	486.0	488.1	487.7	488.9	488.5	489.4	489.0	489.8	489.3
1303	1617	1073	Circular	24	80	13	16	19	20	21	494.9	494.9	497.7	497.5	501.5	501.3	502.5	502.3	503.1	502.9	503.5	503.3
1304	1078	1079	Circular	24	191	8	12	11	13	13	497.0	496.8	501.0	500.7	504.7	504.5	505.3	505.1	505.9	505.7	506.7	506.5
1305	1409	1628	Circular	24	52	13	16	17	17	17	495.9	495.8	499.6	499.4	503.4	503.2	504.1	504.0	504.7	504.5	505.3	505.1
1307	3905	1551	Circular	36	561	26	29	29	31	33	490.8	489.1	493.6	492.8	498.4	497.4	499.8	498.8	500.6	499.5	501.0	500.0
1311	2917	1400	Circular	33	340	12	17	20	23	23	490.9	489.6	492.1	491.2	492.3	491.5	492.5	491.7	494.7	494.0	495.8	495.1
1313	1404	2913	Circular	30	345	2	3	3	4	5	493.6	492.4	494.1	494.1	494.4	494.4	494.7	494.7	496.5	496.5	497.6	497.6
1314	1861	2894	Circular	30	185	10	14	16	17	17	498.3	496.9	499.2	497.8	499.4	498.0	499.5	498.1	499.5	498.1	499.5	498.1
1315	1853	1004	Circular	27	130	10	14	16	17	17	499.6	499.3	501.5	501.3	502.4	502.1	502.9	502.6	503.1	502.8	503.4	503.0
1316	3914	1862	Circular	27	280	10	14	16	17	17	501.0	500.3	502.6	502.2	504.2	503.6	505.1	504.4	505.5	504.7	506.0	505.1
1317	1899	1925	Circular	42	270	24	30	36	40	45	486.4	485.5	488.0	487.2	488.3	487.6	489.1	488.8	490.3	489.9	491.5	490.9
1318	1867	1493	Circular	48	400	20	24	25	27	29	485.1	484.0	486.6	486.0	486.8	486.8	487.3	487.4	487.9	487.9	488.4	488.3
1319	958	1922	Circular	48	195	20	23	25	27	29	487.3	486.7	488.8	488.4	488.9	488.6	489.0	488.7	489.2	488.8	489.3	489.0
1322	832	767	Circular	54	170	70	84	90	95	99	483.3	481.7	486.3	485.9	487.1	486.7	487.6	487.3	488.1	487.7	488.5	488.1
1323	2432	1009	Circular	48	410	14	15	16	17	18	494.7	493.9	496.0	495.3	496.0	495.4	496.1	495.5	496.1	495.5	496.1	495.5
1325	2458	1008	Circular	42	310	17	22	25	29	32	491.6	491.1	493.3	492.9	493.6	493.2	493.8	493.5	494.2	493.9	496.5	496.2
1326	2341	1005	Circular	48	390	14	15	16	17	18	493.0	491.5	494.1	493.0	494.1	493.0	494.2	493.1	494.2	493.1	494.2	493.1
1327	1060	1057	Circular	30	395	7	9	11	13	14	501.7	500.6	502.7	501.8	502.8	502.0	503.0	502.2	503.1	502.3	503.3	502.7
1328	1056	1053	Circular	30	204	7	9	11	13	14	498.5	497.6	499.5	498.9	499.7	499.2	499.8	499.4	500.0	499.7	501.6	501.4
1329	1055	1052	Circular	42	410	24	28	30	31	32	501.1	499.5	502.7	501.6	502.8	501.7	502.9	501.8	502.9	501.9	502.9	501.9
1332	2252	1125	Circular	27	220	24	28	30	31	32	510.9	510.0	514.6	513.3	516.5	514.7	517.3	515.3	518.0	515.8	518.4	516.1
1333	1856	1823	Circular	27	50	16	20	22	23	23	514.3	513.3	517.9	517.8	520.7	520.5	521.7	521.5	522.4	522.2	522.9	522.7
1334	1124	2389	Circular	27	195	7	10	11	13	14	507.3	506.4	508.4	507.8	508.5	508.0	508.7	508.2	508.9	508.4	509.1	508.7
1335	1044	2150	Circular	24	472	12	17	21	24	26	619.0	579.5	619.6	580.8	619.7	581.0	619.8	581.2	619.8	581.3	619.9	581.4
1337	2027	2142	Circular	18	35	5	8	9	11	13	730.2	727.2	730.6	728.3	730.7	728.5	730.8	728.8	732.6	732.2	733.4	733.0
1341	1092	1091	Circular	24	53	5	8	9	11	13	766.4	759.9	766.8	761.2	766.8	761.5	766.9	761.7	767.0	761.9	767.0	762.0
1343	979	978	Circular	42	330	43	49	52	53	55	492.0	491.3	497.4	496.8	501.6	500.9	502.7	502.0	503.4	502.7	503.9	503.2
1344	2103	977	Circular	42	510	43	49	52	56	56	490.5	490.0	495.7	494.8	499.4	498.3	500.4	499.4	501.2	500.1	501.7	500.6
1345	2065	724	Circular	42	20	43	49	52	56	57	488.5	488.3	494.0	494.0	497.2	497.2	498.3	498.3	499.1	499.1	499.6	499.5
1348	2006	3908	Circular	24	125	12	13	14	16	17	497.1	496.4	501.7	501.4	506.9	506.6	507.8	507.5	508.6	508.2	509.2	508.8
1349	992	990	Circular	42	280	30	38	41	44	47	495.2	494.1	499.8	499.6	504.5	504.3	505.5	505.3	506.2	506.0	506.8	506.5
135	1165	1164	Circular	36	82	11	15	19	23	25	649.1	643.2	649.6	644.4	649.7	644.6	649.8	644.8	649.9	645.0	649.9	645.1
1353	3458	200	Circular	30	155	11	15	18	21	23	544.8	544.2	545.9	545.3	546.1	545.5	546.3	545.6	546.4	545.7	546.6	546.0
1354	3417	3464	Circular	30	360	11	15	18	21	23	548.4	546.9	549.6	548.4	549.8	548.7	550.0	548.9	550.2	549.1	550.5	549.4
1358	886	884	Circular	60	305	25	33	41	46	48	472.7	471.9	475.1	475.1	475.8	475.8	476.3	476.4	477.3	477.3	478.0	477.9
1359	935	2308	Circular	24	495	7	9	10	12	12	480.8	479.6	481.9	480.6	482.1	480.7	482.3	481.2	484.0	482.7	484.9	483.5
136	2863	314	Circular	36	63	11	15	19	23	25	683.9	663.6	684.2	664.6	684.3	664.8	684.3	664.9	684.4	665.1	684.4	665.2

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1535	661	3848	Circular	24	250	7	10	10	11	13	457.2	456.8	463.4	463.1	465.2	465.0	465.8	465.6	466.4	466.2	466.9	466.7
1538	1212	1177	Circular	24	37	13	16	18	20	21	461.4	461.5	471.8	471.7	473.9	473.7	476.0	475.8	478.3	478.1	480.3	480.0
1539	660	659	Circular	24	63	16	19	23	24	26	461.1	460.7	468.1	468.0	469.4	469.3	470.6	470.4	472.1	471.9	473.5	473.2
1540	1177	1176	Circular	24	116	14	14	16	18	19	461.5	461.7	471.4	471.0	473.4	473.0	475.4	475.0	477.7	477.2	479.5	479.0
1546	438	431	Circular	36	8	23	31	34	36	38	434.6	434.4	437.6	437.5	438.3	438.2	438.7	438.6	439.1	439.0	439.5	439.4
1547	455	438	Circular	36	141	23	31	34	36	38	436.1	435.4	438.0	437.7	438.9	438.6	439.5	439.1	439.9	439.5	440.4	440.0
1549	3148	3333	Circular	30	59	9	13	14	14	15	421.1	421.2	422.8	422.7	423.2	423.2	424.0	424.0	424.6	424.6	425.2	425.2
1551	3300	2931	Circular	24	233	9	13	14	14	15	424.6	424.1	426.2	425.7	427.2	426.4	427.9	427.1	428.8	427.9	429.9	428.9
1552	3256	3148	Circular	24	262	9	13	14	14	15	423.0	421.5	424.1	423.0	424.5	423.5	425.2	424.3	425.9	424.9	426.7	425.5
1554	3649	3509	Circular	42	240	21	28	33	37	38	427.0	426.9	430.1	430.0	431.5	431.3	433.2	432.9	434.8	434.5	435.5	435.2
1555	3615	3530	Circular	42	120	10	13	16	18	19	427.7	427.7	430.4	430.4	432.0	432.0	434.0	433.9	435.8	435.8	436.6	436.6
1570	2693	2732	Circular	48	176	31	38	38	39	40	437.5	438.7	442.2	442.1	444.0	443.9	445.2	445.1	446.0	445.9	446.7	446.6
1573	1713	3651	Circular	21	166	6	8	9	9	10	444.3	444.0	446.0	445.8	449.9	449.5	451.0	450.6	451.7	451.3	452.2	451.8
1582	3514	3512	Circular	24	38	8	11	12	12	13	451.4	451.5	453.6	453.6	455.6	455.5	457.6	457.5	458.3	458.2	458.6	458.5
1585	2781	2756	Circular	24	324	8	12	14	17	20	483.2	482.0	484.4	483.6	485.6	484.7	488.9	487.7	492.3	491.0	493.9	492.4
1586	2756	2740	Circular	24	187	8	12	14	17	20	482.0	481.4	483.4	483.1	484.5	484.0	487.3	486.6	490.6	489.9	492.0	491.3
1587	908	161	Circular	24	163	8	12	14	17	20	480.8	480.4	482.4	482.1	483.1	482.7	485.1	484.5	488.4	487.7	490.0	489.4
1588	1414	1413	Circular	66	502	58	83	104	122	134	472.6	472.4	476.5	476.3	476.9	476.5	477.3	476.8	477.7	477.0	478.0	477.2
1595	1231	Node_8	Circular	30	80	36	41	45	50	53	540.6	539.0	547.6	547.0	548.7	547.9	549.5	548.6	550.6	549.4	551.3	550.0
1596	2232	2247	Circular	24	241	12	18	23	28	32	594.4	578.1	595.1	580.1	595.2	580.6	595.3	581.1	595.6	586.8	595.8	589.4
160	1887	1912	Circular	42	545	40	52	63	73	80	495.5	494.0	497.7	495.9	498.2	496.2	498.7	496.4	499.5	496.6	500.1	496.7
1600r	240	3457	Circular	66	110	139	180	192	200	205	511.8	510.9	514.7	514.0	514.9	514.0	515.0	514.1	515.1	514.2	515.1	514.3
1601	1233	2552	Circular	54	530	96	132	144	148	151	525.6	523.7	529.0	527.7	531.9	529.5	533.3	530.4	533.9	530.9	534.3	531.2
161	1904	1887	Circular	42	535	29	38	44	51	56	496.7	495.5	498.9	498.3	499.5	498.8	500.5	499.4	501.8	500.4	502.9	501.3
1616	1219	220	Circular	54	56	28	38	44	53	60	511.3	511.0	514.8	514.8	515.3	515.3	515.7	515.7	516.0	516.0	516.3	516.2
1617	183	2042	Circular	54	100	26	36	47	53	59	511.0	511.3	514.9	514.8	515.4	515.4	515.8	515.7	516.2	516.1	516.5	516.4
1622	2000	175	Circular	54	235	17	23	27	31	35	515.9	515.2	517.6	517.6	517.9	517.9	518.1	518.1	518.2	518.2	518.4	518.4
1624	2225	1997	Circular	36	27	0	0	1	3	3	522.8	521.7	523.1	523.1	523.4	523.4	523.7	523.7	523.9	523.9	524.0	524.0
1625	1507	2000	Circular	66	276	45	63	76	90	101	516.0	516.2	518.4	518.0	518.8	518.4	519.0	518.6	519.3	518.8	519.4	518.9
1626	1226	1224	Circular	60	415	18	25	30	35	39	519.2	516.8	520.2	519.5	520.5	520.1	520.6	520.5	520.8	520.9	521.1	521.2
1628	1989	2225	Circular	42	265	7	10	13	15	17	523.8	523.3	524.7	524.1	524.9	524.3	525.0	524.4	525.1	524.4	525.2	524.5
1629	1109	1145	Circular	18	336	4	4	5	6	6	523.0	522.5	532.2	532.0	534.4	534.2	536.3	536.1	538.4	538.1	540.2	539.8
163	1151	1981	Circular	36	383	7	10	11	13	14	500.6	499.7	501.9	502.0	502.5	502.5	504.2	504.0	507.1	507.0	509.3	509.1
1631	1187	1910	Circular	24	15	17	24	30	35	39	535.2	531.6	535.9	533.2	536.0	533.8	536.2	534.3	536.4	534.8	536.5	535.0
1633	1185	1989	Circular	42	280	7	10	13	15	17	528.8	523.8	529.4	524.9	529.5	525.1	529.5	525.2	529.6	525.3	529.7	525.4
1635	1822	2202	Circular	24	20	7	10	12	15	16	577.4	577.2	578.2	578.0	578.5	578.3	578.6	578.4	578.8	578.5	578.9	578.6
1637	266	2074	Circular	24	88	10	15	18	21	24	542.3	533.7	542.8	535.1	542.9	535.4	543.0	535.5	543.0	535.7	543.1	535.8
1638	2202	320	Circular	24	222	7	10	12	15	16	576.8	568.8	577.3	569.4	577.4	569.5	577.5	569.6	577.6	569.6	577.7	569.7
1639	2893	1198	Circular	24	220	7	10	12	15	16	593.4	583.2	593.9	584.4	594.0	584.7	594.0	584.9	594.1	585.1	594.2	585.2
164	3068	1904	Circular	42	460	29	38	44	51	56	496.8	496.7	499.6	499.1	500.4	499.7	501.6	500.7	503.4	502.2	504.8	503.5
1644	1205	1190	Circular	24	252	17	24	30	35	39	603.5	583.9	604.2	585.2	604.3	585.5	604.4	585.7	604.5	585.8	604.6	586.0
1655	1164	322	Circular	36	125	11	15	19	23	25	643.2	638.6	643.8	639.5	643.9	639.7	644.0	639.8	644.1	639.9	644.1	640.0
1656	2840	315	Circular	36	291	11	15	19	23	25	710.3	706.6	711.0	707.4	711.2	707.5	711.3	707.6	711.4	707.7	711.5	707.8
1659	313	1165	Circular	36	87	11	15	19	23	25	655.1	649.1	655.6	650.1	655.7	650.3	655.8	650.5	655.9	650.6	655.9	650.7
1662	2126	1168	Circular	24	125	11	15	19	23	25	750.3	731.9	750.8	733.1	750.9	733.4	750.9	733.6	751.0	733.8	751.1	734.0
167	3438	3395	Circular	42	310	29	38	44	51	56	499.1	499.0	501.7	501.3	502.1	501.6	503.5	502.9	506.2	505.4	508.1	507.2
1676	2777	3438	Circular	42	475	16	21	25	29	32	500.0	499.1	501.9	501.9	502.4	502.4	504.2	503.9	507.2	506.8	509.3	508.9
1677	2566	1115	Circular	42	50	16	21	25	29	32	503.6	503.6	505.5	505.5	505.9	505.8	506.0	505.9	507.7	507.7	510.1	510.0
1678	2554	2566	Circular	42	360	16	21	25	29	32	505.8	503.6	506.9	505.6	507.1	506.0	507.2	506.1	507.9	507.8	510.6	510.2
168	1149	3438	Circular	36	183	7	10	12	13	16	499.6	499.1	501.9	501.9	502.4	502.4	503.9	503.9	506.9	506.8	508.9	508.9
1680	2539	2549	Circular	24	200	7	9	10	12	13	507.4	506.9	508.8	508.6	509.7	509.4	510.4	510.0	511.1	510.6	513.9	513.3
1691	2903	1991	Circular	24	399	9	12	14	15	16	489.2	488.2	490.7	490.0	493.3	492.1	495.2	493.6	496.0	494.3	496.6	494.6
1692	2486	1854	Circular	30	305	9	12	14	15	15	486.9	486.0	489.2	489.1	490.6	490.4	491.6	491.2	492.0	491.6	492.2	491.8
1693	1991	1988	Circular	24	253	9	12	14	15	15	488.2	486.9	489.8	489.5	491.9	491.1	493.2	492.2	493.8	492.7	494.2	493.0
1694	167	3536	Circular	42	65	37	45	47	48	49	479.2	478.7	484.9	484.8	486.0	485.9	486.6	486.4	486.9	486.8	487.2	487.1
1695	3386	176	Circular	42	450	37	45	47	48	49	484.6	482.4	487.2	486.9	490.0	489.1	491.0	490.0	491.6	490.6	492.1	491.0
1700	1620	1617	Circular	24	90	13	16	18	18	19	495.5	494.8	498.3	498.0	502.1	501.8	503.0	502.7	503.6	503.4	504.0	503.8
1702	2021	2427	Circular	24	129	0	1	1	4	4	495.5	495.2	496.9	496.9	500.9	500.9	502.0	502.0	502.6	502.6	502.9	502.9
1703	1079	1080	Circular	24	75	8	12	12	14	14	496.8	496.8	500.6	500.5	504.4	504.3	505.0	504.9	505.6	505.5	506.4	506.3
1705	1087	1078	Circular	24	50	4	9	8	12	12	497.2	497.1	501.1	501.1	504.9	504.8	505.5	505.5	506.1	506.1	506.9	506.9
1706	3919	3913	Circular	36	442	20	23	25	27	27	492.3	490.7	494.2	493.9	499.4	498.9	500.8	500.3	501.5	501.1	501.9	501.5
1707	1084	1083	Circular	27	35	13	16	19	20	21	493.7	493.7	495.5	495.4	499.8	499.8	501.2	501.1	501.9	501.9	502.3	502.3

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1709	1551	1504	Circular	36	360	26	29	30	32	33	489.0	488.4	492.6	492.1	497.1	496.4	498.5	497.8	499.2	498.6	499.7	499.0
171	1115	2777	Circular	42	320	16	21	25	29	32	503.6	500.0	504.6	502.0	504.7	502.5	505.0	504.3	507.6	507.3	509.8	509.5
1713	963	964	Circular	27	267	-1	-4	-8	-10	-11	485.3	485.2	485.8	485.8	486.3	486.4	486.7	486.9	487.3	487.6	487.8	488.1
1714	965	2062	Circular	36	124	17	22	26	30	31	484.8	484.2	486.6	486.4	487.1	487.0	487.9	487.7	488.9	488.7	489.5	489.3
1715	2112	1963	Circular	36	222	17	22	26	30	31	486.1	485.5	487.8	487.5	488.3	488.0	489.1	488.7	490.5	490.1	491.3	490.8
1717	2324	966	Circular	24	453	5	6	7	8	9	488.2	486.6	489.0	487.9	489.1	488.0	489.2	488.1	489.3	488.4	489.8	489.1
1720	2905	415	Circular	30	10	0	0	0	0	-3	496.1	496.1	496.7	496.7	496.8	496.8	496.9	496.9	497.0	497.0	497.6	497.6
1722	1862	1853	Circular	27	358	10	14	16	17	17	500.5	499.6	502.0	501.6	503.4	502.6	504.1	503.2	504.4	503.4	504.8	503.7
1723	3912	3914	Circular	27	410	10	14	16	17	17	501.7	501.0	503.3	502.8	505.3	504.4	506.5	505.4	507.0	505.9	507.6	506.3
1725	1050	3923	Circular	24	584	10	14	16	17	17	503.2	502.2	505.3	504.1	508.5	506.1	510.4	507.5	511.3	508.1	512.1	508.8
1727	1927	1867	Circular	48	280	20	23	25	27	29	485.9	485.1	487.4	486.8	487.5	487.0	487.8	487.4	488.1	487.9	488.5	488.4
1729	1869	831	Circular	42	420	23	30	36	40	45	483.6	482.0	485.6	485.7	486.6	486.4	487.3	486.8	487.8	487.2	488.3	487.4
173	2549	2562	Circular	24	155	7	9	10	12	13	506.8	506.4	508.5	508.4	509.3	509.0	509.9	509.6	510.4	510.0	512.9	512.4
1730	1493	767	Circular	48	390	20	23	25	27	29	484.0	481.7	485.9	485.9	486.8	486.7	487.3	487.3	487.9	487.7	488.3	488.1
1731	152	831	Circular	24	370	5	7	8	9	10	483.6	479.9	485.8	485.7	486.7	486.4	487.2	486.8	487.8	487.2	488.2	487.4
1733	2398	2432	Circular	48	405	12	13	13	14	14	495.5	494.7	496.7	496.2	496.7	496.3	496.8	496.3	496.8	496.4	496.8	496.4
1737	542	2657	Circular	42	240	18	24	28	32	35	489.7	489.4	491.5	491.3	491.9	491.6	492.1	491.9	492.9	492.7	494.9	494.7
1738	2658	960	Circular	42	335	18	24	28	32	35	488.9	488.3	490.6	490.3	490.9	490.6	491.2	490.9	492.2	491.9	494.0	493.6
1739	540	957	Circular	48	268	18	21	22	24	25	488.8	487.9	490.2	489.7	490.3	489.8	490.4	489.9	490.5	490.0	490.6	490.1
174	2562	2551	Circular	24	100	7	9	10	12	13	506.4	506.2	508.4	508.3	508.9	508.8	509.4	509.2	509.8	509.5	512.1	511.8
1741	1062	1059	Circular	42	490	24	28	30	31	32	504.0	503.1	505.9	505.2	506.1	505.3	506.2	505.4	506.3	505.5	506.3	505.5
1742	1057	1054	Circular	30	370	7	9	11	13	14	500.6	499.5	501.6	500.7	501.7	500.9	501.9	501.1	502.0	501.2	502.6	502.2
1743	1054	1056	Circular	30	305	7	9	11	13	14	499.5	498.5	500.5	499.7	500.6	499.9	500.7	500.1	500.9	500.3	502.1	501.7
1744	3938	2680	Circular	30	280	4	4	5	6	6	497.3	496.9	499.3	499.3	499.6	499.5	499.7	499.7	499.8	499.8	499.9	499.8
1745	1014	2406	Circular	36	410	12	15	18	21	23	493.7	492.8	495.1	494.7	495.4	495.0	495.6	495.2	495.9	495.5	498.3	497.9
1748	1126	2243	Circular	24	275	7	10	11	13	14	508.8	508.3	510.2	509.8	510.5	510.1	511.3	510.6	512.2	511.3	513.1	512.0
1749	1128	2252	Circular	27	275	16	20	22	23	24	511.9	510.9	516.1	515.3	518.4	517.4	519.3	518.3	520.0	519.1	520.4	519.6
1750	2478	1123	Circular	36	380	24	28	30	31	32	507.9	507.2	510.0	509.3	510.2	509.4	510.3	509.5	510.4	509.6	510.5	509.6
1751	1068	1064	Circular	42	355	24	28	30	31	32	505.7	505.1	507.6	507.1	507.8	507.3	507.9	507.3	508.0	507.4	508.0	507.4
1752	1438	1855	Circular	24	345	16	19	21	22	23	516.1	514.7	520.9	519.1	524.7	522.3	526.5	523.6	527.8	524.5	528.8	525.2
1753	1043	1044	Circular	24	97	12	17	21	24	26	628.0	618.7	628.6	620.2	628.7	620.4	628.8	620.6	628.8	620.7	628.9	620.7
1754	2125	2027	Circular	18	225	5	8	9	11	13	757.7	730.2	758.1	731.1	758.2	731.3	758.2	731.5	758.3	733.3	758.4	734.4
176	2542	2539	Circular	24	150	0	0	0	0	0	511.1	507.4	511.1	509.0	511.1	509.8	511.1	510.6	511.4	511.4	514.2	514.2
1763	2641	944	Circular	54	645	64	75	78	79	80	484.8	483.4	489.5	488.8	490.7	489.8	491.5	490.5	492.2	491.2	492.7	491.7
1765	949	948	Circular	54	252	64	75	78	80	80	485.6	484.9	490.7	490.4	492.5	492.1	493.4	493.0	494.3	493.9	494.8	494.4
1771	978	855	Circular	42	41	43	49	52	53	55	491.3	491.1	496.5	496.5	500.5	500.4	501.6	501.5	502.3	502.2	502.8	502.7
1772	977	2065	Circular	42	115	43	49	52	56	56	490.1	488.6	494.5	494.3	497.9	497.6	499.0	498.7	499.7	499.5	500.2	500.0
1773	732	952	Circular	48	358	52	58	61	63	65	488.9	486.7	492.9	492.4	495.6	495.0	496.6	496.0	497.4	496.8	497.9	497.3
1777	3930	995	Circular	42	470	24	34	38	42	47	494.6	495.3	501.0	500.7	506.0	505.7	506.9	506.6	507.6	507.3	508.2	507.8
1778	3908	3939	Circular	42	80	24	34	37	41	44	495.8	495.7	501.3	501.3	506.4	506.4	507.3	507.3	508.1	508.0	508.6	508.6
1780	990	1774	Circular	42	320	30	38	43	45	50	493.9	493.4	499.4	499.1	504.1	503.7	505.1	504.8	505.8	505.5	506.3	506.0
1792	1048	1049	Circular	36	291	13	18	22	26	29	502.7	501.2	507.7	507.6	509.6	509.4	511.0	510.7	512.2	511.7	512.9	512.4
1794a	836	838	Circular	36	27	20	26	31	36	38	471.0	470.9	474.7	474.7	475.3	475.2	475.6	475.6	476.2	476.1	476.6	476.5
1794b	836	838	Circular	36	27	20	26	31	36	38	471.0	470.9	474.7	474.7	475.3	475.2	475.6	475.6	476.2	476.1	476.6	476.5
1794c	836	838	Circular	24	27	8	11	13	15	16	471.0	470.9	474.8	474.7	475.3	475.2	475.7	475.6	476.2	476.1	476.6	476.5
1795	1367	902	Circular	48	450	15	20	22	27	30	472.8	471.9	475.0	475.0	475.7	475.7	476.3	476.2	477.2	477.0	477.8	477.6
1798	1692	1689	Circular	27	330	8	10	12	13	15	481.2	480.1	482.2	481.4	482.4	481.6	482.6	481.8	482.7	481.9	482.8	482.0
1800	2080	2060	Circular	36	390	8	10	12	13	15	478.0	477.0	479.0	478.0	479.1	478.2	479.2	478.3	479.3	478.5	479.5	479.0
1802	2507	2505	Circular	42	270	20	27	33	38	40	475.0	475.1	478.0	477.9	478.6	478.4	479.2	478.9	480.0	479.6	480.7	480.2
1811	2671	926	Circular	42	110	20	27	33	38	40	476.1	476.1	478.9	478.8	480.0	480.0	481.4	481.3	483.2	483.0	484.2	484.1
1821	3242	799	Circular	42	264	29	38	44	51	57	461.4	459.7	463.2	462.4	463.5	462.8	463.8	463.1	464.1	463.4	464.5	463.7
1823	848	845	Circular	36	310	11	14	16	18	20	466.3	465.3	467.4	466.9	467.7	467.4	468.4	468.3	469.6	469.4	470.7	470.4
1825	849	850	Circular	54	333	5	7	9	11	12	462.9	462.6	463.8	463.5	464.0	463.7	464.1	463.8	464.2	463.9	464.3	464.0
1827	3227	834	Circular	36	207	20	25	27	27	30	464.1	463.7	470.1	470.0	473.0	472.7	474.0	473.7	474.7	474.4	475.2	474.9
1830	842	4007	Circular	24	14	10	13	14	15	16	468.4	468.4	471.4	471.3	475.2	475.1	476.6	476.5	477.9	477.7	478.5	478.4
1831	2072	892	Circular	24	471	10	13	14	15	17	470.4	469.7	473.5	472.6	478.8	477.3	480.6	478.9	482.7	480.6	484.1	481.6
1833	2430	2416	Circular	36	374	10	13	14	16	17	465.0	463.8	470.1	470.0	473.0	472.9	474.1	474.0	475.0	474.9	475.6	475.4
1834	2401	2408	Circular	36	34	12	17	20	21	25	465.6	465.5	471.8	471.8	475.4	475.4	476.4	476.4	477.0	477.0	477.5	477.4
1835	722	2401	Circular	36	254	12	17	20	21	25	466.0	465.6	472.0	471.9	475.6	475.5	476.5	476.4	477.1	477.1	477.6	477.5
1837	209	244	Circular	33	220	12	16	20	21	24	467.5	467.1	472.6	472.5	476.4	476.3	477.3	477.2	477.8	477.7	478.2	478.1
1842	1759	721	Circular	27	347	7	9	10	12	13	467.0	466.9	468.5	468.2	468.7	468.3	469.2	468.8	470.3	469.8	471.0	470.4
1843	2178	742	Circular	36	35	20	26	30	34	35	466.6	465.7	468.5	468.4	469.0	469.0	470.3	470.2	471.6	471.5	472.4	472.3

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
1844	1583	1572	Circular	27	59	6	7	8	10	11	469.4	469.3	470.7	470.7	471.0	471.0	472.7	472.7	474.8	474.8	475.9	475.8
1845	1671	1694	Circular	27	217	6	7	8	10	11	471.3	470.6	472.3	471.8	472.5	472.0	473.3	473.2	475.7	475.5	477.0	476.7
1847	1512	1572	Circular	30	389	10	14	16	18	19	470.1	468.8	471.3	470.7	471.6	471.0	473.3	472.7	475.5	474.8	476.5	475.8
1848	1379	1470	Circular	27	140	8	10	11	13	16	474.1	473.6	475.3	475.1	475.6	475.4	476.8	476.6	479.7	479.5	480.5	480.3
1851	2309	2402	Circular	27	392	5	6	7	8	9	475.0	473.6	475.8	474.8	475.9	475.0	476.0	475.2	476.4	476.3	478.9	478.6
1852	882	2309	Circular	24	127	5	6	7	8	9	476.8	475.0	477.4	476.0	477.4	476.1	477.5	476.3	477.6	476.5	479.1	478.9
1855	1736	1743	Circular	42	281	18	23	27	31	35	469.1	468.1	470.6	470.0	470.9	470.4	471.6	471.3	473.4	473.1	474.7	474.4
1857	2716	2695	Circular	27	123	3	3	4	5	5	473.2	472.8	474.0	474.0	474.2	474.2	474.4	474.4	476.5	476.5	478.0	477.9
1859	2396	2399	Circular	24	103	3	4	4	5	5	476.8	476.8	477.7	477.7	477.9	477.8	478.7	478.6	482.0	482.0	482.7	482.7
1862	670	2396	Circular	24	197	3	4	4	5	5	477.0	476.8	477.9	477.8	478.1	477.9	478.8	478.7	482.1	482.1	482.8	482.7
1865	857	881	Circular	27	312	9	12	14	16	18	474.7	474.0	476.0	475.5	476.3	475.8	476.6	476.0	478.0	477.2	480.6	479.6
1870	783	657	Circular	24	313	7	9	10	10	10	462.6	463.0	464.8	464.6	465.6	465.2	466.3	465.7	466.7	466.1	466.9	466.2
1871	786	785	Circular	24	360	7	9	10	10	11	463.8	463.3	466.2	465.8	467.9	467.4	469.1	468.5	469.8	469.1	470.2	469.4
1881	189	769	Circular	36	493	17	24	28	32	37	456.7	455.6	459.1	458.8	461.7	461.1	463.2	462.5	464.0	463.3	464.6	463.8
1882	1266	3066	Circular	48	219	5	7	8	10	10	461.1	460.2	461.8	461.1	462.1	462.0	463.5	463.5	464.4	464.4	465.1	465.1
1885	190	189	Circular	30	320	1	9	10	10	10	457.3	456.7	459.2	459.2	462.1	462.0	463.7	463.5	464.5	464.4	465.2	465.1
1891	3292	190	Circular	30	385	1	9	10	10	10	458.2	457.3	459.2	459.2	462.3	462.1	464.0	463.8	464.8	464.6	465.4	465.2
1892	3538	3496	Circular	18	22	0	-5	-6	-6	-6	457.5	460.6	459.5	460.6	462.4	462.5	464.1	464.2	464.9	465.0	465.5	465.6
1893	3488	3493	Circular	33	26	10	11	10	10	10	457.9	457.8	459.7	459.7	462.5	462.5	464.2	464.2	465.0	465.0	465.5	465.5
1894	404	3563	Circular	30	9	8	8	8	8	8	458.5	459.6	460.4	460.4	462.6	462.6	464.3	464.3	465.1	465.1	465.6	465.6
1898	3308	3241	Circular	30	231	7	8	9	10	10	461.7	461.0	463.0	462.7	464.7	464.6	466.6	466.5	467.5	467.3	468.0	467.9
19	4069	4070	Circular	30	188	72	83	91	98	104	423.0	421.6	429.5	423.6	431.4	423.7	433.0	423.8	434.7	423.9	436.0	423.9
1904	2352	1558	Circular	36	359	2	3	3	4	4	455.0	456.0	457.1	457.1	457.3	457.2	457.7	457.7	458.4	458.4	458.9	458.9
1906	1558	1325	Circular	42	92	2	3	3	4	4	456.0	454.7	457.1	457.1	457.2	457.2	457.7	457.7	458.4	458.4	458.9	458.9
1910	804	3700	Circular	60	383	50	68	81	94	105	454.2	453.3	456.5	456.3	457.4	457.3	458.5	458.2	459.6	459.1	460.4	459.9
1911	1841	804	Circular	36	290	8	10	12	15	16	457.3	454.2	458.2	457.1	458.5	457.8	458.9	458.9	460.0	460.0	461.1	461.0
1912	751	1238	Circular	78	986	54	73	88	101	112	452.0	446.6	455.9	455.8	456.8	456.7	457.6	457.4	458.4	458.0	458.9	458.5
1915	1849	1836	Circular	30	370	6	8	10	12	13	460.6	458.8	461.4	460.0	461.5	460.2	461.6	460.4	461.8	460.6	462.0	461.8
1916	1803	1833	Circular	36	390	8	10	13	15	16	458.2	457.3	459.3	458.8	459.5	459.1	459.7	459.3	460.2	460.2	461.5	461.3
1917	2353	1900	Circular	24	278	6	8	10	12	13	463.7	463.9	465.5	465.2	465.8	465.4	466.1	465.6	466.4	465.7	466.8	465.8
1922	1610	2099	Circular	24	247	7	8	9	11	12	453.4	452.3	455.2	455.0	456.5	456.2	457.4	457.1	458.2	457.8	458.9	458.4
1929	1807	2322	Circular	24	183	12	14	15	16	18	451.9	451.5	456.1	455.7	457.7	457.1	458.6	457.9	459.6	458.7	460.4	459.3
1936	2348	2321	Circular	24	412	13	15	17	20	22	454.4	454.0	462.3	461.2	465.3	463.9	467.8	466.0	470.5	468.2	472.9	470.1
1941	3553	3247	Circular	48	351	25	30	31	29	28	452.3	452.4	459.0	458.9	461.6	461.5	463.1	463.0	464.0	464.0	465.0	464.9
1942	3851	3822	Circular	48	55	25	29	30	28	27	451.3	451.6	458.8	458.8	461.2	461.2	462.8	462.8	463.8	463.8	464.9	464.9
1943	3835	3656	Circular	48	111	25	29	30	28	27	452.0	451.2	458.6	458.6	461.0	461.0	462.6	462.6	463.8	463.7	464.8	464.8
1947	694	3784	Circular	36	447	19	22	27	29	29	452.9	452.1	459.1	458.8	461.4	461.2	462.8	462.6	464.1	463.9	465.1	464.9
1948	2271	1749	Circular	3	314	0	0	0	0	0	448.2	447.2	453.3	452.4	453.8	453.2	454.0	453.5	454.2	453.7	454.3	453.9
1949	3504	686	Circular	24	446	7	8	9	18	18	455.1	454.5	460.5	460.1	462.8	462.4	463.8	463.5	465.1	464.9	466.1	465.9
196	1854	821	Circular	30	206	9	12	14	15	15	486.0	486.0	489.0	488.9	490.3	490.1	491.1	490.8	491.4	491.2	491.6	491.3
1961	577	1717	Cross section		191	69	72	74	78	81	443.5	441.9	452.0	451.8	453.5	453.3	454.5	454.3	455.6	455.4	456.3	456.1
197	1988	2486	Circular	30	291	9	12	14	15	15	486.9	486.9	489.4	489.3	491.0	490.7	492.1	491.7	492.6	492.2	492.8	492.4
1979	1706	1716	Cross section		255	71	75	78	82	84	441.0	441.1	448.1	446.6	449.3	447.7	450.0	448.3	450.8	449.0	451.4	449.5
198	821	819	Circular	30	69	9	12	14	15	15	486.0	486.0	488.9	488.8	489.9	489.9	490.6	490.5	490.9	490.8	491.1	491.0
1985	387	386	Circular	18	8	9	10	11	11	12	441.8	441.9	444.7	444.5	446.0	445.6	446.7	446.4	447.4	447.0	448.0	447.5
1986	1665	2976	Circular	24	99	0	0	0	0	0	442.9	442.8	442.9	442.8	442.9	442.8	442.9	442.8	442.9	442.8	442.9	442.8
199	819	3176	Circular	30	159	9	12	14	15	15	486.0	485.8	488.8	488.7	489.8	489.6	490.4	490.2	490.7	490.5	490.8	490.6
1994	1075	985	Circular	24	365	4	5	6	6	7	449.8	449.1	452.0	451.9	452.4	452.2	452.8	452.5	453.2	452.9	453.5	453.2
1995	413	412	Circular	30	280	19	20	21	21	22	450.2	449.0	453.2	452.7	453.8	453.1	454.2	453.5	454.6	453.8	454.9	454.1
1996	1006	414	Circular	24	345	2	3	3	3	4	450.6	450.3	452.2	452.2	452.7	452.6	453.2	453.1	453.6	453.6	454.1	454.0
1997	1021	1006	Circular	24	361	2	3	3	3	4	450.6	450.9	452.2	452.2	452.7	452.7	453.2	453.2	453.7	453.7	454.2	454.1
1998	1560	1544	Circular	24	330	2	3	3	3	4	454.9	454.2	455.5	454.7	455.6	454.8	455.6	454.8	455.7	454.8	455.7	454.9
20	4084	4083	Circular	30	91	12	16	19	22	24	450.4	446.8	451.1	448.3	451.2	448.5	451.3	448.7	451.4	448.9	451.4	449.4
200	3536	3601	Circular	48	335	37	45	47	48	49	478.7	477.9	484.7	484.5	485.6	485.3	486.1	485.8	486.5	486.1	486.7	486.3
2002	134	130	Circular	24	224	1	2	2	2	2	448.9	449.9	450.9	450.9	451.1	451.0	451.2	451.2	451.3	451.3	451.4	451.4
2009	663	2342	Circular	24	605	7	8	8	9	10	458.9	457.7	464.4	463.9	466.4	465.8	467.1	466.4	467.8	467.0	468.4	467.6
201	3601	1976	Circular	48	460	37	45	47	48	49	477.9	477.2	484.3	484.0	485.1	484.7	485.6	485.1	485.9	485.4	486.1	485.6
2011	3600	2752	Circular	24	550	5	5	6	7	7	459.0	458.3	467.0	466.9	468.6	468.4	469.5	469.4	470.8	470.6	472.1	471.9
2013	2708	2748	Circular	24	9	8	8	11	11	11	457.5	457.7	466.7	466.7	468.2	468.2	469.3	469.3	470.5	470.5	471.8	471.8
2014	2715	2738	Circular	24	534	10	11	14	11	12	456.6	457.5	466.7	466.7	468.3	468.3	469.4	469.4	470.6	470.6	471.9	471.8
2015	1629	2715	Circular	24	548	8	10	12	10	11	455.7	456.6	466.7	466.7	468.3	468.3	469.4	469.4	470.7	470.7	471.9	471.9
2021	1174	1181	Circular	24	186	16	19	19	19	19	460.9	461.1	469.5	469.1	471.1	470.6	472.9	472.3	474.8	474.1	476.3	475.6

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2022	659	3660	Circular	24	336	16	19	24	27	27	460.7	460.0	467.8	467.2	469.2	468.7	470.2	469.6	471.7	470.9	473.0	472.2
203	1019	1440	Circular	36	238	31	36	38	40	41	487.4	486.2	489.6	489.0	492.9	492.3	494.2	493.4	494.9	494.1	495.3	494.6
2036	434	1261	Circular	24	341	15	19	21	23	23	444.1	440.9	445.3	443.0	448.5	445.9	450.4	447.5	451.8	448.6	453.0	449.4
2037	432	431	Circular	36	430	19	23	27	31	34	438.0	434.6	439.3	437.5	439.5	438.2	439.7	438.6	439.9	439.0	440.4	439.4
2038	433	2856	Circular	27	205	15	19	21	23	24	438.3	437.4	440.1	439.6	441.8	441.0	442.9	442.0	443.6	442.7	444.1	443.2
2039	2844	455	Circular	36	191	23	31	34	36	38	436.3	436.1	438.6	438.3	439.5	439.1	440.3	439.8	440.9	440.3	441.3	440.8
204	1440	1378	Circular	36	52	31	36	38	40	41	486.2	485.9	488.7	488.6	491.8	491.7	493.0	492.8	493.6	493.5	494.1	493.9
205	2287	1019	Circular	36	30	31	36	38	40	41	487.3	487.4	490.1	490.0	493.5	493.4	494.8	494.6	495.5	495.4	495.9	495.8
2050	445	2256	Circular	30	303	15	19	22	25	27	442.5	441.2	443.9	443.0	444.1	443.2	444.4	443.5	444.8	443.7	445.2	443.9
206	176	3265	Circular	42	55	37	45	47	48	49	482.4	482.0	486.6	486.5	488.6	488.5	489.5	489.4	490.1	489.9	490.5	490.3
2069	2897	Node_14	Circular	18	276	0	0	2	4	5	436.8	436.2	437.3	437.3	437.8	437.8	438.1	438.0	438.6	438.3	439.0	438.4
207	3286	167	Circular	42	340	37	45	47	48	49	482.0	479.2	485.6	485.2	487.1	486.4	487.7	487.0	488.2	487.4	488.5	487.7
2071	110	166	Circular	36	165	9	12	14	16	18	434.4	433.9	437.1	437.1	437.6	437.5	437.8	437.8	438.1	438.0	438.2	438.2
2076	461	3310	Circular	24	281	7	9	10	12	13	439.1	438.3	440.2	439.7	440.5	440.0	440.7	440.1	441.1	440.3	441.5	440.5
2081	1723	124	Circular	24	81	7	9	12	13	13	434.0	433.8	436.7	436.6	440.0	439.9	440.9	440.8	441.7	441.6	442.3	442.2
2084	2560	2545	Circular	30	271	14	18	19	21	21	430.1	429.1	434.6	434.3	436.8	436.3	437.6	437.1	438.3	437.9	438.9	438.4
2085	2015	500	Circular	36	213	22	28	30	32	33	427.8	428.5	432.8	432.5	433.9	433.6	434.5	434.1	435.0	434.6	435.5	434.9
2088	500	501	Circular	36	26	22	28	30	32	33	428.5	428.5	432.4	432.3	433.3	433.3	433.8	433.7	434.2	434.2	434.6	434.5
2099	2312	2299	Circular	30	266	4	5	6	7	8	430.6	430.3	433.4	433.4	433.8	433.8	434.1	434.0	434.3	434.2	434.5	434.4
21	4083	4089	Circular	30	124	12	16	19	22	24	446.8	444.2	447.5	445.0	447.6	445.1	447.7	445.2	447.8	446.3	449.1	449.1
2100	2299	3567	Circular	30	146	4	5	6	7	8	430.3	430.2	433.4	433.3	433.8	433.7	434.0	434.0	434.2	434.2	434.4	434.3
2101	243	2727	Circular	24	12	4	5	6	7	8	431.7	431.1	433.4	433.4	433.9	433.9	434.2	434.2	434.5	434.4	434.7	434.6
2103	334	443	Circular	36	90	16	22	26	29	30	421.6	421.1	423.3	423.1	423.7	423.6	424.2	424.0	424.6	424.5	425.0	424.8
2106	381	2667	Circular	24	318	9	12	14	16	17	429.6	428.9	432.7	432.2	434.9	434.1	437.1	435.8	438.9	437.4	439.6	438.0
2110	2195	1200	Circular	24	180	3	4	4	5	6	429.9	430.4	431.4	431.3	431.7	431.6	432.0	431.9	433.0	432.9	434.4	434.3
2111	1984	95	Circular	36	643	15	20	24	28	31	426.5	425.9	428.4	427.8	428.8	428.1	429.2	428.4	429.8	428.7	430.3	428.9
2117	3616	3815	Circular	30	453	9	11	14	15	16	432.4	431.6	435.7	435.5	438.3	438.0	440.2	439.9	441.4	441.2	442.0	441.9
2118	503	3665	Circular	24	80	4	5	6	6	6	436.8	436.7	438.8	438.8	439.3	439.3	441.2	441.2	442.4	442.4	442.9	442.8
2119	3801	3843	Circular	18	90	5	6	6	6	6	437.3	436.4	439.0	438.8	439.6	439.3	441.2	441.0	442.1	442.0	442.5	442.5
2120	3830	3237	Circular	18	19	0	0	2	4	5	437.3	437.0	439.8	439.8	440.8	440.8	442.2	442.2	442.4	442.3	442.5	442.4
2121	1645	3153	Circular	24	101	4	5	6	7	9	436.3	435.7	438.6	438.6	438.9	438.9	440.7	440.7	441.9	441.8	442.4	442.3
2124	3844	3826	Circular	30	224	5	6	7	8	9	439.0	438.4	440.1	439.9	441.0	440.9	442.5	442.4	443.0	442.9	443.3	443.2
2128	3620	3486	Circular	27	421	2	3	3	4	4	431.4	431.0	433.8	433.8	434.0	434.0	434.2	434.2	434.4	434.3	434.5	434.4
2129	3739	3620	Circular	27	256	4	6	7	8	9	431.9	431.5	433.8	433.8	434.1	434.0	434.3	434.2	434.5	434.4	434.7	434.5
2137	3175	3143	Circular	30	176	4	4	4	5	5	425.7	425.6	428.1	428.1	428.6	428.6	429.1	429.1	429.7	429.7	430.2	430.2
2138	3155	3354	Circular	24	247	2	3	3	4	4	425.9	425.6	427.8	427.8	428.3	428.2	428.7	428.6	429.1	429.1	429.5	429.5
2139	3219	3085	Circular	27	152	6	8	9	11	12	426.5	426.3	428.6	428.5	429.4	429.3	430.2	430.1	431.1	431.0	431.9	431.7
214	3345	1500	Circular	24	487	6	7	9	10	10	489.5	488.5	491.2	491.0	495.4	494.9	496.9	496.2	497.8	497.0	498.4	497.5
2141	2892	3245	Circular	24	58	4	6	6	7	8	427.2	426.5	428.3	428.2	428.6	428.6	429.0	429.0	429.4	429.4	429.8	429.7
2144	3360	3402	Circular	24	367	7	9	11	13	14	426.6	426.1	428.1	427.6	429.0	428.4	429.8	429.0	430.8	429.6	431.7	430.2
2145	3431	3425	Circular	36	76	13	15	17	19	20	425.0	425.2	427.3	427.2	427.6	427.5	427.8	427.7	428.0	428.0	428.2	428.2
2146	3399	3497	Circular	42	97	20	24	28	32	34	424.9	424.4	426.4	426.4	426.6	426.7	426.8	426.8	427.0	427.0	427.1	427.1
2149	3167	112	Circular	42	371	19	24	30	36	41	422.2	421.0	423.6	422.3	423.7	422.5	423.9	422.7	424.2	422.8	424.3	423.0
2151	3382	3282	Circular	24	58	-1	-3	-3	-3	-3	427.0	426.0	427.8	427.8	428.1	428.1	428.6	428.6	429.5	429.5	430.5	430.5
2153	3415	2908	Circular	30	43	6	8	9	11	12	427.3	427.3	428.6	428.6	428.9	428.8	429.2	429.1	430.2	430.1	431.4	431.4
2158	3540	3537	Circular	42	46	27	34	40	45	46	425.8	426.1	429.0	429.0	429.6	429.6	430.3	430.2	431.1	431.0	431.6	431.5
2159	3511	3550	Circular	48	388	32	41	48	54	56	425.7	425.8	428.6	428.2	429.0	428.6	429.4	429.0	430.0	429.4	430.3	429.7
216	1073	2426	Circular	24	50	13	16	19	20	21	495.0	495.0	497.1	496.9	501.0	500.9	502.1	502.0	502.7	502.6	503.0	502.9
2160	3639	3649	Circular	42	244	21	28	33	37	38	427.5	427.1	430.3	430.2	431.8	431.6	433.6	433.4	435.4	435.1	436.2	435.8
2165	3503	354	Circular	24	283	6	7	8	9	10	429.0	428.4	430.1	429.6	430.2	429.7	430.5	430.1	431.4	430.9	432.1	431.5
2166	3505	3534	Circular	24	73	3	4	4	5	6	431.3	431.0	431.9	431.6	432.0	431.7	432.1	431.8	432.2	432.0	432.8	432.7
217	1074	1084	Circular	27	235	13	16	19	20	21	494.4	493.7	496.1	495.7	500.3	500.0	501.5	501.3	502.2	502.0	502.5	502.4
2174	3584	3551	Circular	36	348	42	49	52	54	57	436.4	434.7	439.2	437.8	439.9	438.1	440.4	438.2	440.7	438.4	441.0	438.5
2180	2707	2693	Circular	48	105	31	38	38	39	39	437.2	437.5	442.3	442.3	444.2	444.2	445.5	445.4	446.3	446.2	447.0	446.9
2181	1661	2707	Circular	48	128	31	38	39	38	39	437.4	437.3	442.5	442.5	444.5	444.4	445.8	445.7	446.6	446.5	447.3	447.2
2182	3305	642	Circular	27	164	10	12	13	14	15	440.1	439.3	443.9	443.7	446.9	446.6	448.2	448.0	449.0	448.8	449.6	449.4
2183	517	1679	Circular	48	20	33	42	44	43	46	438.2	437.8	442.5	442.5	444.5	444.5	445.8	445.8	446.6	446.6	447.3	447.3
2185	613	1713	Circular	24	40	6	8	9	10	10	444.4	444.4	446.2	446.1	450.2	450.1	451.3	451.2	452.0	451.9	452.4	452.4
219	2427	2426	Circular	24	45	0	2	2	4	4	495.2	495.0	496.9	496.9	500.9	500.9	502.0	502.0	502.6	502.6	502.9	502.9
2199	640	641	Circular	42	290	18	24	25	25	25	439.3	439.1	444.0	443.9	447.1	446.9	448.5	448.3	449.3	449.1	449.8	449.7
220	1681	2021	Circular	24	147	0	1	0	2	2	495.8	495.5	496.9	496.9	500.9	500.9	502.0	502.0	502.6	502.6	502.9	502.9
2204	3512	430	Circular	24	162	8	11	12	12	13	451.3	451.1	453.5	453.2	455.3	454.9	457.2	456.7	457.9	457.4	458.2	457.7

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2211	161	163	Circular	24	60	19	26	32	35	37	480.4	476.2	481.3	478.5	481.5	479.4	482.5	481.3	484.5	483.1	485.9	484.4
2213	904	1414	Circular	66	502	58	83	104	122	134	472.9	472.6	476.8	476.6	477.4	477.1	478.1	477.6	478.8	478.1	479.3	478.5
222	1655	1643	Circular	24	130	4	5	6	6	7	497.7	497.5	501.3	501.2	505.0	505.0	505.6	505.6	506.3	506.2	507.1	507.0
2221	4023	4026	Circular	24	19	6	7	7	7	8	434.2	433.6	445.0	445.0	446.3	446.3	447.6	447.6	449.5	449.5	451.1	451.1
2225	2900	1217	Circular	36	168	16	22	27	32	35	594.0	573.0	594.5	574.1	594.6	574.3	594.6	574.5	594.7	574.7	594.7	574.8
2226	3516	3532	Circular	36	324	7	9	11	12	14	428.4	428.4	430.5	430.5	432.2	432.1	434.2	434.1	436.2	436.1	437.0	436.9
2229	2229	1231	Circular	24	187	15	18	20	26	29	542.5	541.0	550.1	549.2	551.6	550.7	552.9	552.0	554.5	553.6	555.8	554.7
223	1643	1410	Circular	24	70	4	6	6	8	8	497.4	497.5	501.2	501.2	504.9	504.9	505.6	505.5	506.2	506.2	507.0	507.0
2232	2000	1934	Circular	54	520	30	41	51	60	67	515.7	514.0	517.3	515.8	517.6	516.0	517.8	516.2	518.0	516.5	518.2	516.6
2234	1189	1188	Circular	24	127	17	24	30	35	39	554.9	543.5	555.6	544.2	555.7	544.4	555.8	544.7	555.9	545.0	556.0	545.2
2237	2039	1151	Circular	33	420	7	10	11	13	14	501.5	501.4	502.9	502.3	503.1	502.5	504.4	504.2	507.5	507.2	509.7	509.4
224	1080	1623	Circular	24	160	8	12	13	14	15	496.7	496.3	500.4	500.2	504.2	504.0	504.8	504.7	505.4	505.2	506.1	505.9
2243	1500	2287	Circular	36	138	31	36	38	39	40	487.4	487.4	490.6	490.3	494.3	493.9	495.7	495.2	496.4	496.0	496.9	496.4
2244	1410	1087	Circular	24	60	4	8	8	11	11	497.4	497.2	501.2	501.1	504.9	504.9	505.5	505.5	506.1	506.1	506.9	506.9
2246	964	2457	Circular	36	50	22	25	27	30	31	483.6	483.2	485.4	485.3	486.2	486.2	486.8	486.7	487.5	487.4	487.9	487.8
2247	831	1809	Circular	60	30	-72	-76	-79	83	87	479.0	480.2	485.7	485.7	486.4	486.4	486.8	486.8	487.2	487.1	487.4	487.4
2248	1008	1007	Circular	42	258	17	22	25	29	32	491.1	490.7	492.8	492.4	493.1	492.7	493.3	493.0	493.8	493.5	496.0	495.8
225	1623	1409	Circular	24	160	8	12	13	14	15	496.2	495.9	500.1	499.9	503.9	503.7	504.6	504.4	505.1	504.9	505.8	505.6
2250	2127	1438	Circular	24	168	16	22	24	24	26	520.4	516.3	522.3	521.4	526.8	525.4	528.8	527.3	530.4	528.7	531.7	529.8
2251	1071	1042	Circular	24	288	12	17	21	24	26	672.5	634.8	673.0	635.9	673.1	636.1	673.2	636.2	673.2	636.4	673.3	636.4
2254	3464	3451	Circular	30	239	11	15	18	21	23	546.8	545.8	548.0	547.3	548.3	547.6	548.5	547.8	548.8	548.1	549.1	548.3
2256	1698	1692	Circular	27	330	8	10	12	13	15	482.2	481.2	483.3	482.5	483.5	482.7	483.6	482.9	483.8	483.1	483.9	483.2
2258	2898	2924	Circular	24	200	8	10	12	13	15	483.8	483.1	485.0	484.5	485.2	484.7	485.4	484.9	485.8	485.1	486.3	485.5
2259	799	3847	Circular	42	34	29	38	44	51	57	459.7	459.6	461.4	461.2	461.6	461.5	461.8	461.6	461.9	461.8	462.1	461.9
2265	2545	2537	Circular	30	146	14	18	19	21	21	428.8	428.3	434.1	434.0	436.1	435.8	436.9	436.7	437.6	437.4	438.2	437.9
2266	107	2044	Circular	36	32	22	28	30	32	33	428.4	428.3	433.5	433.5	435.1	435.1	435.9	435.9	436.6	436.5	437.2	437.1
2268	3246	3268	Circular	36	288	16	22	26	29	30	420.9	420.2	422.6	422.3	423.1	422.7	423.5	423.0	423.8	423.3	424.0	423.4
2272	1549	3581	Circular	30	512	24	29	32	34	35	429.2	426.7	430.9	428.3	431.2	428.5	431.8	428.6	432.1	428.7	432.3	428.7
2273	3734	3706	Circular	30	121	0	0	0	0	0	428.9	425.1	428.9	426.0	428.9	426.3	428.9	426.5	428.9	426.7	428.9	426.8
2274	3130	3106	Circular	27	66	7	9	10	12	13	426.2	426.3	428.3	428.3	429.0	429.0	429.7	429.6	430.5	430.4	431.1	431.0
2276	2413	2430	Circular	36	244	10	13	14	16	17	465.4	465.0	470.1	470.1	473.2	473.1	474.3	474.2	475.2	475.1	475.7	475.6
2278	2399	2624	Circular	24	19	3	4	4	5	6	476.8	476.8	477.6	477.6	477.7	477.7	478.6	478.6	481.9	481.9	482.6	482.6
2279	787	162	Circular	42	147	33	46	52	56	59	453.3	453.0	457.4	457.2	458.2	457.9	458.7	458.3	459.2	458.8	459.6	459.2
2280	1766	3713	Circular	48	102	5	7	8	10	10	463.1	463.0	464.0	463.9	464.2	464.0	464.2	464.1	464.4	464.4	465.1	465.1
2281	560	3338	Circular	27	298	8	11	12	12	12	459.5	458.9	460.9	460.6	463.3	462.9	465.2	464.7	466.0	465.6	466.6	466.1
2283	3563	770	Circular	33	174	3	7	7	8	8	459.6	457.9	460.2	459.9	462.5	462.5	464.2	464.2	465.1	465.0	465.6	465.6
2284	3729	3003	Circular	30	509	12	13	14	15	13	458.2	456.9	460.1	459.8	462.7	462.4	464.5	464.1	465.3	464.9	465.8	465.6
2285	1835	806	Circular	24	20	6	10	13	15	16	457.2	455.2	458.4	458.3	459.0	459.0	460.1	460.0	461.9	461.8	463.3	463.2
2289	687	326	Circular	36	288	19	22	27	29	29	454.4	453.9	459.8	459.6	462.1	461.9	463.2	463.1	464.7	464.5	465.7	465.5
2292	2604	2616	Circular	42	119	2	2	-2	2	2	436.6	436.8	440.5	440.5	440.9	440.9	441.2	441.2	441.4	441.4	441.6	441.6
2295	529	528	Circular	24	354	14	15	16	16	17	455.3	455.3	462.3	461.0	464.1	462.6	464.8	463.2	465.4	463.8	465.9	464.3
2296	1269	1270	Circular	24	104	9	11	13	15	16	437.1	437.1	439.4	439.2	440.6	440.4	441.8	441.4	442.7	442.2	443.3	442.7
2297	3314	2930	Circular	30	98	6	8	9	11	12	426.8	426.8	428.2	428.1	428.4	428.4	428.8	428.8	429.8	429.8	431.0	430.9
230	1503	1500	Circular	36	110	26	29	30	32	33	487.7	487.5	491.1	491.0	495.1	494.9	496.4	496.2	497.2	497.0	497.7	497.5
2304	254	253	Circular	24	285	9	13	15	16	17	441.8	441.6	446.1	445.6	450.8	450.0	453.4	452.2	454.7	453.4	455.6	454.1
2305	164	1490	Circular	42	220	19	26	32	35	37	476.1	474.9	478.0	477.8	479.0	479.0	480.6	480.4	482.2	481.9	483.4	483.1
231	1504	1503	Circular	36	140	26	29	30	32	33	488.2	487.7	491.7	491.5	495.8	495.6	497.2	497.0	498.0	497.7	498.5	498.2
2312	1516	1507	Circular	66	25	45	63	76	90	101	516.0	516.0	518.7	518.7	519.2	519.2	519.5	519.5	519.9	519.8	520.1	520.1
2313	1217	2583	Circular	36	112	16	22	27	32	35	572.8	566.3	573.4	567.6	573.5	567.9	573.6	568.1	573.7	568.3	573.8	568.4
2317	3506	3474	Circular	24	109	2	3	3	3	4	428.4	428.1	429.8	429.8	430.9	430.9	432.3	432.3	433.8	433.7	434.4	434.4
2319	1077	3919	Circular	24	440	8	10	13	15	16	493.2	493.3	495.3	494.7	500.6	499.7	502.3	501.1	503.5	501.8	504.3	502.2
2321	521	1292	Circular	24	318	1	1	2	2	2	451.6	449.7	451.9	450.9	451.9	451.1	452.0	451.2	452.0	451.3	452.0	451.4
2325	1042	1043	Circular	24	55	12	17	21	24	26	634.8	628.2	635.3	629.2	635.4	629.4	635.5	629.6	635.6	629.7	635.6	629.8
2326	3597	945	Circular	54	10	8	10	12	14	15	485.0	484.6	488.3	488.3	489.0	489.0	489.7	489.7	490.3	490.3	490.8	490.8
2327	945	3604	Circular	54	450	71	84	89	92	95	484.3	483.4	487.7	487.1	488.5	487.7	489.0	488.1	489.6	488.6	490.0	489.0
2328	2503	2489	Circular	36	100	13	16	19	20	21	497.9	498.1	506.1	506.1	507.0	507.0	507.9	507.8	508.6	508.6	509.3	509.2
2329	3709	3763	Cross section		53	63	75	84	94	101	427.6	427.5	430.2	430.2	430.4	430.4	430.6	430.6	430.7	430.7	430.8	430.8
2331	1534	1535	Circular	60	50	63	75	85	94	101	428.1	428.2	432.8	432.7	432.9	432.9	433.0	432.9	433.0	433.0	433.0	433.0
2332	1576	1577	Circular	60	50	56	65	72	79	84	428.8	428.8	433.0	433.0	433.3	433.2	433.4	433.3	433.5	433.4	433.5	433.5
2339	2961	2605	Circular	60	156	0	0	0	0	0	468.9	468.6	469.1	469.1	469.3	469.3	469.5	469.5	469.7	469.7	469.8	469.8
2340	2523	2511	Circular	60	53	9	12	14	16	18	462.5	462.4	469.0	469.0	469.1	469.1	469.2	469.2	469.2	469.2	469.3	469.3
2341	3456	3465	Circular	42	494	9	12	14	16	18	464.6	464.3	469.1	469.1	469.3	469.2	469.4	469.3	469.5	469.4	469.6	469.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2342	3730	3461	Circular	60	172	-2	-3	-4	-5	-5	464.5	464.0	469.1	469.1	469.3	469.3	469.5	469.5	469.7	469.7	469.8	469.8
2343	3892	3915	Rectangular		35	92	118	132	144	153	459.6	459.6	463.4	463.4	463.9	463.9	464.1	464.1	464.3	464.3	464.4	464.4
2344	1824	3253	Circular	72	251	86	110	123	135	144	460.9	461.0	464.4	464.2	464.9	464.6	465.1	464.8	465.3	465.0	465.4	465.1
2346	3501	3030	Rectangular		331	103	133	150	165	176	459.4	458.9	461.7	461.6	462.1	462.0	462.3	462.2	462.5	462.3	462.6	462.4
2349	1847	1816	Rectangular		70	134	174	198	219	237	452.9	452.8	457.9	457.9	458.5	458.5	458.9	458.9	459.2	459.2	459.5	459.5
2350	3151	3266	Rectangular		181	169	221	252	278	298	451.9	452.3	457.2	457.1	457.9	457.8	458.3	458.2	458.7	458.7	459.1	459.0
2351	3133	1556	Circular	36	12	9	11	13	15	16	434.2	434.0	436.0	436.0	438.7	438.7	440.6	440.6	441.8	441.8	442.3	442.3
2352	1738	179	Rectangular		161	251	330	380	422	454	440.6	440.8	444.5	444.4	445.1	444.9	445.5	445.2	445.7	445.5	445.9	445.7
2355	3486	3811	Circular	48	29	36	43	50	56	61	431.0	430.9	433.8	433.8	434.0	434.0	434.2	434.2	434.3	434.3	434.4	434.4
2356	3348	3379	Circular	30	66	26	29	29	30	31	432.2	431.8	434.3	434.3	434.8	434.5	434.9	434.6	435.1	434.7	435.2	434.8
2357	3807	3820	Circular	60	42	29	38	43	47	50	432.6	432.3	435.0	435.0	435.3	435.3	435.4	435.4	435.5	435.5	435.6	435.6
236	1828	2093	Circular	36	130	22	25	27	30	31	481.4	480.8	484.4	484.3	485.2	485.0	485.6	485.4	485.9	485.7	486.1	485.9
2363	2273	3382	Circular	24	458	0	0	0	0	0	431.2	427.2	431.3	427.8	431.3	428.1	431.3	428.6	431.3	429.5	431.3	430.5
2367	2329	3707	Circular	24	253	3	4	4	5	5	453.4	453.0	454.5	454.4	457.2	457.1	459.4	459.3	460.2	460.1	460.7	460.6
2368	3707	3500	Circular	24	429	3	4	4	5	5	453.0	452.2	454.4	454.4	457.1	457.0	459.3	459.2	460.1	460.0	460.6	460.4
237	963	817	Circular	27	415	2	5	9	12	13	485.2	483.9	485.6	484.9	486.1	485.7	486.5	486.2	487.2	486.6	487.6	487.0
2375	1241	1242	Circular	24	212	3	4	5	6	7	429.5	429.3	430.6	430.4	430.7	430.6	430.9	430.7	431.0	430.8	431.1	430.9
2376	1242	1243	Circular	27	120	3	4	5	6	7	429.3	429.3	430.3	430.2	430.4	430.3	430.5	430.4	430.6	430.5	430.7	430.6
2377	1245	1244	Circular	27	133	3	4	5	6	7	428.4	428.1	429.4	429.4	429.6	429.6	429.8	429.7	429.9	429.8	430.0	429.9
2378	1244	290	Circular	27	32	3	4	5	6	7	428.1	427.7	429.3	429.3	429.5	429.5	429.7	429.7	429.8	429.8	429.8	429.8
238	2062	964	Circular	36	196	17	22	26	30	31	484.2	483.7	486.1	485.8	486.7	486.5	487.3	487.0	488.2	487.8	488.7	488.3
2381	2891	3300	Circular	24	450	8	11	13	15	17	426.0	424.7	427.2	426.5	428.8	427.8	430.0	428.5	431.5	429.5	433.0	430.6
2382	222	3837	Circular	24	278	7	9	10	11	11	463.8	463.2	465.2	464.9	465.7	465.3	467.9	467.4	468.8	468.3	469.4	468.9
239	966	964	Circular	24	410	5	6	7	8	9	486.8	483.7	487.5	485.8	487.6	486.5	487.7	487.0	488.2	487.8	489.0	488.3
240	2457	1828	Circular	36	440	22	25	27	30	31	483.2	481.6	485.0	484.6	486.0	485.4	486.5	485.8	487.1	486.2	487.5	486.5
242	2934	2940	Circular	60	127	69	87	98	108	115	478.8	477.8	484.6	484.5	485.3	485.2	485.7	485.5	486.0	485.8	486.3	486.0
2421	2189	2232	Circular	24	210	12	18	23	28	32	613.2	594.4	613.8	595.7	613.9	596.0	614.0	596.2	614.1	596.8	614.2	597.2
2428	1347	1516	Circular	66	20	45	63	76	90	101	516.5	516.0	518.9	518.9	519.4	519.4	519.8	519.7	520.1	520.0	520.3	520.3
2429	1198	1822	Circular	24	227	7	10	12	15	16	583.2	577.4	583.8	578.7	583.9	579.0	584.0	579.3	584.1	579.5	584.2	579.7
243	2461	2112	Circular	36	339	17	22	26	30	31	487.1	486.1	488.7	488.3	489.1	488.7	490.0	489.5	491.8	491.1	492.7	491.9
2440	2426	1074	Circular	24	50	13	16	19	20	21	495.0	494.9	496.6	496.4	500.6	500.5	501.8	501.7	502.4	502.3	502.7	502.7
2441	1628	1620	Circular	24	193	13	16	17	18	18	495.9	495.5	499.1	498.5	502.9	502.4	503.7	503.2	504.3	503.8	504.8	504.2
2442	2934	2940	Circular	60	127	69	87	98	108	115	478.4	477.9	484.6	484.5	485.3	485.2	485.7	485.5	486.0	485.8	486.3	486.0
2443	831	1809	Circular	60	30	155	157	171	155	147	479.9	479.8	485.7	485.7	486.4	486.4	486.8	486.8	487.2	487.1	487.4	487.4
2445	2657	2658	Circular	42	211	18	24	28	32	35	489.4	488.9	491.1	490.8	491.4	491.1	491.7	491.4	492.6	492.3	494.5	494.2
2446	1059	1058	Circular	42	335	24	28	30	31	32	503.1	502.2	504.8	504.2	505.0	504.4	505.1	504.4	505.1	504.5	505.2	504.5
2447	2680	2676	Circular	42	120	28	32	35	37	38	496.9	496.4	499.0	498.9	499.3	499.1	499.4	499.2	499.5	499.3	499.6	499.4
2449	1064	1062	Circular	42	350	24	28	30	31	32	505.1	504.0	506.8	506.2	507.0	506.4	507.0	506.4	507.1	506.5	507.1	506.5
2452	944	945	Circular	54	347	64	75	78	79	80	483.3	484.4	488.7	488.3	489.5	489.0	490.2	489.7	490.9	490.3	491.3	490.8
2459	2622	2499	Circular	42	235	20	27	33	38	40	476.1	475.1	478.4	478.4	479.5	479.3	480.5	480.2	481.9	481.5	482.7	482.4
246	1963	965	Circular	36	193	17	22	26	30	31	485.5	484.8	487.2	487.0	487.7	487.5	488.5	488.2	489.8	489.4	490.5	490.1
2460	2505	887	Circular	48	290	27	36	43	49	52	475.1	474.8	477.7	477.5	478.2	478.0	478.6	478.4	479.3	479.0	479.9	479.5
2461	1810	1506	Circular	36	302	13	17	21	24	26	478.7	477.4	479.9	479.1	480.3	480.2	482.2	481.9	484.2	483.8	485.4	484.9
2463	165	3699	Circular	24	385	7	9	10	12	12	483.3	481.6	484.2	483.2	484.5	483.8	485.4	484.7	488.0	487.0	489.3	488.2
2464	845	2670	Circular	36	293	11	14	16	18	20	465.3	464.6	466.7	466.4	467.3	467.2	468.3	468.1	469.3	469.1	470.3	470.0
2468	1875	639	Circular	36	111	12	17	20	21	25	466.2	466.2	472.2	472.1	475.8	475.8	476.7	476.7	477.3	477.3	477.7	477.7
2471	822	2178	Circular	36	70	20	26	30	34	35	466.8	466.6	468.8	468.8	469.4	469.3	470.7	470.6	472.2	472.0	473.1	472.9
2472	889	2440	Circular	66	164	44	58	67	77	83	463.7	463.5	467.1	467.0	467.7	467.7	468.2	468.2	468.8	468.7	469.2	469.1
2474	1743	662	Circular	42	281	18	23	27	31	35	468.1	467.6	469.9	469.6	470.2	469.9	471.2	471.0	472.9	472.7	474.2	473.8
2475	2627	2642	Circular	24	41	8	10	11	13	16	474.2	474.2	476.2	476.1	476.6	476.5	477.8	477.7	481.0	480.8	481.7	481.6
2479	781	783	Circular	24	207	7	9	10	10	10	463.4	462.6	465.0	464.9	466.1	465.8	466.8	466.5	467.3	466.8	467.5	467.1
2483	404	771	Circular	24	186	6	6	6	6	6	458.2	458.8	460.3	460.1	462.6	462.5	464.3	464.2	465.1	465.0	465.6	465.6
2485	3837	745	Circular	24	56	7	9	10	10	11	463.2	462.3	464.1	463.8	465.1	465.0	467.1	467.0	468.0	467.9	468.6	468.5
2486	1325	1328	Circular	42	148	2	3	3	4	4	456.0	454.4	457.1	457.1	457.2	457.2	457.7	457.7	458.4	458.4	458.9	458.9
2487	2854	2467	Circular	60	78	43	59	70	85	97	454.5	454.2	457.5	457.5	458.3	458.3	459.4	459.3	460.7	460.6	461.8	461.7
249	967	2324	Circular	24	110	5	6	7	8	9	489.0	488.4	489.8	489.4	490.0	489.6	490.1	489.8	490.2	489.9	490.4	490.1
2491	3863	3851	Circular	48	114	25	29	30	28	27	451.4	451.3	458.8	458.8	461.3	461.3	462.9	462.8	463.9	463.9	464.9	464.9
2495	3187	577	Circular	48	621	70	74	76	78	79	444.4	443.7	453.6	452.2	455.3	453.7	456.3	454.7	457.5	455.8	458.3	456.5
2500	312	1271	Circular	18	241	0	0	0	0	0	440.2	438.5	440.3	438.8	440.3	439.3	440.3	439.6	440.3	439.8	440.4	440.0
2503	262	1021	Circular	24	377	2	3	3	3	4	452.1	450.6	452.7	452.3	452.8	452.8	453.3	453.2	453.8	453.8	454.3	454.2
2505	2752	2708	Circular	24	436	5	5	6	8	8	458.3	457.5	466.8	466.7	468.4	468.3	469.4	469.3	470.6	470.6	471.9	471.8
2508	1181	1179	Circular	24	32	16	19	21	21	22	460.6	460.9	468.7	468.7	470.1	470.0	471.7	471.6	473.4	473.2	474.8	474.7

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS			(ft)	2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
252	1400	337	Circular	33	426	12	17	20	23	23	489.6	488.2	490.8	489.7	491.1	490.1	491.4	490.8	493.8	493.0	494.8	494.0
2520	507	111	Circular	36	52	7	9	10	12	13	434.8	434.5	437.1	437.1	437.6	437.6	437.9	437.9	438.2	438.2	438.4	438.4
2521	484	506	Circular	36	313	7	9	10	12	13	437.3	436.2	438.2	437.2	438.3	437.7	438.4	438.0	438.6	438.4	438.6	438.7
2522	2721	2560	Circular	30	240	14	18	19	21	21	430.9	430.1	435.0	434.7	437.4	437.0	438.3	437.9	439.0	438.5	439.5	439.1
2523	2575	1278	Circular	36	150	28	35	39	42	44	428.8	429.1	431.7	431.5	432.2	431.8	432.5	432.0	432.7	432.1	432.9	432.2
2530	3797	3661	Circular	30	121	5	6	7	8	9	439.7	439.4	440.6	440.4	441.0	441.0	442.6	442.6	443.1	443.1	443.6	443.5
2531	3568	3230	Circular	24	346	4	6	7	8	9	432.3	431.1	434.1	434.0	434.6	434.4	434.9	434.6	435.3	434.8	435.5	435.0
2532	379	3219	Circular	24	440	6	8	9	11	12	427.4	426.6	428.9	428.6	430.0	429.5	431.1	430.4	432.3	431.4	433.3	432.2
2533	390	3611	Circular	30	275	9	13	14	14	15	420.6	417.7	421.8	421.9	422.5	422.5	423.4	423.1	424.0	423.6	424.5	424.1
2535	2931	3256	Circular	24	266	9	13	14	14	15	424.1	423.1	425.5	424.8	426.1	425.2	426.7	425.7	427.5	426.5	428.5	427.3
2537	3534	3559	Circular	24	218	3	4	4	5	6	430.6	430.2	431.4	431.0	431.5	431.1	431.6	431.2	431.9	431.7	432.6	432.5
254	3036	1404	Circular	30	170	2	3	3	4	5	493.8	493.6	494.4	494.3	494.6	494.5	494.8	494.7	496.5	496.5	497.6	497.6
2542	3306	3305	Circular	27	280	10	12	13	14	15	441.0	440.1	444.3	444.0	447.4	447.0	448.7	448.3	449.4	449.1	450.1	449.7
2543	253	658	Circular	24	524	9	13	15	16	16	441.6	440.7	445.5	444.6	449.6	448.1	451.8	449.6	452.9	450.6	453.6	451.2
2547	740	2329	Circular	24	125	3	4	4	5	5	453.6	453.4	454.6	454.5	457.2	457.2	459.5	459.5	460.3	460.3	460.8	460.7
2554	2551	2554	Circular	24	150	7	9	10	12	13	506.2	505.9	508.2	508.1	508.6	508.4	509.0	508.7	509.3	508.9	511.5	511.0
2555	143	158	Circular	30	110	7	10	11	13	14	506.0	506.0	507.5	507.5	507.8	507.7	507.9	507.8	508.0	507.9	510.6	510.4
2557	415	997	Circular	30	365	2	3	3	4	4	496.1	495.1	496.6	495.7	496.7	495.8	496.7	495.9	496.8	496.6	497.6	497.6
256	2913	2917	Circular	30	371	12	17	20	23	23	492.4	491.0	493.6	492.5	493.9	492.7	494.1	493.0	496.0	494.9	497.2	496.0
2560	3939	3930	Circular	42	130	24	34	38	42	46	495.7	495.6	501.2	501.1	506.2	506.1	507.1	507.0	507.8	507.8	508.4	508.3
2566	1511	1512	Circular	30	129	10	14	16	18	19	471.1	470.1	472.2	471.6	472.4	471.9	473.6	473.4	475.9	475.7	476.9	476.7
2568	385	3538	Circular	33	99	9	10	10	10	10	457.5	457.5	459.6	459.5	462.4	462.4	464.1	464.1	464.9	464.9	465.5	465.5
2572	2889	2921	Circular	48	341	25	30	32	33	32	454.5	453.4	459.2	459.1	461.9	461.8	463.4	463.3	464.3	464.2	465.1	465.0
2574	1544	262	Circular	24	380	2	3	3	3	4	453.0	452.2	453.6	452.8	453.7	452.9	453.8	453.3	453.9	453.9	454.4	454.4
2575	2342	2379	Circular	24	122	7	9	9	10	12	457.7	457.6	463.8	463.7	465.7	465.6	466.3	466.2	466.9	466.8	467.5	467.3
2576	3374	3312	Circular	36	598	19	24	30	36	41	425.6	424.4	427.3	426.0	427.6	426.3	428.0	426.6	428.7	427.0	429.6	427.4
258	2894	2905	Circular	30	280	0	0	0	0	-3	496.9	496.1	496.9	496.7	496.9	496.8	496.9	496.9	497.0	497.0	497.5	497.6
2581	2924	1698	Circular	24	200	8	10	12	13	15	483.1	482.2	484.2	483.5	484.4	483.7	484.6	483.9	484.8	484.1	485.1	484.2
2582	3232	3228	Circular	60	126	50	65	77	87	95	462.5	461.4	466.0	466.1	466.8	466.8	467.2	467.2	467.8	467.7	468.1	468.0
259	997	998	Circular	30	41	2	3	3	4	4	495.1	494.9	495.6	495.5	495.7	495.6	495.7	495.6	496.5	496.5	497.6	497.6
2590	1200	1206	Circular	24	52	3	4	4	5	6	430.4	429.9	431.2	431.1	431.5	431.5	431.8	431.8	432.8	432.8	434.2	434.2
2591	3098	2925	Circular	24	182	8	11	13	15	17	426.7	426.2	428.3	428.0	430.1	429.6	431.9	431.3	434.0	433.2	436.1	435.1
2595	3528	3516	Circular	27	376	0	0	0	0	-1	429.3	428.6	430.5	430.5	432.2	432.2	434.3	434.3	436.2	436.2	437.0	437.0
260	998	3036	Circular	30	350	2	3	3	4	4	494.8	493.8	495.3	494.5	495.4	494.6	495.5	494.8	496.5	496.5	497.6	497.6
2604	2386	2370	Circular	42	114	12	16	20	23	24	466.5	466.2	469.9	469.9	470.2	470.2	470.6	470.5	470.9	470.9	471.1	471.1
2605	2083	2386	Circular	24	115	2	3	4	4	5	467.8	466.5	469.9	469.9	470.3	470.3	470.7	470.7	471.1	471.1	471.4	471.3
2606	2376	2386	Circular	30	27	10	13	16	18	20	467.5	466.5	469.9	469.9	470.3	470.3	470.7	470.7	471.1	471.1	471.4	471.3
2609	1366	2392	Circular	42	478	15	20	24	28	30	466.2	465.4	469.7	469.6	469.9	469.7	470.1	469.9	470.3	470.0	470.5	470.0
2610	1524	2394	Circular	42	70	36	49	59	69	76	464.1	463.8	465.9	465.6	466.2	465.9	466.5	466.1	466.7	466.3	466.8	466.4
2611	2392	2390	Circular	54	214	15	20	24	28	30	465.4	464.8	469.6	469.6	469.7	469.7	469.8	469.8	469.9	469.9	470.0	470.0
2612	1361	2083	Circular	24	393	2	3	4	4	5	468.8	467.8	470.0	469.9	470.4	470.4	470.9	470.8	471.3	471.2	471.6	471.5
2613	2370	1366	Circular	42	477	12	16	20	23	24	466.2	466.2	469.8	469.7	470.1	470.0	470.4	470.2	470.7	470.5	470.9	470.6
2615	1373	2366	Circular	30	262	10	13	16	18	20	468.4	467.9	470.2	470.2	471.3	471.0	472.2	471.8	473.1	472.5	473.6	473.0
2616	2366	2365	Circular	30	117	10	13	16	18	20	467.9	467.8	470.2	470.1	470.9	470.8	471.6	471.4	472.3	472.1	472.7	472.5
2617	2365	2376	Circular	30	142	10	13	16	18	20	467.8	467.5	470.0	470.0	470.6	470.4	471.1	470.9	471.6	471.4	472.0	471.7
2618	1089	1373	Circular	30	206	10	13	16	18	20	468.7	468.4	470.5	470.3	471.6	471.4	472.6	472.3	473.7	473.3	474.4	473.9
2619	1090	1089	Circular	30	200	10	13	16	18	20	469.0	468.7	470.8	470.6	472.0	471.7	473.1	472.8	474.4	474.0	475.1	474.7
2620	567	1390	Circular	24	263	3	3	4	5	5	472.7	471.0	473.2	471.8	473.4	472.8	474.4	474.4	476.2	476.1	477.1	477.0
2622	1882	1390	Circular	30	44	3	4	5	5	6	470.6	470.5	471.8	471.8	472.8	472.8	474.4	474.4	476.1	476.1	477.0	477.0
2623	1390	1389	Circular	30	40	6	7	9	10	11	470.5	470.4	471.7	471.6	472.7	472.7	474.3	474.3	476.0	475.9	476.9	476.9
2624	1389	1760	Circular	30	226	6	7	9	10	11	470.4	469.7	471.5	471.3	472.7	472.6	474.2	474.1	475.9	475.7	476.8	476.6
2625	1760	568	Circular	30	282	6	7	9	10	11	469.7	469.4	471.3	471.2	472.6	472.5	474.1	473.9	475.7	475.5	476.6	476.4
2626	568	1090	Circular	30	293	10	13	16	18	20	469.4	469.0	471.1	470.9	472.4	472.1	473.7	473.3	475.2	474.6	476.1	475.4
263	1837	1861	Circular	27	205	10	14	16	17	17	498.9	498.3	500.3	499.9	500.7	500.2	500.9	500.3	501.0	500.4	501.1	500.4
2631	308	303	Circular	24	303	5	8	9	11	13	830.8	799.2	831.2	799.9	831.2	800.0	831.3	800.1	831.3	800.2	831.4	800.2
2632	303	304	Circular	24	112	5	8	9	11	13	799.2	781.8	799.5	783.2	799.6	783.5	799.6	783.7	799.7	783.9	799.7	784.1
2634	1431	1092	Circular	24	83	5	8	9	11	13	781.5	766.4	781.8	767.1	781.9	767.3	781.9	767.4	782.0	767.5	782.0	767.6
2635	304	1431	Circular	24	53	5	8	9	11	13	781.8	781.8	782.8	782.6	782.9	782.8	783.1	782.9	783.2	783.0	783.3	783.1
2637	1996	1995	Circular	24	99	2	2	3	3	4	419.3	419.4	421.3	421.3	422.2	422.2	422.8	422.8	423.3	423.3	423.7	423.7
2638	1952	1983	Circular	24	147	2	2	3	3	4	421.7	421.1	422.2	421.8	422.4	422.3	422.8	422.8	423.4	423.4	423.9	423.9
2639	1971	1996	Circular	24	94	2	2	3	3	4	419.4	419.3	421.4	421.4	422.2	422.2	422.8	422.8	423.3	423.3	423.8	423.8
264	1004	1837	Circular	27	230	10	14	16	17	17	499.3	498.9	501.0	500.8	501.7	501.2	502.0	501.4	502.2	501.5	502.4	501.7

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2640	1979	1952	Circular	24	91	2	2	3	3	4	421.9	421.7	422.5	422.3	422.6	422.5	422.9	422.9	423.4	423.4	423.9	423.9
2642	1983	1971	Circular	24	96	2	2	3	3	4	421.1	419.4	421.6	421.4	422.2	422.2	422.8	422.8	423.4	423.3	423.8	423.8
2647	3331	3366	Circular	24	203	2	3	4	4	5	423.6	423.0	424.2	423.8	424.3	423.9	424.4	424.0	424.5	424.1	424.5	424.1
2649	3366	157	Circular	24	177	2	3	4	4	5	423.0	421.3	423.5	422.1	423.6	422.4	423.6	422.5	423.7	422.7	423.8	422.9
265	3923	3912	Circular	27	80	10	14	16	17	17	502.1	501.7	503.6	503.5	505.7	505.5	507.0	506.8	507.6	507.3	508.2	507.9
2650	157	3220	Circular	24	165	2	3	4	4	5	421.1	420.1	422.1	422.1	422.3	422.3	422.5	422.5	422.6	422.6	422.8	422.8
2651	3220	1279	Circular	60	256	12	16	19	23	26	420.1	420.6	422.0	421.9	422.2	422.1	422.4	422.3	422.5	422.4	422.6	422.5
2652	1279	245	Circular	60	158	12	16	20	23	26	420.6	420.0	421.7	421.8	421.9	421.9	422.0	422.0	422.1	422.1	422.2	422.2
2653	245	1265	Circular	60	22	20	22	25	32	41	420.0	419.3	421.7	421.7	421.9	421.8	422.0	421.9	422.1	422.0	422.1	422.1
2654	1265	Corporate_Pond_Inlet_1	Circular	72	584	15	21	25	29	33	418.5	418.2	421.7	421.7	421.8	421.8	421.9	421.8	421.9	421.9	422.0	421.9
2657	247	1265	Circular	24	145	4	5	6	6	7	422.6	422.0	423.3	422.6	423.4	422.7	423.5	422.8	423.5	422.9	423.6	422.9
2658	3184	3896	Circular	72	275	20	29	34	39	43	416.8	416.0	418.9	418.9	419.5	419.5	419.8	419.8	420.1	420.2	420.3	420.3
2659	3787	1280	Circular	60	485	10	13	16	19	21	421.8	421.1	422.9	422.4	423.1	422.6	423.2	422.8	423.4	422.9	423.4	423.0
2660	1280	3220	Circular	60	489	10	13	16	19	21	421.1	420.5	422.3	422.1	422.5	422.3	422.7	422.5	422.8	422.6	422.9	422.8
2662	3765	3761	Circular	48	366	36	53	61	67	70	420.3	419.6	422.5	422.6	423.8	423.3	424.4	423.7	424.9	424.1	425.2	424.3
2663	3791	3741	Circular	42	196	32	48	55	61	64	421.6	421.3	424.8	424.6	427.6	427.1	429.4	428.8	431.2	430.5	432.0	431.2
2664	3760	3791	Circular	42	200	32	48	55	61	64	421.8	421.9	425.2	425.0	428.5	428.1	430.7	430.1	432.8	432.0	433.7	432.9
2665	3776	3760	Circular	36	282	17	25	30	38	43	422.1	421.8	425.6	425.4	429.4	429.0	431.9	431.4	434.0	433.6	435.1	434.5
2666	3742	3776	Circular	36	179	17	25	30	37	40	422.2	422.3	425.8	425.7	429.9	429.6	432.4	432.1	434.7	434.3	435.8	435.4
2667	3783	3742	Circular	36	214	17	25	30	36	37	422.3	422.4	426.0	425.9	430.4	430.1	433.1	432.7	435.4	435.0	436.6	436.2
2668	3741	3775	Circular	42	232	36	53	61	67	70	421.2	421.1	424.3	424.0	426.6	425.9	428.1	427.2	429.5	428.5	430.2	429.0
2669	3775	3752	Circular	42	152	36	53	61	67	70	421.1	420.6	423.8	423.6	425.4	425.0	426.5	426.0	427.6	426.9	428.1	427.4
2670	3752	3765	Circular	42	70	36	53	61	67	70	420.5	420.4	423.4	423.3	424.6	424.4	425.3	425.1	426.1	425.8	426.5	426.1
2671	3761	1268	Circular	48	335	36	53	62	68	70	419.6	419.4	422.4	422.1	423.1	422.6	423.5	422.8	423.8	423.1	423.9	423.1
2672	1268	Corporate_Pond_Inlet_2	Circular	60	346	36	53	61	68	70	419.3	418.4	421.7	421.7	421.9	421.9	422.0	422.0	422.1	422.1	422.1	422.1
2673	3750	3743	Circular	60	113	27	41	48	55	57	416.8	416.1	418.9	418.9	419.5	419.5	419.8	419.9	420.2	420.2	420.4	420.3
2676	3094	3096	Circular	42	51	14	19	21	23	24	417.9	417.5	421.3	421.3	422.2	422.2	422.7	422.7	423.2	423.2	423.6	423.6
2677	1995	3039	Circular	24	71	2	2	3	3	4	419.4	418.8	421.3	421.3	422.2	422.2	422.7	422.7	423.2	423.2	423.7	423.7
2678	3096	3081	Circular	42	32	16	21	24	25	27	417.5	417.5	421.3	421.3	422.1	422.1	422.6	422.6	423.1	423.1	423.5	423.5
268	3895	1050	Circular	24	447	10	14	16	18	19	504.0	503.2	506.5	505.6	511.0	509.2	513.5	511.3	514.7	512.2	516.0	513.2
2681	3081	1960	Circular	48	290	16	21	24	25	27	417.5	417.4	421.2	421.2	422.0	422.0	422.5	422.4	423.0	422.9	423.4	423.3
2682	1960	2055	Circular	48	164	16	21	24	25	27	417.4	417.3	421.2	421.2	421.9	421.9	422.4	422.4	422.8	422.8	423.2	423.2
2684	288	1914	Circular	48	165	16	21	24	25	27	417.2	417.2	421.1	421.1	421.8	421.7	422.2	422.2	422.6	422.5	422.9	422.9
2685	1914	3170	Circular	48	196	23	30	34	37	40	417.2	417.1	421.0	421.0	421.6	421.6	422.0	421.9	422.4	422.3	422.7	422.6
2686	3170	3224	Circular	48	406	23	30	34	37	40	417.1	416.7	421.0	420.9	421.5	421.3	421.8	421.6	422.1	421.9	422.4	422.1
2687	3224	3201	Circular	48	89	23	30	34	37	40	416.6	417.0	420.8	420.8	421.2	421.2	421.5	421.4	421.7	421.7	421.9	421.8
2692	3333	390	Circular	30	299	9	13	14	14	15	421.2	420.7	422.5	422.1	423.0	422.7	423.9	423.5	424.4	424.1	425.0	424.6
2698	3773	3787	Circular	60	402	6	8	9	11	12	422.5	422.0	423.4	423.2	423.6	423.5	423.7	423.7	423.9	423.8	424.0	423.9
2705	3766	3783	Circular	36	369	17	25	30	35	36	423.0	422.4	426.4	426.2	431.3	430.8	434.2	433.6	436.8	436.0	438.2	437.3
2709	3913	3905	Circular	36	20	20	23	25	27	28	490.8	490.7	493.8	493.8	498.7	498.7	500.2	500.1	500.9	500.9	501.4	501.3
2712	1405	2045	Circular	24	193	2	3	4	4	5	473.1	472.8	473.8	473.5	473.9	473.7	474.0	473.8	474.1	473.9	474.2	474.0
2713	2045	2061	Circular	24	195	2	3	4	4	5	472.8	472.5	473.4	473.0	473.5	473.1	473.6	473.2	473.7	473.3	473.8	473.4
2714	695	2061	Circular	24	37	2	2	3	3	4	472.8	472.3	473.2	473.0	473.3	473.1	473.4	473.2	473.5	473.3	473.5	473.4
2715	1416	1407	Circular	24	300	2	2	3	3	4	474.5	473.5	475.0	474.0	475.1	474.1	475.1	474.2	475.2	474.3	475.2	474.3
2716	1407	695	Circular	24	218	2	2	3	3	4	473.4	472.8	473.9	473.5	474.0	473.5	474.1	473.6	474.1	473.7	474.2	473.7
2724	2061	1408	Circular	36	213	4	5	7	8	9	472.0	470.9	472.6	471.8	472.7	471.9	472.8	472.0	472.9	472.1	472.9	472.2
2725	1408	1469	Circular	36	121	4	5	7	8	9	470.9	470.5	471.5	471.1	471.7	471.2	471.7	471.3	471.8	471.4	471.9	471.4
2728	154	1729	Circular	24	212	3	3	4	5	5	436.8	430.0	437.2	432.5	437.2	432.7	437.3	432.9	437.3	433.0	437.3	433.1
273	1925	1435	Circular	42	320	24	30	36	40	45	485.0	484.3	487.0	486.7	487.5	487.2	488.6	488.2	489.6	489.1	490.6	489.9
274	1435	1857	Circular	42	32	24	30	36	40	45	484.3	484.2	486.6	486.6	487.1	487.1	488.1	488.0	488.9	488.8	489.6	489.5
2746	3058	2720	Circular	48	194	15	20	23	25	26	440.3	440.0	441.8	441.6	442.1	441.9	442.2	442.0	442.3	442.1	442.4	442.2
2749	2724	2681	Circular	48	469	15	20	23	24	26	439.3	438.8	441.0	440.6	441.3	440.9	441.4	441.1	441.6	441.2	441.7	441.3
275	1922	1927	Circular	48	285	20	23	25	27	29	486.7	485.9	488.2	487.6	488.3	487.7	488.5	487.9	488.7	488.2	488.9	488.5
2750	1294	3561	Circular	48	265	18	24	28	31	33	438.4	438.3	440.2	440.0	440.5	440.3	440.7	440.4	440.8	440.6	440.9	440.7
2751	3561	3587	Circular	48	430	18	24	28	31	33	438.3	437.1	439.7	439.1	440.0	439.5	440.1	439.7	440.3	439.9	440.4	440.1
2753	3591	3602	Circular	48	290	18	24	28	31	33	436.9	436.7	438.6	438.3	439.0	438.7	439.2	438.9	439.4	439.1	439.6	439.3
2754	3602	1290	Circular	48	322	18	24	28	31	33	436.6	435.8	438.1	438.1	438.5	438.5	438.8	438.8	439.0	439.0	439.2	439.2
2756	1290	295	Circular	48	502	25	33	38	43	46	435.7	435.3	437.8	437.3	438.2	437.6	438.4	437.8	438.6	438.0	438.8	438.1
2757	104	512	Circular	48	541	25	33	38	43	46	434.5	433.6	436.3	435.1	436.6	435.3	436.8	435.4	436.9	435.5	437.0	435.6
276	1857	1869	Circular	42	320	23	30	36	40	45	484.5	483.6	486.3	485.8	486.8	486.7	487.9	487.5	488.6	488.1	489.2	488.6
2762	699	621	Circular	24	163	8	10	13	15	16	444.1	443.6	445.5	445.2	446.3	445.9	447.7	447.2	449.9	449.2	451.7	450.9
2763	621	1336	Circular	24	479	8	10	13	15	16	443.6	442.7	445.0	444.3	445.7	444.7	446.9	445.4	448.8	446.7	450.3	447.8

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2764	1336	1337	Circular	24	224	8	10	13	15	16	442.7	442.0	444.1	443.7	444.5	444.0	445.2	444.5	446.3	445.4	447.3	446.1
2765	1337	1338	Circular	24	70	8	10	13	15	16	442.0	441.5	443.2	443.0	443.5	443.4	443.9	443.7	444.6	444.3	445.2	444.9
2766	1339	199	Circular	24	100	8	10	13	15	16	440.7	440.6	441.9	441.6	442.1	441.8	442.2	441.9	442.4	442.0	442.6	442.1
277	767	831	Circular	60	60	90	106	113	119	122	481.7	479.9	485.7	485.7	486.5	486.4	486.9	486.8	487.3	487.2	487.6	487.4
2778	1333	1334	Circular	36	306	18	21	24	26	27	443.1	442.2	446.7	446.5	447.3	447.0	447.9	447.5	448.4	448.0	448.8	448.3
2779	1334	1335	Circular	36	300	18	21	24	26	27	442.2	441.1	446.4	446.2	446.8	446.5	447.3	446.9	447.7	447.3	448.1	447.6
278	2434	152	Circular	24	295	5	7	8	9	10	484.3	483.6	485.9	485.9	487.0	486.7	487.7	487.3	488.4	487.9	489.0	488.4
2780	1335	198	Circular	36	1399	18	21	24	26	27	441.1	439.8	446.1	445.0	446.4	445.0	446.7	445.0	447.1	445.0	447.3	445.0
2781	3686	3716	Circular	18	307	13	14	15	17	18	449.8	447.0	453.4	448.8	454.4	448.8	455.5	448.9	456.8	449.0	457.8	449.3
2787	1338	1339	Circular	24	220	8	10	13	15	16	441.5	440.7	442.7	442.2	443.0	442.5	443.4	442.7	443.9	442.9	444.3	443.1
2792	287	1321	Circular	42	358	6	9	10	12	14	441.6	441.1	442.6	442.2	442.8	442.5	442.9	442.7	443.1	442.8	443.1	442.9
2793	1321	3058	Circular	42	111	6	9	10	12	14	441.1	440.9	442.2	442.1	442.4	442.4	442.6	442.5	442.7	442.6	442.8	442.7
2794	2720	2724	Circular	48	321	15	20	23	24	26	440.0	439.5	441.5	441.0	441.7	441.3	441.9	441.5	442.0	441.6	442.1	441.7
2797	2681	1294	Circular	48	307	15	20	23	25	26	438.8	438.4	440.5	440.3	440.8	440.6	441.0	440.8	441.2	441.0	441.3	441.1
2798	3587	3591	Circular	48	71	18	24	28	31	33	437.0	436.9	438.8	438.8	439.2	439.1	439.4	439.4	439.6	439.6	439.8	439.7
2800	295	104	Circular	48	243	25	33	38	43	46	435.3	434.5	437.0	436.5	437.3	436.8	437.5	437.0	437.6	437.2	437.8	437.3
2804	1246	1247	Circular	24	190	4	5	6	7	8	425.9	424.8	426.7	426.4	427.0	426.7	427.2	427.0	427.5	427.3	428.0	427.8
2805	1247	294	Circular	24	150	8	11	14	16	18	424.8	424.5	426.0	425.5	426.2	425.7	426.4	425.8	426.7	425.9	427.0	426.0
2807	1243	1245	Circular	27	120	3	4	5	6	7	429.3	428.4	429.9	429.5	430.1	429.7	430.2	429.8	430.3	430.0	430.4	430.1
2815	499	350	Circular	24	44	1	2	2	2	3	433.4	432.9	433.7	433.2	433.7	433.2	433.7	433.2	433.8	433.3	433.8	433.3
2816	350	1288	Circular	30	142	1	2	2	3	3	432.4	431.5	432.8	432.5	432.9	432.7	433.0	432.9	433.1	433.0	433.1	433.1
2817	1288	349	Circular	30	71	1	2	2	3	3	431.3	431.0	432.5	432.5	432.7	432.7	432.8	432.9	433.0	433.0	433.1	433.1
2822	2808	169	Circular	60	158	9	12	15	18	20	430.6	430.5	432.5	432.5	432.7	432.7	432.8	432.8	433.0	433.0	433.1	433.1
2823	2808	169	Circular	60	158	7	9	11	13	14	430.5	430.7	432.5	432.5	432.7	432.7	432.9	432.8	433.0	433.0	433.1	433.1
2827	934	1199	Circular	24	102	2	2	2	3	3	430.6	430.4	431.3	431.2	431.5	431.5	431.9	431.9	432.9	432.9	434.3	434.2
2828	1199	1201	Circular	30	255	2	2	2	3	3	430.4	429.9	431.2	431.2	431.5	431.5	431.9	431.9	432.9	432.9	434.2	434.2
2829	1201	1203	Circular	18	60	1	1	1	1	2	429.9	429.8	431.2	431.2	431.5	431.5	431.9	431.9	432.8	432.8	434.2	434.2
283	2406	2458	Circular	36	380	17	22	25	29	32	492.8	491.6	494.3	493.4	494.5	493.7	494.8	494.0	495.0	494.3	497.5	496.7
2830	1201	1203	Circular	18	60	0	1	1	1	2	430.8	430.2	431.2	431.2	431.5	431.5	431.9	431.9	432.8	432.8	434.2	434.2
2831	1203	1206	Circular	30	243	2	2	2	3	3	429.9	429.9	431.2	431.1	431.5	431.5	431.9	431.8	432.8	432.8	434.2	434.2
2832	2440	3303	Circular	72	397	51	67	79	91	99	463.5	463.0	466.9	466.9	467.6	467.6	468.1	468.0	468.6	468.5	468.9	468.9
2833	337	3083	Circular	36	113	12	17	20	23	23	488.0	487.6	489.6	489.5	490.0	489.9	490.7	490.6	492.9	492.7	493.9	493.7
2834	3083	2439	Circular	36	235	12	17	20	23	23	487.7	487.1	489.4	489.1	489.7	489.5	490.5	490.3	492.6	492.3	493.5	493.3
2835	2439	2461	Circular	36	46	12	17	20	23	23	487.1	487.1	489.0	489.0	489.4	489.4	490.2	490.2	492.1	492.1	493.1	493.0
285	1009	2341	Circular	48	465	14	15	16	17	18	493.9	493.0	495.2	494.4	495.2	494.5	495.3	494.6	495.3	494.6	495.3	494.6
2854	2230	2698	Circular	24	370	16	17	18	20	22	547.4	543.9	553.2	551.5	555.0	553.1	556.7	554.5	558.7	556.3	560.3	557.6
2858	1378	3386	Circular	36	312	31	36	38	40	41	485.9	484.6	488.1	487.5	491.2	490.3	492.3	491.4	493.0	492.1	493.4	492.5
2875	1301	1302	Circular	24	190	17	23	28	33	36	471.3	467.0	472.4	469.3	472.7	469.9	473.9	471.1	476.6	472.6	478.7	473.9
288	1007	542	Circular	42	480	17	22	25	29	32	490.7	489.7	492.2	491.7	492.5	492.0	492.8	492.3	493.4	493.0	495.6	495.2
289	1005	961	Circular	48	370	14	15	16	17	18	491.5	490.5	492.7	492.2	492.8	492.3	492.8	492.4	492.9	492.5	492.9	492.6
2892	3418	984	Circular	24	135	6	8	10	11	13	516.5	510.7	517.0	511.9	517.1	512.1	517.2	512.3	517.3	512.5	517.3	512.8
2893	2347	1849	Circular	30	271	6	8	10	12	13	461.9	460.6	462.7	461.8	462.9	461.9	463.0	462.1	463.1	462.2	463.2	462.3
2894	2357	2347	Circular	24	144	6	8	10	12	13	462.5	462.0	463.5	463.0	463.7	463.2	463.8	463.4	464.0	463.5	464.1	463.6
2896	259	1683	Circular	60	306	32	42	50	61	69	462.2	461.7	465.0	465.0	465.5	465.5	465.8	465.8	466.2	466.2	466.5	466.5
2897	1683	1608	Circular	60	158	37	50	60	71	80	462.2	461.3	464.6	464.6	464.9	465.0	465.2	465.2	465.4	465.5	465.7	465.7
29	4085	4084	Circular	30	145	12	16	19	22	24	455.6	450.4	456.3	451.8	456.4	452.0	456.5	452.2	456.6	452.3	456.6	452.5
291	960	956	Circular	42	295	18	24	28	32	35	488.3	487.7	490.1	489.8	490.4	490.1	490.7	490.4	491.8	491.5	493.4	493.0
2910	3110	1295	Circular	42	149	9	12	14	14	16	440.0	439.6	444.2	444.2	447.4	447.3	448.8	448.8	449.6	449.6	450.2	450.2
292	956	1899	Circular	42	460	24	30	36	40	45	487.7	486.4	489.4	488.4	489.7	488.7	490.0	489.3	491.3	490.5	492.7	491.8
293	957	958	Circular	48	240	20	23	25	27	29	487.9	487.3	489.5	489.0	489.6	489.2	489.7	489.3	489.8	489.4	489.9	489.5
294	959	540	Circular	48	420	18	21	22	24	25	489.9	488.8	491.3	490.4	491.4	490.6	491.5	490.6	491.5	490.7	491.6	490.8
2942	2612	2636	Circular	48	234	24	30	35	40	44	457.5	451.6	458.4	453.6	458.5	453.8	458.6	454.0	458.7	454.2	458.8	454.4
2945	2824	3243	Circular	36	511	7	7	7	7	8	426.8	427.6	435.8	435.7	439.6	439.6	442.9	442.8	446.3	446.2	449.0	449.0
2947	2814	2787	Circular	72	261	98	130	155	180	200	438.3	435.7	440.3	438.1	440.7	439.9	443.3	443.3	447.1	447.0	450.1	449.9
295	961	959	Circular	48	190	18	21	22	24	25	490.5	489.9	491.9	491.6	492.0	491.7	492.1	491.8	492.2	491.8	492.2	491.9
2953	2636	4046	Circular	48	674	24	30	35	40	44	451.6	441.3	452.6	446.7	452.7	446.9	452.8	447.1	452.9	447.2	453.0	449.1
2954	3034	3044	Circular	48	249	17	19	17	17	18	423.4	422.9	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
2955	3034	3044	Circular	48	249	17	19	16	16	18	423.0	422.9	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
2958	3466	3476	Circular	42	85	1	1	1	1	1	497.1	496.8	497.4	497.1	497.4	497.1	497.4	497.2	497.5	497.2	497.5	497.2
296	1058	1055	Circular	42	330	24	28	30	31	32	502.2	501.1	503.8	503.1	504.0	503.3	504.0	503.3	504.1	503.4	504.1	503.4
2960	3476	3886	Circular	42	306	1	1	1	1	1	496.7	495.4	497.0	497.0	497.1	497.1	497.1	497.1	497.1	497.1	497.1	497.1
2962	3226	3577	Circular	24	190	9	12	14	15	15	486.5	485.8	487.6	486.8	487.8	487.0	488.0	487.1	488.0	487.1	488.1	487.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
2964	130	133	Circular	24	237	1	1	2	2	2	449.9	449.6	450.9	450.9	451.0	451.0	451.2	451.2	451.3	451.3	451.4	451.4
2969	3230	3001	Circular	30	638	4	6	7	8	9	430.8	431.1	434.0	434.0	434.3	434.2	434.5	434.3	434.7	434.5	434.9	434.6
297	1061	1060	Circular	30	380	7	9	11	13	14	502.7	501.7	503.7	502.9	503.9	503.1	504.0	503.3	504.2	503.4	504.3	503.5
2970	1210	3376	Circular	30	295	11	14	16	19	21	428.8	428.5	430.2	429.6	430.5	429.7	430.7	430.0	431.3	430.7	432.3	431.5
2975	3519	3489	Circular	42	54	2	3	3	3	4	426.9	426.8	429.7	429.7	430.8	430.8	432.2	432.2	433.6	433.6	434.2	434.2
2979	1910	1186	Circular	42	260	-9	-11	-16	-20	-21	534.7	530.6	535.6	535.8	535.8	536.0	535.9	536.1	536.0	536.2	536.1	536.3
2980	2725	2735	Circular	42	106	23	26	28	30	32	457.6	457.7	466.9	466.8	468.4	468.4	469.4	469.4	470.6	470.6	471.9	471.9
2981	2735	2722	Circular	42	342	23	26	29	33	34	457.1	457.0	466.8	466.7	468.3	468.2	469.4	469.3	470.6	470.5	471.9	471.8
2982	2722	1446	Circular	42	406	23	26	32	36	36	457.0	456.4	466.6	466.5	468.2	468.1	469.3	469.2	470.5	470.5	471.8	471.7
2983	2748	1446	Circular	24	23	17	19	24	24	22	457.7	456.4	466.6	466.5	468.2	468.1	469.3	469.2	470.5	470.5	471.7	471.7
2984	2738	2748	Circular	24	90	10	11	14	11	12	457.5	457.8	466.7	466.7	468.2	468.2	469.3	469.3	470.5	470.5	471.8	471.8
2985	1446	1447	Circular	48	244	37	41	52	57	57	456.4	456.2	466.5	466.4	468.1	468.1	469.2	469.2	470.5	470.4	471.7	471.7
2986	1447	3708	Circular	48	147	37	41	52	57	58	456.2	455.6	466.4	466.3	468.1	468.0	469.2	469.2	470.4	470.4	471.6	471.6
2987	3708	3678	Circular	48	15	37	42	52	57	61	455.6	455.6	466.3	466.3	468.0	468.0	469.2	469.2	470.4	470.4	471.6	471.6
2988	3678	3714	Circular	48	432	65	70	73	76	81	455.6	455.2	465.4	464.6	467.0	466.0	468.3	467.2	469.6	468.4	470.7	469.4
2989	3714	3671	Circular	48	453	65	70	73	76	80	455.2	454.9	464.1	463.2	465.5	464.4	466.6	465.5	467.8	466.5	468.7	467.4
299	1053	1016	Circular	30	380	7	10	11	13	15	497.6	496.7	498.8	498.4	499.0	498.7	499.2	498.9	499.5	499.2	501.2	500.8
2990	3671	1699	Circular	48	449	68	73	78	81	84	454.9	454.7	462.7	461.7	463.9	462.7	464.8	463.5	465.8	464.4	466.6	465.0
2991	1699	1668	Circular	48	534	68	73	78	81	84	454.7	454.4	461.3	460.1	462.2	460.8	462.9	461.4	463.7	462.0	464.3	462.4
2992	1668	1678	Circular	48	25	68	73	78	81	84	454.4	454.3	459.6	459.6	460.2	460.1	460.7	460.6	461.2	461.1	461.6	461.5
2993	1678	1619	Circular	48	358	68	73	78	81	84	454.3	454.1	459.1	458.3	459.6	458.7	460.0	459.0	460.4	459.2	460.7	459.5
2994	1619	1452	Circular	48	242	68	73	78	81	84	454.1	453.9	458.1	457.5	458.3	457.7	458.6	457.9	458.8	458.0	458.9	458.1
2995	1452	1096	Circular	48	235	68	73	77	81	84	453.9	453.7	456.8	456.2	457.0	456.2	457.1	456.3	457.1	456.4	457.2	456.4
2996	2786	3724	Circular	30	352	7	8	8	9	9	461.7	461.3	467.6	467.5	469.0	469.0	469.9	469.8	471.2	471.2	472.5	472.4
2997	3724	3717	Circular	30	336	7	8	8	10	9	461.3	460.9	467.5	467.4	469.0	468.9	469.8	469.8	471.1	471.1	472.4	472.4
2998	2769	2786	Circular	30	218	7	8	9	9	10	461.9	461.7	467.7	467.6	469.1	469.1	469.9	469.9	471.3	471.3	472.6	472.5
2999	1454	2769	Circular	24	472	7	9	10	11	11	463.0	462.1	468.0	467.7	469.6	469.1	470.5	469.9	471.8	471.3	473.1	472.6
30	366	3615	Circular	24	287	3	4	5	6	6	428.4	428.1	430.5	430.4	432.1	432.0	434.2	434.0	436.1	435.9	436.9	436.7
300	1051	2680	Circular	42	305	24	28	30	31	32	498.7	496.9	500.2	499.3	500.4	499.5	500.5	499.7	500.6	499.8	500.6	499.8
3000	3660	3546	Circular	42	509	22	24	27	30	30	458.3	457.9	467.1	467.1	468.6	468.6	469.6	469.5	470.9	470.8	472.2	472.1
3001	2405	3242	Circular	42	82	27	35	42	48	53	463.2	463.0	464.9	464.6	465.1	464.8	465.3	465.0	465.6	465.3	465.9	465.6
3002	1352	2405	Circular	42	58	26	34	40	47	52	462.3	463.2	465.5	465.4	465.8	465.8	466.1	466.0	466.4	466.3	466.7	466.5
3003	1351	1352	Circular	42	31	26	34	40	47	52	462.4	462.5	465.6	465.6	466.1	466.0	466.4	466.4	466.8	466.8	467.2	467.1
3004	3264	3715	Circular	36	512	9	12	15	17	19	464.5	463.2	465.9	465.9	466.5	466.5	467.3	467.0	468.1	467.7	468.7	468.3
3005	3715	3642	Circular	36	168	9	12	15	17	19	463.1	462.7	465.8	465.8	466.4	466.4	467.0	466.9	467.6	467.5	468.2	468.0
3006	3642	1351	Circular	36	52	10	13	16	19	21	462.4	462.4	465.8	465.8	466.3	466.3	466.8	466.7	467.3	467.3	467.8	467.8
3007	2739	1346	Circular	30	355	7	10	12	14	16	466.6	465.8	467.8	467.9	468.1	468.1	468.3	468.3	469.1	468.7	470.0	469.5
3008	1346	214	Circular	36	240	9	12	15	17	19	465.9	466.3	467.8	467.7	468.0	467.9	468.2	468.0	468.6	468.4	469.3	469.1
3009	214	3264	Circular	36	318	9	12	15	17	19	466.3	464.5	467.2	466.0	467.4	466.6	467.5	467.3	468.2	468.2	469.0	468.9
301	1052	1051	Circular	42	240	24	28	30	31	32	499.5	498.7	501.2	500.7	501.4	500.8	501.5	500.9	501.5	501.0	501.6	501.0
3015	853	2744	Circular	27	337	7	10	12	14	16	467.8	467.3	469.1	468.6	469.3	468.8	469.6	469.0	470.3	469.6	471.5	470.7
3016	2744	2739	Circular	30	238	7	10	12	14	16	467.3	466.6	468.4	468.0	468.7	468.3	468.8	468.5	469.5	469.2	470.5	470.2
302	1016	3897	Circular	30	240	12	15	18	21	23	496.7	495.9	498.1	497.6	498.4	497.8	498.6	498.0	498.8	498.2	500.4	499.7
3046	2959	2858	Circular	18	121	7	10	11	13	14	425.1	427.8	429.8	429.2	430.4	429.4	430.9	429.5	431.4	429.6	431.7	429.7
3047	2858	2877	Circular	30	238	1	2	3	4	5	427.7	428.9	429.2	429.1	429.4	429.3	429.5	429.4	429.6	429.5	429.7	429.6
3048	2858	2927	Circular	30	227	10	12	14	15	16	427.4	427.1	428.9	428.9	428.9	428.9	428.9	428.9	429.0	428.9	429.0	428.9
305	1015	1014	Circular	36	380	12	15	18	21	23	494.4	493.7	495.8	495.3	496.0	495.5	496.2	495.8	496.5	496.0	498.9	498.5
3053	2397	2390	Circular	72	187	21	29	35	41	46	464.0	463.0	469.6	469.6	469.7	469.7	469.8	469.8	469.9	469.9	470.0	470.0
3054	2417	2397	Circular	72	625	21	29	35	41	46	464.6	464.0	469.6	469.6	469.8	469.7	469.9	469.8	470.0	469.9	470.1	470.0
3057	3733	2417	Circular	72	410	17	23	28	33	37	465.1	464.6	469.6	469.6	469.8	469.8	469.9	469.9	470.0	470.0	470.1	470.1
306	3886	2398	Circular	48	220	12	13	13	14	14	495.5	495.4	497.0	496.8	497.1	496.9	497.1	496.9	497.1	497.0	497.1	497.0
3060	1146	283	Circular	36	136	16	22	27	32	36	430.2	424.1	430.9	425.3	431.1	425.6	431.1	425.7	431.2	425.9	431.3	426.0
3061	283	1422	Circular	36	127	16	22	27	32	36	424.1	416.8	424.7	417.4	424.8	417.6	424.9	417.6	425.0	417.7	425.0	417.8
3067	1714	3159	Cross section		984	63	67	69	70	71	446.0	447.6	458.2	456.9	460.5	459.1	462.0	460.4	463.3	461.8	464.3	462.7
307	2676	1601	Circular	48	382	28	32	35	37	38	496.4	496.1	498.8	498.4	499.0	498.7	499.1	498.8	499.2	498.8	499.3	498.9
3071	291	1234	Circular	54	450	90	125	137	139	141	529.1	526.5	531.8	530.2	536.1	534.3	538.3	536.2	539.2	536.9	539.7	537.4
3075	1433	2230	Circular	24	200	16	19	22	24	27	550.5	547.4	554.6	553.6	556.6	555.5	558.6	557.2	561.0	559.4	563.1	561.1
3077	1601	3886	Circular	48	70	28	32	35	37	38	496.2	495.4	497.5	497.0	497.6	497.1	497.6	497.1	497.7	497.1	497.7	497.1
3082	1127	1134	Circular	24	118	11	15	19	23	25	790.0	777.2	790.5	778.6	790.6	779.0	790.7	779.3	790.8	779.6	790.8	779.9
3085	3546	2725	Circular	42	312	23	25	28	30	30	457.8	457.6	467.0	466.9	468.5	468.5	469.5	469.5	470.7	470.7	472.1	472.0
3087	3677	3660	Circular	36	368	7	10	9	12	13	459.0	458.5	467.2	467.2	468.7	468.7	469.6	469.6	470.9	470.9	472.2	472.2
3088	3735	3677	Circular	36	352	7	10	8	12	12	459.6	459.0	467.3	467.2	468.7	468.7	469.6	469.6	470.9	470.9	472.2	472.2

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3089	1453	3735	Circular	36	369	7	8	8	12	11	460.1	459.6	467.3	467.3	468.8	468.8	469.7	469.7	471.0	471.0	472.3	472.3
3090	3717	1453	Circular	30	193	7	8	8	11	10	460.9	460.1	467.4	467.3	468.8	468.8	469.7	469.7	471.0	471.0	472.3	472.3
31	2123	1231	Circular	24	7	21	28	34	38	38	543.2	542.3	549.5	549.2	551.2	550.7	552.7	552.0	554.5	553.6	555.7	554.7
310	2243	1124	Circular	24	555	7	10	11	13	14	508.3	507.3	509.6	508.6	509.9	508.8	510.4	509.0	511.0	509.2	511.6	509.4
3100	235	3334	Circular	42	75	9	12	14	17	18	463.1	464.4	469.1	469.1	469.3	469.3	469.4	469.4	469.6	469.6	469.7	469.7
3101	3197	3100	Circular	30	69	2	3	4	5	5	471.0	470.7	471.5	471.4	471.7	471.5	471.8	471.6	471.9	471.8	472.0	471.9
3102	3100	128	Circular	36	246	2	3	4	5	5	470.6	470.1	471.3	471.2	471.4	471.4	471.6	471.6	471.7	471.7	471.9	471.9
3103	128	1401	Circular	36	113	6	8	10	12	13	470.1	469.8	471.1	470.9	471.3	471.1	471.4	471.2	471.5	471.4	471.6	471.5
3104	1401	688	Circular	36	83	6	8	10	12	13	469.8	469.6	470.6	470.4	470.8	470.6	470.9	470.7	471.1	470.9	471.1	470.9
3105	688	1402	Circular	42	76	6	8	10	12	13	469.4	469.1	470.3	470.1	470.4	470.3	470.6	470.5	470.7	470.6	470.8	470.7
3106	1402	1445	Circular	48	202	6	8	10	12	13	469.1	468.6	470.1	469.8	470.3	470.1	470.4	470.3	470.5	470.4	470.6	470.6
3107	1445	1449	Circular	48	71	6	8	10	12	13	468.6	468.4	469.8	469.8	470.0	470.0	470.2	470.2	470.3	470.3	470.5	470.5
311	1125	2478	Circular	27	400	24	28	30	31	32	510.0	507.9	512.7	510.3	513.8	510.5	514.3	510.6	514.7	510.7	514.9	510.8
3117	2085	2942	Circular	54	364	32	42	50	61	69	462.6	463.1	465.9	465.6	466.3	466.1	466.7	466.4	467.1	466.8	467.5	467.1
3118	2942	2333	Circular	54	35	32	42	50	61	69	463.3	462.8	465.5	465.4	465.9	465.9	466.2	466.2	466.6	466.6	466.9	466.9
312	1823	1128	Circular	27	390	16	20	22	23	24	513.3	511.9	517.5	516.4	520.1	518.8	521.1	519.6	521.7	520.3	522.3	520.7
313	1855	1856	Circular	24	40	16	19	21	22	23	514.7	514.3	518.5	518.3	521.4	521.1	522.5	522.2	523.4	523.0	523.9	523.5
314	2389	1069	Circular	27	480	7	10	11	13	14	506.4	505.5	507.6	506.8	507.8	507.0	508.0	507.2	508.2	507.3	508.5	507.5
3149	2102	3097	Circular	24	198	7	9	10	11	12	435.5	434.8	437.2	437.1	440.8	440.5	441.9	441.6	442.7	442.3	443.3	443.0
315	1123	1070	Circular	42	345	24	28	30	31	32	507.2	506.2	508.9	508.4	509.1	508.6	509.2	508.7	509.3	508.7	509.3	508.8
3150	3097	1730	Circular	24	89	7	8	9	10	10	434.8	434.4	437.0	436.9	440.4	440.3	441.4	441.3	442.2	442.1	442.9	442.7
3151	1730	1723	Circular	24	38	7	8	11	12	11	434.4	434.0	436.8	436.8	440.2	440.1	441.1	441.1	441.9	441.8	442.5	442.5
3156	2925	2891	Circular	24	118	8	11	13	15	17	426.2	426.1	427.9	427.7	429.4	429.2	430.9	430.6	432.7	432.2	434.6	434.0
316	1069	1063	Circular	27	480	7	10	11	13	14	505.5	504.3	506.6	505.5	506.8	505.7	506.9	505.9	507.1	506.0	507.2	506.1
317	1070	1068	Circular	42	270	24	28	30	31	32	506.2	505.7	508.2	507.8	508.4	508.0	508.5	508.1	508.6	508.2	508.6	508.2
3174	3347	3663	Circular	27	57	14	16	18	20	21	449.1	448.5	457.8	457.7	459.7	459.6	461.9	461.7	464.4	464.2	466.5	466.3
3175	3663	3686	Circular	18	17	13	14	16	17	19	449.6	449.6	455.7	455.2	457.2	456.6	458.9	458.2	460.8	459.9	462.4	461.4
3178	1461	1462	Circular	27	320	13	17	20	23	25	451.2	450.8	459.9	459.4	462.4	461.6	465.1	464.3	468.3	467.4	471.1	470.0
318	1063	1061	Circular	30	525	7	9	11	13	14	504.3	502.7	505.3	504.0	505.4	504.2	505.5	504.3	505.7	504.4	505.7	504.6
319	2105	2127	Circular	24	68	16	22	26	28	29	523.2	519.7	524.2	522.9	528.5	527.9	530.6	529.9	532.3	531.5	533.8	532.9
3191	1488	3733	Circular	72	722	17	23	28	33	37	465.5	465.1	469.6	469.6	469.8	469.8	469.9	469.9	470.1	470.0	470.2	470.1
3199	2764	1488	Circular	72	523	17	23	28	33	37	466.2	465.7	469.6	469.6	469.8	469.8	470.0	469.9	470.1	470.1	470.2	470.2
320	2159	2111	Circular	24	246	12	17	21	24	26	574.0	554.6	574.6	555.2	574.7	555.4	574.8	555.4	574.9	555.5	574.9	555.5
3200	2071	2764	Circular	72	408	13	18	22	26	29	467.3	466.2	469.6	469.7	469.8	469.8	470.0	470.0	470.1	470.1	470.3	470.3
3201	2369	2071	Circular	72	87	13	18	22	26	29	467.5	467.4	469.7	469.7	469.9	469.8	470.0	470.0	470.2	470.2	470.3	470.3
3202	2393	2369	Circular	54	120	7	10	12	14	16	467.8	467.6	469.7	469.7	469.9	469.9	470.1	470.1	470.2	470.2	470.4	470.4
3203	1486	2393	Circular	54	644	7	10	12	14	16	468.3	467.8	469.7	469.7	469.9	469.9	470.1	470.1	470.3	470.3	470.5	470.4
3204	1469	1486	Circular	54	300	7	10	12	14	16	468.8	468.3	469.9	469.8	470.1	470.0	470.3	470.1	470.4	470.3	470.6	470.5
3205	1468	1469	Circular	24	60	3	5	6	6	7	470.0	469.7	470.6	470.3	470.7	470.5	470.8	470.5	470.9	470.6	471.0	470.7
3209	1449	2369	Circular	48	51	6	8	10	12	13	468.4	468.2	469.7	469.7	469.9	469.9	470.1	470.1	470.2	470.2	470.4	470.4
321	2150	2159	Circular	24	77	12	17	21	24	26	579.5	574.5	580.1	575.2	580.3	575.4	580.3	575.6	580.4	575.7	580.5	575.8
3212	894	893	Circular	24	218	2	2	3	3	4	471.6	471.1	472.3	472.1	472.4	472.3	472.5	472.4	472.6	472.5	472.7	472.7
3213	893	1380	Circular	24	292	3	5	6	6	7	471.1	470.6	471.9	471.5	472.1	471.7	472.2	471.8	472.4	471.9	472.5	472.0
3214	1380	1468	Circular	24	249	3	5	6	6	7	470.6	470.0	471.4	470.9	471.5	471.0	471.6	471.1	471.8	471.2	471.8	471.3
3242	3123	3092	Circular	24	339	6	9	11	13	15	463.8	462.9	465.2	465.1	466.1	465.6	466.8	466.0	467.6	466.5	468.3	466.9
3245	3092	2336	Circular	36	249	6	9	11	13	15	462.8	462.6	465.1	465.0	465.6	465.6	466.0	465.9	466.4	466.3	466.8	466.7
3246	2345	1683	Circular	36	57	6	9	11	13	15	462.5	462.2	465.0	465.0	465.5	465.5	465.8	465.8	466.2	466.2	466.5	466.5
3247	2336	2345	Circular	36	138	6	9	11	13	15	462.6	462.6	465.0	465.0	465.5	465.5	465.9	465.8	466.3	466.2	466.6	466.5
3251	1442	1441	Circular	24	231	2	3	4	5	5	476.3	474.6	476.8	475.4	476.9	475.5	477.0	475.7	477.0	475.8	477.1	475.8
3252	1441	1437	Circular	24	156	2	3	4	5	5	474.6	473.0	475.0	473.8	475.1	473.9	475.2	474.0	475.3	474.1	475.3	474.2
3253	1437	1664	Circular	30	240	2	3	4	5	5	473.0	472.0	473.5	472.9	473.7	473.0	473.7	473.1	473.8	473.2	473.9	473.3
3290	3886	3933	Circular	48	35	19	21	22	24	25	495.2	494.3	496.3	496.1	496.5	496.4	496.6	496.5	496.7	496.6	496.8	496.7
3291	3933	3887	Circular	48	40	20	21	22	24	25	494.3	494.2	496.0	496.0	496.3	496.3	496.4	496.4	496.5	496.5	496.6	496.6
3292	3887	3922	Circular	48	450	17	21	22	24	25	494.2	493.7	495.9	495.6	496.2	495.9	496.3	496.0	496.4	496.1	496.5	496.2
3293	3922	2894	Circular	48	810	17	21	22	24	25	493.7	492.8	495.5	495.1	495.8	495.5	495.9	495.6	496.0	495.7	496.2	495.9
3294	2894	3917	Circular	60	350	27	35	38	40	44	492.8	491.8	494.9	495.0	495.3	495.3	495.4	495.4	495.5	495.5	495.6	495.6
3295	3917	3907	Circular	60	250	27	35	38	40	44	491.8	492.2	494.9	494.8	495.3	495.2	495.4	495.3	495.5	495.3	495.6	495.5
3296	3426	2503	Circular	36	189	13	17	19	20	20	498.8	498.3	506.3	506.2	507.2	507.1	508.1	508.0	508.9	508.8	509.5	509.4
33	2247	2220	Circular	24	246	22	31	39	42	45	578.1	567.9	579.1	569.6	579.3	570.1	579.6	570.5	583.4	575.1	585.6	576.4
3300	2216	2201	Circular	36	208	2	3	3	3	3	560.0	554.3	560.3	554.9	560.3	555.0	560.3	555.0	560.4	555.1	560.4	555.1
3301	2201	2197	Circular	36	60	2	3	3	3	3	554.3	552.6	554.6	553.2	554.6	553.3	554.7	553.4	554.7	553.5	554.7	553.5
3302	2197	2221	Circular	36	88	2	3	3	3	3	552.6	550.3	552.9	551.4	553.0	551.7	553.0	551.9	553.0	552.0	553.1	552.1

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3303	2221	2188	Circular	36	24	2	3	3	4	4	550.3	549.7	551.4	551.4	551.7	551.7	551.9	551.9	552.0	552.0	552.1	552.1
3304	2188	200	Circular	42	224	22	30	34	36	38	549.7	540.7	550.5	543.7	550.7	544.4	550.8	545.1	550.8	545.6	550.9	546.0
3305	2862	3449	Circular	24	55	22	30	34	36	38	562.0	561.7	564.9	564.4	566.6	565.7	567.7	566.5	568.3	566.9	568.9	567.4
3311	2481	2484	Circular	24	218	4	5	6	8	9	505.6	504.7	507.1	507.0	507.1	507.1	507.1	507.1	507.4	507.2	507.3	507.3
3312	2538	2240	Circular	24	209	1	1	1	2	2	509.0	508.4	509.5	509.2	509.6	509.4	509.6	509.5	509.7	509.7	509.8	509.8
3313	2240	2795	Circular	24	100	3	4	4	5	6	508.3	507.8	508.9	508.7	509.1	508.9	509.3	509.1	509.4	509.3	509.5	509.4
3314	2795	2765	Circular	24	175	4	5	6	8	9	507.7	507.0	508.5	508.1	508.6	508.3	508.8	508.4	509.0	508.6	509.1	508.7
3315	2765	2219	Circular	24	60	4	5	6	8	9	507.0	506.9	507.9	507.8	508.1	508.0	508.3	508.2	508.5	508.4	508.5	508.4
3318	2219	2761	Circular	24	229	4	5	6	8	9	506.9	505.8	507.7	507.2	507.8	507.3	507.9	507.4	508.2	507.7	508.2	507.7
3319	2761	2481	Circular	24	10	4	5	6	8	9	505.8	505.7	507.1	507.1	507.2	507.2	507.2	507.2	507.6	507.5	507.5	507.4
3321	2785	2446	Circular	24	18	1	2	2	2	3	504.9	504.9	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.1
3322	2156	2785	Circular	24	202	1	2	2	2	3	505.6	504.9	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.1	507.1	507.1
3323	2487	2156	Circular	24	60	1	2	2	2	3	505.9	505.6	507.0	507.0	507.0	507.0	507.0	507.0	507.1	507.1	507.1	507.1
3324	2498	2487	Circular	24	141	1	2	2	2	3	506.5	505.9	507.0	507.0	507.0	507.0	507.1	507.1	507.1	507.1	507.1	507.1
3325	2260	2498	Circular	24	60	1	2	2	2	3	506.7	506.5	507.2	507.1	507.3	507.2	507.3	507.2	507.4	507.3	507.5	507.3
3326	2191	2260	Circular	24	50	1	2	2	2	3	507.1	506.9	507.5	507.3	507.6	507.4	507.6	507.5	507.7	507.6	507.7	507.6
3327	2231	2191	Circular	24	200	1	2	2	2	3	507.8	507.1	508.2	507.6	508.3	507.7	508.4	507.8	508.4	507.9	508.5	507.9
3337	3129	2619	Circular	24	234	0	0	0	-1	-1	442.9	442.9	444.2	444.2	447.4	447.4	448.8	448.8	449.7	449.7	450.2	450.2
3338	2619	3110	Circular	24	22	0	0	0	-2	-2	442.9	441.9	444.2	444.2	447.4	447.4	448.8	448.8	449.7	449.7	450.2	450.2
334	1091	2125	Circular	36	365	5	8	9	11	13	759.9	758.1	760.6	758.8	760.7	758.9	760.8	759.0	760.9	759.1	761.0	759.1
3367	1213	2609	Circular	24	211	3	4	4	5	5	457.5	455.7	458.3	458.1	458.8	458.8	459.2	459.2	459.7	459.6	460.0	459.9
3380	2776	2775	Circular	66	142	99	127	147	169	186	427.6	427.0	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
3382	3807	3820	Circular	60	42	17	17	17	17	18	432.6	432.3	435.0	435.0	435.3	435.3	435.4	435.4	435.5	435.5	435.6	435.6
3384	741	3902	Circular	24	465	16	20	24	28	31	463.2	462.3	474.7	472.8	478.1	474.9	481.4	477.3	485.4	480.0	488.6	482.3
3385	2609	2540	Circular	24	25	5	7	8	9	10	455.4	455.1	458.1	458.1	458.7	458.7	459.1	459.1	459.5	459.4	459.8	459.7
3388	2490	2509	Rectangular		83	135	174	200	223	240	436.3	436.7	440.5	440.4	440.9	440.8	441.2	441.1	441.5	441.3	441.7	441.5
3389	2490	2509	Rectangular		83	128	172	198	221	238	436.4	436.7	440.5	440.4	440.9	440.8	441.2	441.1	441.5	441.3	441.7	441.5
3390	2870	2861	Circular	96	334	29	32	35	38	41	447.4	448.2	451.4	451.4	451.6	451.6	451.8	451.7	451.9	451.9	452.0	452.0
3391	2870	2861	Circular	96	334	29	32	35	38	41	447.4	448.2	451.4	451.4	451.6	451.6	451.8	451.7	451.9	451.9	452.0	452.0
3392	2870	2861	Circular	96	334	29	32	35	38	40	447.4	448.2	451.4	451.4	451.6	451.6	451.8	451.7	451.9	451.9	452.0	452.0
3393	3348	3379	Circular	30	66	20	26	28	30	31	432.1	431.9	434.3	434.3	434.8	434.5	434.9	434.6	435.1	434.7	435.2	434.8
34	2211	2189	Circular	24	80	12	18	23	28	32	637.5	613.2	638.0	614.3	638.1	614.6	638.1	614.8	638.2	615.0	638.2	615.2
3404	3454	3439	Circular	18	90	1	3	-6	-9	-10	465.5	464.8	465.8	465.1	466.1	465.4	467.0	467.0	467.8	468.1	468.3	468.8
3405	237	318	Circular	36	13	14	19	22	28	32	462.8	462.8	466.1	466.0	466.6	466.5	466.9	466.9	467.5	467.4	468.0	467.9
3410	2621	2536	Circular	30	63	16	22	27	31	34	464.7	464.7	466.2	466.0	466.5	466.3	466.7	466.4	466.9	466.5	467.1	466.6
3411	2621	2536	Circular	30	63	6	11	15	19	22	465.5	465.2	466.3	466.1	466.6	466.3	466.8	466.5	467.0	466.7	467.1	466.8
3412	2617	2614	Circular	30	68	15	20	24	28	31	465.1	466.4	467.8	467.7	468.1	467.9	468.3	468.1	468.5	468.2	468.6	468.3
3413	2617	2614	Circular	30	68	7	13	17	22	25	466.5	466.7	467.7	467.6	468.0	467.9	468.2	468.1	468.4	468.2	468.6	468.4
3414	2607	2601	Circular	30	28	12	17	22	26	29	468.6	468.5	469.8	469.6	470.0	469.9	470.2	470.0	470.4	470.2	470.5	470.3
342	950	951	Circular	54	148	52	58	61	64	68	486.0	485.7	491.3	491.2	493.4	493.3	494.4	494.3	495.2	495.1	495.8	495.6
3420	2995	2987	Circular	36	100	5	6	8	13	14	467.8	474.2	475.0	474.9	475.1	475.0	475.2	475.1	475.2	475.2	475.3	475.2
3421	3014	3025	Circular	30	35	5	6	8	9	10	478.1	477.8	478.7	478.5	478.8	478.6	478.9	478.6	478.9	478.7	479.0	478.7
3426	2581	2582	Circular	42	355	9	12	14	16	18	466.2	465.4	469.0	469.0	469.1	469.1	469.2	469.2	469.3	469.2	469.4	469.3
3428	2975	3174	Circular	84	30	51	67	80	92	100	471.9	471.9	473.8	473.7	474.1	474.0	474.3	474.2	474.5	474.4	474.6	474.5
343	951	949	Circular	54	289	52	58	61	64	68	485.7	485.6	491.1	490.9	493.1	492.8	494.1	493.8	494.9	494.7	495.5	495.2
3438	2963	2962	Circular	30	32	16	22	26	28	30	535.9	535.1	537.0	536.7	537.2	536.9	537.4	537.1	537.4	537.1	537.5	537.2
3439	2963	2962	Circular	30	32	16	22	26	28	30	535.9	535.1	537.0	536.7	537.2	536.9	537.4	537.1	537.4	537.1	537.5	537.2
344	948	2641	Circular	54	90	64	75	78	79	80	484.9	484.8	490.0	489.9	491.5	491.3	492.3	492.2	493.1	493.0	493.6	493.5
3443	3411	3436	Circular	18	15	0	0	2	3	4	508.1	508.0	508.2	508.1	508.4	508.3	508.7	508.6	508.9	508.8	509.5	509.4
3444	2220	2594	Circular	24	132	22	31	39	42	42	567.8	559.6	568.7	561.4	568.9	562.1	569.2	563.2	572.1	567.8	573.2	568.9
3445	2594	2123	Circular	24	230	22	31	39	42	42	559.5	543.1	560.5	550.4	560.8	552.8	561.4	555.1	564.8	557.7	565.9	558.9
3448	2446	2569	Circular	24	15	1	2	2	2	3	504.6	504.6	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
3449	3269	3297	Circular	42	183	6	8	10	12	14	503.6	503.2	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
3450	2484	3349	Circular	24	35	4	5	6	8	9	504.6	504.3	507.0	507.0	507.0	507.0	507.1	507.0	507.1	507.0	507.1	507.0
3451	3470	3381	Circular	18	30	5	11	18	28	37	517.7	516.8	518.5	518.2	519.0	518.6	520.3	519.0	522.6	519.5	525.0	519.8
3452	3470	3381	Circular	18	30	5	10	18	28	37	517.7	516.9	518.5	518.2	519.0	518.6	520.3	519.0	522.6	519.5	525.0	519.8
3453	3470	3381	Circular	18	30	6	11	18	28	37	517.6	516.8	518.5	518.2	519.0	518.6	520.2	519.0	522.5	519.5	525.0	519.8
3463	3127	3128	Circular	24	299	3	5	6	7	8	471.3	470.5	472.0	471.4	472.2	471.6	472.3	471.7	472.5	471.9	472.6	472.0
3464	3128	3126	Circular	30	186	3	5	6	7	8	470.5	469.7	471.2	470.6	471.3	470.8	471.4	470.9	471.6	471.1	471.6	471.2
3465	3126	3193	Circular	30	284	3	5	6	7	8	469.7	469.1	470.4	469.9	470.6	470.1	470.7	470.2	470.8	470.4	470.9	470.5
3466	3193	3166	Circular	30	326	3	5	6	7	8	469.1	468.4	469.8	469.2	469.9	469.4	470.1	469.6	470.2	469.7	470.3	469.8
3467	3166	3209	Circular	42	70	3	5	6	7	8	468.3	467.9	468.8	468.4	468.9	468.5	469.0	468.5	469.1	468.6	469.1	468.7

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3469	2947	2965	Circular	30	20	15	24	31	38	43	546.6	545.8	547.5	546.7	547.7	547.0	547.9	547.2	548.1	547.4	548.3	547.5
3470	2947	2965	Circular	30	20	19	27	34	40	45	546.2	545.6	547.3	546.7	547.6	546.9	547.7	547.1	547.9	547.3	548.1	547.5
3480	3317	3337	Circular	42	183	57	64	70	74	78	430.6	429.3	432.8	431.7	433.0	431.8	433.1	432.0	433.3	432.1	433.4	432.2
3487	4012	2945	Circular	42	43	34	40	44	47	51	436.3	436.2	441.5	441.4	443.1	443.0	444.1	444.1	444.9	444.8	445.6	445.5
3488	2945	3043	Circular	42	5	43	49	52	55	57	436.2	436.2	441.1	441.0	442.6	442.5	443.5	443.5	444.2	444.1	444.9	444.8
3489	3043	4018	Circular	42	18	43	49	52	55	57	436.2	436.2	440.8	440.7	442.1	442.0	443.0	442.9	443.6	443.5	444.2	444.1
3490	3221	575	Circular	36	136	2	4	-4	7	8	444.0	443.0	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3491	575	577	Circular	36	487	2	4	-4	8	8	443.0	443.6	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3492	1716	3105	Circular	50	444	71	75	78	82	84	441.1	439.2	446.3	445.4	447.3	446.4	447.9	447.1	448.5	447.7	449.0	448.2
3493	3105	3838	Circular	50	248	77	82	85	88	90	439.2	438.3	445.0	444.4	445.9	445.3	446.5	445.8	447.0	446.3	447.5	446.7
3494	204	2845	Rectangular		122	233	307	354	395	425	447.3	446.7	455.0	455.0	456.2	456.2	457.0	456.9	457.7	457.6	458.2	458.1
3495	2845	3290	Rectangular		38	236	311	359	400	430	446.7	446.6	455.0	455.0	456.1	456.1	456.8	456.8	457.4	457.4	457.9	457.9
3496	760	2835	Circular	36	49	13	16	16	16	17	459.0	458.2	460.4	460.3	462.9	462.8	464.6	464.6	465.4	465.4	465.9	465.9
3497	2835	3729	Circular	36	46	13	13	14	16	13	458.2	458.2	460.2	460.2	462.8	462.8	464.6	464.5	465.3	465.3	465.9	465.9
3498	3693	3116	Circular	42	191	17	24	28	32	37	454.9	454.7	458.4	458.4	460.3	460.2	461.4	461.3	462.2	462.0	462.8	462.6
3499	3116	3157	Circular	42	307	17	24	28	32	37	454.7	454.4	458.4	458.3	460.1	459.9	461.1	460.9	461.9	461.7	462.5	462.4
35	2146	2211	Circular	24	302	12	18	23	28	32	680.8	637.5	681.3	638.4	681.4	638.6	681.5	638.7	681.6	638.8	681.7	638.9
3501	902	901	Circular	48	185	15	20	22	27	30	471.9	471.4	475.0	475.0	475.6	475.6	476.2	476.1	477.0	476.9	477.5	477.4
3502	901	899	Circular	48	124	15	20	22	27	30	471.4	471.3	474.9	474.9	475.6	475.6	476.1	476.1	476.8	476.8	477.4	477.3
3503	3777	955	Circular	60	225	6	8	9	11	12	422.9	422.6	423.8	423.6	423.9	423.8	424.1	423.9	424.2	424.0	424.3	424.1
3504	955	3773	Circular	60	58	6	8	9	11	12	422.6	422.5	423.5	423.5	423.7	423.7	423.8	423.8	424.0	423.9	424.1	424.0
3505	1182	1232	Circular	54	336	26	38	44	52	58	519.5	519.0	521.6	521.4	521.8	521.6	522.0	521.6	522.2	521.8	522.4	521.9
3506	1232	1223	Circular	54	4	28	45	47	54	61	519.0	518.1	520.2	519.9	520.6	520.4	520.8	520.7	521.2	521.1	521.4	521.3
3507	1664	1439	Circular	30	224	2	3	4	5	5	472.0	472.0	472.8	472.7	473.0	472.8	473.1	472.9	473.2	473.0	473.2	473.1
3508	1439	3197	Circular	30	202	2	3	4	5	5	472.0	471.0	472.5	471.7	472.6	471.8	472.7	471.9	472.7	472.0	472.8	472.1
351	1774	980	Circular	42	220	30	38	43	45	50	493.4	492.9	499.0	498.8	503.6	503.3	504.6	504.4	505.3	505.1	505.9	505.7
3511	3593	3429	Circular	60	102	30	40	50	59	66	508.3	507.9	510.9	510.9	511.2	511.2	511.4	511.4	511.6	511.7	511.8	511.8
3512	2880	3694	Circular	48	124	23	30	34	37	40	416.9	416.6	420.7	420.7	421.0	421.0	421.2	421.2	421.4	421.3	421.5	421.4
3513	3694	3178	Circular	48	20	23	30	34	37	40	416.6	416.8	420.6	420.6	420.9	420.9	421.1	421.1	421.2	421.2	421.3	421.3
3514	1710	3684	Rectangular		1185	2	4	-4	3	4	446.1	445.7	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3515	3684	576	Rectangular		54	2	4	-4	3	5	445.7	444.4	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
3516	4041	3824	Circular	42	40	13	26	21	36	41	496.2	496.0	501.5	501.5	506.7	506.6	507.5	507.5	508.3	508.3	508.9	508.9
3517	3824	3873	Circular	42	16	13	27	22	37	41	496.0	495.9	501.5	501.5	506.6	506.6	507.5	507.5	508.2	508.2	508.9	508.8
3518	3897	3927	Circular	36	10	12	15	18	21	23	495.9	495.9	497.4	497.4	497.6	497.6	497.8	497.8	498.0	497.9	499.6	499.5
3519	3927	1015	Circular	36	288	12	15	18	21	23	495.9	494.5	497.0	495.9	497.2	496.2	497.3	496.4	497.5	496.6	499.4	499.1
352	980	979	Circular	42	410	43	49	52	53	55	492.9	491.9	498.5	497.7	502.9	502.0	504.0	503.1	504.7	503.8	505.2	504.3
3524	3250	1405	Circular	24	321	2	3	4	4	5	473.6	473.1	474.3	473.9	474.4	474.0	474.5	474.1	474.6	474.2	474.7	474.3
3527	1277	1086	Circular	36	90	28	35	39	42	44	427.1	425.8	428.3	427.0	428.5	427.1	428.6	427.2	428.6	427.3	428.7	427.3
3528	1302	3926	Circular	24	142	17	23	28	33	36	467.0	465.9	468.4	467.3	469.0	467.5	469.7	467.5	470.6	467.7	471.4	467.8
3529	1941	3926	Circular	48	30	0	0	0	0	0	464.8	465.9	467.1	467.1	467.3	467.3	467.5	467.5	467.7	467.7	467.8	467.8
353	855	2103	Circular	42	93	43	49	52	53	55	491.2	490.6	496.2	496.0	500.0	499.8	501.1	500.9	501.8	501.6	502.3	502.1
3530	3926	1905	Circular	48	43	17	23	28	33	36	465.9	463.6	466.5	464.3	466.6	464.5	466.7	464.7	466.8	464.8	466.8	464.9
3533	1891	3010	Circular	42	60	33	44	52	56	60	540.5	539.8	541.8	541.1	542.0	541.3	542.2	541.5	542.3	541.6	542.3	541.6
354	724	732	Circular	48	560	52	58	60	63	64	488.3	488.9	493.7	493.0	496.8	495.9	497.9	497.0	498.7	497.8	499.2	498.2
3545	2615	4108	Circular	42	190	12	16	19	22	24	491.5	490.2	492.4	491.1	492.5	491.3	492.6	491.4	492.7	491.5	492.8	491.5
355	952	2340	Circular	54	90	52	58	61	63	65	486.7	486.4	492.3	492.2	494.8	494.7	495.8	495.8	496.6	496.6	497.1	497.0
3550	4032	4033	Circular	24	106	1	2	2	2	3	435.0	434.3	435.3	434.8	435.4	434.9	435.5	434.9	435.5	435.0	435.5	435.0
3551	4033	499	Circular	24	88	1	2	2	2	3	434.2	433.4	434.5	433.9	434.6	434.1	434.7	434.1	434.7	434.2	434.7	434.2
3552	4031	4032	Circular	24	261	1	2	2	2	3	436.2	435.2	436.6	435.6	436.6	435.7	436.7	435.8	436.7	435.9	436.8	436.0
3554	2630	4031	Circular	24	278	1	2	2	2	3	438.3	436.9	438.6	437.3	438.7	437.3	438.8	437.4	438.8	437.4	438.8	437.5
3556	3201	2880	Circular	48	18	23	30	34	37	40	416.9	416.9	420.7	420.7	421.1	421.1	421.3	421.3	421.5	421.5	421.7	421.6
3559	3376	3666	Circular	36	161	11	14	16	19	21	427.5	427.5	429.1	429.0	429.5	429.4	429.8	429.7	430.5	430.3	431.2	431.1
356	2340	2167	Circular	54	81	52	58	61	63	67	486.4	486.3	491.9	491.9	494.3	494.2	495.3	495.3	496.2	496.1	496.6	496.6
3560	3666	1984	Circular	36	273	11	14	16	19	21	427.5	426.5	428.9	428.6	429.2	429.0	429.6	429.4	430.3	430.0	430.9	430.7
3562	3744	3308	Circular	30	289	7	8	10	10	10	462.3	461.7	463.4	463.1	464.9	464.7	466.8	466.7	467.7	467.5	468.2	468.1
3563	745	3744	Circular	30	220	7	8	10	10	11	462.3	462.3	463.7	463.6	465.0	464.9	467.0	466.9	467.8	467.7	468.4	468.3
3564	3902	1211	Rectangular		165	16	20	24	25	28	462.1	461.8	472.7	472.6	474.9	474.8	477.3	477.2	479.9	479.8	482.1	482.0
3567	2847	287	Circular	42	197	6	9	10	12	14	442.0	441.6	443.0	442.7	443.2	442.9	443.3	443.1	443.4	443.2	443.5	443.3
357	2167	950	Circular	54	270	52	58	61	64	68	486.3	486.0	491.6	491.4	493.8	493.6	494.9	494.6	495.7	495.4	496.2	496.0
3571	1208	1213	Circular	24	68	3	3	4	5	5	457.9	457.9	458.6	458.5	458.9	458.8	459.2	459.2	459.7	459.7	460.1	460.1
3572	3395	3261	Circular	42	176	29	38	44	51	56	499.0	496.4	500.6	499.8	501.2	500.8	502.6	502.3	504.9	504.5	506.6	506.1
3573	3261	3068	Circular	42	30	29	38	44	51	56	496.4	496.4	499.8	499.7	500.6	500.5	502.0	501.9	504.0	503.9	505.5	505.4

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3574	2653	3426	Circular	36	122	13	17	19	20	20	499.2	499.7	506.4	506.4	507.4	507.4	508.4	508.3	509.2	509.1	509.8	509.7
3584	3998	4003	Circular	36	31	18	22	23	24	25	462.6	462.2	466.2	466.1	466.9	466.8	467.3	467.3	467.7	467.7	468.0	468.0
3585	3999	4003	Circular	36	37	18	22	23	24	25	462.7	462.0	466.2	466.1	466.9	466.8	467.3	467.3	467.7	467.7	468.0	468.0
3604	1656	2261	Circular	48	27	35	44	46	45	45	437.8	437.4	442.0	442.0	443.8	443.8	445.0	444.9	445.7	445.7	446.4	446.4
3605	2261	Node_11	Circular	48	48	35	44	46	45	45	437.4	437.8	441.9	441.9	443.6	443.6	444.8	444.7	445.5	445.5	446.2	446.2
3606	3039	3096	Circular	24	107	2	2	3	3	4	418.7	418.0	421.3	421.3	422.2	422.2	422.7	422.7	423.2	423.2	423.6	423.6
3607	1584	106	Circular	60	307	34	43	50	55	59	423.1	423.4	426.2	426.0	426.5	426.3	426.7	426.5	426.9	426.7	427.0	426.8
3608	119	106	Circular	42	572	-1	-1	-1	-1	-1	424.6	423.4	426.0	426.0	426.3	426.3	426.5	426.5	426.7	426.7	426.8	426.8
363	2489	1517	Circular	36	64	13	16	18	19	19	497.9	497.5	506.0	506.0	506.9	506.9	507.7	507.7	508.5	508.5	509.1	509.1
3632	2950	4037	Circular	42	259	11	12	12	12	12	425.3	424.8	426.5	426.0	426.5	426.0	426.5	426.0	426.5	426.0	426.5	426.0
3633	2950	4010	Circular	42	260	-25	-25	-25	-25	-25	425.4	424.8	427.0	427.0	427.0	427.0	427.0	427.0	427.0	427.0	427.0	427.0
3634	3941	3940	Circular	36	56	7	10	12	14	16	425.8	425.8	427.5	427.5	427.7	427.7	427.8	427.8	427.9	427.9	428.0	428.0
3635	2111	2105	Circular	24	235	16	22	27	31	34	553.4	523.2	554.0	525.2	554.1	529.4	554.2	531.8	554.3	533.6	554.4	535.0
3637	2249	4008	Circular	27	85	6	8	10	10	11	448.1	447.4	454.9	454.9	456.0	455.9	456.6	456.6	457.1	457.1	457.5	457.5
3638	2626	4008	Rectangular		166	236	311	359	399	430	446.1	446.1	454.9	454.9	456.0	455.9	456.7	456.6	457.2	457.1	457.6	457.5
3639	4000	2967	Circular	60	43	19	25	31	36	40	430.2	429.4	430.9	430.2	431.1	430.3	431.2	430.4	431.2	430.5	431.3	430.6
364	3873	3908	Circular	42	50	13	27	22	37	41	495.9	495.4	501.4	501.4	506.6	506.6	507.5	507.5	508.2	508.2	508.8	508.8
3641	364	363	Circular	42	240	27	34	40	45	46	426.9	426.7	429.4	429.2	430.4	430.1	431.5	431.1	432.7	432.2	433.2	432.7
3642	3987	3779	Circular	60	153	84	108	121	133	141	461.4	461.5	465.5	465.4	466.1	465.8	466.4	466.1	466.7	466.3	466.9	466.4
365	4039	4041	Circular	42	188	13	26	21	36	41	496.6	496.2	501.6	501.5	506.7	506.7	507.6	507.6	508.4	508.3	509.0	509.0
3652	4029	4028	Circular	24	69	1	1	2	2	2	435.4	435.1	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.0	437.0
3653	4030	4029	Circular	24	117	1	1	2	2	2	435.7	435.4	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.1	437.1
3654	3949	4030	Circular	24	301	1	1	2	2	2	436.3	435.7	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.1	437.1
3656	4028	3966	Circular	24	31	1	1	2	2	2	434.9	435.0	436.8	436.8	436.9	436.9	437.0	437.0	437.0	437.0	437.0	437.0
3657	3429	3953	Circular	60	30	30	40	50	59	66	507.9	507.9	510.8	510.8	511.2	511.1	511.4	511.4	511.6	511.6	511.7	511.7
366	4040	4039	Circular	42	16	13	17	17	18	17	504.1	496.6	504.6	501.6	506.8	506.8	507.7	507.6	508.4	508.4	509.0	509.0
3664	1	3967	Circular	24	45	21	20	20	20	21	457.8	456.0	461.7	461.4	464.7	464.4	466.7	466.5	468.1	467.9	468.8	468.7
3665	3968	3022	Circular	24	25	21	20	20	20	21	457.2	456.5	460.9	460.7	463.8	463.6	465.8	465.7	467.3	467.2	468.3	468.1
3666	712	3999	Circular	36	364	18	22	23	24	25	462.4	462.7	466.6	466.3	467.6	467.2	468.0	467.6	468.5	468.1	468.8	468.4
3667	712	3998	Circular	36	352	18	22	23	24	25	462.4	462.6	466.6	466.3	467.6	467.2	468.0	467.6	468.5	468.1	468.8	468.4
3668	4013	4017	Circular	42	44	42	49	52	55	57	436.2	436.0	440.4	440.4	441.6	441.5	442.4	442.3	442.9	442.8	443.5	443.3
3669	4017	3032	Circular	42	35	42	49	52	55	57	436.0	436.0	440.0	439.9	441.0	440.9	441.6	441.5	442.1	442.0	442.5	442.4
3670	3032	3080	Circular	42	73	42	49	52	55	57	436.0	436.3	439.7	439.6	440.5	440.4	441.1	440.9	441.5	441.3	441.9	441.6
3676	49	3	Circular	34	109	2	-6	-7	-8	-9	428.2	418.1	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
368	3900	992	Circular	42	35	30	38	41	44	47	494.8	495.1	500.0	499.9	504.8	504.7	505.8	505.7	506.5	506.4	507.0	506.9
3681	53	49	Circular	24	124	2	-2	-3	-3	-3	429.1	428.2	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
3683	25	4	Circular	24	191	-2	-3	-4	-5	-5	427.0	424.2	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
371	3910	3890	Circular	24	200	6	8	10	11	13	505.5	502.1	506.1	503.3	506.5	505.5	506.9	506.5	507.8	507.3	508.5	508.0
372	984	3910	Circular	24	265	6	8	10	11	13	510.7	505.5	511.3	506.8	511.4	507.0	511.5	507.2	511.6	508.0	511.7	508.8
3727	88	89	Circular	18	24	12	13	15	16	17	408.8	408.1	441.2	440.8	443.5	443.1	444.8	444.4	446.2	445.8	447.7	447.2
3728	87	88	Circular	18	671	10	11	12	13	13	428.5	408.8	444.1	442.0	445.7	444.3	446.8	445.6	448.7	447.1	450.4	448.5
3729	89	13	Circular	18	454	18	19	20	20	21	408.1	394.7	438.8	426.0	440.9	426.0	442.0	426.0	443.2	426.0	444.5	426.0
373	3890	3900	Circular	24	290	6	8	10	11	13	502.1	495.0	502.7	500.2	505.4	505.1	506.4	506.1	507.2	506.8	507.7	507.3
3730	90	87	Circular	18	24	8	10	10	11	11	429.2	428.5	444.5	444.4	445.9	445.9	447.1	447.1	449.0	449.0	450.7	450.6
3734	12	90	Circular	18	4	7	9	9	9	10	429.4	429.2	444.7	444.6	446.1	446.0	447.3	447.3	449.2	449.2	450.8	450.8
3745	2602	34	Circular	24	88	23	27	30	33	35	449.7	450.4	456.4	455.5	458.5	457.3	460.4	458.9	462.3	460.6	463.8	461.8
3746	34	35	Circular	24	437	23	26	29	31	33	450.4	448.2	454.3	449.9	455.7	449.9	457.0	449.9	458.3	449.9	459.3	449.9
3747	36	4135	Circular	27	370	9	11	13	16	17	435.0	433.8	436.2	435.6	436.4	435.8	436.6	436.0	437.0	436.1	437.4	436.2
3750	37	36	Circular	24	168	8	11	13	16	17	443.3	435.0	443.9	436.6	444.0	436.9	444.1	437.2	444.2	437.5	444.2	437.9
3753	4107	4088	Circular	30	168	12	16	19	22	24	472.7	469.0	473.5	470.4	473.6	470.7	473.7	470.9	473.8	471.0	473.9	471.2
3754	4088	4087	Circular	24	214	12	16	19	22	24	469.0	460.8	469.7	462.4	469.8	462.6	469.9	462.9	470.0	463.1	470.1	463.3
3756	4093	4096	Circular	36	56	14	19	22	26	30	440.4	440.8	442.6	442.6	442.8	442.7	442.9	442.8	446.2	446.2	449.0	449.0
3759	1739	4098	Circular	42	411	9	13	15	15	15	440.9	440.2	444.3	444.2	447.5	447.5	449.0	448.9	449.9	449.8	450.4	450.3
3760	4098	3110	Circular	42	353	9	12	14	14	15	440.2	440.0	444.2	444.2	447.4	447.4	448.9	448.8	449.7	449.7	450.3	450.2
3761	3593	4044	Circular	60	102	33	46	55	64	71	508.8	507.9	510.9	510.9	511.2	511.2	511.4	511.5	511.6	511.7	511.8	511.8
3763	886	1367	Circular	48	305	15	20	22	27	30	472.9	472.8	475.1	475.0	475.8	475.7	476.3	476.3	477.3	477.2	478.0	477.8
3767	1733	591	Circular	48	176	0	0	0	0	0	441.9	441.9	442.1	442.0	442.1	442.0	442.1	442.0	442.1	442.0	442.1	442.0
3768	591	1727	Circular	48	12	0	0	0	0	0	441.9	441.5	442.0	441.5	442.0	441.5	442.0	441.5	442.0	441.5	442.0	441.6
3770	1717	1706	Cross section		151	71	75	78	81	83	445.0	440.2	450.0	449.1	451.3	450.3	452.2	451.1	453.1	452.0	453.7	452.6
3773	2055	4097	Circular	48	42	16	21	24	25	27	417.2	417.2	421.2	421.2	421.9	421.8	422.3	422.3	422.7	422.7	423.1	423.1
3774	4097	288	Circular	48	108	16	21	24	25	27	417.2	417.2	421.1	421.1	421.8	421.8	422.3	422.2	422.7	422.6	423.0	423.0
3781	3557	4023	Circular	24	42	6	7	8	10	11	435.4	434.2	445.1	445.0	446.4	446.3	447.7	447.7	449.6	449.5	451.2	451.2

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
3795	1462	3704	Circular	27	274	18	21	25	28	31	450.8	449.1	459.1	458.4	461.2	460.5	463.9	462.9	466.8	465.6	469.3	467.9
3796	3704	3347	Circular	27	50	16	19	22	25	27	449.1	449.1	458.2	458.1	460.2	460.1	462.6	462.4	465.2	465.0	467.4	467.2
38	1234	1233	Circular	54	125	90	125	135	138	140	526.5	525.6	529.9	529.6	533.5	533.0	535.2	534.6	535.9	535.3	536.4	535.7
3810	4089	Node_4	Natural Channel		88	12	16	19	22	24	442.3	435.7	443.2	439.6	443.3	440.2	443.4	442.9	446.3	446.3	449.1	449.1
3842	4026	12	Circular	24	0	6	6	6	6	7	433.6	429.4	444.9	444.8	446.2	446.2	447.5	447.5	449.4	449.4	451.1	451.0
386	3451	3458	Circular	30	231	11	15	18	21	23	545.8	544.8	547.0	546.3	547.3	546.6	547.5	546.8	547.7	547.0	547.9	547.2
396	3990	1048	Circular	36	222	13	18	22	26	29	503.0	502.7	507.8	507.7	509.9	509.7	511.4	511.2	512.7	512.4	513.6	513.2
398	633	3208	Circular	72	520	51	67	80	92	100	470.4	469.1	474.6	474.6	475.0	475.0	475.3	475.3	475.6	475.5	475.9	475.7
399	838	633	Circular	72	520	51	67	81	93	100	470.9	470.4	474.6	474.6	475.1	475.0	475.4	475.3	475.9	475.7	476.3	476.0
40	2283	2869	Circular	54	125	96	132	144	148	151	522.4	522.5	526.0	525.7	526.7	526.1	526.9	526.3	527.1	526.3	527.1	526.4
401	899	836	Circular	72	270	48	63	75	86	93	471.1	471.0	474.9	474.8	475.5	475.5	476.0	475.9	476.7	476.6	477.2	477.1
402	1731	899	Circular	60	420	33	43	53	60	63	471.9	471.3	474.9	474.9	475.6	475.6	476.1	476.1	477.0	476.8	477.6	477.3
404	884	1731	Circular	60	345	25	33	41	46	48	471.9	471.9	475.1	475.0	475.8	475.7	476.3	476.2	477.2	477.1	477.8	477.7
405	3699	935	Circular	21	434	7	9	10	12	12	481.6	480.8	483.0	482.1	483.6	482.4	484.3	482.6	486.5	484.2	487.7	485.2
406	1689	1688	Circular	27	332	8	10	12	13	15	480.1	478.6	481.0	479.8	481.2	480.0	481.3	480.1	481.4	480.2	481.5	480.3
408	2308	2411	Circular	24	475	7	9	10	12	12	478.4	478.0	479.9	479.3	480.2	479.5	480.9	480.0	482.4	481.1	483.2	481.9
409	2411	2505	Circular	24	480	7	9	10	12	12	478.0	475.1	478.9	477.9	479.1	478.4	479.8	478.9	480.9	479.6	481.6	480.2
41	2698	2229	Circular	24	110	15	16	17	22	24	543.8	542.9	551.0	550.5	552.6	552.1	554.0	553.4	555.7	555.1	557.0	556.3
410	2060	1832	Circular	36	570	8	10	12	13	15	476.8	474.2	477.7	476.8	477.8	477.2	477.9	477.5	478.3	478.3	478.9	478.7
411	1688	2080	Circular	36	270	8	10	12	13	15	478.6	478.0	479.6	479.2	479.8	479.4	479.9	479.5	480.0	479.6	480.2	479.7
413	2499	2480	Circular	42	160	20	27	33	38	40	475.1	475.1	478.4	478.3	479.2	479.1	480.1	479.9	481.3	481.1	482.1	481.8
429	1506	2671	Circular	42	375	13	17	21	24	26	477.4	476.1	479.0	479.0	480.2	480.2	481.8	481.6	483.7	483.5	484.8	484.5
430	930	2622	Circular	42	78	20	27	33	38	40	476.1	476.1	478.6	478.6	479.7	479.6	480.9	480.8	482.4	482.3	483.4	483.2
450	2412	2410	Circular	24	146	2	2	3	3	3	462.9	462.5	464.2	464.2	464.6	464.6	464.9	464.9	465.3	465.3	465.7	465.6
452	3280	1351	Circular	36	649	15	19	22	25	28	463.2	462.5	466.1	465.8	466.8	466.3	467.5	466.7	468.2	467.3	468.9	467.8
453	2410	3242	Circular	30	170	2	2	3	3	3	462.5	462.0	464.2	464.2	464.6	464.6	464.9	464.9	465.3	465.3	465.6	465.6
454	2670	3280	Circular	36	319	15	19	22	25	28	464.6	463.2	466.1	466.1	467.0	466.9	468.0	467.6	468.8	468.4	469.7	469.2
457	850	851	Circular	54	272	5	7	9	11	12	462.6	462.1	463.4	463.0	463.6	463.2	463.7	463.3	463.8	463.4	463.8	463.5
459	851	2361	Circular	54	212	5	7	9	11	13	462.1	461.5	462.9	462.6	463.1	463.0	463.3	463.2	463.4	463.3	463.4	463.4
460	2762	848	Circular	36	285	11	14	16	18	20	467.2	466.3	468.4	467.7	468.6	467.9	468.9	468.5	469.8	469.7	471.1	470.8
461	853	854	Circular	24	47	6	8	10	11	12	467.9	467.6	469.2	469.2	469.5	469.5	469.8	469.7	470.5	470.4	471.8	471.7
462	854	2762	Circular	36	326	11	14	16	18	20	467.4	467.2	469.0	468.6	469.2	468.8	469.4	469.1	470.2	469.9	471.5	471.2
465	3038	3351	Circular	24	125	0	0	0	0	0	459.8	459.0	461.5	461.5	461.9	461.9	462.1	462.1	462.3	462.3	462.4	462.4
466	2378	800	Circular	54	281	5	7	9	12	12	461.1	460.3	462.5	462.5	462.9	462.9	463.1	463.1	463.3	463.3	463.4	463.4
467	800	3499	Circular	54	57	5	7	9	11	12	460.3	460.1	462.5	462.5	462.9	462.9	463.1	463.1	463.3	463.3	463.4	463.4
468	709	712	Circular	36	448	35	44	46	48	49	462.8	462.4	467.9	466.6	469.6	467.7	470.3	468.2	470.9	468.7	471.3	469.0
470	3336	709	Circular	36	233	35	44	46	48	49	463.2	462.8	469.0	468.4	471.4	470.4	472.2	471.1	473.0	471.8	473.4	472.2
471	3215	3336	Circular	36	195	15	20	22	24	25	463.4	463.2	469.7	469.6	472.4	472.2	473.4	473.2	474.2	473.9	474.7	474.4
472	3239	3227	Circular	36	121	20	25	27	27	30	464.2	464.1	470.5	470.4	473.5	473.4	474.5	474.3	475.2	475.1	475.7	475.5
473	834	3336	Circular	36	238	20	25	27	27	30	463.7	463.2	469.8	469.6	472.5	472.2	473.5	473.2	474.2	473.9	474.7	474.4
475	4007	841	Circular	24	148	10	13	14	16	17	467.1	465.9	470.9	470.6	474.4	474.0	475.7	475.2	476.8	476.2	477.4	476.8
478	552	1875	Circular	33	301	12	17	20	21	24	467.1	466.2	472.4	472.2	476.1	475.9	477.0	476.8	477.5	477.4	477.9	477.8
480	2416	3215	Circular	36	228	15	20	22	24	25	463.6	463.4	469.9	469.8	472.7	472.5	473.8	473.5	474.7	474.4	475.2	474.9
484	723	2418	Circular	36	348	20	25	27	27	30	464.9	464.6	471.4	471.1	474.8	474.3	475.8	475.3	476.5	476.0	476.9	476.5
485	2418	3239	Circular	36	173	20	25	27	27	30	464.6	464.2	470.8	470.7	474.0	473.7	474.9	474.7	475.7	475.4	476.1	475.9
491	244	552	Circular	33	46	12	17	20	21	24	467.1	467.1	472.4	472.4	476.2	476.2	477.1	477.0	477.6	477.6	478.0	478.0
492	207	872	Circular	30	251	8	13	18	19	23	467.8	467.7	472.8	472.7	476.7	476.6	477.6	477.4	478.1	478.0	478.5	478.4
495	869	1879	Circular	24	293	8	10	10	16	20	469.7	468.9	473.4	473.1	477.5	477.0	478.3	477.8	478.8	478.3	479.3	478.7
501	721	889	Circular	27	550	7	9	10	12	13	466.9	463.7	467.8	467.1	468.0	467.8	468.7	468.3	469.7	468.9	470.2	469.3
502	2910	1759	Circular	24	498	5	6	7	8	9	468.3	467.0	469.2	468.6	469.4	468.8	469.8	469.3	471.2	470.5	472.0	471.2
503	1750	742	Circular	42	551	19	23	27	31	35	466.9	465.7	468.6	468.4	469.1	469.0	470.6	470.2	472.0	471.5	473.0	472.3
504	742	820	Circular	48	570	38	49	57	65	70	465.7	464.1	467.9	467.4	468.5	468.2	469.9	469.0	471.0	469.8	471.7	470.3
505	824	822	Circular	36	310	20	26	30	34	35	467.6	466.8	469.4	469.0	470.0	469.6	471.7	471.1	473.5	472.7	474.5	473.6
506	1572	824	Circular	36	319	16	21	24	27	28	468.8	467.6	470.2	469.7	470.6	470.3	472.4	472.0	474.4	473.9	475.5	474.9
507	829	1583	Circular	27	237	6	7	8	10	11	470.2	469.4	471.2	470.8	471.5	471.1	473.0	472.8	475.2	474.9	476.3	476.0
508	1694	829	Circular	27	86	6	7	8	10	11	470.6	470.3	471.6	471.4	471.8	471.6	473.1	473.0	475.4	475.3	476.6	476.5
509	2447	1671	Circular	27	213	6	7	9	10	11	472.3	471.4	473.1	472.5	473.3	472.7	473.7	473.4	476.0	475.8	477.3	477.1
512	820	889	Circular	48	60	38	49	57	65	70	464.1	463.7	467.1	467.1	467.9	467.8	468.4	468.3	469.0	468.9	469.4	469.3
514	1473	1511	Circular	27	240	10	14	16	18	19	471.8	471.1	473.2	472.6	473.5	472.9	474.4	473.8	476.9	476.1	477.8	477.1
516	1472	1473	Circular	27	339	10	14	16	18	19	472.9	471.9	474.2	473.7	474.7	474.1	475.8	474.9	478.6	477.5	479.5	478.5
517	1353	1379	Circular	27	149	8	10	11	13	16	474.4	474.1	475.7	475.5	476.0	475.8	477.1	476.9	480.1	479.9	480.9	480.6
522	1782	878	Circular	36	297	14	18	21	23	26	472.6	471.9	474.0	473.4	474.2	473.7	474.4	474.0	475.7	475.3	477.7	477.3

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
523	2424	1782	Circular	27	281	5	6	7	8	9	473.6	472.6	474.4	474.5	474.7	474.7	474.9	474.9	476.1	475.9	478.3	478.1
524	2402	2424	Circular	27	126	5	6	7	8	9	473.6	473.6	474.7	474.6	475.0	474.8	475.1	475.0	476.2	476.2	478.5	478.4
525	881	1782	Circular	27	375	9	12	14	16	18	474.0	473.0	475.2	474.5	475.5	474.7	475.7	474.9	476.9	475.9	479.3	478.1
527	875	830	Circular	36	280	14	18	21	23	26	470.5	469.3	471.9	471.2	472.1	471.5	472.4	472.0	474.1	473.8	475.7	475.2
528	876	875	Circular	36	310	14	18	21	23	26	471.1	470.7	472.7	472.1	472.9	472.4	473.1	472.7	474.6	474.3	476.4	475.9
531	830	1736	Circular	42	297	14	18	21	23	26	469.3	469.1	471.1	470.9	471.4	471.2	471.9	471.8	473.7	473.5	475.1	474.9
533	2695	2447	Circular	27	259	6	7	9	10	11	472.8	472.3	473.8	473.4	474.0	473.6	474.2	473.8	476.4	476.1	477.8	477.5
535	2717	2716	Circular	24	31	3	3	4	5	5	473.2	473.2	474.1	474.1	474.3	474.3	474.5	474.4	476.6	476.6	478.0	478.0
536	1870	1802	Circular	24	325	3	3	4	5	5	474.4	474.0	475.1	474.5	475.2	474.7	475.3	474.8	476.9	476.7	478.4	478.2
537	2624	815	Circular	24	212	3	4	4	5	7	476.8	476.2	477.4	476.9	477.6	477.1	478.6	478.5	481.9	481.8	482.6	482.5
538	815	2640	Circular	24	325	3	4	4	5	8	476.1	475.1	476.8	476.6	477.0	477.1	478.5	478.4	481.8	481.7	482.5	482.4
539	2642	1353	Circular	27	267	8	10	11	13	16	474.2	474.8	476.1	475.9	476.4	476.2	477.6	477.2	480.7	480.3	481.4	481.0
542	671	670	Circular	24	292	0	0	0	1	1	477.2	477.0	478.0	478.0	478.1	478.1	478.8	478.8	482.2	482.2	482.9	482.9
556	784	3236	Circular	24	181	7	9	10	10	10	461.3	460.0	463.8	463.6	464.3	464.1	464.6	464.3	464.8	464.5	465.0	464.6
557	657	784	Circular	24	288	7	9	10	10	10	463.0	461.3	464.0	463.9	465.0	464.5	465.4	464.9	465.7	465.2	465.9	465.3
558	731	783	Circular	24	296	0	0	0	2	2	466.1	462.6	466.1	464.9	466.1	465.8	466.5	466.5	466.8	466.8	467.1	467.1
559	780	781	Circular	24	312	7	9	10	10	10	462.8	463.4	465.4	465.1	466.6	466.2	467.6	467.0	468.0	467.4	468.3	467.7
560	785	780	Circular	24	330	7	9	10	10	10	463.3	462.8	465.8	465.5	467.3	466.8	468.3	467.7	468.9	468.2	469.2	468.5
562	756	786	Circular	24	409	7	9	10	11	11	464.2	463.8	466.6	466.2	468.6	468.0	470.0	469.3	470.8	470.0	471.3	470.4
564	572	599	Circular	42	11	17	24	28	32	37	453.6	453.6	458.1	458.1	459.6	459.5	460.5	460.5	461.3	461.3	462.0	461.9
568	792	3693	Circular	42	179	17	24	28	32	37	455.4	454.9	458.5	458.5	460.4	460.3	461.6	461.5	462.4	462.3	463.0	462.9
569	3157	572	Circular	42	362	17	24	28	32	37	454.4	453.7	458.2	458.1	459.8	459.6	460.8	460.6	461.6	461.4	462.3	462.1
570	189	188	Circular	48	331	-3	-13	-18	-23	-26	457.6	457.6	459.2	459.2	462.0	462.0	463.5	463.5	464.4	464.4	465.1	465.1
571	769	792	Circular	36	364	17	24	28	32	37	455.6	455.4	458.8	458.5	461.0	460.5	462.3	461.7	463.1	462.5	463.6	463.1
574	3713	1564	Circular	48	189	5	7	8	10	11	463.0	461.5	463.6	462.4	463.7	462.6	463.9	463.5	464.4	464.4	465.1	465.1
575	3066	763	Circular	48	239	5	7	7	10	10	460.2	459.1	460.9	460.0	462.0	462.0	463.5	463.5	464.4	464.4	465.1	465.1
578	191	189	Circular	33	294	11	12	13	13	13	457.1	456.7	459.3	459.2	462.1	462.0	463.7	463.5	464.5	464.4	465.2	465.1
583	777	776	Circular	24	290	8	11	12	13	14	460.7	460.1	462.1	461.6	464.6	464.0	466.6	465.9	467.6	466.8	468.4	467.4
586	776	560	Circular	27	317	8	11	12	12	13	460.1	459.6	461.5	461.1	463.8	463.4	465.7	465.3	466.6	466.2	467.3	466.7
590	1642	3292	Circular	30	72	1	9	10	10	9	459.7	458.2	460.0	459.2	462.4	462.3	464.1	464.0	464.9	464.8	465.5	465.4
591	3538	1642	Circular	30	12	-1	-2	-3	-3	-3	458.4	459.7	459.5	460.0	462.4	462.4	464.1	464.1	464.9	464.9	465.5	465.5
592	3496	2835	Circular	30	290	0	-5	-6	-6	-6	458.5	458.2	460.3	460.3	462.8	462.8	464.5	464.6	465.3	465.3	465.8	465.9
593	3493	385	Circular	33	71	9	10	10	10	10	457.5	457.5	459.6	459.6	462.5	462.4	464.2	464.2	465.0	465.0	465.5	465.5
594	770	1642	Circular	30	202	-1	6	6	7	7	458.6	459.7	459.9	460.2	462.5	462.4	464.2	464.1	465.0	464.9	465.5	465.5
595	771	770	Circular	33	14	6	7	6	6	6	458.8	458.5	459.9	459.9	462.5	462.5	464.2	464.2	465.0	465.0	465.6	465.6
596	772	404	Circular	30	24	-2	-2	3	3	2	459.1	458.4	460.4	460.4	462.6	462.6	464.3	464.3	465.2	465.2	465.7	465.7
597	3338	404	Circular	30	286	8	11	12	12	12	458.9	458.4	460.4	460.4	462.8	462.6	464.6	464.3	465.4	465.2	465.9	465.7
601	1519	2889	Circular	48	231	4	-12	-17	-22	-25	456.0	454.5	459.2	459.2	462.0	462.0	463.5	463.5	464.4	464.4	465.1	465.1
602	188	1519	Circular	48	348	5	-12	-17	-22	-25	457.6	456.0	459.2	459.2	462.0	462.0	463.5	463.5	464.4	464.4	465.1	465.1
603	3003	2889	Circular	30	510	14	15	16	17	15	456.9	454.5	459.7	459.2	462.3	462.0	464.0	463.5	464.8	464.4	465.5	465.1
607	3241	3259	Circular	30	451	13	16	17	18	18	461.0	459.5	462.3	461.2	464.4	463.8	466.3	465.6	467.1	466.4	467.7	466.9
609	2306	225	Circular	24	493	7	9	10	11	11	465.7	464.6	466.9	466.0	467.1	466.3	469.6	468.7	470.8	469.7	471.3	470.3
611	225	222	Circular	24	226	7	9	10	11	11	464.6	463.8	465.8	465.4	466.2	465.8	468.5	468.1	469.5	469.0	470.1	469.6
615	807	2352	Circular	36	100	2	3	3	4	4	455.1	455.0	457.1	457.1	457.3	457.3	457.7	457.7	458.4	458.4	458.9	458.9
616	808	807	Circular	30	300	2	3	3	4	4	454.7	455.1	457.1	457.1	457.3	457.3	457.7	457.7	458.4	458.4	459.0	458.9
620	1328	1327	Circular	42	8	5	6	7	8	9	454.3	454.9	457.1	457.1	457.2	457.2	457.7	457.7	458.4	458.3	458.9	458.9
621	1327	1571	Circular	24	146	5	6	7	8	9	454.5	454.6	457.0	456.9	457.1	457.0	457.6	457.5	458.2	458.1	458.8	458.6
624	2095	1762	Circular	42	343	6	6	6	7	8	454.5	453.0	455.8	455.8	456.7	456.7	457.4	457.4	458.1	458.1	458.6	458.5
629	2467	804	Circular	60	56	43	59	70	85	97	454.2	454.2	457.1	457.1	457.9	457.8	458.9	458.9	460.1	460.0	461.0	461.0
630	806	2854	Circular	60	343	43	59	70	85	97	455.3	454.5	457.6	457.6	458.4	458.4	459.6	459.5	461.2	460.9	462.5	462.1
631	1811	1835	Circular	24	270	6	10	13	15	16	458.0	457.3	459.1	458.6	459.6	459.2	461.0	460.3	463.2	462.2	464.8	463.7
632	1833	1841	Circular	36	310	8	10	12	14	16	457.3	457.3	458.8	458.5	459.0	458.7	459.3	459.0	460.2	460.1	461.3	461.1
635	1311	1238	Circular	42	117	7	8	9	10	11	452.2	451.8	455.8	455.8	456.7	456.7	457.4	457.4	458.0	458.0	458.5	458.5
639	1836	1803	Circular	30	300	6	8	10	12	13	458.8	458.2	459.8	459.5	460.1	459.7	460.2	459.9	460.5	460.3	461.8	461.5
640	1798	1811	Circular	24	280	6	10	13	15	16	458.8	458.2	459.9	459.3	460.4	459.8	462.0	461.2	464.6	463.5	466.5	465.3
644	1900	2357	Circular	24	216	6	8	10	12	13	463.9	462.5	464.8	463.8	465.0	464.0	465.1	464.2	465.3	464.3	465.4	464.5
650	665	1610	Circular	24	316	7	8	9	11	12	454.7	453.4	455.7	455.2	456.9	456.6	458.0	457.6	459.1	458.4	459.9	459.1
657	2224	2249	Circular	27	138	12	14	17	18	20	451.3	448.3	455.1	455.0	456.3	456.0	456.9	456.7	457.5	457.2	458.0	457.6
658	2249	4008	Circular	27	85	6	8	10	10	11	448.4	447.4	454.9	454.9	456.0	455.9	456.6	456.6	457.1	457.1	457.5	457.5
659	2322	2224	Circular	24	83	12	14	17	18	18	451.5	451.3	455.5	455.3	456.8	456.5	457.5	457.2	458.2	457.8	458.8	458.3
663	1801	1807	Circular	24	206	12	15	16	18	20	453.1	452.0	456.9	456.3	458.8	458.0	459.9	459.0	461.2	460.1	462.3	461.0
678	2321	3662	Circular	24	378	13	14	15	16	18	454.0	453.5	460.9	459.9	463.6	462.4	465.6	464.2	467.8	466.0	469.6	467.5

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
682	3247	3863	Circular	48	143	25	29	30	28	27	452.3	451.4	458.9	458.9	461.4	461.4	463.0	462.9	463.9	463.9	464.9	464.9
684	3822	3835	Circular	48	276	25	29	30	28	27	451.6	452.0	458.7	458.7	461.2	461.1	462.7	462.6	463.8	463.8	464.8	464.8
685	3656	2282	Circular	48	137	25	29	30	28	27	451.0	450.4	458.6	458.6	461.0	461.0	462.5	462.5	463.7	463.7	464.8	464.7
693	326	694	Circular	36	386	19	22	27	29	29	453.9	453.6	459.5	459.2	461.8	461.6	463.0	462.8	464.4	464.2	465.4	465.2
694	2282	2279	Circular	3	188	0	0	0	0	0	450.4	449.5	458.4	454.4	460.8	455.0	462.2	455.3	463.4	455.5	464.4	455.6
695	2279	2271	Circular	3	121	0	0	0	0	0	449.5	448.2	454.4	453.3	455.0	453.8	455.2	454.0	455.4	454.2	455.6	454.3
696	1749	1710	Circular	3	342	0	0	0	0	0	447.2	446.4	452.4	452.2	453.2	453.7	453.5	454.7	453.7	455.7	453.8	456.4
698	689	3504	Circular	24	464	7	8	9	15	15	456.4	455.1	461.0	460.6	463.4	462.9	464.2	463.8	465.5	465.2	466.5	466.2
701	686	687	Circular	36	32	19	22	21	23	24	454.5	454.4	459.9	459.9	462.2	462.2	463.3	463.3	464.8	464.7	465.8	465.8
711	344	1621	Circular	36	219	15	15	18	22	25	447.6	447.3	458.8	458.7	461.3	461.2	462.9	462.7	464.2	464.0	465.3	465.1
712	1621	1714	Circular	36	368	14	17	17	20	22	447.3	446.0	458.7	458.6	461.1	461.0	462.6	462.5	463.9	463.7	465.0	464.7
72	2042	220	Circular	54	50	26	36	47	53	59	511.4	510.9	514.8	514.8	515.3	515.3	515.7	515.7	516.0	516.0	516.3	516.2
721	576	3221	Circular	36	172	2	4	-4	4	5	444.0	444.1	452.2	452.2	453.7	453.7	454.7	454.7	455.8	455.8	456.5	456.5
722	3410	3187	Circular	48	175	70	75	77	79	80	446.8	444.5	454.5	454.1	456.3	455.8	457.4	456.9	458.7	458.2	459.5	459.0
724	3195	3410	Circular	42	14	70	77	79	80	82	447.4	446.8	455.1	454.9	456.9	456.8	458.1	457.9	459.4	459.2	460.3	460.1
73	183	1219	Circular	54	90	28	38	44	53	60	511.1	511.3	514.9	514.8	515.4	515.4	515.8	515.8	516.2	516.1	516.5	516.4
757	3838	2616	Circular	42	464	77	82	85	87	89	438.2	434.1	443.2	440.5	443.9	440.9	444.3	441.2	444.8	441.4	445.1	441.6
766	495	493	Circular	24	39	9	11	12	13	14	442.2	442.7	445.9	445.9	447.6	447.6	448.5	448.4	449.4	449.3	450.1	450.0
767	3573	495	Circular	24	145	9	11	13	15	16	443.0	442.2	446.4	446.2	448.3	448.0	449.3	448.9	450.3	449.8	451.1	450.6
769	493	387	Circular	24	184	9	10	11	11	12	442.7	441.9	445.7	445.5	447.4	447.0	448.2	447.8	449.1	448.6	449.7	449.2
773	3571	3102	Circular	18	358	9	10	11	11	12	441.5	438.1	442.6	439.4	443.3	439.8	443.8	440.0	444.3	440.3	444.7	440.4
78	1228	2225	Circular	36	310	10	15	18	21	24	523.8	523.0	524.9	524.0	525.1	524.2	525.3	524.3	525.5	524.5	525.6	524.6
797	985	986	Circular	24	145	4	5	6	6	7	448.9	449.2	451.8	451.8	452.1	452.1	452.4	452.3	452.7	452.6	453.0	452.9
798	986	129	Circular	30	334	23	25	26	28	29	449.0	448.2	451.1	449.9	451.4	450.1	451.6	450.2	451.8	450.3	451.9	450.3
799	412	986	Circular	30	320	19	20	21	21	22	449.0	449.0	452.4	451.8	452.8	452.1	453.2	452.3	453.5	452.6	453.8	452.9
80	2074	1228	Circular	36	460	10	15	18	21	24	533.8	523.8	534.4	525.2	534.6	525.5	534.7	525.7	534.7	525.8	534.8	526.0
800	414	1075	Circular	24	332	4	5	6	6	7	450.2	449.9	452.1	452.0	452.6	452.4	453.0	452.8	453.5	453.2	453.9	453.6
803	1565	413	Circular	30	185	19	20	21	21	22	450.8	450.2	453.9	453.5	454.5	454.1	455.0	454.5	455.4	454.9	455.7	455.2
806	263	1597	Circular	30	310	14	15	16	16	17	453.8	453.3	457.9	457.5	459.2	458.8	459.9	459.5	460.5	460.2	461.0	460.7
807	1597	1611	Circular	30	386	18	19	19	20	20	453.3	452.7	457.3	456.5	458.6	457.7	459.2	458.4	459.9	459.0	460.3	459.4
812	1611	522	Circular	30	401	18	19	19	20	20	452.7	451.9	456.3	455.6	457.5	456.6	458.1	457.2	458.7	457.7	459.1	458.2
814	522	530	Circular	30	358	18	19	19	20	20	451.7	451.3	455.4	454.7	456.4	455.6	456.9	456.1	457.4	456.6	457.9	457.0
816	1292	134	Circular	24	74	1	2	2	2	2	449.7	449.2	450.9	450.9	451.1	451.1	451.2	451.2	451.3	451.3	451.4	451.4
829	2379	661	Circular	24	162	7	9	10	11	13	457.6	457.2	463.6	463.4	465.5	465.3	466.1	465.9	466.7	466.5	467.2	467.0
830	3848	529	Circular	24	352	7	10	11	12	14	456.8	455.3	463.0	462.7	464.9	464.6	465.5	465.2	466.1	465.8	466.6	466.3
833	528	263	Circular	24	664	14	15	16	16	17	455.3	453.9	460.6	458.0	462.2	459.4	462.8	460.1	463.4	460.7	463.9	461.2
834	2519	1629	Circular	24	620	4	6	7	5	6	461.4	458.5	466.7	466.7	468.3	468.3	469.4	469.4	470.7	470.7	471.9	471.9
844	1179	660	Circular	24	95	16	19	23	23	25	460.9	461.2	468.5	468.3	469.8	469.6	471.2	470.9	472.8	472.5	474.2	473.8
845	3660	3600	Circular	24	582	3	3	-5	5	5	462.4	459.0	467.2	467.1	468.6	468.6	469.6	469.6	470.9	470.8	472.2	472.1
846	1176	1175	Circular	24	107	15	14	15	16	17	461.7	461.9	470.8	470.5	472.7	472.4	474.7	474.3	476.8	476.3	478.5	478.0
847	1175	1174	Circular	24	133	16	17	17	17	17	461.9	461.0	470.2	469.9	472.1	471.6	474.0	473.5	476.0	475.4	477.6	477.1
848	1211	1212	Circular	24	70	14	18	21	22	24	461.8	461.5	472.3	472.1	474.4	474.2	476.7	476.4	479.2	478.8	481.3	480.8
85	175	1934	Circular	54	300	20	26	32	37	41	515.8	514.0	517.0	515.8	517.2	516.0	517.4	516.2	517.5	516.5	517.7	516.6
86	1224	1347	Circular	66	90	45	63	77	90	101	516.9	516.5	519.3	519.2	519.8	519.7	520.2	520.1	520.6	520.5	520.9	520.8
87	1496	1224	Circular	66	200	28	38	47	56	63	517.5	516.9	519.5	519.5	520.1	520.1	520.5	520.5	520.9	520.9	521.2	521.2
872	1263	433	Circular	24	34	15	19	21	23	24	439.1	438.4	440.6	440.4	442.5	442.3	443.6	443.4	444.4	444.1	445.0	444.7
873	2856	2844	Circular	27	158	15	19	21	23	24	437.4	436.7	439.3	439.0	440.6	440.0	441.5	440.9	442.2	441.5	442.7	442.0
874	1261	1263	Circular	24	275	15	19	21	23	24	440.9	439.1	442.4	441.2	445.2	443.2	446.7	444.4	447.7	445.3	448.5	445.8
876	2923	432	Circular	36	575	19	23	27	31	34	440.4	438.0	441.8	440.0	442.0	440.2	442.1	440.4	442.3	440.5	442.5	440.8
879	1270	2844	Circular	24	42	9	11	13	15	16	437.1	436.3	439.0	439.0	440.1	440.0	441.0	440.9	441.7	441.5	442.2	442.0
88	1223	1496	Circular	60	60	28	43	48	57	64	517.9	517.5	519.8	519.7	520.3	520.2	520.6	520.6	521.0	521.0	521.3	521.3
880	431	97	Circular	36	159	42	54	61	67	70	434.3	430.9	435.9	433.9	436.2	434.4	436.5	434.7	436.7	435.0	436.9	435.1
881	97	1602	Circular	36	169	42	54	61	67	70	430.9	427.4	432.4	429.7	432.7	429.9	432.8	430.1	432.9	430.2	433.0	430.3
89	1997	1223	Circular	36	379	0	0	1	1	2	523.3	519.6	523.3	519.9	523.4	520.4	523.5	520.7	523.6	521.1	523.6	521.3
898	987	551	Circular	24	378	9	12	14	16	18	447.1	445.4	448.2	446.9	448.5	447.4	449.5	448.1	451.0	449.1	452.8	450.4
90	2225	1226	Circular	60	75	18	25	30	36	39	521.4	519.2	522.2	521.2	522.4	521.5	522.6	521.7	522.7	522.0	522.7	522.0
902	447	434	Circular	24	330	15	19	21	23	25	444.8	444.1	447.6	446.2	451.6	449.2	454.1	451.3	456.0	452.7	457.6	454.0
938	506	507	Circular	36	348	7	9	10	12	13	435.7	434.8	437.1	437.1	437.6	437.6	438.0	438.0	438.3	438.2	438.6	438.5
939	111	110	Circular	36	54	7	9	10	12	13	434.5	434.4	437.1	437.1	437.6	437.6	437.9	437.9	438.2	438.1	438.3	438.3
94	2009	1085	Circular	24	285	5	7	8	9	10	564.2	562.7	565.0	563.9	565.1	564.1	565.2	564.2	565.3	564.3	565.4	564.4
944	468	2520	Circular	36	147	7	9	10	12	13	438.3	437.9	439.4	439.2	439.5	439.4	439.7	439.5	439.8	439.6	439.9	439.7
945	3310	468	Circular	24	47	7	9	10	12	13	438.3	438.3	439.6	439.5	439.8	439.7	439.9	439.8	440.1	439.9	440.2	440.0

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
946	2520	1580	Circular	36	305	7	9	10	12	13	437.9	437.6	439.1	438.8	439.3	439.0	439.4	439.1	439.5	439.2	439.6	439.3
95	1085	1065	Circular	24	198	5	7	8	9	10	562.7	561.7	563.5	562.4	563.6	562.5	563.7	562.6	563.8	562.7	563.9	562.8
955	2763	2751	Circular	30	126	14	18	19	21	21	431.2	431.0	435.6	435.5	438.3	438.1	439.2	439.0	439.9	439.6	440.5	440.2
958	124	2750	Circular	24	35	14	18	19	20	21	433.8	433.7	436.2	436.1	439.3	439.1	440.2	440.0	440.9	440.7	441.6	441.3
96	1412	1109	Circular	24	195	5	7	8	9	10	544.6	522.6	545.0	532.2	545.1	534.4	545.1	536.4	545.2	538.5	545.3	540.3
961	2537	107	Circular	36	438	14	18	19	21	21	428.3	428.4	433.9	433.7	435.7	435.4	436.5	436.3	437.3	437.0	437.8	437.6
962	2044	2015	Circular	36	355	22	28	30	32	33	428.3	427.8	433.3	432.9	434.8	434.2	435.5	434.8	436.2	435.4	436.7	435.8
969	501	2575	Circular	36	233	22	28	30	32	33	428.5	428.8	432.2	431.9	433.0	432.6	433.4	433.0	433.8	433.3	434.1	433.6
97	1065	1412	Circular	24	187	5	7	8	9	10	561.4	544.8	561.8	545.4	561.9	545.5	561.9	545.7	561.9	545.8	562.0	545.9
970	1278	1277	Circular	36	172	28	35	39	42	44	429.1	428.5	430.9	430.2	431.1	430.4	431.3	430.5	431.4	430.6	431.5	430.6
99	1183	1182	Circular	42	107	26	36	44	52	58	524.1	523.4	525.4	524.7	525.7	525.0	525.9	525.2	526.1	525.4	526.2	525.5
991	2727	2312	Circular	30	198	4	5	6	7	8	431.0	430.6	433.4	433.4	433.8	433.8	434.1	434.1	434.4	434.3	434.6	434.5
992	3575	3650	Circular	24	236	1	2	2	2	3	424.8	424.3	425.2	424.7	425.3	424.8	425.4	424.8	425.4	424.9	425.4	424.9
993	1555	2843	Circular	36	544	16	22	26	29	30	420.0	419.0	421.5	420.2	421.8	420.5	422.1	420.8	422.3	421.1	422.4	421.3
994	443	3246	Circular	36	63	16	22	26	29	30	421.1	420.9	422.9	422.9	423.4	423.3	423.8	423.7	424.2	424.1	424.5	424.3
995	331	333	Circular	24	602	9	12	14	15	16	427.0	424.3	428.1	425.9	428.3	426.3	429.1	426.7	429.7	427.2	430.2	427.7
996	1530	331	Circular	24	260	9	12	14	15	16	429.1	427.0	430.1	428.9	430.4	429.3	430.7	429.7	431.6	430.5	432.0	430.9
997	3268	1555	Circular	36	94	16	22	26	29	30	420.2	420.0	422.0	421.9	422.4	422.3	422.7	422.6	422.9	422.8	423.1	422.9
998	200	1891	Circular	12	28	3	4	4	5	5	540.7	540.4	543.4	543.1	544.0	543.6	544.4	543.9	544.7	544.1	544.9	544.2
Link_10	3577	Node_12	Natural Channel		415	9	12	14	15	15	485.8	476.0	486.5	484.4	486.6	484.5	486.7	484.5	486.7	484.5	486.7	484.7
Link_100	4	2775	Natural Channel		1251	43	51	56	62	66	424.2	422.4	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_101	3	4	Natural Channel		230	35	43	47	52	56	418.1	424.2	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_102	2775	4067	Natural Channel		93	72	83	91	98	104	422.4	424.6	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_103	Node_12	4184	Natural Channel		3797	272	348	394	433	463	476.0	462.8	483.2	465.0	483.9	465.2	484.2	465.4	484.5	465.5	484.7	465.5
Link_104	1096	2870	Natural Channel		821	79	88	95	102	107	453.7	447.4	455.5	451.4	455.6	451.6	455.7	451.8	455.8	451.9	455.8	452.0
Link_105	133	129	Natural Channel		240	87	98	107	116	123	447.9	448.2	450.9	449.9	451.0	450.1	451.2	450.2	451.3	450.3	451.4	450.3
Link_106	2843	3650	Natural Channel		270	538	680	773	858	918	413.4	414.3	420.0	419.5	420.5	420.0	420.8	420.3	421.1	420.6	421.3	420.7
Link_107	2564	2843	Natural Channel		395	524	661	749	831	891	415.8	413.4	420.0	420.0	420.5	420.5	420.8	420.8	421.0	421.1	421.2	421.3
Link_108	3650	4117	Natural Channel		1875	543	686	781	877	936	414.3	411.8	419.5	418.0	420.0	418.0	420.3	418.0	420.6	418.0	420.7	418.0
Link_109	3567	2564	Natural Channel		925	368	465	527	583	625	428.4	415.8	433.3	420.0	433.7	420.5	434.0	420.8	434.2	421.0	434.3	421.2
Link_11	Node_17	3300	Circular	18	171	1	3	3	3	3	425.6	424.6	426.5	426.5	427.8	427.8	428.5	428.5	429.5	429.5	430.6	430.6
Link_110	Node_14	166	Natural Channel		426	353	445	503	555	594	432.4	431.6	437.3	437.1	437.8	437.5	438.0	437.8	438.3	438.0	438.4	438.2
Link_111	4231	Node_14	Natural Channel		949	353	445	502	551	589	433.5	432.4	438.8	437.3	439.3	437.8	439.6	438.0	439.8	438.3	440.0	438.4
Link_112	166	3567	Natural Channel		2131	364	459	520	575	616	431.6	428.4	437.1	433.3	437.5	433.7	437.8	434.0	438.0	434.2	438.2	434.3
Link_113	3102	4231	Natural Channel		416	347	436	491	539	575	435.3	433.5	439.4	438.8	439.8	439.3	440.0	439.6	440.3	439.8	440.4	440.0
Link_116	1415	3226	Natural Channel		141	9	12	14	15	15	486.1	486.5	488.2	488.1	488.5	488.4	488.7	488.6	488.8	488.7	488.8	488.8
Link_117	4046	4093	Natural Channel		378	24	30	35	40	45	441.3	440.4	446.2	442.7	446.4	442.9	446.4	443.1	446.5	446.3	449.1	449.1
Link_119	3243	3034	Natural Channel		44	7	7	6	7	7	427.6	423.0	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_12	4093	4096	Circular	30	56	12	14	16	19	21	440.4	440.8	442.6	442.6	442.8	442.7	442.9	442.8	446.3	446.2	449.0	449.0
Link_120	290	2858	Natural Channel		286	3	4	5	6	7	427.7	427.4	429.3	429.2	429.5	429.4	429.6	429.5	429.8	429.6	429.8	429.7
Link_121	3644	2567	Natural Channel		30	158	197	226	251	268	419.0	418.8	421.4	420.9	421.6	421.1	421.8	421.3	421.9	421.4	422.1	421.5
Link_123	Node_34	3102	Natural Channel		1338	339	426	480	528	564	435.7	435.3	440.4	439.4	440.9	439.8	441.2	440.0	441.4	440.3	441.6	440.4
Link_124	129	Node_10	Natural Channel		851	112	127	138	149	158	448.2	434.9	449.9	436.1	450.1	436.3	450.2	436.6	450.3	436.7	450.3	436.8
Link_125	2509	Node_34	Natural Channel		171	263	346	398	443	477	436.5	435.7	440.4	440.4	440.8	440.9	441.1	441.2	441.3	441.4	441.5	441.6
Link_126	4008	1738	Natural Channel		2753	246	324	372	414	445	446.1	439.9	454.8	445.1	455.8	445.8	456.4	446.2	456.9	446.6	457.2	446.9
Link_127	3915	3499	Natural Channel		644	92	118	132	145	153	459.1	459.3	463.4	462.5	463.9	462.9	464.1	463.1	464.3	463.3	464.4	463.4
Link_128	3236	3892	Natural Channel		191	92	118	132	144	153	459.5	459.2	463.6	463.4	464.1	463.9	464.3	464.1	464.5	464.3	464.6	464.4
Link_129	3499	3501	Natural Channel		283	97	125	141	154	164	459.3	459.3	462.5	461.8	462.9	462.2	463.1	462.3	463.3	462.5	463.4	462.6
Link_13	3159	3195	Circular	42	34	73	79	82	82	83	447.5	447.5	456.0	455.8	458.0	457.8	459.2	459.0	460.5	460.3	461.4	461.2
Link_130	3253	3236	Natural Channel		129	86	110	123	135	143	460.8	459.5	464.1	463.6	464.6	464.1	464.8	464.3	465.0	464.5	465.1	464.6
Link_132	2861	133	Natural Channel		401	86	97	106	114	122	448.2	447.9	451.4	450.9	451.6	451.0	451.7	451.2	451.9	451.3	452.0	451.4
Link_133	Node_10	4179	Natural Channel		329	56	63	69	75	80	434.9	430.0	436.1	430.6	436.2	430.6	436.3	430.7	436.3	430.7	436.4	430.8
Link_134	179	2490	Natural Channel		1785	257	338	389	433	466	439.8	436.3	444.4	440.5	444.9	440.9	445.2	441.2	445.5	441.5	445.7	441.7
Link_135	3351	3847	Natural Channel		282	103	133	150	165	176	455.7	456.8	461.4	461.0	461.8	461.4	462.0	461.5	462.2	461.7	462.2	461.8
Link_136	2540	1847	Natural Channel		552	134	174	198	219	237	452.8	452.9	458.1	457.9	458.7	458.5	459.1	458.9	459.4	459.2	459.7	459.5
Link_138	3266	1238	Natural Channel		1205	169	221	252	276	295	452.3	446.6	457.1	455.8	457.8	456.7	458.2	457.4	458.7	458.0	459.0	458.5
Link_139	3847	2540	Natural Channel		1071	130	168	191	212	229	456.8	452.8	459.7	458.1	460.0	458.7	460.1	459.1	460.2	459.4	460.3	459.7
Link_14	Node_17	3382	Circular	18	117	-1	-3	-3	-3	-3	425.6	427.0	426.6	427.4	427.9	427.9	428.6	428.6	429.5	429.5	430.6	430.5
Link_140	3379	3001	Natural Channel		70	46	52	56	60	63	431.8	425.2	434.3	434.0	434.5	434.2	434.6	434.3	434.7	434.5	434.8	434.6
Link_141	1816	162	Natural Channel		581	137	177	201	223	240	452.8	451.9	457.9	457.2	458.5	457.9	458.9	458.3	459.2	458.8	459.5	459.2
Link_143	162	3151	Natural Channel		76	169	221	252	278	298	451.9	451.9	457.2	457.2	457.9	457.9	458.3	458.3	458.8	458.8	459.2	459.1
Link_145	3349	3269	Natural Channel		438	5	7	8	10	11	504.3	503.6	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Link_146	1976	3703	Natural Channel		595	197	246	275	300	316	477.2	476.5	484.0	483.9	484.7	484.6	485.1	485.0	485.4	485.3	485.6	485.5
Link_147	2940	2093	Natural Channel		580	141	178	202	223	237	477.8	476.6	484.5	484.3	485.2	485.0	485.5	485.4	485.8	485.7	486.0	485.9
Link_148	149	3014	Natural Channel		497	5	6	8	9	10	479.9	478.1	480.3	479.2	480.4	479.3	480.5	479.5	480.5	479.6	480.5	479.7
Link_149	3604	832	Natural Channel		866	70	84	90	95	99	483.4	483.3	487.1	486.6	487.7	487.3	488.1	487.9	488.6	488.4	489.0	488.8
Link_15	Node_20	Node_29	Circular	36	147	13	17	19	21	22	501.3	501.1	507.3	507.2	508.9	508.9	510.1	510.0	511.0	510.9	511.6	511.5
Link_150	3010	2963	Natural Channel		362	33	44	52	56	60	539.8	535.9	540.7	537.7	540.9	537.9	541.0	538.0	541.1	538.0	541.2	538.0
Link_151	1517	4040	Natural Channel		393	13	17	17	17	17	497.5	504.1	506.0	505.1	506.9	506.8	507.7	507.7	508.5	508.4	509.1	509.1
Link_152	1934	183	Natural Channel		398	49	67	82	96	108	514.0	511.0	515.8	514.9	516.0	515.4	516.2	515.8	516.5	516.2	516.6	516.5
Link_154	2033	3411	Natural Channel		30	0	0	2	3	4	508.8	508.0	508.9	508.2	509.0	508.4	509.1	508.9	509.2	509.1	509.5	509.5
Link_155	3953	4191	Natural Channel		625	65	88	107	124	139	507.9	504.0	510.8	508.0	511.1	508.0	511.4	508.0	511.6	508.0	511.7	508.0
Link_156	3178	Node_6	Natural Channel		813	28	36	43	47	51	416.2	416.0	420.6	418.8	420.9	419.4	421.1	419.8	421.2	420.1	421.3	420.3
Link_157	4042	3941	Natural Channel		77	7	10	12	14	16	426.1	425.8	427.6	427.5	427.8	427.7	427.9	427.9	428.1	428.0	428.1	428.1
Link_158	827	3966	Natural Channel		30	42	49	52	54	57	434.8	434.9	437.0	436.8	437.1	436.9	437.2	437.0	437.2	437.0	437.3	437.0
Link_159	3820	3348	Natural Channel		566	46	52	57	61	64	432.3	432.1	435.0	434.3	435.3	434.8	435.4	434.9	435.5	435.1	435.6	435.2
Link_16	4214	4213	Circular	30	119	0	0	0	0	0	445.2	445.0	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1	445.3	445.1
Link_160	3611	1569	Natural Channel		688	9	13	15	17	18	417.7	417.6	421.9	421.5	422.5	422.5	423.1	423.1	423.6	423.6	424.1	424.1
Link_161	3763	4197	Natural Channel		683	63	75	84	94	101	427.5	420.0	430.2	424.9	430.4	425.2	430.6	425.5	430.7	425.7	430.8	425.8
Link_162	1577	1534	Natural Channel		887	63	75	85	94	101	428.6	428.1	433.0	432.8	433.2	433.0	433.3	433.1	433.4	433.1	433.5	433.1
Link_163	4120	4118	Natural Channel		708	1	2	2	2	3	434.0	429.8	434.2	433.3	434.2	433.5	434.2	433.7	434.2	433.8	434.2	433.9
Link_165	3779	1824	Natural Channel		400	86	110	123	135	144	461.4	460.9	465.3	464.8	465.8	465.3	466.1	465.5	466.3	465.8	466.4	465.9
Link_166	Node_11	3613	Natural Channel		1076	33	39	42	44	46	437.8	436.6	441.9	441.8	443.6	443.6	444.7	444.7	445.5	445.5	446.2	446.2
Link_167	3208	2975	Natural Channel		331	51	67	80	92	100	469.1	471.9	474.6	474.4	475.0	474.8	475.3	475.1	475.5	475.3	475.7	475.4
Link_168	3461	235	Natural Channel		251	9	12	14	17	18	464.0	463.1	469.1	469.1	469.3	469.3	469.5	469.5	469.7	469.7	469.8	469.8
Link_169	2333	259	Natural Channel		462	32	42	50	61	69	462.8	462.2	465.4	465.1	465.9	465.6	466.2	465.9	466.6	466.3	466.9	466.7
Link_17	1145	Node_21	Circular	8	195	2	2	3	3	3	522.5	524.5	530.8	525.2	532.6	525.3	534.2	525.3	535.8	525.4	537.2	525.5
Link_170	3495	4012	Natural Channel		89	34	38	43	46	49	436.7	436.3	441.6	441.6	443.3	443.3	444.3	444.3	445.1	445.1	445.8	445.8
Link_171	2732	1656	Natural Channel		144	30	37	38	39	40	438.7	437.8	442.1	442.1	443.9	443.9	445.1	445.1	445.9	445.9	446.6	446.6
Link_172	4018	4013	Natural Channel		30	43	49	52	55	57	436.2	436.1	440.7	440.7	442.0	442.0	442.9	442.9	443.5	443.5	444.1	444.1
Link_173	3967	3968	Natural Channel		30	21	20	20	20	21	456.0	457.2	461.4	461.4	464.4	464.4	466.5	466.5	467.9	467.9	468.7	468.7
Link_174	3022	3048	Natural Channel		1130	16	19	19	20	20	455.1	451.4	460.7	460.7	463.6	463.6	465.7	465.7	467.2	467.2	468.1	468.1
Link_175	3080	3584	Natural Channel		73	42	49	52	55	57	436.3	436.4	439.6	439.6	440.4	440.4	440.9	440.9	441.3	441.3	441.6	441.6
Link_177	1608	1820	Natural Channel		1155	37	50	59	71	80	461.3	459.6	464.5	463.1	464.9	463.5	465.2	463.8	465.4	464.1	465.7	464.6
Link_178	2511	135	Natural Channel		1625	10	14	17	18	20	462.4	464.1	469.0	466.5	469.1	467.0	469.2	467.4	469.2	468.0	469.3	468.5
Link_179	3334	3456	Natural Channel		361	9	12	14	16	18	463.5	463.6	469.1	469.1	469.3	469.3	469.4	469.4	469.6	469.6	469.7	469.7
Link_18	Node_29	Node_37	Circular	36	259	13	17	19	20	21	501.1	500.6	507.2	507.1	508.7	508.6	509.9	509.7	510.8	510.5	511.3	511.1
Link_180	3465	2581	Natural Channel		329	9	12	14	16	18	463.0	462.5	469.1	469.1	469.2	469.2	469.3	469.3	469.4	469.4	469.5	469.5
Link_181	1679	1661	Natural Channel		311	32	40	42	41	42	437.8	437.4	442.5	442.5	444.5	444.5	445.8	445.8	446.6	446.6	447.3	447.3
Link_182	2616	Node_34	Natural Channel		153	77	82	84	87	89	434.1	435.7	440.4	440.4	440.9	440.9	441.2	441.2	441.4	441.4	441.6	441.6
Link_183	2976	312	Natural Channel		21	0	0	0	0	0	442.8	440.2	442.8	440.4	442.8	440.4	442.8	440.4	442.8	440.4	442.8	440.4
Link_184	3237	2897	Natural Channel		117	0	0	2	4	5	437.0	436.8	442.0	440.0	442.0	440.0	442.1	440.0	442.2	440.0	442.3	440.0
Link_185	2582	2523	Natural Channel		31	9	12	14	16	18	462.4	462.5	469.0	469.0	469.1	469.1	469.2	469.2	469.2	469.2	469.3	469.3
Link_186	2093	1976	Natural Channel		1580	161	203	228	252	267	476.6	477.2	484.3	484.0	485.0	484.7	485.4	485.1	485.7	485.4	485.9	485.6
Link_187	1727	2604	Natural Channel		562	-2	2	-2	2	1	441.5	436.6	441.5	440.5	441.5	440.9	441.5	441.2	441.5	441.4	441.6	441.6
Link_188	573	4214	Natural Channel		274	0	0	0	0	0	446.5	445.2	446.5	445.4	446.5	445.4	446.5	445.4	446.5	445.4	446.5	445.4
Link_189	4185	2605	Natural Channel		340	0	0	0	1	-1	469.7	465.3	469.8	469.1	469.8	469.3	469.8	469.5	469.8	469.7	469.8	469.8
Link_19	Node_23	1232	Circular	8	12	2	2	3	3	3	521.7	519.0	522.3	521.4	522.5	521.6	522.9	521.6	523.2	521.8	523.5	521.9
Link_190	3896	Node_6	Natural Channel		2367	53	77	94	107	114	411.5	416.0	418.9	418.8	419.5	419.4	419.8	419.8	420.2	420.1	420.3	420.3
Link_191	2605	3730	Natural Channel		968	-2	-3	-4	-5	-5	465.3	463.4	469.1	469.1	469.3	469.3	469.5	469.5	469.7	469.7	469.8	469.8
Link_192	4070	4073	Natural Channel		115	72	83	91	98	104	421.6	409.7	422.8	410.1	422.9	410.2	422.9	410.2	423.0	410.3	423.0	410.3
Link_193	4096	3034	Natural Channel		915	24	31	35	39	42	440.8	423.0	442.3	435.7	442.4	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_194	4058	4092	Natural Channel		754	2	3	3	3	3	437.6	429.2	439.1	435.7	439.6	439.6	442.9	442.9	446.3	446.3	449.0	449.0
Link_195	4065	4069	Natural Channel		95	72	83	91	98	104	424.6	422.3	434.0	434.0	437.3	437.3	440.1	440.1	443.0	443.0	445.4	445.4
Link_196	Node_8a	2602	Natural Channel		489	23	27	30	33	35	450.9	449.7	457.4	457.4	459.9	459.9	462.1	462.1	464.3	464.3	466.1	466.1
Link_197	3454	237	Natural Channel		88	29	38	44	56	63	461.3	462.8	466.1	466.1	466.7	466.7	467.1	467.1	467.8	467.8	468.3	468.3
Link_198	Node_28	1	Natural Channel		1018	8	13	13	14	-18	460.7	457.8	462.4	462.4	465.4	465.4	467.3	467.3	468.6	468.6	469.2	469.2
Link_199	817	2934	Natural Channel		478	117	146	164	178	187	478.4	478.4	484.9	484.6	485.7	485.5	486.2	486.0	486.6	486.4	487.0	486.7
Link_2	1049	2033	Circular	12	176	0	0	2	3	4	501.1	509.1	507.6	509.1	509.4	509.3	510.5	509.7	511.1	509.8	511.5	509.9
Link_20	Node_30	Node_26	Circular	12	298	0	0	0	0	0	522.0	519.2	522.0	519.4	522.0	521.1	522.2	522.2	523.0	523.0	523.5	523.5
Link_200	1809	817	Natural Channel		1969	116	141	155	167	174	479.8	478.4	485.7	484.9	486.4	485.7	486.8	486.2	487.1	486.6	487.4	487.0
Link_201	3447	3454	Natural Channel		1900	30	41	49	49	55	464.1	461.3	466.3	466.1	466.8	466.7	467.2	467.1	467.8	467.8	468.4	468.3
Link_203	2536	2394	Natural Channel		1799	23	34	42	51	57	462.5	456.4	464.7	463.4	464.9	463.7	465.1	463.9	465.2	464.0	465.3	464.1
Link_204	2809	2628	Natural Channel		3238	12	17	22	26	29	466.3	466.2	471.9	470.9	472.2	471.5	472.4	471.9	472.6	472.3	472.9	472.7

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Link_205	2394	4149	Natural Channel		587	55	79	97	115	129	456.4	459.7	463.4	463.0	463.7	463.1	463.9	463.2	464.0	463.3	464.1	463.4
Link_206	2874	2607	Natural Channel		420	12	17	22	26	29	466.3	464.5	470.8	470.8	471.3	471.3	471.7	471.7	472.1	472.1	472.4	472.4
Link_207	4213	1733	Natural Channel		675	0	0	0	0	0	445.0	441.9	445.0	442.1	445.0	442.1	445.0	442.1	445.0	442.1	445.0	442.1
Link_208	2601	2617	Natural Channel		508	22	33	41	49	56	466.9	464.1	468.0	468.0	468.6	468.6	469.0	469.0	469.4	469.4	469.7	469.7
Link_209	3025	2995	Natural Channel		385	5	6	8	12	13	477.8	467.8	478.4	475.0	478.4	475.1	478.5	475.2	478.5	475.3	478.5	475.3
Link_21	Node_26	Node_27	Circular	12	208	0	0	1	0	1	519.4	519.1	519.4	519.1	521.1	521.1	522.2	522.2	523.0	523.0	523.5	523.5
Link_210	2965	4170	Natural Channel		441	34	51	64	77	88	545.2	535.4	546.3	538.9	546.5	539.3	546.6	539.8	546.7	540.5	546.8	541.1
Link_211	2649	4115	Natural Channel		385	7	10	11	13	15	430.3	425.5	431.2	430.2	431.4	431.2	432.0	432.0	432.7	432.7	433.2	433.2
Link_213	2282	1714	Natural Channel		1211	45	54	52	52	57	450.4	446.0	458.6	458.6	461.0	461.0	462.5	462.5	463.7	463.7	464.7	464.7
Link_214	1905	Node_3	Natural Channel		863	17	23	28	33	36	462.5	429.1	464.0	430.2	464.2	430.4	464.3	430.5	464.4	430.6	464.5	430.6
Link_215	4175	1941	Natural Channel		1186	0	0	0	0	0	504.8	464.8	504.8	467.1	504.8	467.3	504.8	467.5	504.8	467.7	504.8	467.8
Link_216	3290	2626	Natural Channel		910	236	311	359	399	430	446.6	446.1	455.0	455.0	456.1	456.1	456.8	456.8	457.4	457.4	457.9	457.9
Link_217	2614	2621	Natural Channel		319	22	33	42	50	56	465.0	463.8	466.7	466.7	467.2	467.2	467.5	467.5	467.7	467.7	468.0	468.0
Link_218	3940	2950	Natural Channel		267	7	10	12	14	16	425.6	425.1	427.5	427.0	427.7	427.0	427.8	427.0	427.9	427.0	428.0	427.0
Link_219	Node_10	3317	Natural Channel		232	57	64	70	75	79	434.9	430.6	436.1	435.0	436.2	435.4	436.3	435.6	436.3	435.8	436.4	435.9
Link_22	Node_27	Node_25	Circular	12	140	0	0	1	1	2	519.1	516.8	519.1	518.3	521.1	521.1	522.2	522.2	523.0	523.0	523.5	523.5
Link_220	3381	4173	Natural Channel		222	16	31	54	85	110	516.8	513.3	518.2	514.2	518.6	514.6	519.0	515.0	519.5	515.4	519.8	515.7
Link_221	4170	3470	Natural Channel		1444	16	32	54	92	119	535.4	517.6	538.9	518.8	539.3	519.5	539.8	521.7	540.5	526.2	541.1	531.1
Link_222	2216	2188	Natural Channel		383	20	27	31	33	34	560.0	549.7	560.5	551.4	560.6	551.7	560.7	551.9	560.7	552.0	560.7	552.1
Link_224	3436	2503	Natural Channel		1311	1	2	4	5	6	508.0	497.9	508.1	506.2	508.3	507.1	508.6	508.0	508.8	508.8	509.4	509.4
Link_225	169	4000	Natural Channel		427	19	25	31	36	41	430.5	430.2	432.5	431.7	432.7	432.0	432.8	432.2	433.0	432.3	433.1	432.5
Link_226	318	2085	Natural Channel		175	29	38	45	56	63	462.8	462.6	466.0	466.0	466.5	466.5	466.9	466.8	467.4	467.4	467.9	467.9
Link_227	3269	2569	Natural Channel		244	-1	-2	-2	-2	-3	503.6	504.6	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0	507.0
Link_228	Node_6	4129	Natural Channel		3092	111	167	205	239	265	416.0	406.0	418.8	407.8	419.4	408.0	419.8	408.1	420.1	408.2	420.3	408.2
Link_229	Node_36	3896	Natural Channel		224	30	43	52	59	63	410.2	411.5	418.9	418.9	419.5	419.5	419.9	419.8	420.2	420.2	420.3	420.3
Link_23	Node_25	Node_24	Circular	15	348	0	2	3	3	3	516.8	515.1	518.3	518.3	521.1	521.1	522.2	522.2	523.0	523.0	523.5	523.5
Link_231	Node_19	3743	Natural Channel		342	1	2	2	2	3	421.2	412.1	421.3	418.9	421.3	419.5	421.3	419.9	421.3	420.2	421.3	420.3
Link_233	3001	3486	Natural Channel		276	49	60	65	70	74	425.2	430.8	434.0	433.8	434.2	434.0	434.3	434.2	434.5	434.3	434.6	434.4
Link_24	Node_24	1856	Circular	15	220	0	2	3	3	4	515.1	514.3	518.3	518.3	521.1	521.1	522.2	522.2	523.0	523.0	523.5	523.5
Link_25	3716	1333	Circular	36	0	13	14	16	17	18	446.9	443.1	447.9	446.8	448.0	447.5	448.1	448.1	448.7	448.6	449.2	449.1
Link_26	2142	Node_31	Circular	12	97	5	8	9	11	11	727.2	719.7	727.7	720.6	727.9	720.9	728.0	721.0	729.7	721.2	730.1	721.2
Link_27	Node_31	Node_32	Circular	12	143	5	8	9	11	11	719.7	703.0	720.2	703.9	720.3	704.1	720.4	704.3	720.4	704.5	720.4	704.5
Link_28	Node_32	Node_33	Circular	12	168	5	8	9	11	11	703.0	683.0	703.5	683.9	703.6	684.2	703.7	684.3	703.7	684.5	703.7	684.5
Link_29	Node_33	1071	Circular	12	89	5	8	9	11	11	683.0	672.5	683.5	673.5	683.6	673.7	683.7	673.9	683.7	674.0	683.8	674.0
Link_3	636	611	Circular	24	193	6	8	8	9	9	442.8	442.3	444.9	444.7	448.2	448.0	449.3	449.2	450.0	449.9	450.7	450.5
Link_30	Node_18	Node_3-E	Natural Channel		483	34	51	65	78	88	588.2	559.3	589.5	561.8	589.6	561.9	589.8	562.0	589.9	562.1	589.9	562.1
Link_31	2300	Node_13	Circular	48	50	33	42	44	43	46	438.1	438.0	443.1	443.1	445.5	445.5	446.8	446.8	447.7	447.6	448.3	448.3
Link_32	3048	Node_8a	Circular	12	44	8	9	10	10	10	451.4	450.9	459.0	457.4	461.5	459.9	463.7	462.1	465.6	464.3	467.0	466.1
Link_33	3048	Node_8a	Circular	12	44	8	9	10	10	10	451.4	450.9	459.0	457.4	461.5	459.9	463.7	462.1	465.6	464.3	467.0	466.1
Link_34	Node_37	Node_39	Circular	36	382	13	17	19	20	21	500.6	500.0	507.0	506.9	508.5	508.2	509.6	509.2	510.4	510.1	510.9	510.6
Link_35	4067	4065	Circular	30	87	36	41	45	49	52	424.9	424.6	434.7	434.0	438.2	437.3	441.1	440.1	444.2	443.0	446.8	445.4
Link_36	4067	4065	Circular	30	87	36	41	45	49	52	424.9	424.6	434.7	434.0	438.2	437.3	441.1	440.1	444.2	443.0	446.8	445.4
Link_37	Node_39	Node_40	Circular	36	332	13	17	19	20	20	500.0	499.4	506.8	506.7	508.1	507.9	509.1	508.9	510.0	509.7	510.5	510.3
Link_38	Node_9	3558	Circular	48	447	32	41	48	54	56	425.1	424.4	427.3	426.7	427.7	427.1	428.0	427.3	428.4	427.8	428.6	427.9
Link_39	3620	3486	Circular	27	421	2	3	3	4	4	431.4	431.0	433.8	433.8	434.0	434.0	434.2	434.2	434.4	434.3	434.5	434.4
Link_3-E	Node_3-E	Node_5-E	Circular	32	40	16	24	31	38	43	559.4	557.7	560.1	558.5	560.3	558.7	560.5	558.8	560.6	559.0	560.7	559.0
Link_4	Node_8	170	Circular	30	80	36	41	45	49	52	539.0	538.1	546.0	545.4	546.6	545.8	547.0	546.1	547.5	546.4	547.8	546.5
Link_40	Node_40	2653	Circular	36	150	13	17	19	20	20	499.4	499.2	506.6	506.5	507.7	507.6	508.6	508.5	509.5	509.4	510.1	510.0
Link_41	2567	2564	Rectangular		220	79	98	113	126	134	418.8	417.6	420.5	420.0	420.9	420.5	421.1	420.8	421.4	421.0	421.5	421.2
Link_42	3030	3351	Rectangular		53	103	133	150	165	176	458.9	458.8	461.6	461.5	461.9	461.9	462.1	462.1	462.3	462.3	462.4	462.4
Link_43	Node_13	Node_5	Circular	48	55	33	42	44	43	46	430.4	428.9	442.9	442.9	445.2	445.1	446.5	446.5	447.3	447.3	448.0	447.9
Link_44	2567	2564	Rectangular		220	79	98	113	126	134	418.8	417.6	420.5	420.0	420.9	420.5	421.1	420.8	421.4	421.0	421.5	421.2
Link_45	3486	3811	Circular	48	29	19	22	22	22	22	431.0	430.9	433.8	433.8	434.0	434.0	434.2	434.2	434.3	434.3	434.4	434.4
Link_46	3034	3044	Circular	48	249	17	19	16	16	18	423.0	422.9	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_47	Node_4	4091	Circular	42	36	12	16	19	23	24	438.4	437.3	439.0	438.0	439.6	439.6	442.9	442.9	446.3	446.3	449.0	449.0
Link_48	4044	3953	Circular	60	30	33	46	55	64	71	507.9	508.0	510.8	510.8	511.2	511.1	511.4	511.4	511.6	511.6	511.7	511.7
Link_49	737	Node_35	Circular	24	509	8	11	12	12	13	449.8	448.0	451.0	449.0	451.3	450.1	452.8	451.3	453.2	451.7	453.5	451.9
Link_4-E	Node_3-E	Node_5-E	Circular	32	40	18	27	33	40	45	559.3	557.9	560.1	558.8	560.3	559.0	560.5	559.1	560.6	559.2	560.7	559.3
Link_5	1083	3919	Circular	36	295	13	16	19	20	21	493.7	493.0	495.2	494.7	499.8	499.7	501.1	501.1	501.8	501.8	502.2	502.2
Link_50	Node_35	3058	Circular	18	487	8	11	12	12	13	445.9	442.0	447.0	443.1	448.7	443.2	449.7	443.2	450.0	443.2	450.2	443.2
Link_51	237	318	Circular	36	0	14	19	22	28	32	462.8	462.8	466.1	466.0	466.6	466.5	466.9	466.9	467.5	467.4	468.0	467.9
Link_52	Node_21	Node_23	Circular	21	320	2	2	3	3	3	524.5	521.7	524.9	522.8	524.9	523.3	525.0	523.9	525.0	524.5	525.0	525.0

APPENDIX B HYDRAULIC PERFORMANCE OF SPRINGFIELD STORMWATER SYSTEM
FUTURE CONDITIONS

Segment ID	Node ID		Segment Type	Segment Size (inch)	Segment Length (ft)	Peak Flows (cfs)					Invert Elevation (ft)		Water Surface Elevations Under Future Conditions (ft.)									
													2-Year		5-Year		10-Year		25-Year		100-Year	
	US	DS				2-Year	5-Year	10-Year	25-Year	100-Year	US	DS	US	DS	US	DS	US	DS	US	DS	US	DS
Link_53	200	1891	Circular	36	28	30	41	47	52	55	540.7	540.4	543.2	543.1	543.7	543.6	544.0	543.9	544.3	544.1	544.4	544.2
Link_54	3439	Node_28	Natural Channel		783	-3	-6	-8	-11	-15	463.2	460.7	463.4	462.4	465.4	465.4	467.3	467.3	468.6	468.6	469.2	469.2
Link_55	3550	Node_9	Circular	48	440	32	41	48	54	56	425.8	425.1	428.1	427.6	428.5	428.0	428.8	428.3	429.3	428.7	429.6	428.9
Link_56	3743	Node_36	Natural Channel		308	26	40	48	55	58	412.1	410.2	418.9	418.9	419.5	419.5	419.9	419.9	420.2	420.2	420.3	420.3
Link_6	3113	1266	Circular	48	306	5	7	8	10	10	460.9	461.1	462.1	462.0	462.3	462.2	463.5	463.5	464.4	464.4	465.1	465.1
Link_61	3449	2216	Circular	24	80	22	30	34	36	38	561.0	560.3	562.7	561.9	563.3	561.9	563.7	561.9	564.0	561.9	564.2	561.9
Link_62	2390	1524	Circular	6	14	2	2	2	2	2	464.1	464.1	468.2	466.7	468.5	467.2	468.8	467.6	469.0	467.9	469.1	468.2
Link_64	4091	4092	Natural Channel		107	12	16	18	23	23	436.6	429.2	437.4	435.7	439.6	439.6	442.9	442.9	446.3	446.3	449.0	449.0
Link_65	3153	3141	Natural Channel		30	4	5	6	7	9	435.7	436.4	438.6	438.6	438.9	438.9	440.7	440.7	441.8	441.8	442.3	442.3
Link_66	4197	3644	Natural Channel		2600	135	168	194	217	233	420.0	419.0	424.9	421.4	425.2	421.6	425.5	421.8	425.7	421.9	425.8	422.1
Link_67	3141	3133	Natural Channel		447	9	11	13	15	16	436.4	432.9	438.5	436.1	438.9	438.8	440.7	440.7	441.8	441.8	442.3	442.3
Link_68	4123	4197	Natural Channel		716	67	84	98	111	118	422.1	420.0	425.8	424.9	426.1	425.2	426.3	425.5	426.4	425.7	426.6	425.8
Link_69	4115	2959	Natural Channel		73	7	10	11	13	14	425.5	425.1	430.2	430.2	431.2	431.2	432.0	432.0	432.7	432.7	433.2	433.2
Link_6-E	Node_5-E	2947	Natural Channel		375	34	51	65	78	88	556.0	546.2	557.6	548.4	557.8	548.9	558.0	549.3	558.2	549.6	558.3	549.9
Link_7	3000	4231	Natural Channel		75	0	1	1	1	1	434.6	433.5	438.8	438.8	439.3	439.3	439.6	439.6	439.8	439.8	440.0	440.0
Link_70	4116	4115	Natural Channel		646	0	0	1	-1	2	428.0	425.5	432.5	430.2	432.5	431.2	432.5	432.0	432.7	432.7	433.2	433.2
Link_71	1532	4123	Natural Channel		30	67	84	100	111	119	423.9	422.1	425.9	425.8	426.1	426.1	426.3	426.3	426.5	426.4	426.6	426.6
Link_72	4229	4123	Natural Channel		220	0	0	0	0	0	428.3	422.1	428.4	425.8	428.4	426.1	428.4	426.3	428.4	426.4	428.4	426.6
Link_73	3337	1602	Natural Channel		1038	63	72	79	85	91	429.3	427.4	431.7	429.7	431.8	429.9	432.0	430.1	432.1	430.2	432.2	430.3
Link_74_1	1834	Node_74	Natural Channel		1261	37	50	59	71	81	459.8	458.3	462.9	461.2	463.2	461.4	463.5	461.6	463.7	462.2	464.1	463.3
Link_74_2	Node_74	806	Natural Channel		893	38	50	60	76	89	458.3	455.2	461.1	458.3	461.4	459.0	461.6	460.0	462.2	461.8	463.3	463.2
Link_75	4003	3987	Natural Channel		448	35	44	48	50	52	462.0	461.4	466.1	466.0	466.8	466.8	467.3	467.2	467.7	467.6	468.0	468.0
Link_77	1602	4194	Natural Channel		1037	112	136	151	165	175	427.4	421.0	429.7	422.4	429.9	422.6	430.1	422.8	430.2	422.9	430.3	423.0
Link_78	3987	3228	Natural Channel		113	-50	-65	-77	-87	-95	461.4	461.4	466.0	466.1	466.8	466.8	467.2	467.2	467.6	467.7	468.0	468.0
Link_79	1729	2808	Natural Channel		485	15	20	24	28	31	430.0	430.1	432.5	432.5	432.7	432.7	432.9	432.9	433.0	433.0	433.1	433.1
Link_8	Node_7	3597	Natural Channel		4198	8	10	12	14	15	499.6	485.0	501.1	488.3	501.3	489.0	501.3	489.7	501.4	490.3	501.5	490.8
Link_80	4135	1729	Natural Channel		1233	13	17	20	24	26	433.8	430.0	435.5	432.6	435.7	432.7	435.8	432.9	435.9	433.0	435.9	433.1
Link_81	3303	3232	Natural Channel		1806	50	65	77	87	95	462.0	462.4	466.9	466.2	467.6	467.0	468.0	467.5	468.5	468.1	468.9	468.5
Link_82	1539	1584	Natural Channel		104	66	75	82	84	85	423.4	421.5	426.2	426.2	426.5	426.5	426.7	426.7	426.9	426.9	427.0	427.0
Link_83	349	2808	Natural Channel		363	1	2	2	2	3	430.1	430.1	432.5	432.5	432.7	432.7	432.9	432.9	433.0	433.0	433.1	433.1
Link_84	3497	1584	Natural Channel		2143	28	32	33	33	35	424.4	421.5	426.4	426.2	426.7	426.5	426.8	426.7	427.0	426.9	427.1	427.0
Link_85	3811	4118	Natural Channel		657	55	64	70	77	81	430.8	429.8	433.8	433.3	434.0	433.5	434.2	433.7	434.3	433.8	434.4	433.9
Link_87	2787	2776	Natural Channel		1020	93	119	138	158	175	435.3	422.8	437.7	435.9	439.9	439.9	443.3	443.4	447.0	447.0	449.9	449.9
Link_88	Node_22	2775	Natural Channel		1577	-36	-38	-43	-49	-54	425.9	422.4	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_89	4170	291	Natural Channel		764	85	118	133	135	134	535.4	528.2	538.9	533.2	539.3	537.1	539.8	539.5	540.5	540.4	541.1	541.0
Link_9	1049	Node_20	Circular	36	142	13	17	19	22	25	501.6	501.3	507.5	507.4	509.2	509.1	510.5	510.4	511.4	511.3	512.0	511.9
Link_90r	2869	240	Natural Channel		1526	138	176	188	195	200	522.5	511.8	525.7	516.4	526.1	517.6	526.3	517.9	526.3	518.0	526.4	518.1
Link_91r	170	2869	Natural Channel		653	36	41	45	49	52	538.1	522.5	545.1	525.7	545.5	526.1	545.8	526.3	546.0	526.3	546.2	526.4
Link_92	Node_16	4170	Natural Channel		5031	41	62	75	91	104	537.0	535.4	541.9	538.9	542.3	539.3	542.6	539.8	542.8	540.5	543.0	541.1
Link_93	4118	1576	Natural Channel		368	56	65	72	79	84	429.8	428.6	433.3	433.1	433.5	433.3	433.7	433.5	433.8	433.6	433.9	433.7
Link_94	4053	4092	Natural Channel		1543	21	23	20	21	22	435.1	429.2	436.4	435.7	439.6	439.6	442.9	442.9	446.3	446.3	449.0	449.0
Link_95	3044	3	Natural Channel		922	31	37	42	46	49	422.9	418.1	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_96	1571	2095	Natural Channel		252	5	7	7	8	8	454.6	454.5	456.8	456.1	456.8	456.7	457.5	457.4	458.1	458.1	458.6	458.6
Link_97	3907	3204	Natural Channel		2628	28	37	40	43	46	491.9	485.7	494.8	489.3	495.2	490.2	495.3	490.8	495.3	491.2	495.5	491.8
Link_98	Node_15	3034	Natural Channel		595	21	22	21	23	26	428.5	423.0	435.7	435.7	439.6	439.6	442.8	442.8	446.2	446.2	449.0	449.0
Link_99	4108	4107	Natural Channel		222	12	16	19	22	24	485.6	472.7	486.4	474.3	486.4	474.5	486.5	474.7	486.5	474.9	486.6	475.1

APPENDIX C

DHI TECHNICAL MEMO

Memorandum

To: George Walker/City of Springfield

From: Ann Weinstein, Johan Spannare, Rose Wallick-Brink DHI

Cc: Krista Reininga/URS Corporation

Date: November 14, 2007

Updated: August 20, 2008

Project: City of Springfield Stormwater Master Plan

Re: Task 1 and Task 2 Deliverable

Purpose

The memorandum discusses the data sources used to develop the existing and future condition hydrologic and hydraulic model as well as the methods used for building each model.

MIKE URBAN is a complete urban water modeling system, fully integrated with GIS and is comprised of both MIKE URBAN Collection System (CS) and MIKE URBAN Water Distribution (WD). MIKE URBAN is fully dynamic and is capable of mathematically simulating free surface and pressure flow as well as the transition between the two flow regimes. It includes: GIS functionality powered by ESRI's ArcObjects™ components, simulation engines for sewers and water networks, plus tools for importing, entering, analyzing, and visualizing data. For the current project, the MOUSE engine was used to provide a detailed hydrodynamic solution for pipeflow and rainfall-runoff within the MIKE Urban framework. MIKE Urban requires information describing both the physical system (e.g., pipe network, open channels, manholes, outlets) and the hydrology of the study area (e.g., basin boundaries, soil characteristics, etc). Each of the data items are described in more detail in the following sections with respect to the model that was developed for Springfield.

Data Used in Model Development

The following shapefiles from the City were used as the basis for creating the City of Springfield Stormwater MIKE URBAN hydraulic model:

- stm_model_lines_03312006.shp: This shapefile includes the pipes in the City's storm drainage system.
- stm_model_nodes_03312006.shp: This shape file includes manholes and points where pipes connect to ditch and open waterway systems.
- stm_model_waterways_08212006.shp: This shapefile includes the open channels and waterways that are part of the City's storm drainage system.
- xsections_model_08242006.shp: This shapefile included the locations of cross-sections along the waterways.

- Sf_stm_basin_ply.shp: This shape file included the catchment areas delineated by the City.

To develop the cross sections of the waterways, the Excel spreadsheet xsections_model_08242006.xls was used. This file was provided by the City and contained information regarding the location of the cross section along the reach and the geometry (the horizontal location along the line of the cross section and the associated depth) of the cross section. The City also provided a Digital Elevation Model (DEM) and aerial photographs, which were used to provide general information about the study area.

A variety of hand written notes about the stormwater system from George Walker of the City of Springfield were also incorporated into the model.

Once all the information was imported into MIKE URBAN, a quality check was conducted to compare the data against the data sources. This quality check was completed by drawing longitudinal profiles of the system and hand checking the inverts, pipe sizes, manhole depths, rim elevations, etc. against the raw data. There were often inconsistencies when comparing data sources. For example, invert elevations from the pipe data did not always match inverts from the cross section data at the same location. If there was an inconsistency between the data sources, priority was given to assigning elevations as follows:

1. Hand written notes from the City
2. Cross section data
3. Pipe data
4. Manhole data

The City's shapefile sf_stm_basin_ply.shp was imported to create the City of Springfield Stormwater MIKE URBAN hydrologic model. The delineated stormwater catchments provided by the City, were then further divided and refined based on network topology and surface topography. The purposes of further refining the catchments were to route runoff and ensure that all runoff was represented in the modeled network, create smaller catchments to better reflect flows in the system, and to distribute the inflow to manholes/model input points.

Development of the Hydraulic Model

In MIKE URBAN it is essential that identifying attributes for all channels, cross sections, pipes, and manholes are unique. However, the City's naming convention did not provide a mechanism in which a unique ID for each of these modeled elements could be generated. Therefore, for continuity, the City's names were retained in a column in

MIKE URBAN (i.e., the Asset ID column), and a unique name was automatically generated for each manhole, pipe, waterway, and cross section.

The City's delineation of network geometry at flow bifurcations (e.g., where a waterway may split into 2 or 3 channels) created a GIS issue which needed to be addressed within MIKE URBAN. In the City's GIS, the bifurcation was defined as a single line which doubled back on itself several times before connecting to the mainstream channel (see example in Figure 1). The model views this as a continuous line where flow would change direction several times before finally entering one of the pipes and continuing downstream. These problem locations were identified and fixed in the system to ensure proper lengths and flow directions.

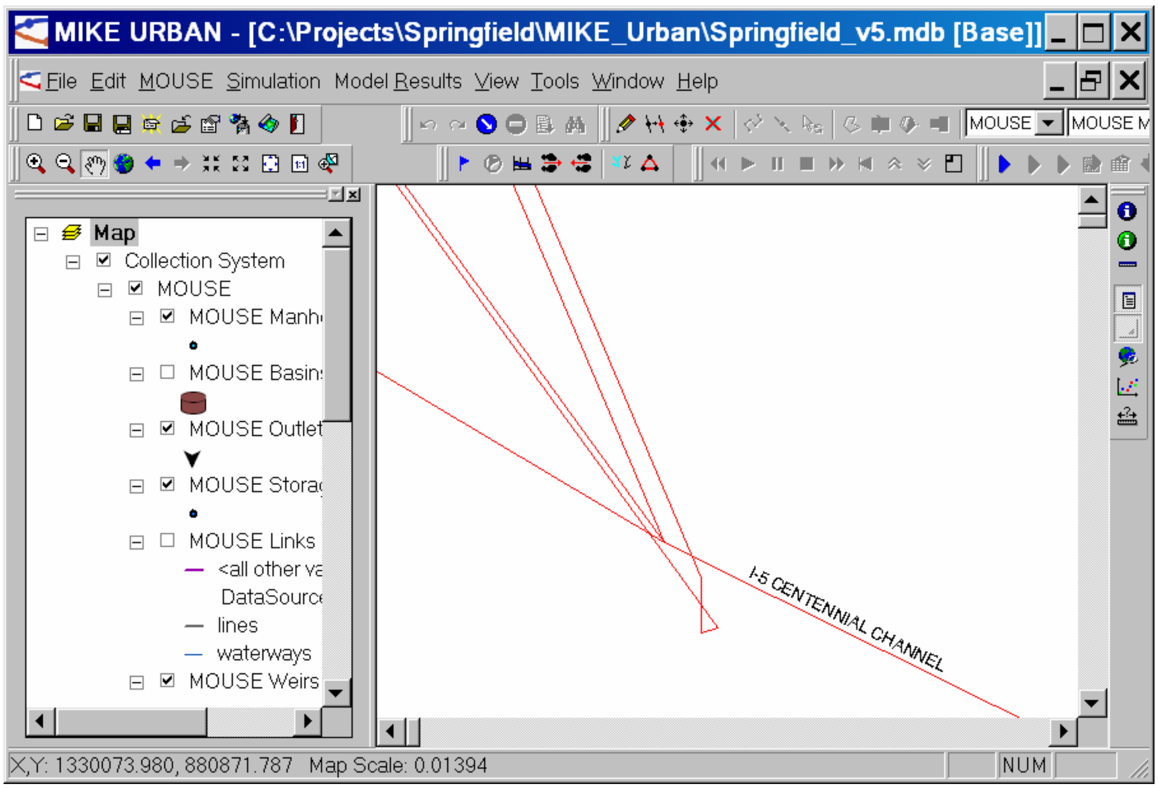

Figure 1: Example of Improper Network Geometry at Flow Bifurcation.

When importing city shapefiles, there were also many instances where a node was not present at the junction of multiple channels. Therefore a node was inserted at each of these locations. The invert and rim elevation of the node was estimated from the cross section data and the DEM provided by the City.

The hydraulic network data included numerous instances where the inverts were not included in the pipe and manhole shapefiles. Figures 2 and 3 show examples of pipe section longitudinal profiles with missing inverts.

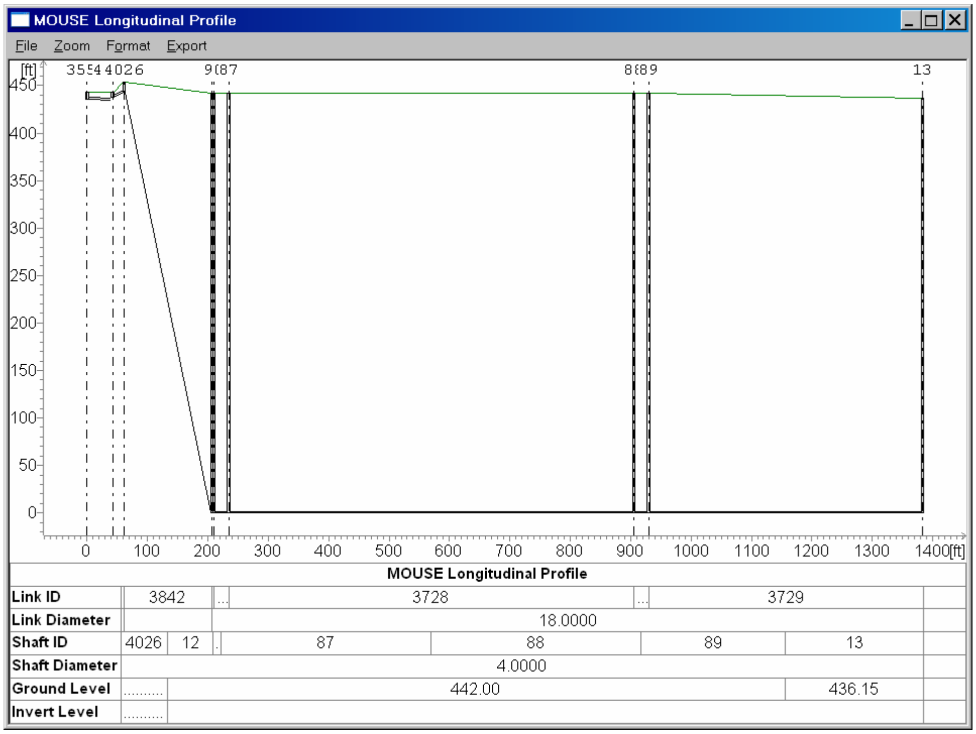

Figure 2: Longitudinal Profile of Network – Example of missing invert.

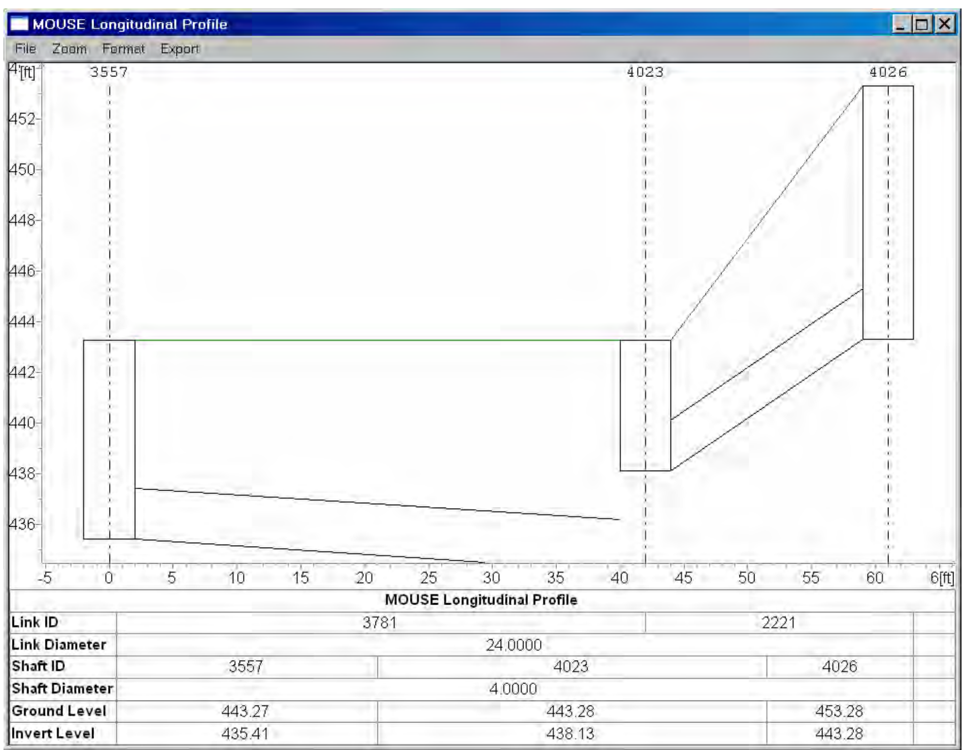

Figure 3: Longitudinal Profile of Network – Example of missing invert.

In these cases, the MIKE URBAN Interpolation and Assignment Tool was used to estimate the missing inverts. In order to determine the elevation for the missing invert, the interpolation tool works by conducting a linear interpolation between nearby nodes with known elevations. For the interpolation tool to work correctly, the missing invert must be located between two or more points with a known elevation. Therefore, if two adjacent nodes are missing elevation data, the tool cannot perform the linear interpolation. Additionally, if an outlet or another point that is not located between two other nodes is missing elevation data, the tool cannot perform the linear interpolation. If the MIKE URBAN Interpolation and Assignment Tool could not be used to estimate the missing information due to the location, the City obtained and provided a field measured value. These assignments of new elevations were reviewed and approved by the City of Springfield.

Screen captures were made of the anomalies and sent to the City of Springfield for review. The City then verified or revised the data based on field measurements or as-built drawings. These modifications were then included in the MIKE URBAN hydraulic model.

In some cases, data anomalies were noted. When these were encountered, the waterway portion of the model was updated using the City's shapefile stm_model_waterways_08212006.shp. The shapefile was updated to make it a model ready file by merging and deleting various lines within the shapefile.

Pipe Data

The pipe data was taken from the shapefile with modifications made as described in the previous section based on hand written notes from the City and based on connecting it with cross-section data. Given the master planning level scope of this project, the model included pipe sizes of a 24" diameter and greater. Smaller sized pipes were only included when necessary as they were located downstream of 24" diameter or larger pipes.

Some pipes had noncircular cross sections. These cross sections were created in Excel and imported to MIKE URBAN (e.g., arch pipes). These cross sections were reviewed and approved by George Walker, City of Springfield.

A material was assigned to each pipe, if available in the pipe database. From the material a roughness value, Manning's number (n), was assigned to each pipe. These values are provided below in Figure 4.

Open Waterway Data

The open waterway cross sections were edited and refined prior to importing the data into MIKE URBAN as follows:

1. <u>Merged Reaches:</u> Reaches were identified that needed to be merged prior to import into MIKE URBAN.

    Certain waterways in the shapefile supplied by the City were composed of multiple reaches that needed to be merged because there were no incoming pipes or nodes along the reaches. The process for merging waterways involved the following:

- Individual reaches within these waterways were sorted so that they appeared in the correct order (from upstream to downstream).
- The point of intersection for each individual reach was identified (e.g., the downstream point of one reach and the upstream end of the next reach), and the reaches were merged based on these locations.
- The chainage for the merged waterway was recalculated to account for the greater length.
- The cross sections within the merged waterway were renamed to match the newly merged waterways. For example, if Reach 1 and Reach 2 of a certain waterway were merged into a single reach, and each of the original reaches had three cross sections, the reach now has six cross sections with the first cross section in Reach 2 becoming the fourth cross section of the reach.

2. Split Reaches: Reaches were identified that needed to be split prior to import into MIKE URBAN.

   Certain waterways in the shapefile supplied by the City were composed of reaches that needed to be split at an incoming pipe that intersected the waterway. The process for splitting waterways involved the following:

   - Individual reaches within waterways were split at incoming pipes.
   - Nodes were inserted at the split location of the waterway.
   - The reaches composing the split waterway were sorted from upstream to downstream.
   - The chainage location for each cross section located along split reaches was recalculated.
   - Cross sections along the split waterway were re-named to match the split waterway.
   - Each cross section was assigned a unique cross section name. The unique name was a concatenation of the new, modified reach name, the last number of the initial reach name and the original cross section name.

3. Conducted a Quality Check:
   - The number of cross section points in each waterway segment was re-calculated to ensure all points had been correctly imported.
   - Cross sections with fewer than three points were not considered to be valid. In cases where cross sections had fewer than three points, the original cross section shape was replaced with the cross section shape of the nearest up or downstream cross section, with the invert (e.g., lowest point in the cross section) being set to equal to the elevation at that location.
   - If there was not a valid cross section within a reach, a default cross section was assigned to represent that reach. The default cross section was devised by reviewing the existing cross sections for a given waterway and determining typical dimensions.
   - All the survey points that fell along the centerline of the waterways with their respective coordinate locations and bed elevations were stored within

the MIKE URBAN topography tables in order to better define the description of the channel bottom level and slope.
- The cross section data was also checked for valid geometry. The first point of the cross section had to be higher than the next and the last point of the cross section had to be higher than the previous point (e.g., the top of bank locations needed to be the first and last points in the cross section). Sections that didn't match this criterion were replaced with another valid cross section from that reach, or with the default section as described above.

4. <u>Prepared Data for Import:</u>

   Four Excel spreadsheets were created to store the data for each of the tables containing cross section and waterway data. The tables are: CRS_D, CRS, TOPO_D, TOPO and are described in more detail below.
   - CRS_D: Contains cross section data. Only the valid cross sections were kept in this sheet. The cross sections with too few points and those with shapes considered to be invalid were deleted. The cross section elevations in this table for each cross-section were ordered according to increasing x-coordinate (e.g., distance from right bank).
   - CRS: Contains a list of the unique identifiers for each of the cross sections.
   - TOPO_D: Contains the chainages, invert elevations and cross section IDs for each open waterway link. The chainage for each open waterway is provided in an ascending order. MIKE URBAN requires chainage points within one meter from the start and end points of each open waterway link. If a cross section was missing at the start or end of a reach, it was inserted by copying a nearby cross section. The bottom elevations for these inserted cross sections were interpolated if there were two or more points on the reach. Otherwise the bottom elevation was set equal to the nearest survey point.
   - TOPO: Contains a list of all topographies (a list of all cross sections associated with an open waterway link).

5. <u>Checked the Model for Consistency:</u>
   - MIKE URBAN requires that the invert levels of nodes connected to open waterways must be equal to, or lower than, the elevation of the last cross section of the upstream channel and the first cross section of the downstream channel.
   - The channel length was checked against the chainage for the most downstream point on the waterway (as provided in original datasets). If the computed channel length was less than the actual chainage, it was edited to match the actual channel length.
   - Topographies for the channels without cross section data were inserted manually.

6. <u>Checked the Model for Accuracy:</u>

Each cross section and waterway was hand checked against the raw data.

7. Estimated a Link roughness:
   Each waterway was given a Manning's number (n) of 0.04. When waterway links were modified as a result of preparing conceptual CIPs, the Manning's n was increased to 0.08 to account for the likelihood of needing to enhance riparian vegetation in association with modifying the channel in order to obtain the appropriate permits.

The following material and roughness values were used in the model for pipes and waterways.

Material/LinkType	Manning (n)
ADSP	0.0130
CAS	0.0130
CON	0.0130
CONCOR	0.0130
Concrete (Rough)	0.0147
Concrete (Smooth)	0.0118
CONWOO	0.0130
COR	0.0130
DI	0.0130
Generic Pipe	0.0130
Generic Waterway	0.0400
PVC	0.0130
STEEL	0.0130
WOO	0.0130
WOOPOL	0.0130
Modified Waterway	0.08

Figure 4: Material and Manning's number (n) in the model

Development of the Existing Condition Hydrologic Model

Working with the City, a decision was made to use the event-based hydrologic model, Model B, instead of the MIKE URBAN RDII model as originally scoped. This decision was made due to the lack of monitoring data needed to complete a MIKE URBAN RDII calibration. Please refer to the MIKE URBAN manual for a detailed description of the Runoff B concept and the parameters used. The hydrologic model data needs to include the following for each catchment: name/ID, area, impervious area, slope, length of flow path, and infiltration information. These model input parameters were developed as follows:

1. Catchment ID: A unique field was created for the catchment ID which is the concatenation of the original ID field present in the shapefile and the FID field which is an automated field of unique values inherit to the shapefiles structure.

2. Catchment Area and Impervious Area: The area, perimeter, and impervious area for each catchment were calculated in ArcGIS. The existing impervious area was based on the spfd_impervious.shp shapefile provided by the City. The following equation was used to calculate the percentage of impervious area for each catchment:
   - IMPERV_SUR = (ACRES * PERCENT_IM / 100)
   - Where:
     i. IMPERV _SUR – represents the area of impervious surfaces in acres
     ii. ACRES – is the area in acres of each catchment
     iii. PERCENT_IM – is the percentage of impervious area in each catchment

3. Slope:
   The slope of each cell of the DEM was calculated using ArcGIS Spatial Analyst's Slope command. The result of this process is referred to as the Slope GRID. The mean slope for each catchment area was then calculated by applying the ArcGIS Spatial Analyst Zonal Statistics command on the Slope GRID, which creates several statistics for a given area (catchment).

4. Length of Flow Path: The length in Model B describes the length of the conceptual catchment flow path. In most cases, the length was automatically calculated using the area divided by the perimeter multiplied by 4, assuming circle shaped areas. Lengths for the areas that have special shapes were estimated manually. The same was true for catchments where the inflow manhole was placed far from the center of the polygon. For circular shaped areas, the following equations were used to calculate the length:
   - Area = pi * r^2
   - Perimeter = 2 * pi * r
   - 4 * Area / Perimeter = 4 * (pi * r^2) / (2 * pi * r) = 2 * r = Diameter

5. Hydrological Model Parameters: For assigning infiltration rates using Model B (a Kinematic Wave rainfall-runoff model) of MIKE URBAN, the surface areas are discerned by two different groups of behaviors; impervious and pervious. For the impervious areas (houses, streets, etc.,) the key factor is steepness. Consequently areas in this group are classified as either being steep or flat. For this study, the percent steep impervious area was calculated by assuming that areas with slope greater than 20 % are considered steep. The remainder of the modeled area is considered flat. For the pervious areas, the key factor is how pervious are the soils. These areas are then classified according to their permeability as either being small, medium and large, which might be better described as slow, medium and fast infiltration rates.

   The following equations were used to calculate the percent steep impervious, flat impervious and the small, medium and large pervious areas:

- Impervious Areas
    - i. Steep = IMPERV_SUR*Steepness/100
    - ii. Flat = IMPERV_SUR*(100-Steepness)/100

- Pervious Areas
    - i. Small = 0
    - ii. Medium = 100 – IMPERV_SUR
    - iii. Large = 0

In MIKE URBAN, the default hydrological model parameter set was used along with the Runoff Model B concept. Figure 5 shows a screen shot of the parameter values used for the system.

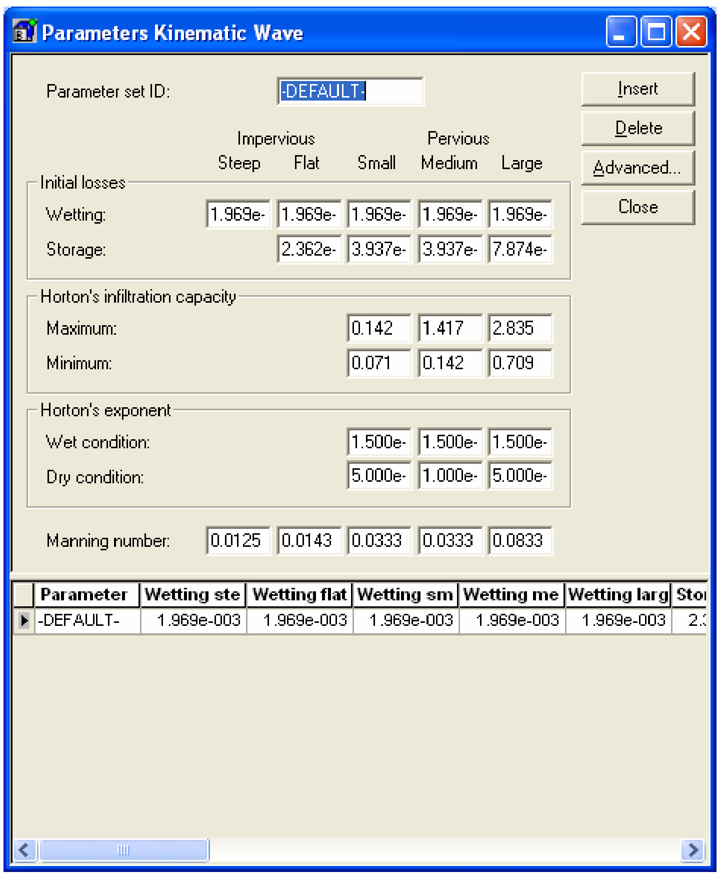

Figure 5: Hydrological Parameters used in Mike Urban

Validation of the Existing Conditions Model

In the next phase of the model work, model results and performance were evaluated and judged against available data and information. As there were no measured flow data available for calibration, the model validation merely consisted of a comparison of modeled results with field observations of flow levels from a 1996 storm event. The November 1996 storm was selected by George Walker (City of Springfield) since the

City had the most ground information recorded for this event and it was an event with significant flooding issues.

In addition to this, George Walker reviewed the model results in more detail, comparing them with the City's in-house knowledge of system performance. A first round of validation results was reviewed and discussed at a meeting in June 2007 (DHI, URS, City of Springfield).

The following storm event/design storms were used when running the model:

- November 1996 storm event. Hourly data records of accumulated rain depth (see Figure 6). Total rainfall depth reached around 7.7 inches throughout a period of about 48 hours.
- SCS Type 1A storm distribution with a rainfall amount of 4.3 inches for the 10 year Storm Event. 10 minute values of rain depth. Agreed upon with the city of Springfield (see Figure 7).
- SCS Type 1A storm distribution with a rainfall amount of 4.8 inches for the 25 year storm Event. 10 minute values of rain depth. Agreed upon with the city of Springfield (see Figure 8).

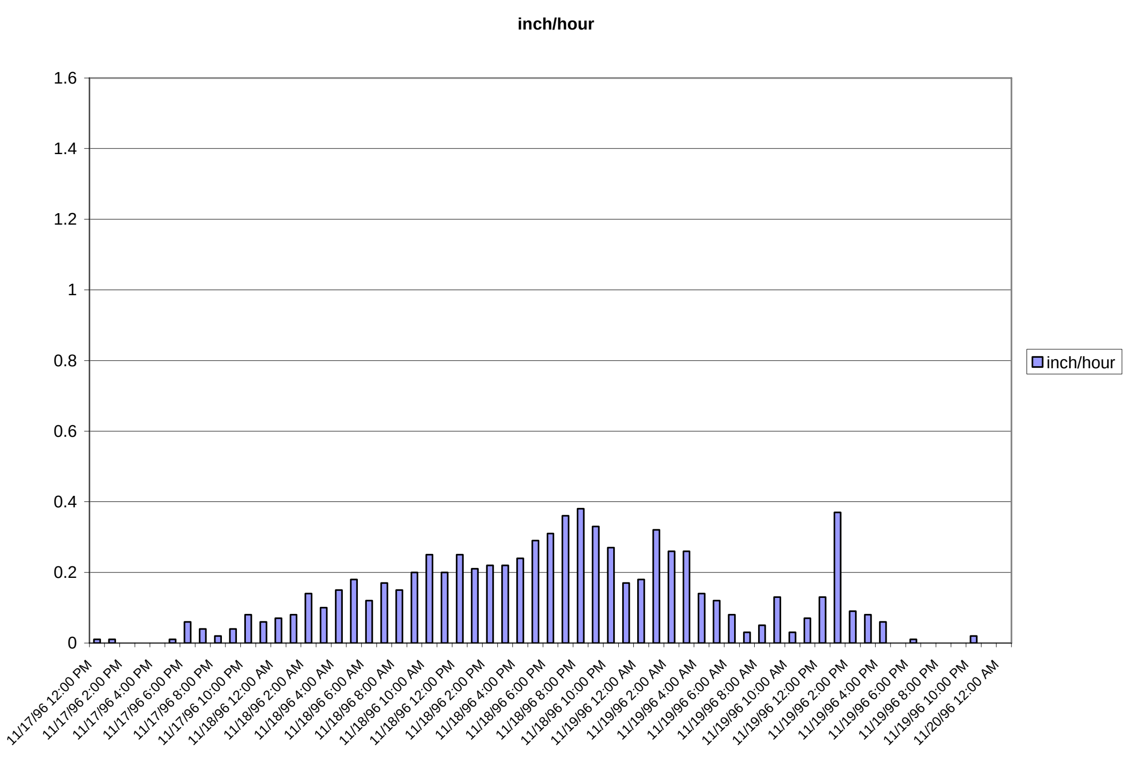

Figure 6 November 1996 Storm Event, Rain Intensity (inch/hour)

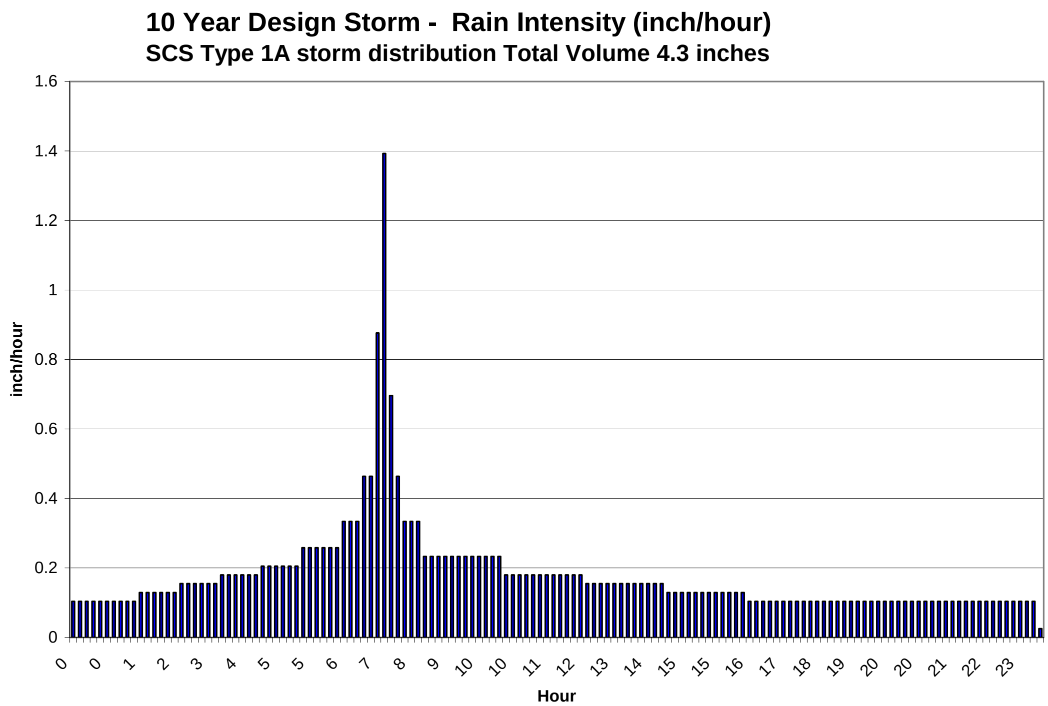

Figure 7 10y Design Storm Event; rain intensity (inch/hour)

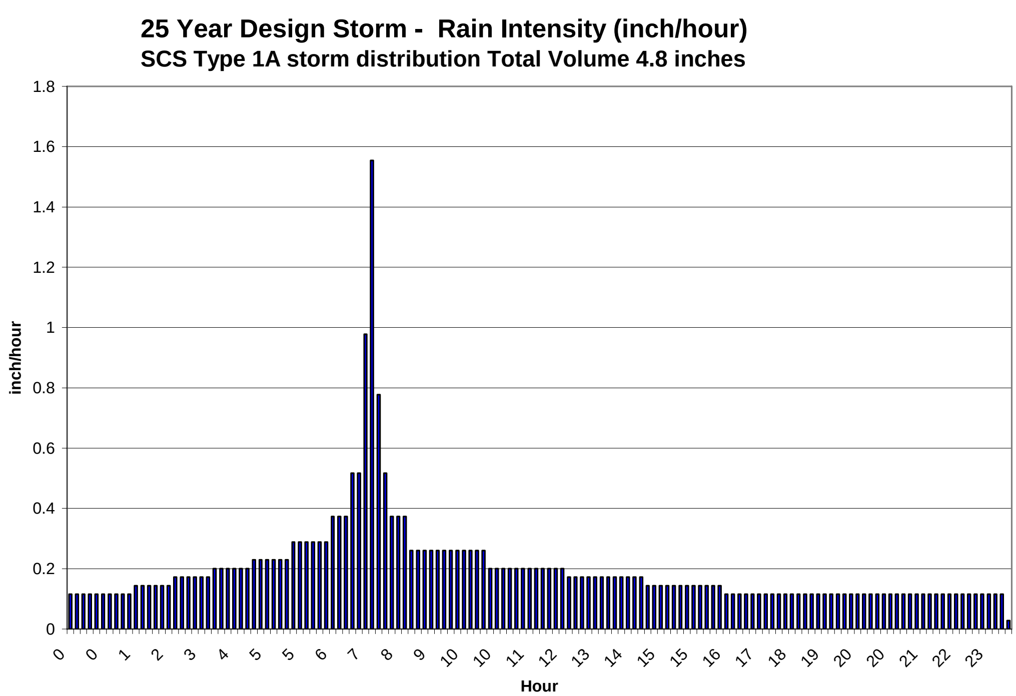

Figure 8 25y Design Storm Event; rain intensity (inch/ hour)

Model Validation Steps

After reviewing model results compared with field observations from the November 96 storm, the following steps towards obtaining a validated model were undertaken:

1. The model was further adjusted as per review by George Walker (City of Springfield). These model adjustments included:
    - The model was adjusted geometrically at selected locations (hand written notes and drawings provided by the City of Springfield), These adjustments included corrections of dimensions and elevations at some locations in accordance with field data or new information provided by the City.
    - The following detention/storage basins were added and/or adjusted in the model: Amberside Pond, Jasper Pond and the Corporate Pond. Geometry and functional data for the basins were interpreted from drawings provided by the City of Springfield.
    - External Boundary conditions were added to some of the river outlets. The water levels were either determined from field measurements or by City in-house knowledge.

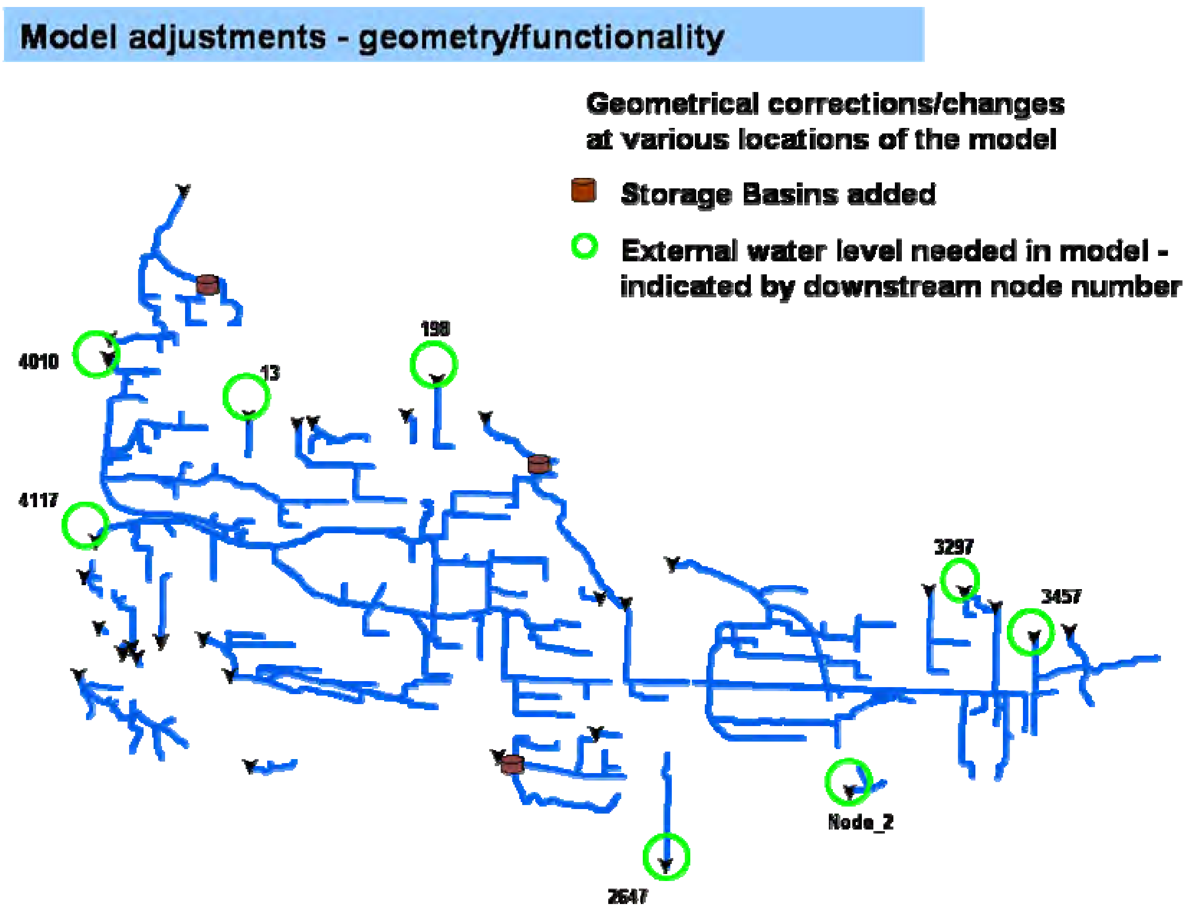

Figure 9 Model adjustments conducted as part of the calibration process

2. Following the review performed by George Walker of model results, additional refinements to the catchment file were also made. The following catchment area refinements were made and provided by the City:
    - Some catchments were modified or further divided in order to better represent the flow distribution in the model.
    - Some catchments were disconnected from the model as they were judged as not contributing to the modeled system.
    - A few new catchments in the Laurel Hill area were added to the model in order to account for flow from the City of Eugene area draining to the southwestern portion of the Glenwood storm water system.
    - For the new and modified catchments basins, the hydrologic model input parameters were redeveloped:
    - For the new and modified catchments, an appropriate connection node was assigned in the model. Wherever necessary, some catchment connections were also modified due to geometrical changes to the system.

Figure 10 shows the catchments connected to the existing system, following the above described adjustments conducted.

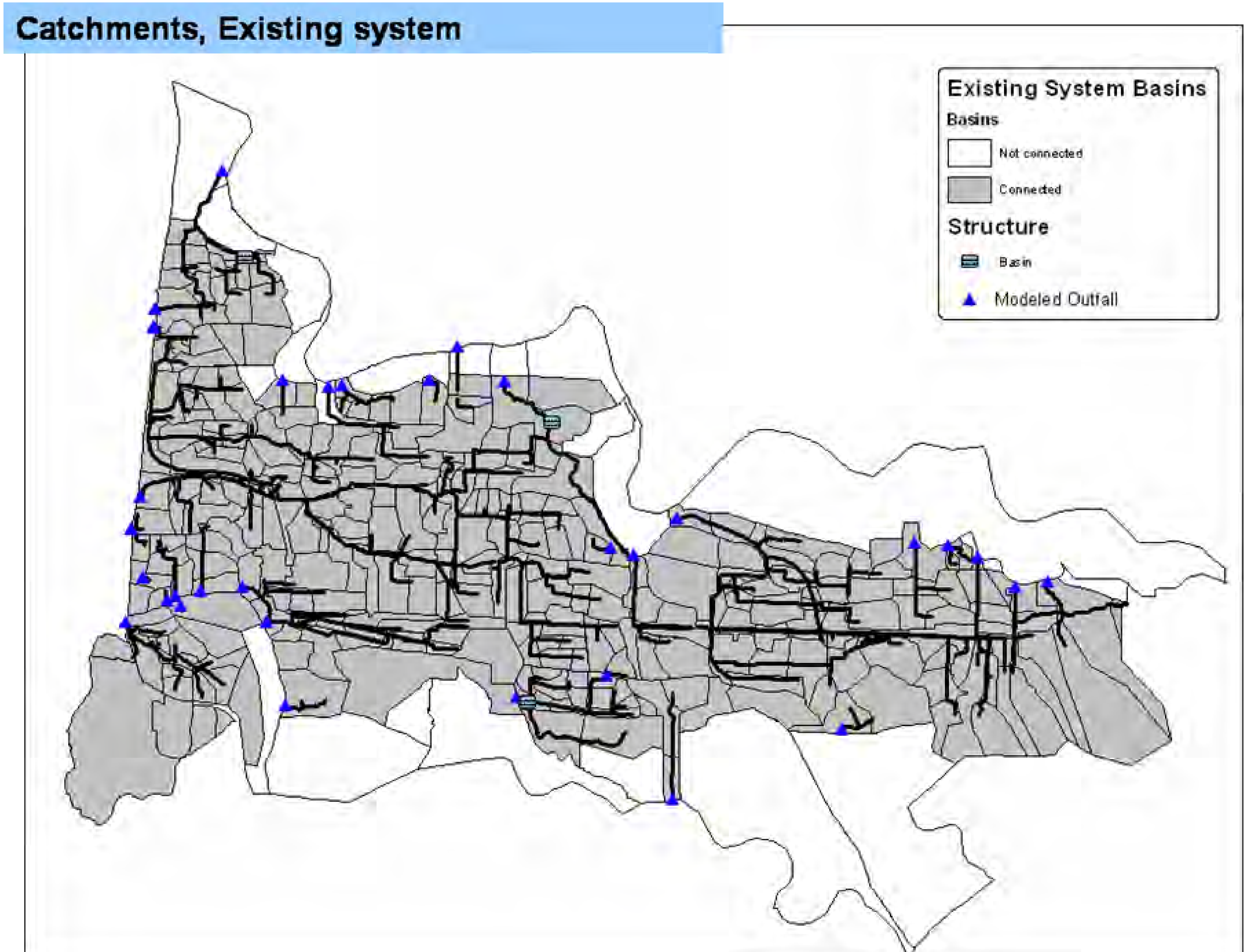

Figure 10

Catchments connected (in gray to the existing system as a result of the calibration steps performed to the model

Development of Flood Maps

The existing conditions model was run to identify capacity deficiencies in the system. Maps were produced to highlight areas where flooding is anticipated for the selected design storms. The technique used when creating flood maps from a model simulation is described below:

Figure 11 shows the maximum water level (in red) along a defined profile. A link is defined from an upstream node/manhole to a downstream node/manhole. In the picture it is obvious that there is flooding taking place in the first few pipe sections, through the manholes and out to the ground surface. The water is not lost from the model but will return once the system obtains sufficient capacity again.

A piped system was not identified as flooding when it was surcharged but only when water came out of the manholes and on to the ground surface.

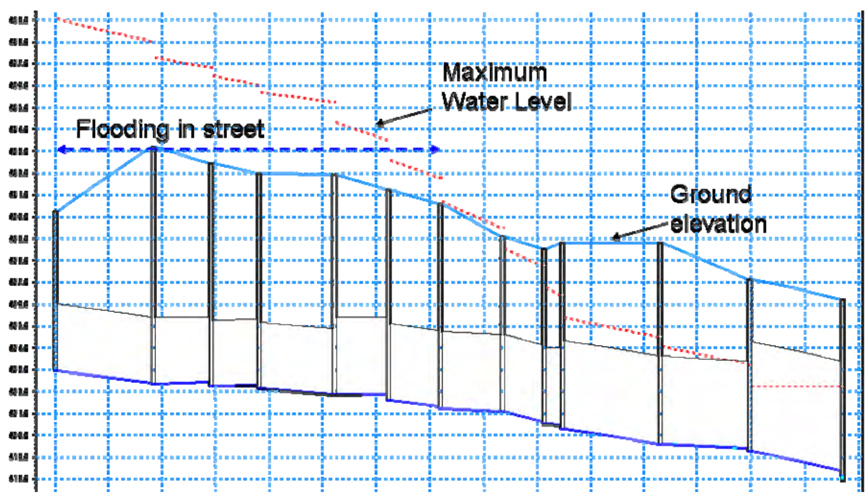

Figure 11 Hydraulic profile showing the inverts of several pipe sections along with the calculated HGL (in red)

Figure 12 shows a typical cross section used in an open waterway link. Typically there are several cross sections along such a waterway link. In the model, the walls of some of the waterways were raised at both sides of the channel up to a certain level (typically 25 ft over the bottom elevation used in the model). This was necessary (using the current version of MIKE URBAN) in order to keep the simulation running and to prevent the water from being lost from the model.

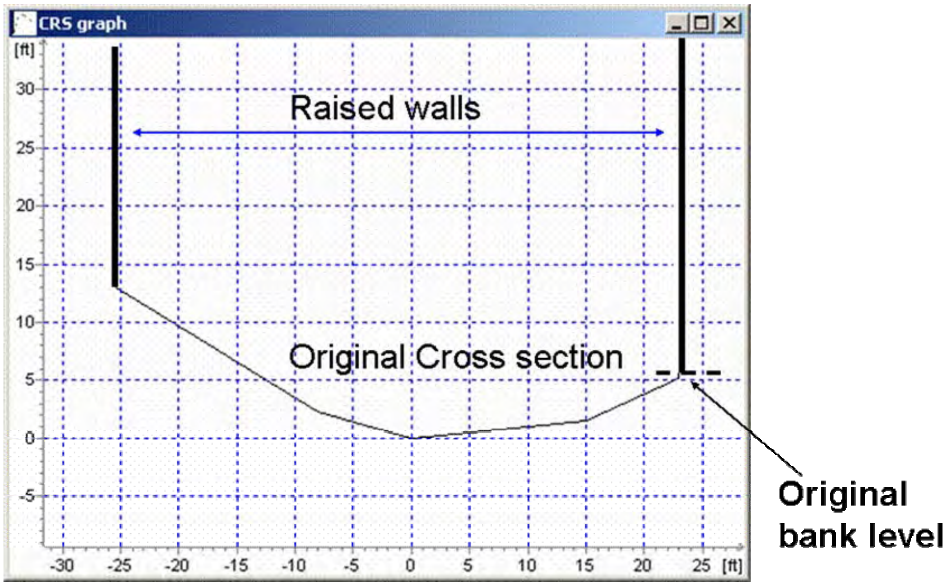

Figure 12 Typical cross section along a waterway used in the model

In order to identify and display the flooding results in the waterways the following steps were undertaken:

- The maximum water level (HGL) for each computational grid point* along each link in the model was extracted from the result file. The maximum level occurs whenever the maximum flow is generated by the rain event used in the simulation.

  * From the hydraulic simulation, hydraulic results are provided from the model not only for the beginning and end of each link, but also for each location where a cross section occurs in the link(computational grid points)

- For every computational grid point along each link the maximum water level was compared with the original bank level (Figure12) of the actual cross section. Flooding was identified as occurring when the maximum water level exceeded the minimum top of bank.

The flooding results were then displayed on maps using ArcGIS for both waterways and pipes. Flooded segments are shown in red **, and segments that were not identified as flooded are shown in green ***.

** This means that if any or a single computational grid point along the link is flooded, the entire link would be shown as flooded on the map.
*** If a link is shown as not flooded, this means that none of the computational grid points along the link are flooded.

Model Validation Results

Once the model validation measures described were performed on the system, the November 4-21 1996 storm was again run through the model and flooding results were mapped. The flood map below illustrates the model estimated flooding results along with areas reported by the City which flooded during this event (see Figure 12).

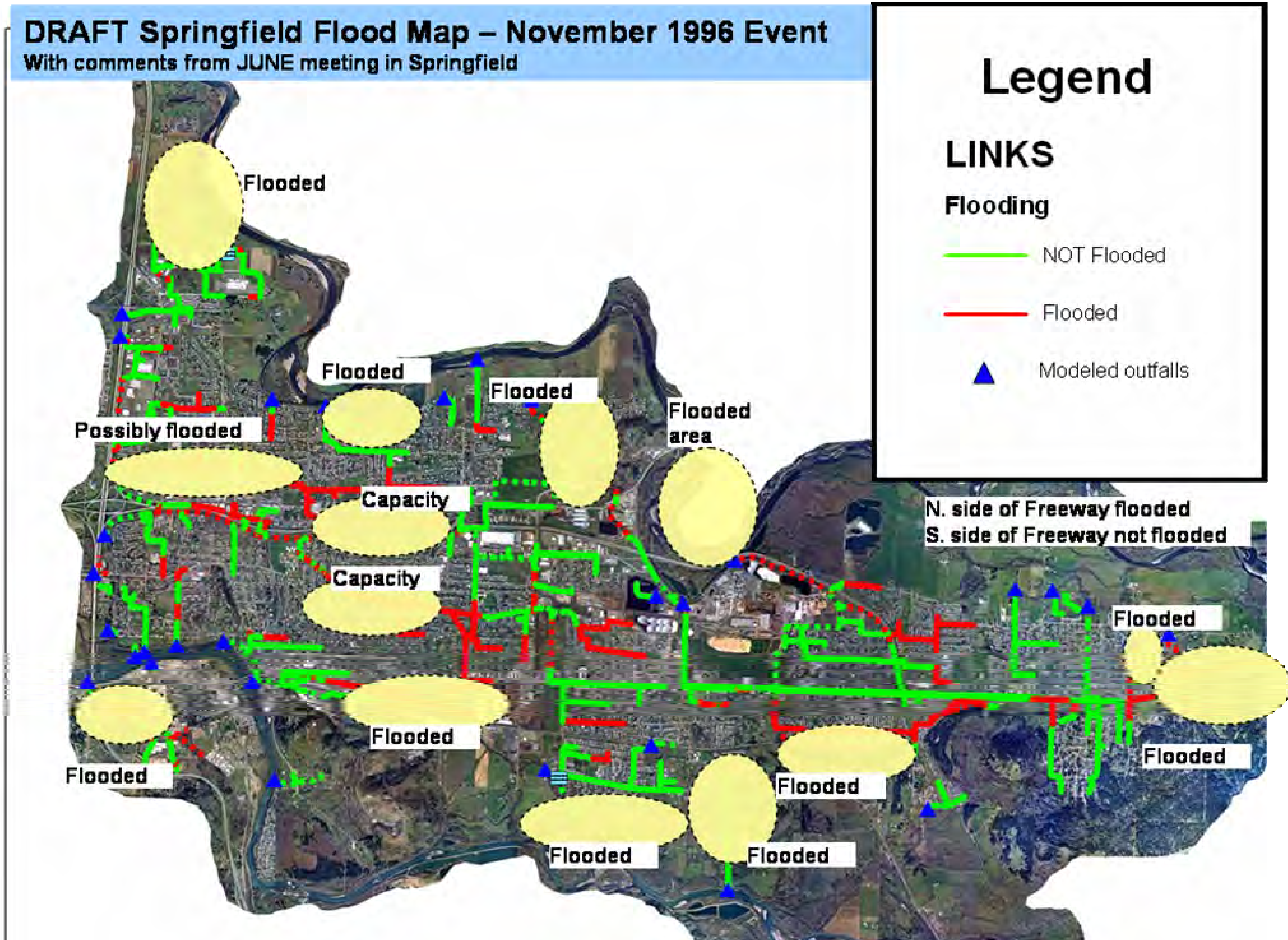

Figure 13

Flood Map Springfield - 1996 Storm Event; observed flooding circled and mapped in the picture along with model estimated results.

The overall results of the model and the agreement between model estimated flood results and field observations (Fig 13) were considered by the City to be satisfactory.

Development of the Future Condition Hydrologic Model

Following the calibration phase of the existing system model, the next step consisted of adjusting the model for future conditions. One difference from the existing conditions and the future conditions model is the number of connected (active) catchments. Some catchments where not anticipated to go "active" until the future condition model scenario, thus the future model includes a few additional contributing catchments as compared to the existing model.

No geometrical/functional changes were made to the model itself. The steps performed towards the development of a future catchment file were basically the same as the ones described in the previous section of this document:

- Redefining catchment areas per information from the City Springfield.
- Using new future impervious area percentages (developed by URS).
- Recalculating model parameters necessary for Runoff Model B.
- Adding/adjusting catchment connections for new and modified catchments.

Another difference between the existing and future condition model is the impervious percentage area used for each catchment. Additional development in the future condition results in a higher cumulative impervious percentage for catchments in the future condition. In order to develop impervious area estimates for each catchment for future conditions, the following process was followed:

1. Project a Future Impervious % for the **Vacant Areas** within Each Catchment:

    - <u>Identify Vacant Areas Slated for Future Development:</u> The lot_use shape file was overlayed on to the catchment areas shape file. For each catchment area, the vacant areas (from the lot_use shape file) were identified.

    - <u>Identify the Future Land Use for the Vacant Areas:</u> The vacant areas were then overlayed with the Plan Designation shape file (PlanDes.shp) in order to predict the type of development anticipated to occur on the vacant lands. The plan designation shape file includes 25 plan designation use codes.

    - <u>Assign an Impervious Percentage to Each Future Land Use Category:</u> For each of the 25 plan designation use codes, a future percent imperviousness was assigned. In order to develop and assign these future impervious percentages, an analysis of the existing impervious percentages by plan designation use code was conducted. The results are provided in Figure 14 below. For each plan designation use code, the city-wide actual existing impervious percentage was calculated using GIS, then the plan designation use codes were sorted into six categories: 1) outside UGB, 2) residential, 3) high density residential, 4) commercial, 5) industrial and 6) open space. Given the expectation that development densities would increase in the future, the projected impervious percentages were subjectively estimated to be somewhat higher than the actual existing average impervious percentages calculated for each of the six categories of plan designation use codes.

- Develop an Area-Weighted Impervious Percentage for Vacant Lands: The projected average impervious percentages from the table below were assigned to the plan designation use codes within the vacant areas. An area-weighted impervious percentage was then developed for the vacant area within each catchment area.

2. Calculate the Actual Existing Impervious % for the **Non-Vacant Areas** within Each Catchment:
   - Develop an Impervious Percentage for the Non-Vacant Lands: The impervious areas from the spfd_impervious.shp file were used to calculate the impervious percentages for only the non-vacant areas in each catchment.

3. Develop an Overall Area-Weighted Impervious Percentage for Each Catchment Area: An overall area-weighted impervious percentage was calculated for each catchment based on: 1) the projected future impervious percentage for the vacant lands, and 2) the actual existing impervious percentage in the non-vacant lands. The calculation that was conducted for each catchment is as follows:

A = % Impervious for the vacant area in the catchment (as described under item 1 above).

a = The area of vacant land within the catchment (as described under item 1 above).

B = % Impervious for the non-vacant area in a catchment (calculated as described under item 2 above).

b = The area of non-vacant land within a catchment (as described under item 2 above).

Overall Future Impervious % for the Catchment = [(A x a) + (B x b)]/(a+b)

In a few cases, the projected future impervious percentage that was calculated for a catchment was smaller than the actual existing impervious percentage. This was due to the fact that in some cases there was a significant amount of impervious area already located within lands designated as vacant. And, these impervious areas already covered more area than anticipated based on projected impervious areas for plan designation use codes. When the future impervious percentage was smaller than the existing impervious percentage, the existing impervious percentage was used in the model for the future conditions scenario.

Plan Desigation Use Code	Plan Designation Use Description	City-Wide Actual Existing Impervious Area in Acres	City-Wide Total Area in Acres	Existing % Impervious	Assigned General Land Use Category	Existing Avg. % Impervious for Each General Land Use Category	Projected Average % Impervious for Each General Land Use Category
No Use Code	Area outside of the UGB (no plan des.)	0.91	2808.23	0.03%	Outside UGB	0%	2%
V	Vacant	*	*	*			
D	Residential, duplex	120.6	307.66	39.20%	Residential	30%	35
E	Education	99.63	309.59	32.18%	Residential		
J	Religious	46.05	132.1	34.86%	Residential		
N	MH on a single lot	90.63	354.39	25.57%	Residential		
S	Residential, Single Family	1059.71	3655.51	28.99%	Residential		
Z	Roads	41.72	164.06	25.43%	Residential		
K	MH in a park	116.39	220.3	52.83%	High Density Residential	51%	55%
M	Residential, Multi-Family	137.88	271.71	50.75%	High Density Residential		
Q	Residential, Group Quarters	3.87	7.21	53.68%	High Density Residential		
Y	Alley Ways, Walkways, Bikepaths	6.97	17.17	40.59%	High Density Residential		
F	Transportation Related	17.58	39.83	44.14%	Commercial	47%	60%
G	Government	34.99	324.19	10.79%	Commercial		
H	Wholesale Trade	46.58	86.86	53.63%	Commercial		
L	Recreation	16.05	49.68	32.31%	Commercial		
O	General Services	193.08	327.51	58.95%	Commercial		
R	Retail Trade	305.62	465.9	65.60%	Commercial		
B	Railroad	10.29	85.89	11.98%	Industrial	30%	45%
C	Communication	1.65	13.91	11.86%	Industrial		
I	Industrial	401.76	1212.71	33.13%	Industrial		
U	Utilities	27.97	171.38	16.32%	Industrial		
A	Agricullturial	49.6	3501.39	1.42%	Open Space	2%	2%
P	Parks	20.46	469.74	4.36%	Open Space		
T	Timber	3.1	510.25	0.61%	Open Space		
W	Water	3.47	271.65	1.28%	Open Space		

Figure 14 Summary of Existing and Future Condition Impervious Percentages by Land Use

Note: The vacant lands were removed from this analysis of existing impervious percentages.

Figure 15 shows the catchments connected to the future system.

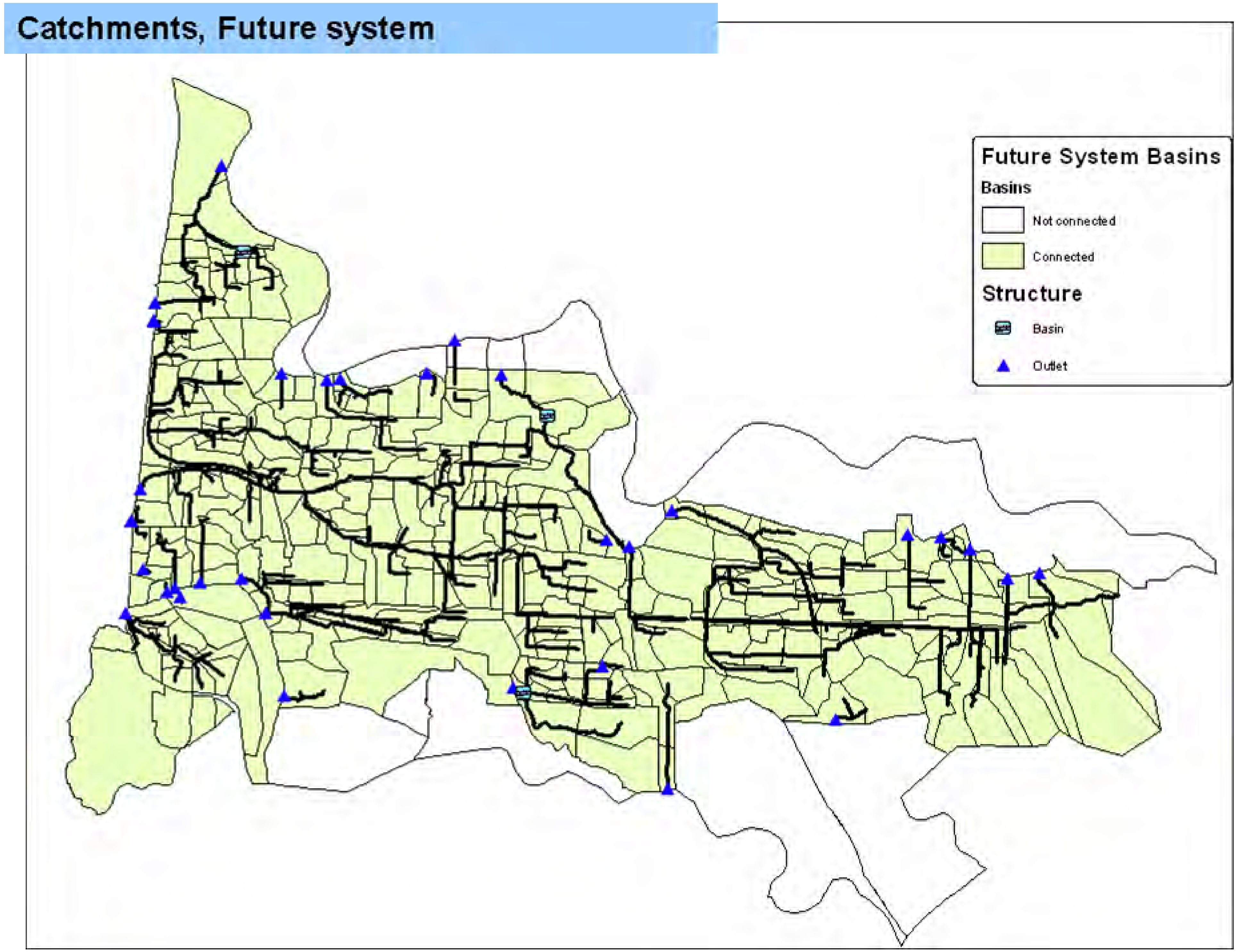

Figure 15 Catchments connected (in green) to the modeled future system file as a result of the calibration steps performed to the model

A workshop was held September 26th, 2007, where discussions included a review of:

- Model adjustments performed.
- Model validation; comparison of field observations and model estimated results.
- Priority areas for the development of CIPs.

It was decided during this workshop that in order to identify flooding problems and design conceptual CIPs, the URS/DHI team would be using the future conditions model with the November 1996 rainfall event as opposed to using the SCS 10-year/25-year design event. The SCS Type IA design storms are estimated to be very conservative and could potentially result in very significant and unnecessary CIP costs. The 1996 storm was considered by Springfield to be on the order of a 25-year event when it occurred and yet the SCS 10-year model results are showing much higher flows.

The following figures show flood maps for the 10-year design storm (Figure 16) as well as the 1996 storm event (Figure 17) for future conditions.

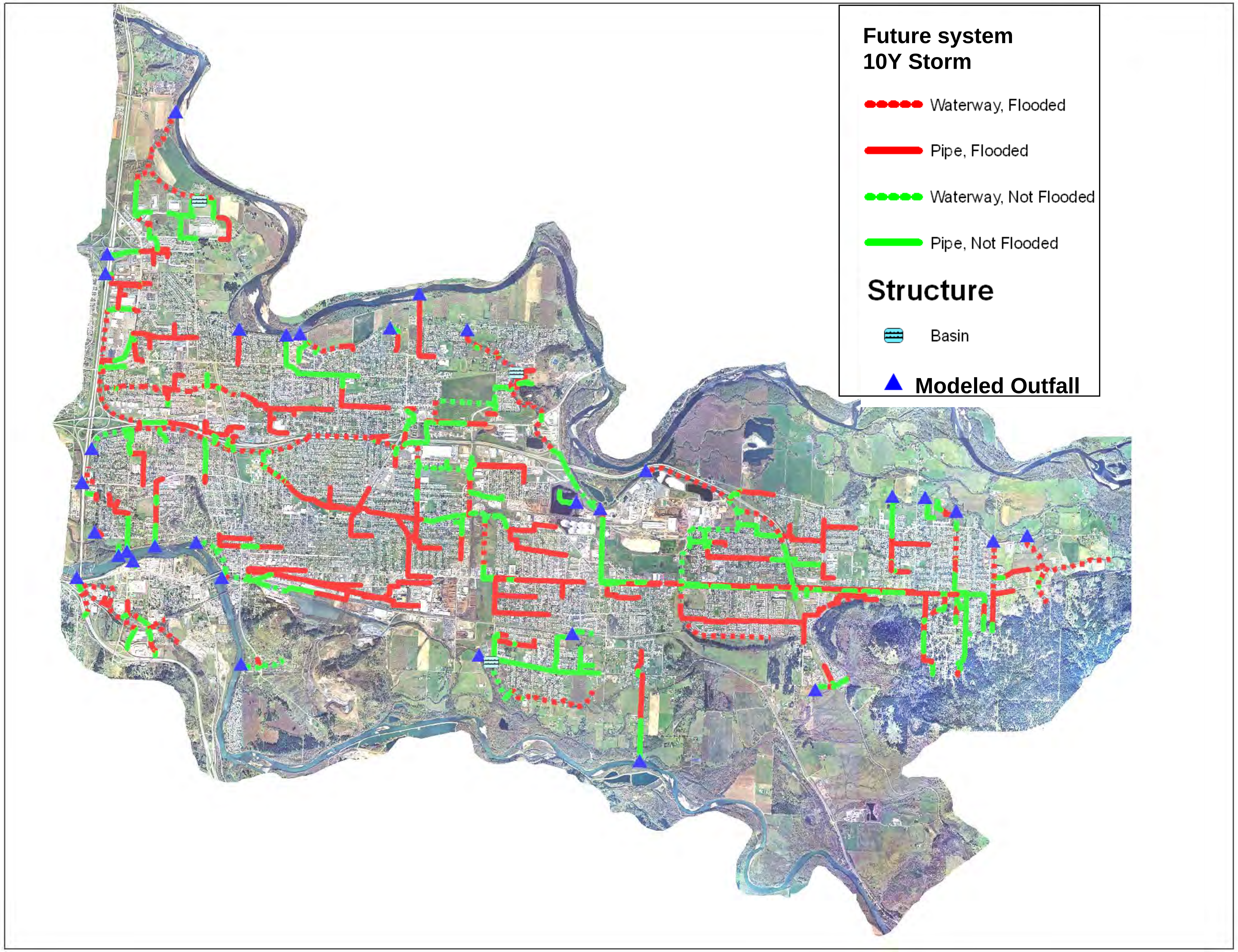

Figure 16 **Future System Flood Map 10y Design Storm**

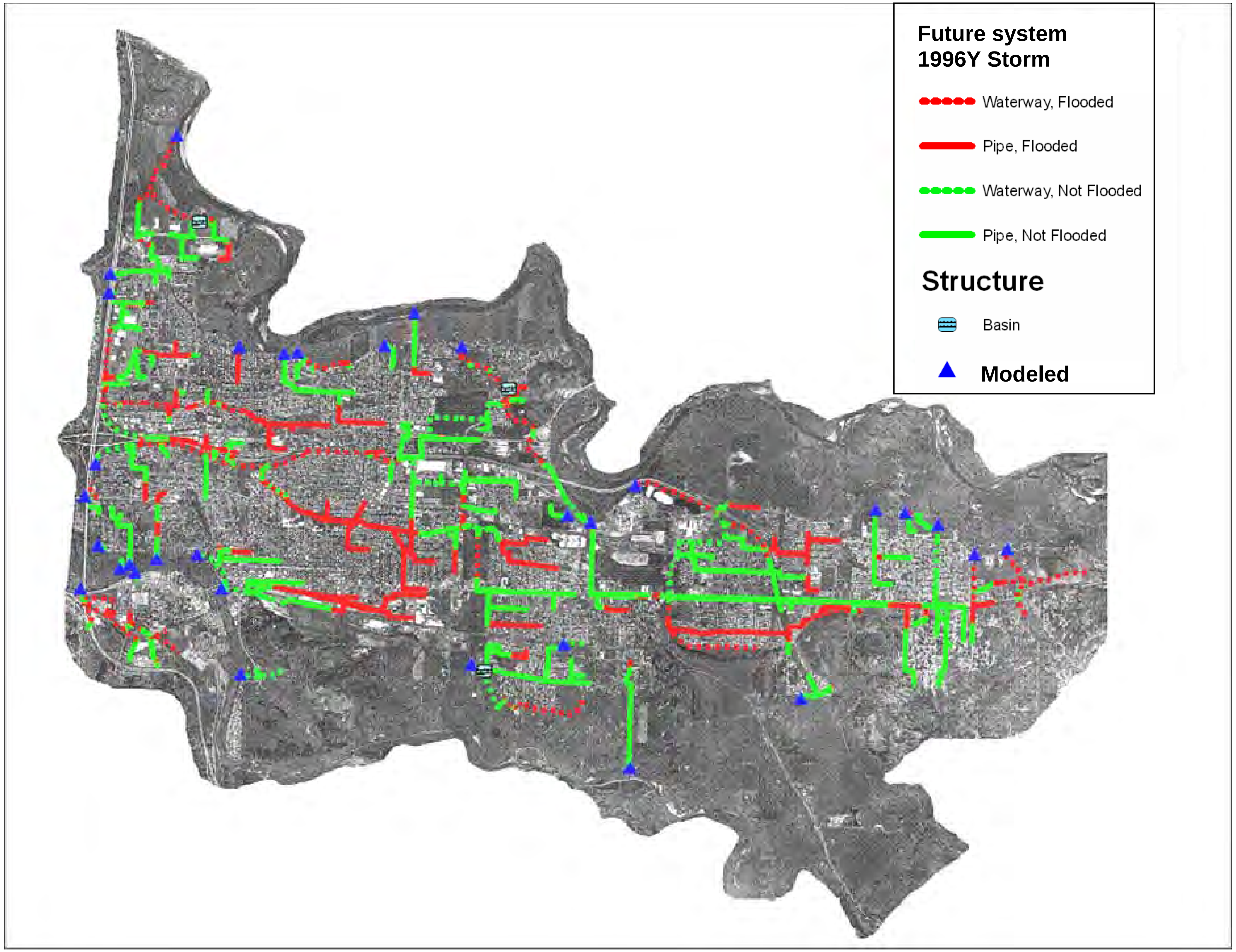

Figure 17 Future System Flood Map 1996 Storm event

APPENDIX D

UNIT COST ESTIMATES FOR CIPS

Appendix D Overview

The following tables provide the unit costs and back-up documentation associated with material and construction costs for various drainage system components.

Tables D-1 through D-4 – Tables D-1 through D-4 provide estimated capital/construction costs for each CIP type (e.g., pipe installation, open channel improvements, detention and water quality facilities). Table D-1 provides cost estimates for all of the CIP types except for pipes and water quality structures. Table D-2 provides cost estimates for drainage pipe, based on pipe size and depth of cover. Table D-3 provides detailed back-up information regarding estimated construction costs for drainage pipe installation. Table D-4 provides cost estimates for five different sized structural water quality facilities (i.e., CONTECH Storm Filter). For many of the CIPs in Table D-1 and the pipe costs in Table D-2, the unit cost must be multiplied by a quantity such as acre-feet, square yards, or lineal feet to come up with the total estimated capital cost for that CIP.

Tables D-5 through D-7 – Tables D-5 through D-7 provide the back-up information that was used to estimate the unit costs for CIP types listed in Table D-1. Table D-5 provides unit costs for the various elements that comprise each CIP (e.g., labor, excavation, etc.). Table D-6 provides the quantities of each element that comprise the CIPs (e.g., 1 hour of labor, 6 cubic yards of excavation, etc.). Table D-7 provides the detailed back-up capital/construction cost information for each CIP type based on Tables D-5 and D-6. (Note: a revision was made to the Natural Resource Enhancement and Open Waterway Improvement Construction unit costs November 2001. See the addendum attached at the back of the unit cost tables in Appendix D.)

Table D-8 – Table D-8 provides the estimated maintenance costs for each CIP type. For many of the CIPs, the maintenance cost must be multiplied by a unit such as acre-feet or square yards in order to come up with the total estimated maintenance cost.

Table D-9 – Table D-9 provides the detailed back-up information for estimating the maintenance costs for each CIP type except for increased pipe sizes. A maintenance cost is not provided for capital projects to increase the pipe sizes based on the assumption that maintenance of piped systems typically includes catch basin/manhole cleaning and that this cleaning is already being conducted for the existing piped system.

Tables D-1, D-2, D-4, and D-8 were used to estimate capital and maintenance costs that are provided in the draft CIP fact sheets. Tables D-3, D-5, D-6, D-7 and D-9 are only provided to show back-up for information presented in tables D-1, D-2, D-4, and D-8.

The purpose of these tables is to provide general guidance with respect to CIP costs and to allow for cost comparisons between CIPs. These unit costs are based on original unit costs used for the Eugene Master Plan in 1999 with a 15% increase to all original unit costs to reflect current conditions. These increased costs are consistent with the revised costs used for the Eugene Master Plan update (ongoing) and are only applicable to the scale of projects in the City's preliminary storm system CIP list. They are not applicable to projects that are of a much smaller or larger scale than those preliminary CIPs.

STORMWATER FACILITIES
ESTIMATED CONSTRUCTION COSTS PER UNIT
Table D-1

Stormwater Facility Type	Unit	$/Unit (Notes 1+2)	Description of Stormwater Facility Construction Activities
Trash Rack Inlet (Type 1)	EA	$5,940	Cone shaped rebar cage bolted to an inlet structure (manhole or vault), inlet protection (riprap, geotextile fabric), clearing of invasive vegetation, grading and revegetation .
Trash Rack Inlet (Type 2)	EA	$9,970	Steel trash rack approximately 15 ft wide and 4 ft high placed in the channel with concrete foundation walls on both banks. Also includes inlet protection, clearing of invasive vegetation, grading and revegetation.
Garbage and Debris Removal	CY	$120	Hand collected debris not requiring mechanical means to lift, hauled in 10 CY truck to disposal.
Sediment Removal	CY	$250	Removal of sediment from channels and culverts with heavy equipment. Includes hydroseeding for revegetation.
Streambank Stabilization	SY	$90	Grading, geotextile, toe reinforcement, revegetation and erosion control.
Open Channel Improvements (Type 1)	LF	$350	Traffic control, excavation (0 to10 ft bottom width, 4 to 6 ft depth, 3:1 side slopes), hydroseed, erosion protection at inlet and outlet. Modification of existing channel.
Open Channel Improvements (Type 2)	LF	$730	Same as above except 10 to 20 ft bottom width, 6 to 10 ft depth.
Open Channel Improvements (Type 3)	LF	$1,120	Same as above except 20+ ft bottom width, 6 to 10 ft depth.
Open Channel Improvements (Type 4)	LF	$1,330	Same as above except 20+ ft bottom width, 10 to 16 ft depth.
Dry Extended Pond	Ac-Ft	$59,700	Gravel access road (25 ft long x 12 ft width), clearing & grubbing, excavation (3 ft depth), grading, erosion protection at inlet & outlet, hydroseed, trees & shrubs, safety fence, erosion control.
Wet Extended Pond	Ac-Ft	$59,700	Gravel access road (25 ft long x 12 ft width), clearing & grubbing, excavation (3-6 ft depth), grading, erosion protection at inlet & outlet, hydroseed, trees & shrubs, safety fence, erosion control. No lining has been included.
Stormwater Marsh/Wetland	AC	$88,300	Gravel access road (25 ft long x 12 ft width), grading (1-2 ft depth, no removal from site), erosion protection at inlet & outlet, hydroseed, vegetation and erosion control.
Flood Control Facility	Ac-Ft	$59,700	Gravel access road (25 ft long x 12 ft width), clearing & grubbing, excavation (3 ft depth), grading, erosion protection at inlet & outlet, hydroseed, trees & shrubs, safety fence, erosion control.
Outfall Protection	EA	$7,670	Precast concrete outlet structure, erosion protection, geotextile fabric, clearing of vegetation around structure, grading and revegetation.
Vegetated Swale	LF	$17	Traffic control, clearing & grubbing, excavation (4ft bottom width, 2 ft depth, 4:1 side slopes), hydroseed, erosion protection at inlet and outlet.
Infiltration Trench	LF	$50	Clearing & grubbing, excavation (2ft bottom width, 4 ft depth), geotextile fabric, 4"-8" perforated pipe, drain rock, and hydroseed.
Natural Resource Enhancement (Note 3)	SY	$10	Add additional vegetation
Natural Resource Revegetation (Note 3)	SY	$56	Remove invasive vegetation, grade and revegetate.
Recreational Trail	SF	$5	Clearing & grubbing, grading (up to 1 ft depth), erosion control, cedar shavings. Does not include storm drainage, signage, benches or other recreational amenities.

Note 1: The costs in this table reflect an update of the original Table D-1 prepared in 1999. It is based on a 2007 update that included an accross the board increase of 15% to all unit costs in Table D-7. It also includes the inclusion of geotextile fabric for all types of open channel improvements (see update to Table D-7).

Note 2: Construction costs presented in this table are planning level estimates. They are reflective of average facilities constructed under typical conditions. Each facility will vary depending on site conditions, the size and number of facilities constructed, and depending on the local construction market at the time of bidding. Contingencies should be reflected for budgeting purposes based on the variety of possible conditions.

Note 3: These 2 categories have been combined and called Natural Resource Enhancement **(use $13/sy)** see attached addendum dated 11/01. This $13/sy should be updated to **$15/sq** based on the 15% increase being applied for a 2007 update.

Reference:
Table D-1 summarizes data in Table D-7.
Table D-5 (Unit Cost) x Table D-6 (Quantities) = Table D-7 (Unit Cost per CIP Type)

STORMWATER FACILITIES
ESTIMATED CONSTRUCTION COSTS
FOR STORM DRAIN INSTALLATION IN IMPROVED AREAS
Table D-2

Storm Drain Pipe Construction Cost per Linear Foot												
	Diameter (inches)											
Cover Depth (feet)	18	24	30	36	42	48	54	60	66	72	84	96
2-5	$90	$120	$170	$220	$250	$300	$350	$400	$480	$520	$680	$830
5-10	$110	$150	$200	$250	$290	$340	$400	$450	$540	$580	$760	$920
10-15	$120	$170	$230	$280	$330	$380	$440	$500	$600	$650	$830	$1000
15-20	$140	$190	$250	$310	$360	$420	$490	$560	$660	$710	$910	$1090

Note 1: The costs in this table reflect an update of the original table prepared in 1999. The 2007 update includes a 15% increase to all unit costs.

Note 2: Construction costs presented in this table are planning level estimates. These estimated costs include shoring, excavation, backfill/air tamped compaction, piping, pavement restoration, minor stream management, and traffic control costs associated with typical projects, and average utility relocation in improved areas. Trench excavation is assumed to be by excavator or backhoe (mechanical means or blasting not included). Utility easement or other land acquisition costs are excluded. Information presented in this table is a summary of Table D-3.

Reference: Cost = volume * ($excavation + $backfill) + $shoring + $piping + 5 + $pavement + $traffic control + $stream management

STORMWATER FACILITIES
ESTIMATED CONSTRUCTION COSTS
FOR STORM DRAIN INSTALLATION IN IMPROVED AREAS
BACK UP INFORMATION
Table D-3

	Storm Drain Pipe Construction Cost per Linear Foot											
	Diameter (inch)											
Depth of Cover (ft)	18	24	30	36	42	48	54	60	66	72	84	96
Sub Task												
Pipe + Bed (ft)	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7.5	8.5
Width (ft)	3	4	5	6	7	8	9	10	11	12	14	16
Bedding (ft)	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.6
Shoring (lf)	$ 10.34	$12.42	$14.90	$17.88	$21.46	$25.75	$30.90	$30.90	$37.09	$44.51	$53.41	$64.09
Excavation (CY)	$ 11.50	$11.50	$11.50	$11.50	$11.50	$11.50	$11.50	$11.50	$11.50	$11.50	$11.50	$11.50
Backfill and Air Tamped Compaction	$ 17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25	$17.25
Piping (lf)	$ 15.00	$29.33	$59.80	$79.35	$90.85	$108.10	$131.10	$154.10	$204.70	$203.55	$304.75	$379.50
Pavement Restoration	$ 6.40	$8.54	$10.67	$12.81	$14.94	$17.08	$19.21	$21.35	$23.48	$25.62	$29.89	$34.16
Traffic Control	$ 20.91	$23.00	$25.30	$27.83	$30.61	$33.67	$37.04	$40.75	$44.82	$49.30	$54.23	$59.66
Stream Management	$ 12.54	$14.38	$16.53	$19.01	$21.86	$25.14	$28.91	$33.25	$38.24	$43.97	$50.57	$58.15
Cover (CY)												
2-5	0.7	1.1	1.5	1.9	2.3	2.8	3.3	3.9	4.5	5.1	6.5	8.0
5-10	1.4	1.9	2.4	3.0	3.6	4.3	5.0	5.7	6.5	7.3	9.1	11.0
10-15	1.9	2.6	3.3	4.1	4.9	5.8	6.7	7.6	8.6	9.6	11.7	13.9
15-20	2.3	3.3	4.3	5.2	6.2	7.3	8.3	9.4	10.6	11.8	14.3	16.9
2-5	$90.32	$124.60	$174.80	$216.19	$251.81	$295.67	$348.00	$397.15	$482.17	$518.89	$684.19	$830.56
5-10	$110.44	$145.90	$201.42	$248.13	$289.08	$338.26	$395.92	$450.39	$540.73	$582.78	$758.72	$915.74
10-15	$124.82	$167.20	$228.04	$280.08	$326.35	$380.85	$443.83	$503.63	$599.30	$646.67	$833.26	$1,000.93
15-20	$136.32	$188.49	$254.66	$312.02	$363.62	$423.45	$491.75	$556.87	$657.86	$710.56	$907.80	$1,086.11

Note 1: The costs in this table reflect an update of the original table prepared in 1999. The 2007 update includes a 15% increase to all unit costs.

Note 2: Construction costs presented in this table are planning level estimates. These estimated costs include minor stream management, traffic control costs associated with typical in-stream culvert projects, average utility relocation and pavement restoration costs in improved areas. Utility easement or other land acquisition costs are excluded. Information presented in this table is summarized in Table D-2.

STORMWATER FACILITIES
ESTIMATED CONSTRUCTION COSTS
FOR WATER QUALITY STRUCTURES

Table D-4

Device/Model	Total Installed Cost
Compost Storm Filter (CSF) Function: Primarily metals uptake and oil & grease removal. Commonly used with sediment manhole.	
CSF 8x6	$58,500
CSF 8x6	$70,000
CSF 12x6	$73,280
CSF 16x8	$138,560
CSF 16x8	$157,000

Note 1: Only the costs for CSF StormFilter units have been updated for 2007 and shown in Table D-4. If other proprietary treatment systems are proposed, costs for other facilities will be updated.

Note 2: Construction costs presented in this table are planning level estimates. Costs represent installation of average facilities under typical conditions. Estimates reflect vaults installed in public right of way, in an existing residential paved street, with average utility conflicts and restoration costs.

STORMWATER FACILITIES
CONSTRUCTION COST ESTIMATE
BACK-UP INFORMATION
Table D-5

Construction Activity/Materials	Units	$/Unit
Manual Labor	Labor-Hr	$35
Traffic Control	Labor-Hr	$32
Gravel Access Road	SF	$4.37
Clearing & Grubbing	AC	$2,300
General Excavation	CY	$17
Grading	CY	$6
Inlet Cone & Structure	EA	$4,025
Trash Rack Structure	EA	$8,050
Pond Outlet	EA	$5,750
Curb & Gutter	LF	$14
Hydroseed	AC	$2,300
Trees & Shrubs	EA	$58
Geotextile Fabric	SY	$2.01
Rip Rap	TN	$69
Chain Link Fence	LF	$20
Erosion Control	AC	$2,300
Drain Rock	CY	$30
Crushed Rock	CY	$25
Truck Haul (Disposal)	CY	$21
Perforated Drain Pipe	LF	$30
Cedar Savings	CY	$25

Note 1: The above costs (originally prepared in 1999) were updated in 2007 with an accross the board increase of 15%.

Note 2: The above are representative unit costs based on information collected from bid tabulation sheets during the period from 1997-1999 in the Eugene, Lebanon and Portland areas. These costs are representative of average conditions and assume that the CIP projects are competitively bid. Unit costs include materials and installation. Actual construction cost will vary with site conditions and local factors at time of bidding.

Unit cost for trees assumes bare root stock with temporary water for 2-3 years.

Note 3: With respect to Natural Resource Enhancement and Open Waterway Improvement Construction Costs, unit costs were revised (Nov. 2001) for clearing & grubbing, hydroseeding, trees & shrubs, and erosion control.

Reference:
Table 5 (Unit Cost) x Table 6 (Quantities) = Table 7 (Unit Cost per CIP Type)

Note 1: The above costs (originally prepared in 1999) were updated in 2007 with an accross the board increase of 15%.

Note 2: The above are representative unit costs based on information collected from bid tabulation sheets during the period from 1997-1999 in the Eugene, Lebanon and Portland areas. These costs are representative of average conditions and assume that the CIP projects are competitively bid. Unit costs include materials and installation. Actual construction cost will vary with site conditions and local factors at time of bidding.

Unit cost for trees assumes bare root stock with temporary water for 2-3 years.

Note 3: With respect to Natural Resource Enhancement and Open Waterway Improvement Construction Costs, unit costs were revised (Nov. 2001) for clearing & grubbing, hydroseeding, trees & shrubs, and erosion control.

Reference:
Table 5 (Unit Cost) x Table 6 (Quantities) = Table 7 (Unit Cost per CIP Type)

STORMWATER FACILITIES
CONSTRUCTION EFFORT/QUANTITIES ESTIMATE
BACK-UP INFORMATION
Table D-6

Construction Activity/ Materials	Unit	Trash Rack Inlet (Type 1)	Trash Rack Inlet (Type 2)	Garbage and Debris Removal	Sediment Removal	Streambank Stabilization	Open Channel Improvements (Type 1)	Open Channel Improvements (Type 2)	Open Channel Improvements (Type 3)	Open Channel Improvements (Type 4)	Dry Extended Pond	Wet Extended Pond	Stormwater Marsh/Wetland	Flood Control Facility	Outfall Protection	Vegetated Swale	Infiltration Trench	Natural Resource Revegetation*	Natural Resource Enhancement*	Recreational Trail
		EA	EA	CY	CY	SY	LF	LF	LF	LF	Ac-Ft	Ac-Ft	AC	Ac-Ft	EA	LF	LF	SY	SY	SF
Manual Labor	**Lb-Hr**			3																
Traffic Control	**Lb-Hr**						0.6	1.2	1.8	2.4						0.16				
Gravel Access Road	**SF**										350	350	350	350						
Clearing & Grubbing	**AC**	0.1	0.1		0.0002						0.33	0.33		0.33	0.1	0.0002	0.0002			0.00002
General Excavation	**CY**				8		2	6	10	18	1600	1600	500	1600		0.3	0.3	0.5		
Grading	**CY**	8	8			0.6					100	100	1000	100	8					0.4
Inlet Cone & Structure	**EA**	1									1	1	1	1						
Trash Rack Structure	**EA**		1																	
Pond Outlet Structure	**EA**										1	1	1	1	1					
Curb & Gutter	**LF**										20	20	20	20						
Hydroseed	**AC**	0.1	0.1		0.0002	0.0002	0.008	0.02	0.035	0.05	0.33	0.33	1	0.33	0.1	0.0002	0.0002	0.0002		
Trees & Shrubs	**EA**	5	5		2	1	4	8	12	12	100	100	1000	100	5	0.1		0.5	0.21	
Geotextile Fabric	**SY**	45	45			1	3	3	3	3					45		1.1			
Rip Rap	**CY**	15	15			0.33	0.28	0.5	0.89	0.89	3	3	3	3	15					
Chain Link Fence	**LF**										600	600		600						
Erosion Control	**AC**				0.0002	0.0002	0.008	0.016	0.024	0.032	0.33	0.33	1	0.33		0.0002		0.008		0.00002
Drain Rock	**CY**																0.3			
Crushed Rock	**CY**																			
Truck Haul	**CY**			1																
Perforated Drain Pipe	**LF**																1			
Cedar Shavings	**CY**																			0.11

Note 1: An update to this table was made in 2007 to add 3SY of geotextile fabric for each lineal foot of open channel improvement for all Channel Improvements types.

Note 2: The above are representative quantities based on average construction conditions. Actual construction quantities will vary with site conditions. The quantities above represent the volume and effort to construct/perform each unit of water quality facility (i.e. 1 CY of Sediment Removal). Volumes of excavation are assumed to include hauling offsite (approximately 10 mile round trip) and disposal.

*The Natural Resource Revegetation and Natural Resource Enhancement columns were combined into one column called Natural Resources Enhancement and associated quantities were also revised. See attached memo dated 11/01.

Reference:
Table D-5 (Unit Cost) x Table 6 (Quantities) = Table 7 (Cost per CIP)

STORMWATER FACILITIES
CONSTRUCTION COST ESTIMATE
BACK-UP INFORMATION
Table D-7

Construction Activity/ Materials	Unit	Trash Rack Inlet (Type 1)	Trash Rack Inlet (Type 2)	Garbage and Debris Removal	Sediment Removal	Streambank Stabilization	Open Channel Improvements (Type 1)	Open Channel Improvements (Type 2)	Open Channel Improvements (Type 3)	Open Channel Improvements (Type 4)	Dry Extended Pond	Wet Extended Pond	Stormwater Marsh/Wetland	Flood Control Facility	Outfall Protection	Vegetated Swale	Infiltration Trench	Natural Resource Revegetation*	Natural Resource Enhancement*	Recreational Trail
		EA	EA	CY	CY	SY	LF	LF	LF	LF	Ac-Ft	Ac-Ft	AC	Ac-Ft	EA	LF	LF	SY	SY	SF
Manual Labor	**Lb-Hr**	$ -	$ -	$ 103.50	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Traffic Control	**Lb-Hr**	$ -	$ -	$ -	$ -	$ -	$ 19.32	$ 38.64	$ 57.96	$ 77.28	$ -	$ -	$ -	$ -	$ -	$ 5.15	$ -	$ -	$ -	$ -
Gravel Access Road	**SF**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,529.50	$ 1,529.50	$ 1,529.50	$ 1,529.50	$ -	$ -	$ -	$ -	$ -	$ -
Clearing & Grubbing	**AC**	$ 230.00	$ 230.00	$ -	$ 0.46	$ -	$ -	$ -	$ -	$ -	$ 759.00	$ 759.00	$ -	$ 759.00	$ 230.00	$ 0.46	$ 0.46	$ -	$ -	$ 0.05
General Excavation	**CY**	$ -	$ -	$ -	$ 138.00	$ -	$ 34.50	$ 103.50	$ 172.50	$ 310.50	$ 27,600.00	$27,600.00	$ 8,625.00	$ 27,600.00	$ -	$ 5.18	$ 5.18	$ 8.63	$ -	$ -
Grading	**CY**	$ 46.00	$ 46.00	$ -	$ -	$ 3.45	$ -	$ -	$ -	$ -	$ 575.00	$ 575.00	$ 5,750.00	$ 575.00	$ 46.00	$ -	$ -	$ -	$ -	$ 2.30
Inlet Cone & Structure	**EA**	$ 4,025.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,025.00	$ 4,025.00	$ 4,025.00	$ 4,025.00	$ -	$ -	$ -	$ -	$ -	$ -
Trash Rack Structure	**EA**	$ -	$ 8,050.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pond Outlet Structure	**EA**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,750.00	$ 5,750.00	$ 5,750.00	$ 5,750.00	$ 5,750.00	$ -	$ -	$ -	$ -	$ -
Curb & Gutter	**LF**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 276.00	$ 276.00	$ 276.00	$ 276.00	$ -	$ -	$ -	$ -	$ -	$ -
Hydroseed	**AC**	$ 230.00	$ 230.00	$ -	$ 0.46	$ 0.46	$ 18.40	$ 46.00	$ 80.50	$ 115.00	$ 759.00	$ 759.00	$ 2,300.00	$ 759.00	$ 230.00	$ 0.46	$ 0.46	$ 0.46	$ -	$ -
Trees & Shrubs	**EA**	$ 287.50	$ 287.50	$ -	$ 115.00	$ 57.50	$ 230.00	$ 460.00	$ 690.00	$ 690.00	$ 5,750.00	$ 5,750.00	$ 57,500.00	$ 5,750.00	$ 287.50	$ 5.75	$ -	$ 28.75	$ 12.08	$ -
Geotextile Fabric	**SY**	$ 90.56	$ 90.56	$ -	$ -	$ 2.01	$ 6.04	$ 6.04	$ 6.04	$ 6.04	$ -	$ -	$ -	$ -	$ 90.56	$ -	$ 2.21	$ -	$ -	$ -
Rip Rap	**CY**	$ 1,035.00	$ 1,035.00	$ -	$ -	$ 22.77	$ 19.32	$ 34.50	$ 61.41	$ 61.41	$ 207.00	$ 207.00	$ 207.00	$ 207.00	$ 1,035.00	$ -	$ -	$ -	$ -	$ -
Chain Link Fence	**LF**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,730.00	$11,730.00	$ -	$ 11,730.00	$ -	$ -	$ -	$ -	$ -	$ -
Erosion Control	**AC**	$ -	$ -	$ -	$ 0.46	$ 0.46	$ 18.40	$ 36.80	$ 55.20	$ 73.60	$ 759.00	$ 759.00	$ 2,300.00	$ 759.00	$ -	$ 0.46	$ -	$ 18.40	$ -	$ 0.05
Drain Rock	**CY**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8.97	$ -	$ -	$ -
Crushed Rock	**CY**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Truck Haul	**CY**	$ -	$ -	$ 20.70	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Perforated Drain Pipe	**LF**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 29.90	$ -	$ -	$ -
Cedar Shavings	**CY**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2.78
Total $/Unit CIP		$ 5,944.06	$ 9,969.06	$ 124.20	$ 254.38	$ 86.65	$ 345.98	$ 725.48	$ 1,123.61	$ 1,333.83	$ 59,719.50	$59,719.50	$ 88,262.50	$ 59,719.50	$ 7,669.06	$ 17.46	$ 47.18	$ 56.24	$ 12.08	$ 5.18

Note 1: These costs that were originally estimated in 1999 now reflect 2007 updates. The updates in this table are based on a 15% increase to costs provided in Table D-5.

**Note 2: ***The Natural Resource Revegetation and Natural Resource Enhancement columns were combined into one column called Natural Resources Enhancement and associated quantities were also revised. See attached memo dated 11/01.

Reference:

Table D-5 (Unit Cost) x Table D-6 (Quantities) = Table D-7 (Unit Cost per CIP Type)
Table D-7 Total Cost per Unit of CIP is Summarized in Table D-1

STORMWATER FACILITIES
ESTIMATED ANNUAL MAINTENANCE COSTS
Table D-8

Stormwater Facility Type	Unit	Annual $/Unit	Description of Stormwater Facility Maintenance Activities
Trash Rack Inlet (Type 1 & 2)	1 EA	$3,080	Inspect and clean inlet, inspect vegetation and slope protection, remove debris.
Open Channel (all types)	500 LF	$3,800	Inspect sediment loading and vegetation, remove sediment and debris.
Dry Extended Pond	5 AC-FT	$6,490	Inspect and clean inlet and outlet, maintain vegetation, inspect sediment loading, remove sediment, remove debris, inspect separation berm.
Wet Extended Pond	5 AC-FT	$6,030	Inspect and clean inlet and outlet, maintain vegetation, inspect sediment loading, remove sediment, remove debris, inspect and repair separation berm.
Flood Control Facility	5 AC-FT	$4,810	Inspect and clean inlet and outlet, maintain vegetation, inspect sediment loading, remove sediment, remove debris, inspect and repair separation berm.
Stormwater Marsh/Wetland	5 AC	$3,310	Inspect and clean inlet and outlet, inspect & maintain vegetation, remove debris.
Vegetated Swale	500 LF	$4,090	Inspect and clean inlet and outlet, remove debris, remove sediment, maintain vegetation.
Infiltration Trench	500 LF	$2,700	Inspect and clean inlet, remove debris, remove sediment.
Water Quality Structures	1 EA	$1,170	Inspect and remove debris and sediment from structures.
Natural Resource Enhancement	5 AC	$644	Inspect vegetation, remove debris.
Natural Resource Revegetation	5 AC	$1,012	Inspect vegetation, remove debris.
Recreational Trail	1,000 LF	$2,300	Inspect trail, remove debris and maintain vegetation.

Note: Maintenance costs presented in this table are planning level estimates and are based on information provided by the Unified Sewerage Agency of Washington County (1999). They are representative of average facilities maintained under typical conditions. Each facility will vary depending on site conditions and the size of the facility.

Reference:
Table D-8 is a summary of data presented in Table D-9.

STORMWATER FACILITIES
ESTIMATED ANNUAL MAINTENANCE COSTS
Calculation Table D-9

	Frequency	Effort/Time			Equip./Time		
	Times/Year	**Lb-Hr**	**$ @ $46/hr**	**Hours**	**$/hr Rate**	**$ Total**	**Comments**
Trash Rack Inlet (Type 1 & 2)							
Emergency Response	10	1	$ 460.00	0	$ -	$ -	
Inspect & Clean Inlet/Outlet	4	4	$ 736.00	2	$ 172.50	$ 1,380.00	Vactor Truck & Operator
Routine Repair			$ -		$ -	$ -	
Maintain Vegetation	4	2	$ 368.00	2	$ 11.50	$ 92.00	Mower, Weedeater, Etc.
Disposal Costs	4		$ 46.00		$ -	$ -	
Subtotals			*$ 1,610.00*			*$ 1,472.00*	
Total Estimate Annual Maintenance				***$ 3,082.00***			
Open Channel (all types)							
Inspect Vegetation & Sediment Loading	2	1	$ 92.00	0	$ -	$ -	
Maintain Vegetation			$ -		$ -	$ -	
Remove Debris/Garbage	4	2	$ 368.00	0	$ -	$ -	
Remove Sediment	1	8	$ 368.00	4	$ 345.00	$ 1,380.00	Tractor Shovel, 10 CY Dump & Operators
Disposal Costs	1		$ 920.00		$ -	$ -	Assumes 10 CY/Year
Inspect Slopes	2	1	$ 92.00	0	$ -	$ -	
Repair Slopes (On Going Activity)			$ 575.00	0	$ -	$ -	Annual Misc. Cost
Subtotals			*$ 2,415.00*			*$ 1,380.00*	
Total Estimate Annual Maintenance				***$ 3,795.00***			
Dry Extended Pond							
Inspect & Clean Inlet/Outlet	4	4	$ 736.00	2	$ 172.50	$ 1,380.00	Vactor Truck & Operator
Inspect Vegetation	2	1	$ 92.00	0	$ -	$ -	
Remove Debris/Garbage	4	2	$ 368.00	0	$ -	$ -	
Maintain Vegetation	4	4	$ 736.00	4	$ 11.50	$ 184.00	Mower, Weedeater, Etc.
Inspect Sediment Loading	2	1	$ 92.00	0	$ -	$ -	
Remove Sediment	0.5	12	$ 276.00	6	$ 345.00	$ 1,035.00	Tractor Shovel, 10 CY Dump & Operators
Disposal Costs	0.5		$ 920.00		$ -	$ -	Assumes 10 CY Every Two Years
Inspect slopes	2	1	$ 92.00	0	$ -	$ -	
Repair Slopes (On Going Activity)			$ 575.00		$ -	$ -	Annual Misc. Cost
Subtotals			*$ 3,887.00*			*$ 2,599.00*	
Total Estimate Annual Maintenance				***$ 6,486.00***			
Wet Extended Pond							
Inspect & Clean Inlet/Outlet	4	4	$ 736.00	2	$ 172.50	$ 1,380.00	Vactor Truck & Operator
Inspect Vegetation	2	1	$ 92.00	0	$ -	$ -	
Remove Debris/Garbage	4	2	$ 368.00	0	$ -	$ -	
Maintain Vegetation	4	4	$ 736.00	4	$ 11.50	$ 184.00	Mower, Weedeater, Etc.
Inspect Sediment Loading	2	1	$ 92.00	0	$ -	$ -	
Remove Sediment	0.5	12	$ 276.00	6	$ 345.00	$ 1,035.00	Tractor Shovel, 10 CY Dump & Operators
Disposal Costs	0.5		$ 460.00		$ -	$ -	Assumes 10 CY Every TwoYears
Inspect slopes	2	1	$ 92.00	0	$ -	$ -	
Repair Slopes			$ 575.00		$ -	$ -	Annual Misc. Cost
Subtotals			*$ 3,427.00*			*$ 2,599.00*	
Total Estimate Annual Maintenance				***$ 6,026.00***			
Flood Control Facility							
Inspect & Clean Inlet/Outlet	4	2	$ 368.00	2	$ 172.50	$ 1,380.00	Vactor Truck & Operator
Inspect Vegetation	2	1	$ 92.00	0	$ -	$ -	
Remove Debris/Garbage	4	1	$ 184.00	0	$ -	$ -	
Maintain Vegetation	4	4	$ 736.00	4	$ 11.50	$ 184.00	Mower, Weedeater, Etc.
Inspect Sediment Loading	2	1	$ 92.00	0	$ -	$ -	
Remove Sediment	0.5	8	$ 184.00	4	$ 345.00	$ 690.00	Tractor Shovel, 10 CY Dump & Operators
Disposal Costs	0.5		$ 230.00			$ -	Assumes 5 CY Every two Years
Inspect slopes	2	1	$ 92.00	0	$ -	$ -	
Slope Repair (On Going Activity)			$ 575.00		$ -	$ -	Annual Misc. Cost
Subtotals			*$ 2,553.00*			*$ 2,254.00*	
Total Estimate Annual Maintenance				***$ 4,807.00***			
Stormwater Marsh/Wetland							
Inspect & Clean Inlet/Outlet	4	4	$ 736.00	2	$ 172.50	$ 1,380.00	Vactor Truck & Operator
Inspect Vegetation	2	1	$ 92.00	0	$ -	$ -	
Remove Debris/Garbage	2	2	$ 184.00	0	$ -	$ -	
Maintain Vegetation	4	4	$ 736.00	4	$ 11.50	$ 184.00	Mower, Weedeater, Etc.
Subtotals			*$ 1,748.00*			*$ 1,564.00*	
Total Estimate Annual Maintenance				***$ 3,312.00***			
Vegetated Swale							
Inspect & Clean Inlet/Outlet	4	2	$ 368.00	1	$ 172.50	$ 690.00	Vactor Truck & Operator
Remove Debris/Garbage	2	2	$ 184.00	0	$ -	$ -	
Maintain Vegetation	4	4	$ 736.00	4	$ 11.50	$ 184.00	Mower, Weedeater, Etc.
Inspect Sediment Loading	2	1	$ 92.00	0	$ -	$ -	
Remove Sediment/Regrade	1	8	$ 368.00	4	$ 345.00	$ 1,380.00	Tractor Shovel, 10 CY Dump & Operators
Disposal Costs	1		$ 92.00		$ -	$ -	Assumes 2 CY Per Year
Subtotals			*$ 1,840.00*			*$ 2,254.00*	
Total Estimate Annual Maintenance				***$ 4,094.00***			

STORMWATER FACILITIES
ESTIMATED ANNUAL MAINTENANCE COSTS
Calculation Table D-9

	Frequency	Effort/Time		Equip./Time			
	Times/Year	Lb-Hr	$ @ $40/hr	Hours	$/hr Rate	$ Total	Comments
Infiltration Trench							
Inspect & Clean Inlet/Outlet	4	4	$ 736.00	2	$ 172.50	$ 1,380.00	Vactor Truck & Operator
Remove Debris/Garbage	2	2	$ 184.00	0	$ -	$ -	
Inspect Sediment Loading	2	2	$ 184.00	0	$ -	$ -	
Remove Sediment	0.3	8	$ 110.40	4	$ 86.25	$ 103.50	Water Truck (Flush lines) & Operator
Disposal Costs	0.3		$ 28.75		$ -	$ -	Assumes 2 CY Every Three Years
Subtotals			*$ 1,214.40*			*$ 1,483.50*	
Total Estimate Annual Maintenance				***$ 2,697.90***			
Water Quality Structures							
Remove Debris/Garbage	2	2	$ 184.00	0	$ -	$ -	
Inspect Sediment Loading	2	2	$ 184.00	0	$ -	$ -	
Remove Sediment	0.3	8	$ 110.40	4	$ 172.50	$ 690.00	Vactor Truck & Operator
Disposal Costs	4		$ 276.00		$ -	$ -	Assumes 3 CY a Year
Subtotals			*$ 478.40*			*$ 690.00*	
Total Estimate Annual Maintenance				***$ 1,168.40***			
Natural Resource Enhancement							
Inspect Vegetation	1	1	$ 46.00	0	$ -	$ -	
Routine Repair			$ 230.00		$ -	$ -	Annual Misc. Cost
Remove Debris/Garbage	2	4	$ 368.00	0	$ -	$ -	
Subtotals			*$ 644.00*			*$ -*	
Total Estimate Annual Maintenance				***$ 644.00***			
Natural Resource Revegetation							
Inspect Vegetation	2	2	$ 184.00	0	$ -	$ -	
Routine Repair			$ 460.00		$ -	$ -	Annual Misc. Cost
Remove Debris/Garbage	2	4	$ 368.00	0	$ -	$ -	
Subtotals			*$ 1,012.00*			*$ -*	
Total Estimate Annual Maintenance				***$ 1,012.00***			
Recreational Trail							
Inspect Vegetation	2	2	$ 184.00	0	$ -	$ -	
Remove Debris/Garbage	4	4	$ 736.00	0	$ -	$ -	
Maintain Vegetation	2	12	$ 1,104.00	12	$ 11.50	$ 276.00	Mower, Weedeater, Etc.
Subtotals			*$ 2,024.00*			*$ 276.00*	
Total Estimate Annual Maintenance				***$ 2,300.00***			

Note: Labor rate of $40/hr from the original table produced in 1999 was updated with an increase of 15% to $46/hr in 2007. The original information was based on information provided by the Unified Sewerage Agency of Washington County (now Clean Water Services). Labor for maintenance activities was assumed to be City maintenance staff averaged for maintenance and supervisor effort. Effort shown includes travel time and office documentation time. This table also reflects a 2007 update of of +15% to the unit costs for equipment, disposal, and slope repair.

Reference:
Table D-9 information is summarized in Table D-8.

APPENDIX E

RESULTS OF THE MODELING AND FLOOD CONTROL CIP DEVELOPMENT FOR THE FIVE HIGHEST PRIORITY CIP LOCATIONS

Results of the Modeling and CIP Development for the Five Highest Priority Flood Control CIP Locations

CIP #1 Glenwood

The Glenwood CIP is located in the far southwestern portion of the City, on the western bank of the Willamette River (see Figure 5-1, Location #1). The system discharges to the Willamette River. There are steep slopes in the southern portion of the drainage area, specifically the Laurel Hill Basin in the Eugene area that discharges into this system. The process for developing the CIP is described below.

1. Upon initial review of the model results, it was determined that some of the eastern catchments (catchment_1, catchment_3, and 77_234_gw3 per Figure 3-12, Sheets D-1 and E-1) do not actually discharge to the main storm system in Glenwood. In these locations the roadway is unimproved and runoff generated currently infiltrates or already discharges to the Willamette River. Roadway improvements are expected, and runoff from the catchment_3 (Figure 3-12, Sheet E-1) is proposed to discharge to the Willamette River via a new pipe and outlet structure (Figure E-1, Reach #1). Costs were calculated for a new pipe and outfall along 19th Avenue, but not the expected permitting costs associated with the proposed new outfall. Flow conditions in the main stem of the Glenwood system were re-evaluated after the eastern catchments were disconnected in the model from this system.
2. The main stem of the Glenwood system (Figure E-1, Reaches #2 and #3) was primarily assessed from upstream to downstream. Reach #2 was identified as potentially affecting upstream segments due to backwater conditions and also as being undersized to accommodate existing flows. Reach #2 is irregularly graded, and the bottom of Segment 2b is eight feet higher than the upstream segment (Figure E-3). Segments 2c and 2b were determined to be Type 4 channels (see Appendix D for definition of channel types) and Segment 2a was a Type 3 channel. Costs were calculated for re-grading Reach #2 with a constant slope to decrease the hydraulic grade line and convey additional flow downstream (Figure E-4).
3. Immediately downstream of Reach #2 is Reach #3, which consists of relatively short culvert and open channel segments. Following the regrading of Reach #2, the bottom elevations of the open channel segments in Reach #3 were lowered by about four feet to better align with the channel regrading upstream, and the culverts in Reach #3 were upsized to align with the open channel segments (Figure E-4). Costs were calculated for improvements throughout Channel 3.
4. Flow conditions were reassessed in the main stem of Glenwood to determine whether the modifications to Reaches #2 and #3 eliminated flooding conditions in the upstream-most portion of the main stem channel and tributary channels (Figure E-1, Reaches #4 and #5). Flooding in the upstream-most portion of the main channel was eliminated, but slight flooding was still occurring in Reaches #4 and #5. Areas for localized improvements were identified and costs calculated based on the length and depth/width of proposed excavation (for open channel improvements). There were two areas (total length = 261 feet) of improvements identified for Reach #4 (Type 1 channel) and two areas (total length = 230 feet) of improvement identified for Reach #5 (Type 2 channel).

Capital Project Fact Sheet

Basin Name: Glenwood Basin

Project #: Springfield1

Project Identifier	**Springfield1**
Project Title	**Reduce flooding in the Glenwood area**

Project Location

Glenwood is located in the southwest corner of the City of Springfield, on the western bank of the Willamette River. There is a limited piped system in the area, such that stormwater runoff that does enter a piped conveyance system discharges to the Willamette River, either directly or via an outfall or open drainage channel, while other runoff pools and eventually infiltrates. Improvement projects associated with this CIP are distributed throughout the subbasin and include modifications to the piped and open channel conveyance systems.

Refer to Figure 5-1, area 1, for the CIP location.

Drainage Area Served by Capital Project	**1230.3**	Acres
% Impervious (Existing Land Use)	**24.3**	
% Impervious (Future)	**39.3**	

Problems and/or Opportunities Identified

Problems

Roadway flooding is expected to occur in the eastern portion of the Glenwood subbasin as a result of the lack of a piped or channelized conveyance system to collect runoff from developed areas. The main stem of the piped and open channel conveyance system that collects runoff from a majority of the subbasin is anticipated to be undersized for a 25-year event. In addition, some of the open channel segments have a negative slope or significant grading issues which inhibit free flow conditions.

Opportunities

With significant improvements to the piped and open channel conveyance system, there are opportunities to incorporate water quality during construction. Potential stormwater treatment could include traditional structural BMPs or low impact development (LID) BMPs. Open channel modifications could include riparian area enhancements to address water quality (specifically temperature) and habitat issues.

Project Description to Address Identified Problems / Opportunities

First, add 1247' of 30" storm pipe to convey runoff from the eastern portion of Glenwood to a new outfall to the Willamette River (Figures 5-2 and 5-3, Reach #1). Second, regrade the existing open channel (Figures 5-2, 5-4, and 5-5, Reaches 2 and 3) and downstream piped portions (Figures 5-4 and 5-5, Reach 3) of the main conveyance system currently predicted to flood. Finally, regrade and/or widen the existing open channel (Figures 5-2, 5-6, and 5-7, Reaches 4 and 5) portions of the tributary conveyance system.

Project Elements

1247 Ft – 30" SP (5-10 ft. cover)
1480 LF – Open Channel Improvements (Type 4)
1015 LF – Open Channel Improvements (Type 3)
325 LF – Open Channel Improvements (Type 2)
261 LF – Open Channel Improvements (Type 1)
174 Ft – 60" SP (5-10 ft. cover)
188 Ft – 72" SP (5-10 ft. cover)

Maintenance Requirements

Facility Type	***Annual Maintenance Activities***
30" SP (5-10 ft. cover)	N/A
Open Channel Improvements (Type 4)	Inspect sediment loading and vegetation, remove sediment and debris.
Open Channel Improvements (Type 3)	Inspect sediment loading and vegetation, remove sediment and debris.
Open Channel Improvements (Type 2)	Inspect sediment loading and vegetation, remove sediment and debris.
Open Channel Improvements (Type 1)	Inspect sediment loading and vegetation, remove sediment and debris.
60" SP (5-10 ft. cover)	N/A
72" SP (5-10 ft. cover)	N/A

Objectives Addressed by the Capital Project

Flood Control

The CIP addresses existing and projected future flooding problems associated with undersized and/or improperly graded portions of the existing stormwater system.

Water Quality

When the piped conveyance system is designed, consideration should be given to retrofitting the system to include stormwater treatment devices including rain gardens, bioswales, and structural treatment systems.

Natural Resources

Open channel improvements should be constructed in accordance with riparian enhancements. The CIP was modeled with an increased roughness coefficient to account for additional vegetation that would be needed.

Other City Objectives Addressed by the Capital Project

TBD

Costs

Cost Notes

Permitting costs associated with installation of a new outfall and riparian modifications are not included. Facilities for water quality (e.g., bioswales, rain gardens, structural treatment) were not included for this phase of the project.

Construction Costs:	$3,870,400
Site Acquisition:	$0
Permitting:	TBD
Engineering / Administration:	$967,600
Capital Project Implementation Costs	**$4,644,400**
Annual Maintenance Costs	**$26,500**

Figure E-1 Springfield1 – CIP Overview

- Nodes associated with minor adjustments to modeled system (channel inverts or cross sections)

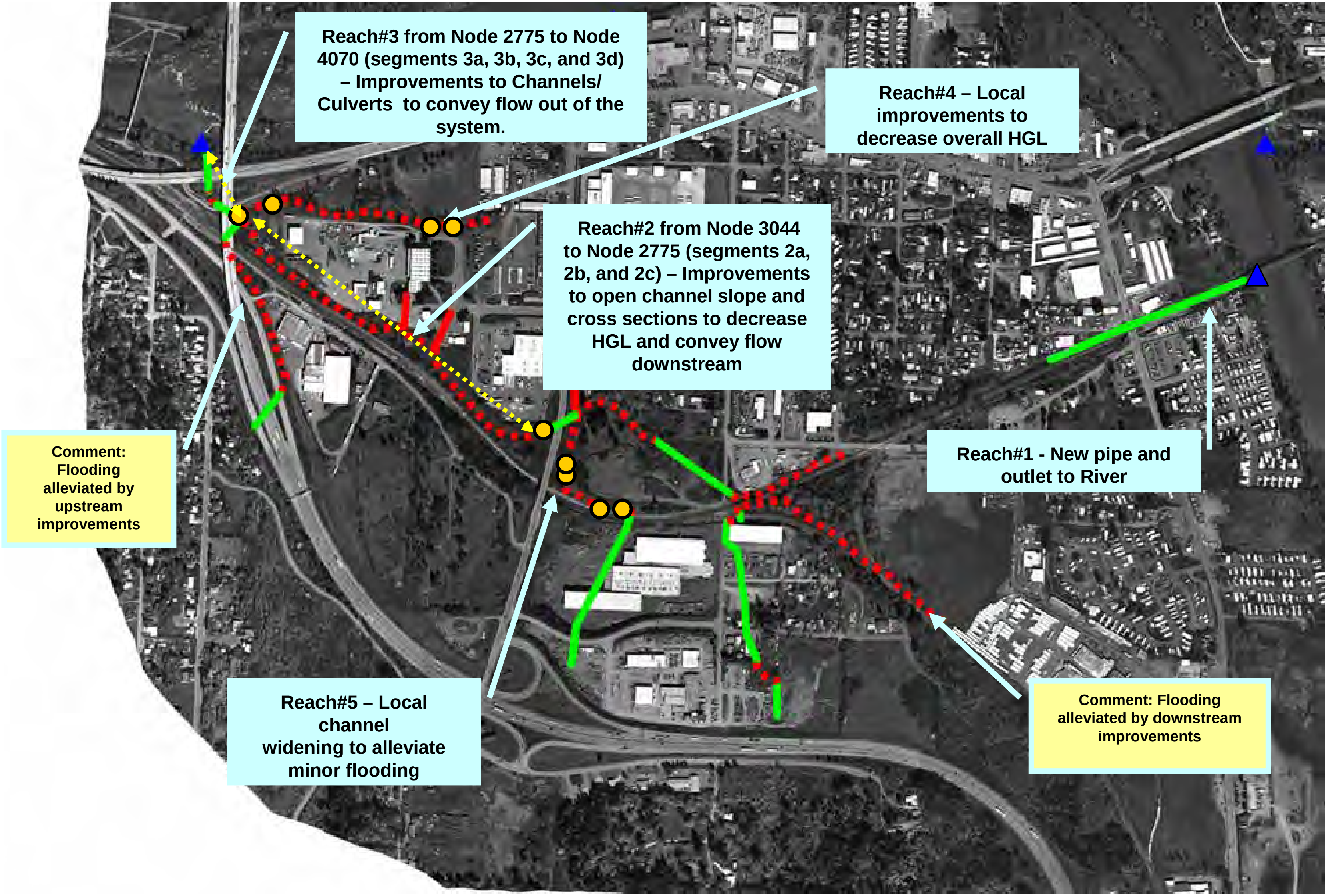

Figure E-2 Springfield1 – Reach #1 – New Reach (Future Condition)

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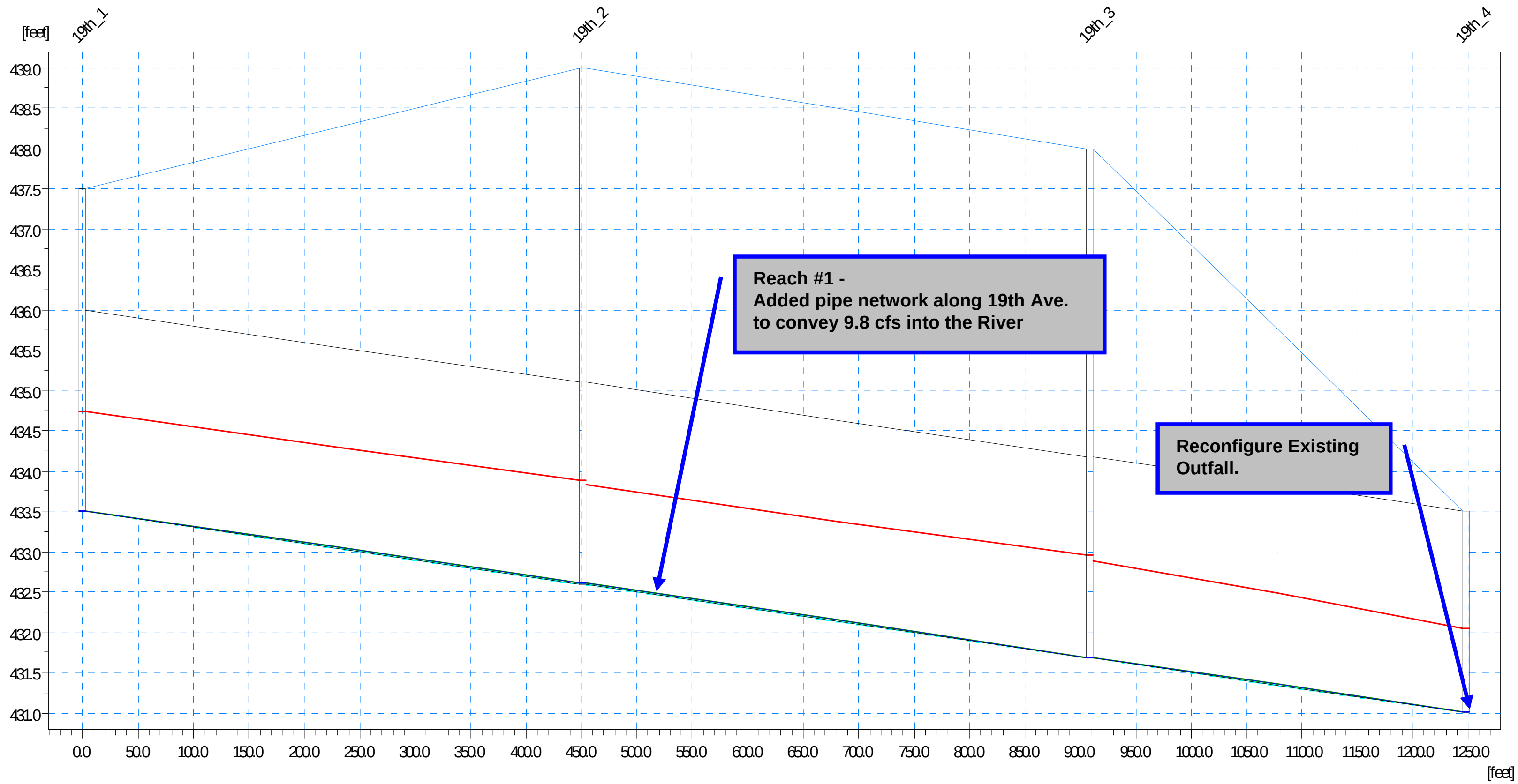


	19th_1		19th_2		19th_3		19th_4	
Ground Lev.	437.50		439.00		438.00			[m]
Invert lev.	433.49		432.59		431.68			[m]
Length		451.06		457.32		338.99		[m]
Diameter		2.50		2.50		2.50		[m]
Slope o/oo		2.00		2.00		2.00		

Figure E-3 Springfield1 – Reaches #2 and #3 – Existing Conditions

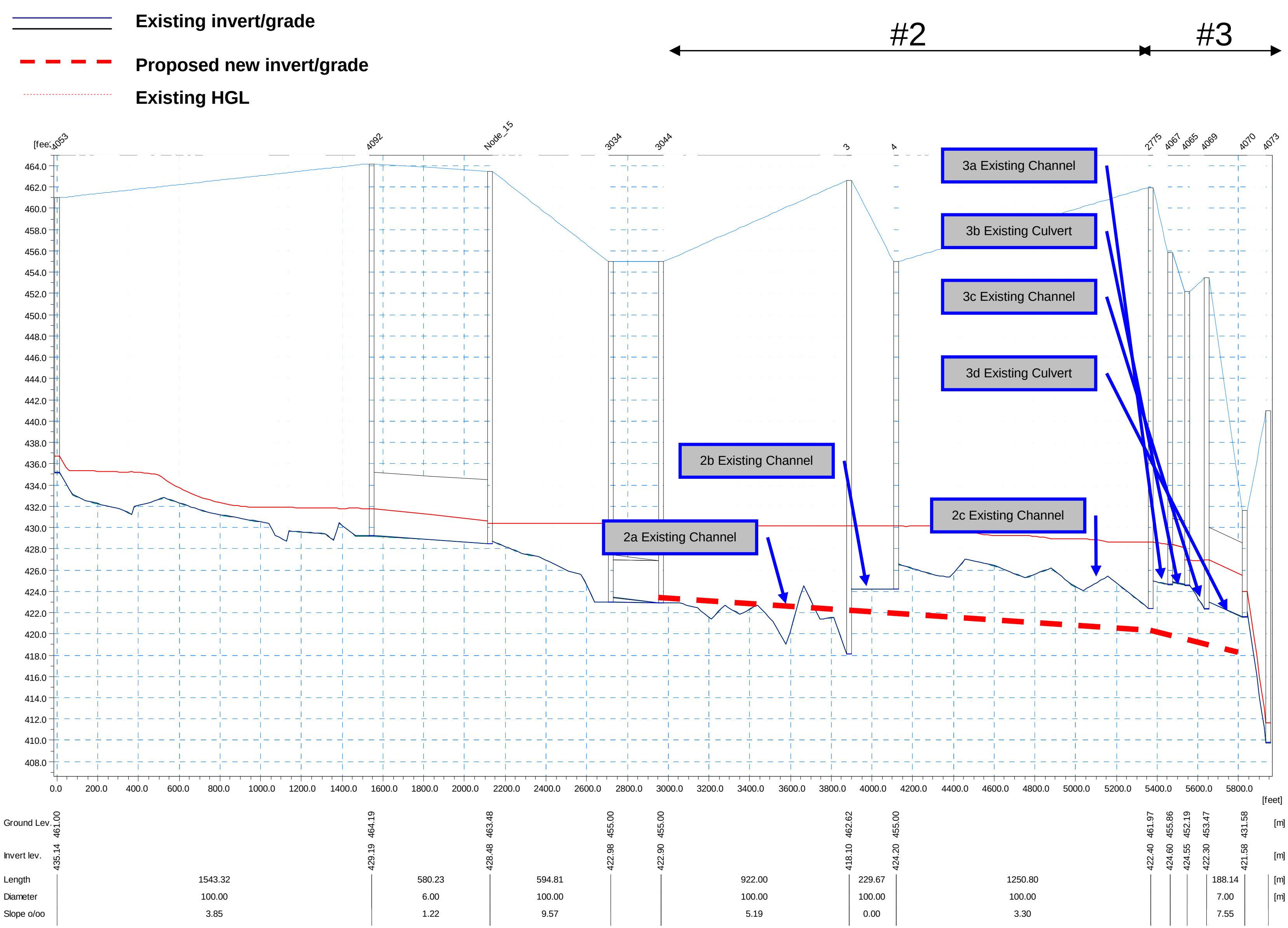


Figure E-4 Springfield1 – Reaches #2 and #3 – Future Conditions

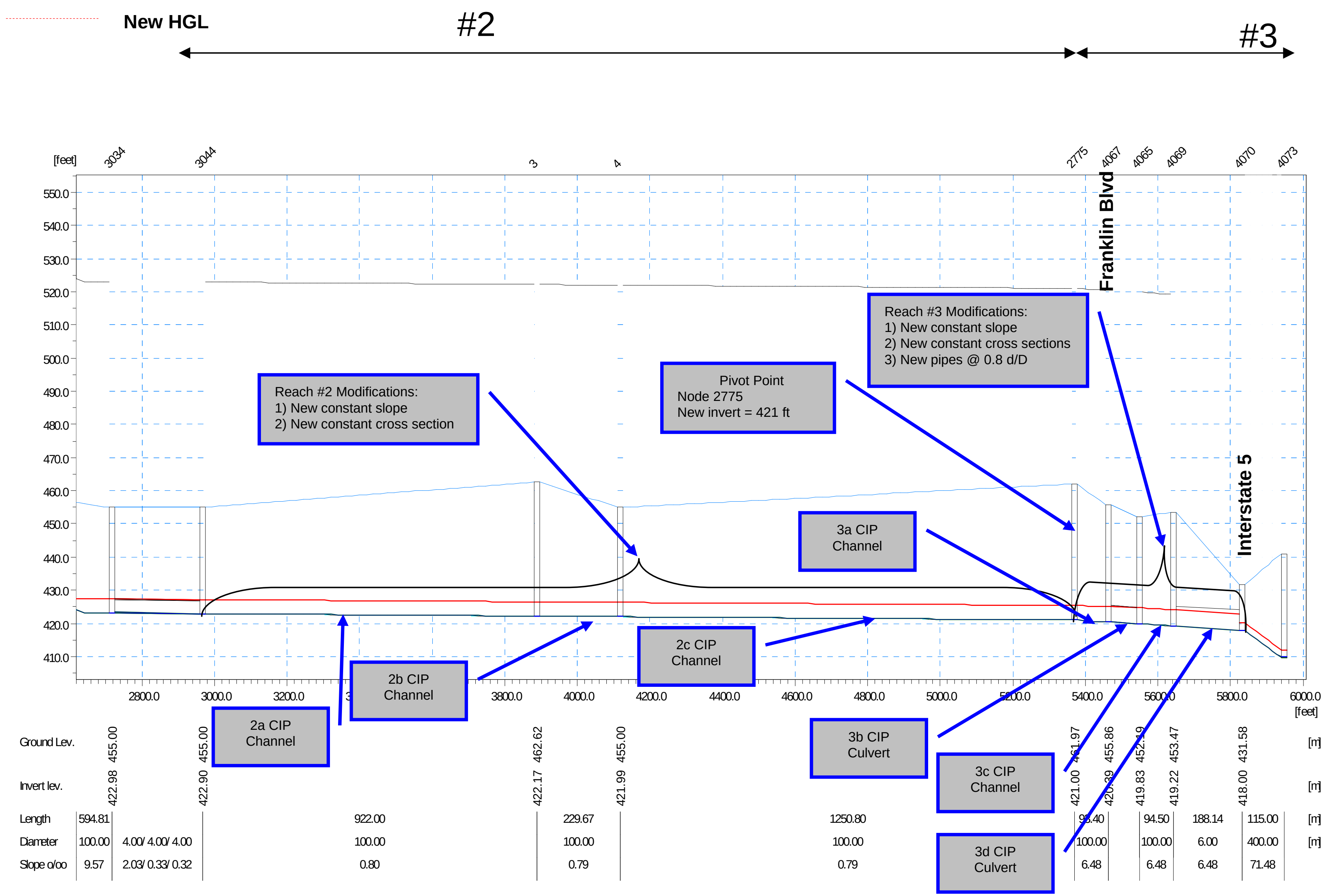


Figure E-5 Springfield1 – Reach #4 – Future Conditions

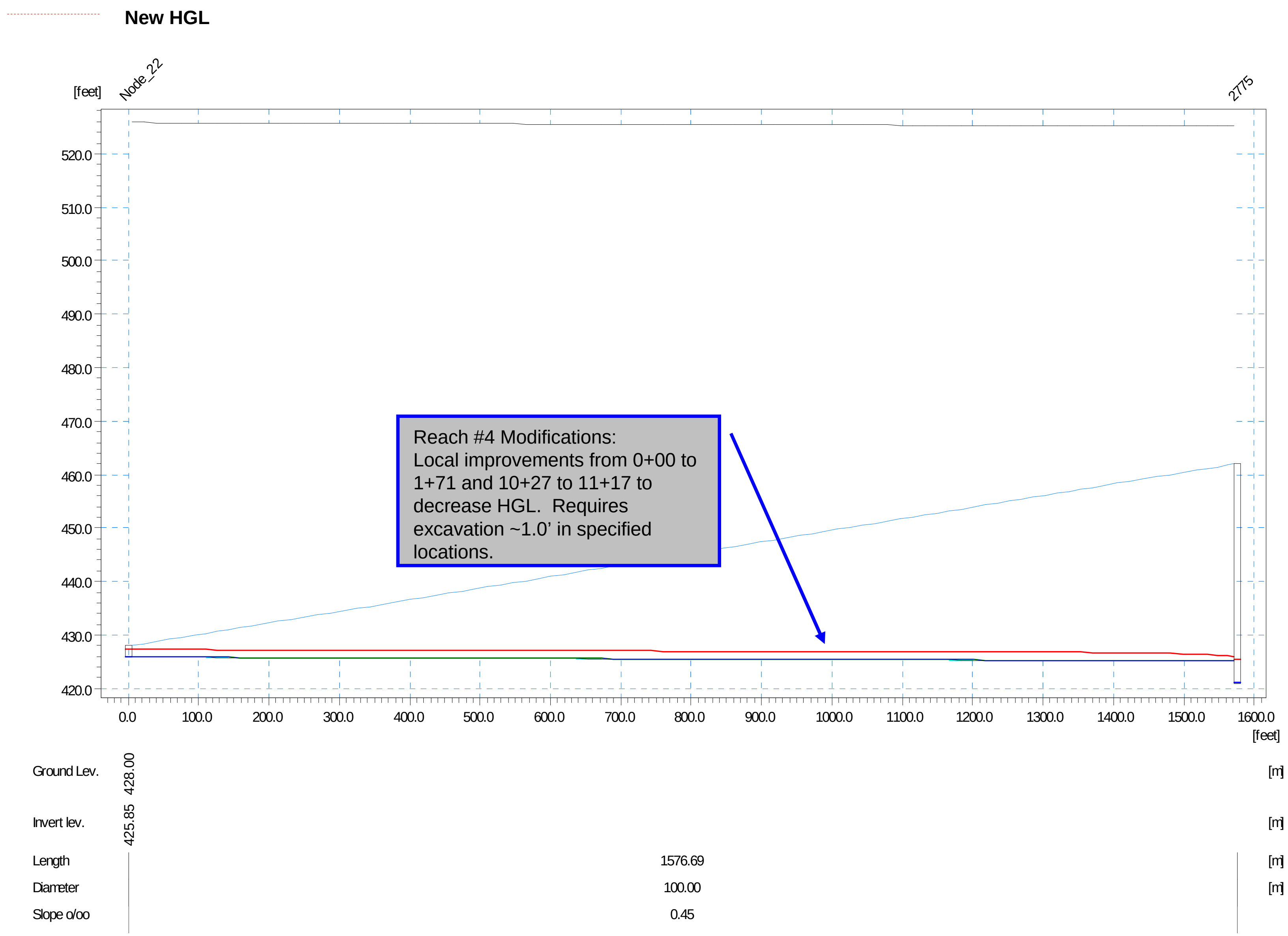
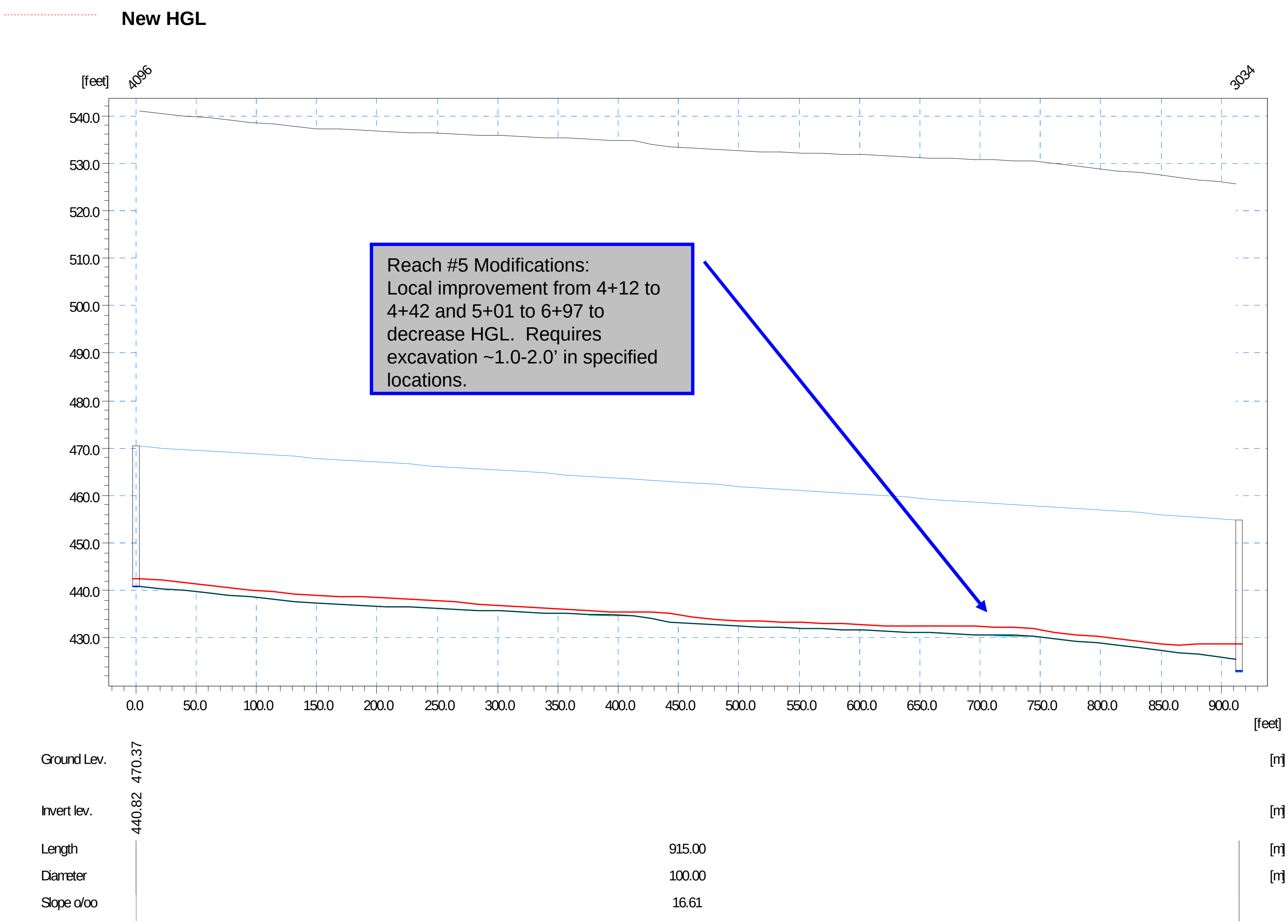


Figure E-6 Springfield1 – Reach #5 – Future Conditions



CIPs #2 and #7 Gray Creek/ 72nd Street

The Gray Creek/ 72nd Street system is located in the far eastern portion of the City (Figure 5-1, CIP #2 and #7). There is a large amount of area outside of the city limits that contributes a substantial amount of flow to the system. Area to the south of the system is steeply sloped and conveys runoff rapidly to the north. Stormwater conveyed in the system discharges north and discharges into Cedar Creek, a tributary to the McKenzie River. The process for developing the CIP is described below.

1. Excavation of a new waterway and outfall to Cedar Creek was estimated as necessary to alleviate the significant upstream flooding (Figures E-7 and E-8, Reach #1-1). Costs were developed for construction of a new open channel, culvert, and outfall to divert flows from the east and take them north. Permitting and land acquisition costs were not included.
2. Flooding conditions throughout the Gray Creek system were reassessed following inclusion of Reach #1-1 in the model. Upstream flooding was still occurring in the system along Reaches #1 and #4, likely a result of the open channel characteristics of the reaches (irregular grade) and (for Reach #1) potential backwater at the confluence with Reaches #2 and #3. Reach #3 currently serves as a bypass channel for the main conveyance system which flows from Reach #1 to Reach #4. Increasing the capacity of Reach #3, thus allowing it to function as main conveyance channel and not a bypass channel, was shown to alleviate flooding conditions in Reach #3 itself and reduce flows into Reach #4 (Figures E-7 and E-10). Costs were developed for open channel improvements and new culverts associated with Reach #3, but permitting and land acquisition costs were not included.
3. Flooding conditions were again reassessed. As a result of modifying Reach #3, downstream flooding was significantly reduced in Reaches #4 and #7, and backwater conditions improved in Reach #1. However, there was still flooding in Reach #1 so this reach was regraded to provide a constant slope (Figure E-9). Costs were developed for open channel improvements to Reach #1.
4. Although flooding conditions were reduced on Reaches #2 and #4, the upstream portion of Reach #4 was still experiencing minor flooding and capacity issues, and there were localized areas still needing improvement in Reach #2. Therefore the upstream portion (352 feet) of Reach #4 and two areas of Reach #2 (64 feet) were regraded to increase capacity. Costs were developed for the improvements.
5. As a result of the increased capacity in Reach #3, flooding was alleviated in the furthest downstream reach (Reach #7) of the Gray Creek/ 72nd Street system. However, other segments upstream of Reach #7 (Reaches #5, 6, and 8) still showed flooding occurring as a result of undersized pipes and irregularly graded open channels. As a result, from upstream to downstream, pipes were upsized on Reaches #5 and #8, and the open channel system was regraded and the culvert was upsized on Reach #6 (Figures E-11, E-12, and E-13). Costs were developed for each of the improvements.

Capital Project Fact Sheet

Basin Name: Gray Creek Basin

Project #: Springfield2

Project Identifier	**Springfield2**
Project Title	**Reduce flooding in the Gray Creek/ 72nd Street area**

Project Location

The Gray Creek drainage system is located in the far eastern portion of the City of Springfield, running east to west with three (proposed) channels diverting water to the north towards Cedar Creek and the McKenzie River. Improvement projects associated with this CIP are distributed throughout the system and include modifications to both the piped and open channel conveyance systems.

Refer to Figure 5-1, areas 2 and 7, for the CIP location.

Drainage Area Served by Capital Project	**1383.7**	Acres
% Impervious (Existing Land Use)	**5.1**	
% Impervious (Future)	**9.1**	

Problems and/or Opportunities Identified

Problems

Roadway and property flooding are expected to occur throughout the Gray Creek and 72nd Street area as a result of an undersized piped and channelized conveyance system that currently exists to collect runoff and also due to some pipe constrictions. The southern boundary of the Gray Creek drainage is a steeply sloped area that conveys runoff quickly. Gray Creek itself (running east to west) conveys significant runoff from an area to the east of the City and outside the City boundary, both of which contribute to the capacity issues.

Opportunities

With significant improvements to the piped and open channel conveyance system, there are opportunities to incorporate water quality during construction. Potential stormwater treatment could include traditional structural BMPs or low impact development (LID) BMPs. Open channel modifications could include riparian area enhancements to address water quality (specifically temperature) and habitat issues.

Project Description to Address Identified Problems / Opportunities

First, construct a new open channel to convey discharges from the eastern most portion of Gray Creek to a new outfall to Cedar Creek (Figures 5-8 and 5-9, Reach #1-1). Then, regrade the existing open channel (Figures 5-8, 5-10, 5-11, and 5-13, Reaches 1, 2, 3, 4, and 6) and downstream piped portions (Figures 5-8, 5-11, 5-13, and 5-14, Reaches 3, 5, 6, and 8) of the conveyance system currently anticipated to cause flooding.

Project Elements

2342 LF – Open Channel Improvements (Type 1)
4201 LF – Open Channel Improvements (Type 2)
90 LF – 27" SP (2-5 ft. cover)
250 Ft – 42" SP (2-5 ft. cover)
1510 Ft – 30" SP (2-5 ft. cover)

Maintenance Requirements

Facility Type	***Annual Maintenance Activities***
Open Channel Improvements (Type 1)	Inspect sediment loading and vegetation, remove sediment and debris.
Open Channel Improvements (Type 2)	Inspect sediment loading and vegetation, remove sediment and debris.
27" SP (2-5 ft. cover)	N/A
42" SP (2-5 ft. cover)	N/A
30" SP (2-5 ft. cover)	N/A

Objectives Addressed by the Capital Project

Flood Control

The CIP addresses existing and projected future flooding problems associated with undersized and/or improperly graded portions of the existing stormwater system.

Water Quality

When the piped conveyance system is designed, consideration should be given to retrofitting the system to include stormwater treatment devices including rain gardens, bioswales, and structural treatment systems.

Natural Resources

Open channel improvements should be constructed in accordance with riparian enhancements. The CIP was modeled with an increased roughness coefficient to account for additional vegetation that would be needed.

Other City Objectives Addressed by the Capital Project

TBD

Costs

Cost Notes

Permitting costs associated with installation of a new outfall and riparian modifications are not included. Potential acquisistion costs are not included. Facilities for water quality (e.g., bioswales, rain gardens, structural treatment) were not included for this phase of the project.

Construction Costs:	$4,237,100
Site Acquisition:	$0
Permitting:	TBD
Engineering / Administration:	$1,059,275
Capital Project Implementation Costs	**$5,084,500**
Annual Maintenance Costs	**$49,700**

Figure E-7 Springfield2 – CIP Overview

Nodes associated with minor adjustments to the modeled system (channel inverts or cross sections)

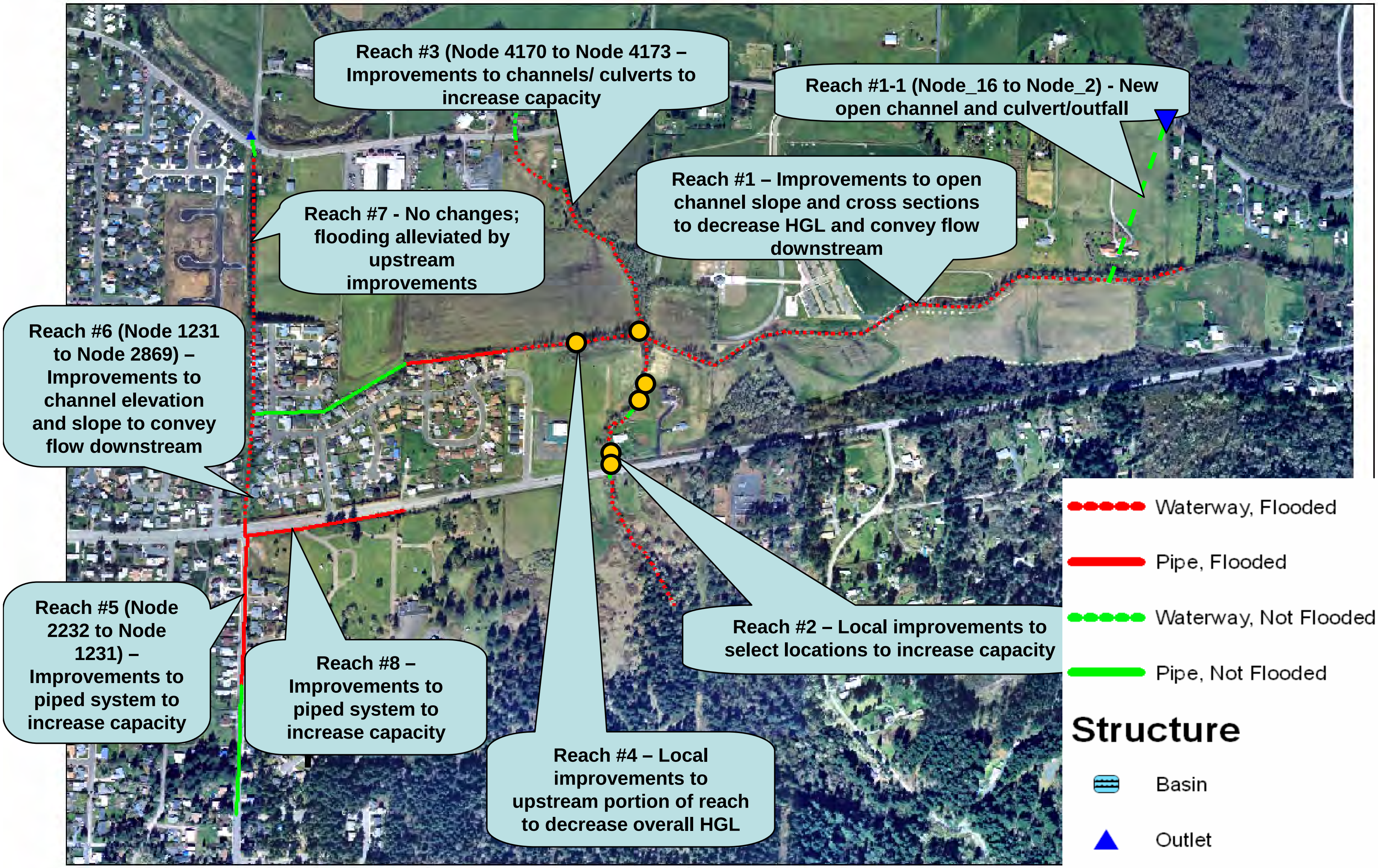


Figure E-8 Springfield2- Reach #1-1 – New Reach - Future Condition

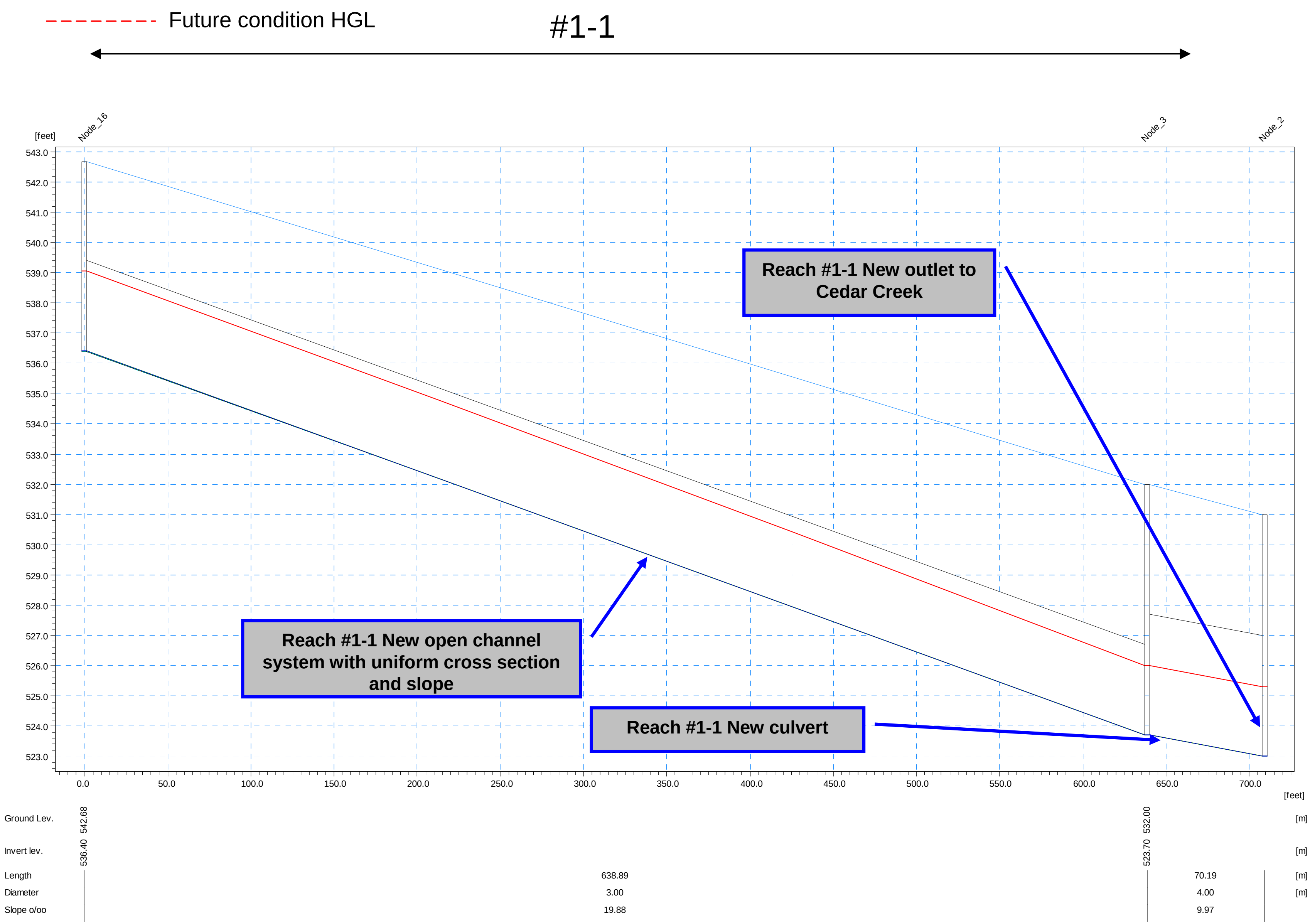


Figure E-9 Springfield 2 – Reach #1 – Future Condition

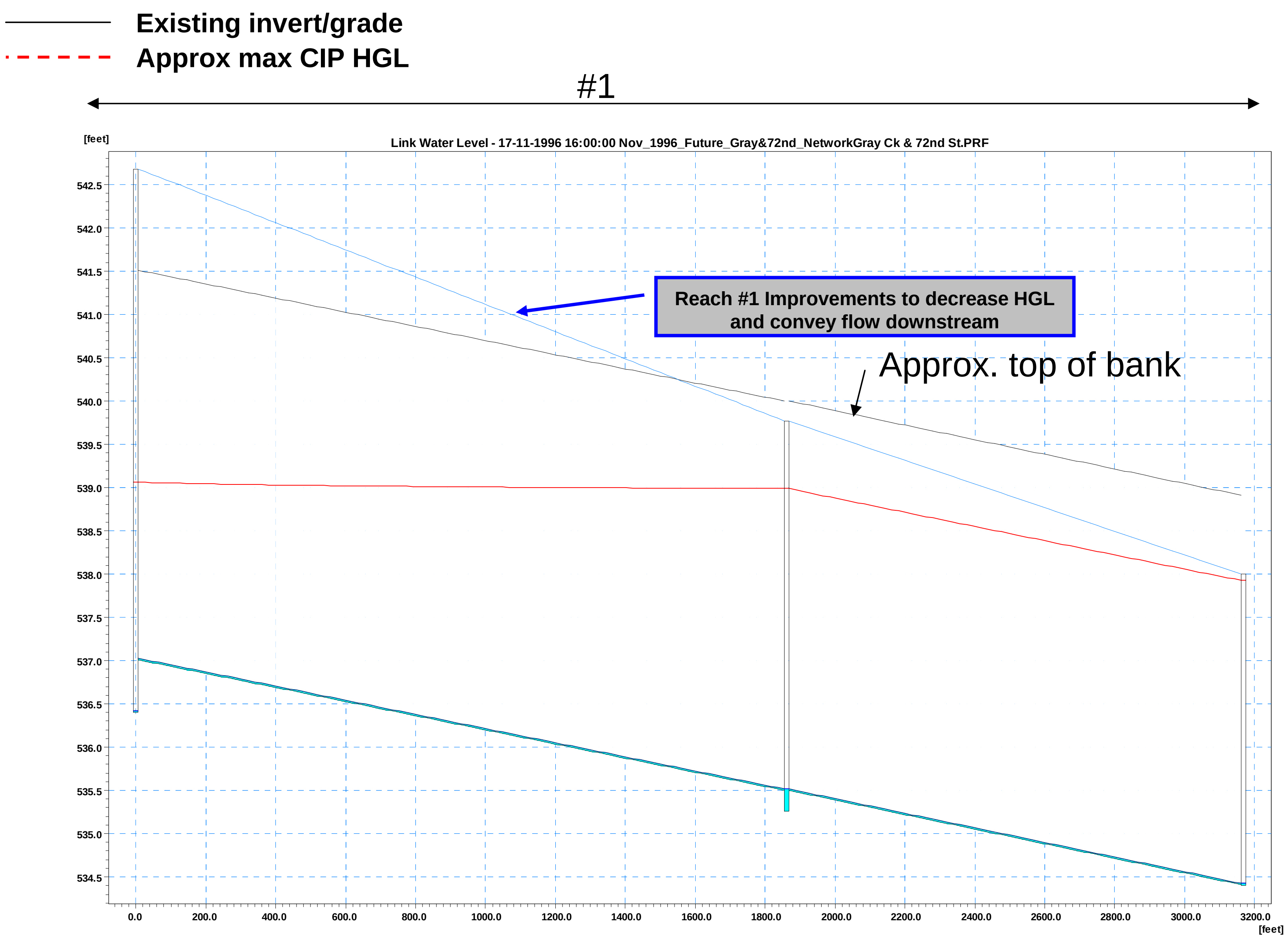


Figure E-10 Springfield2 – Reach #3 - Future Condition

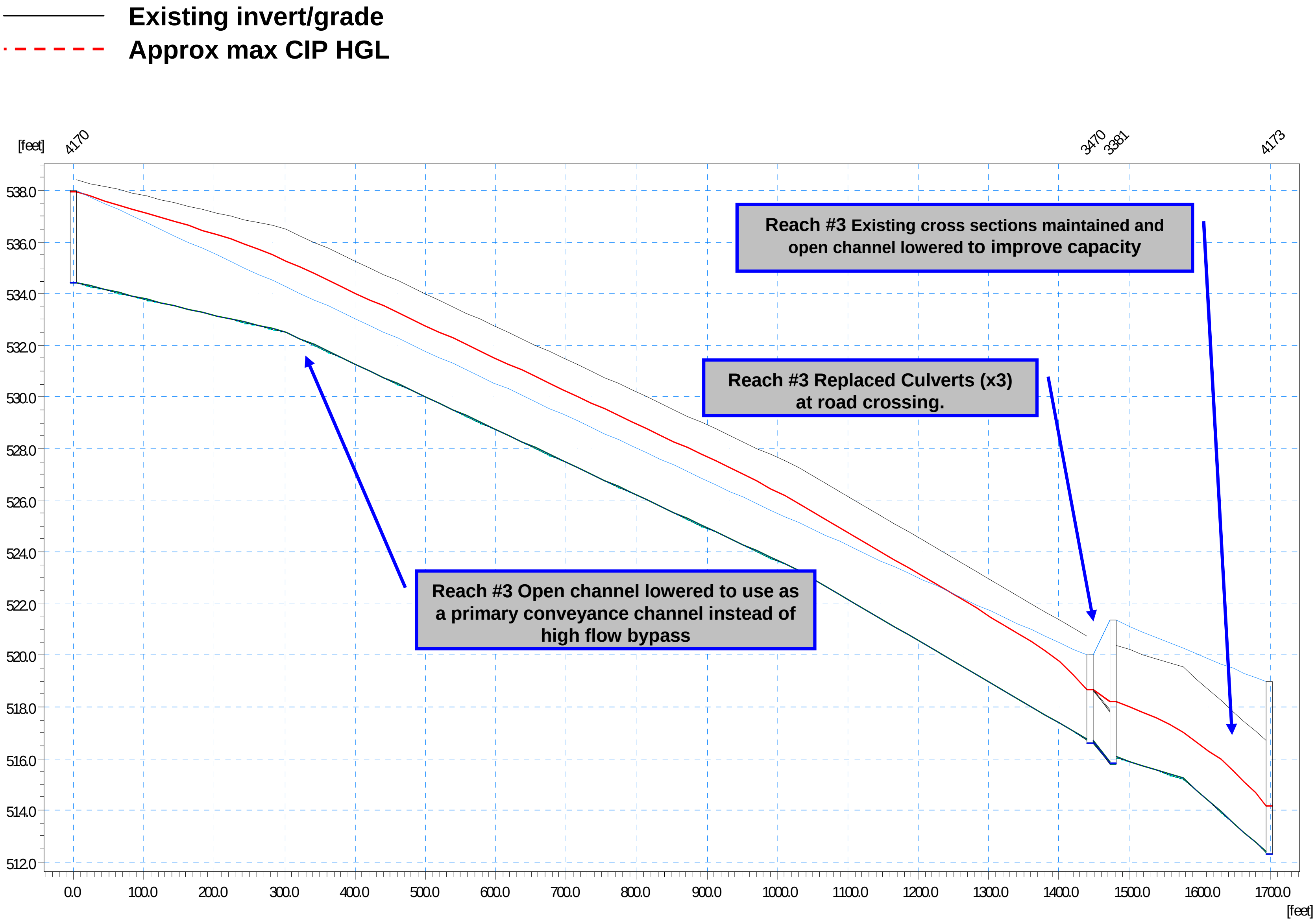


Figure E-11 Springfield2 – Reach #5 – Future Condition

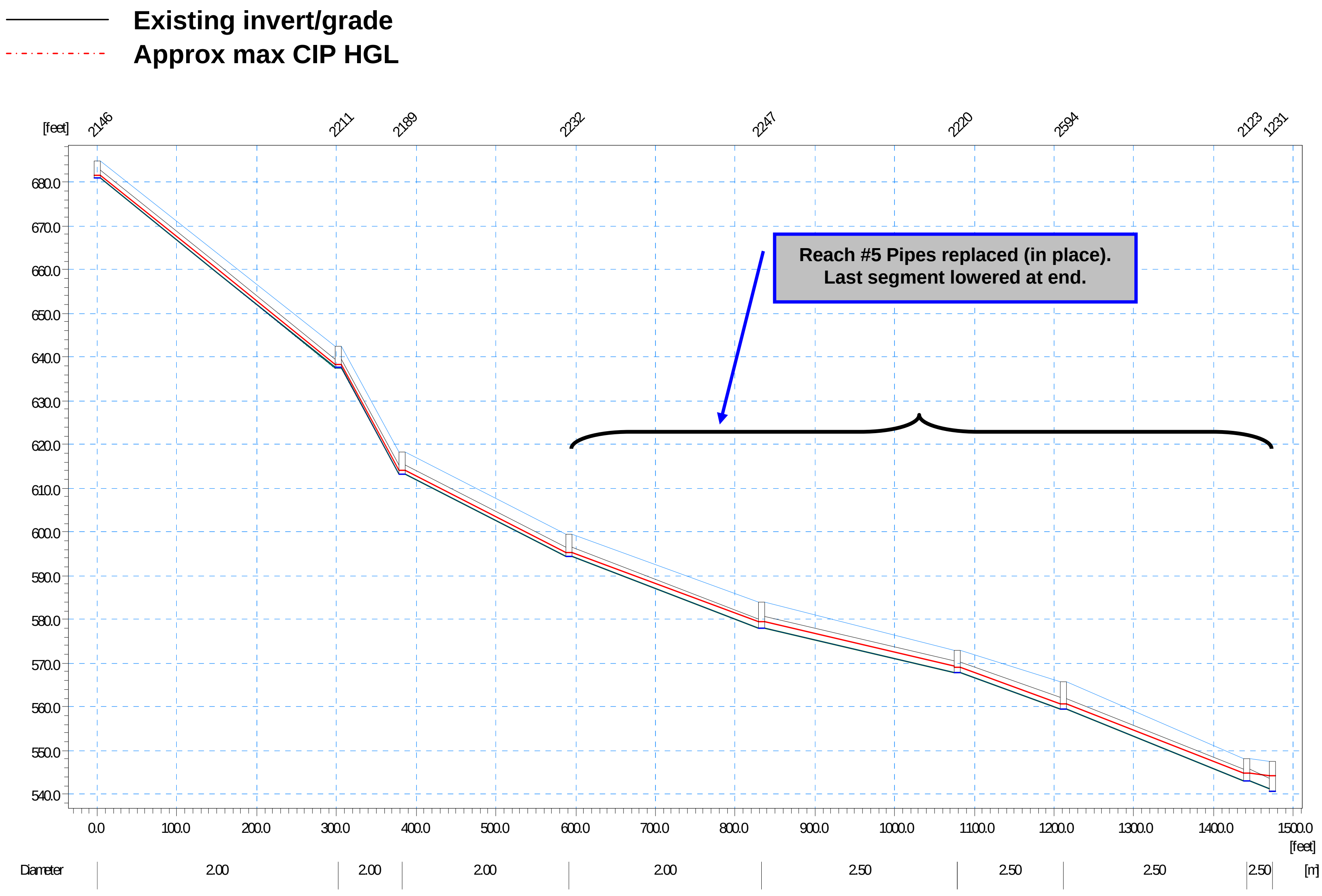


Figure E-12 Springfield2 – Reaches #6 and #7 – Future Condition

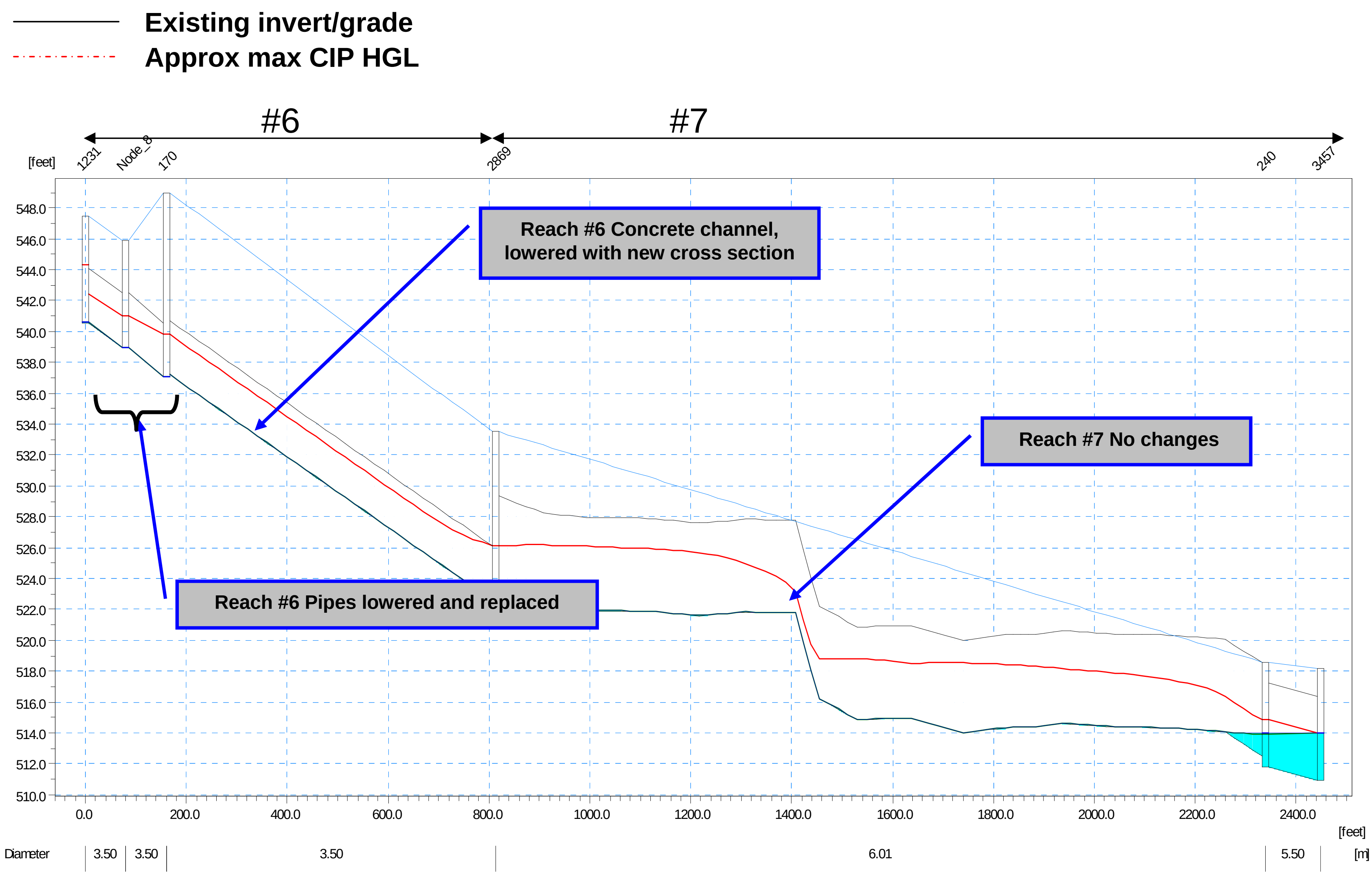
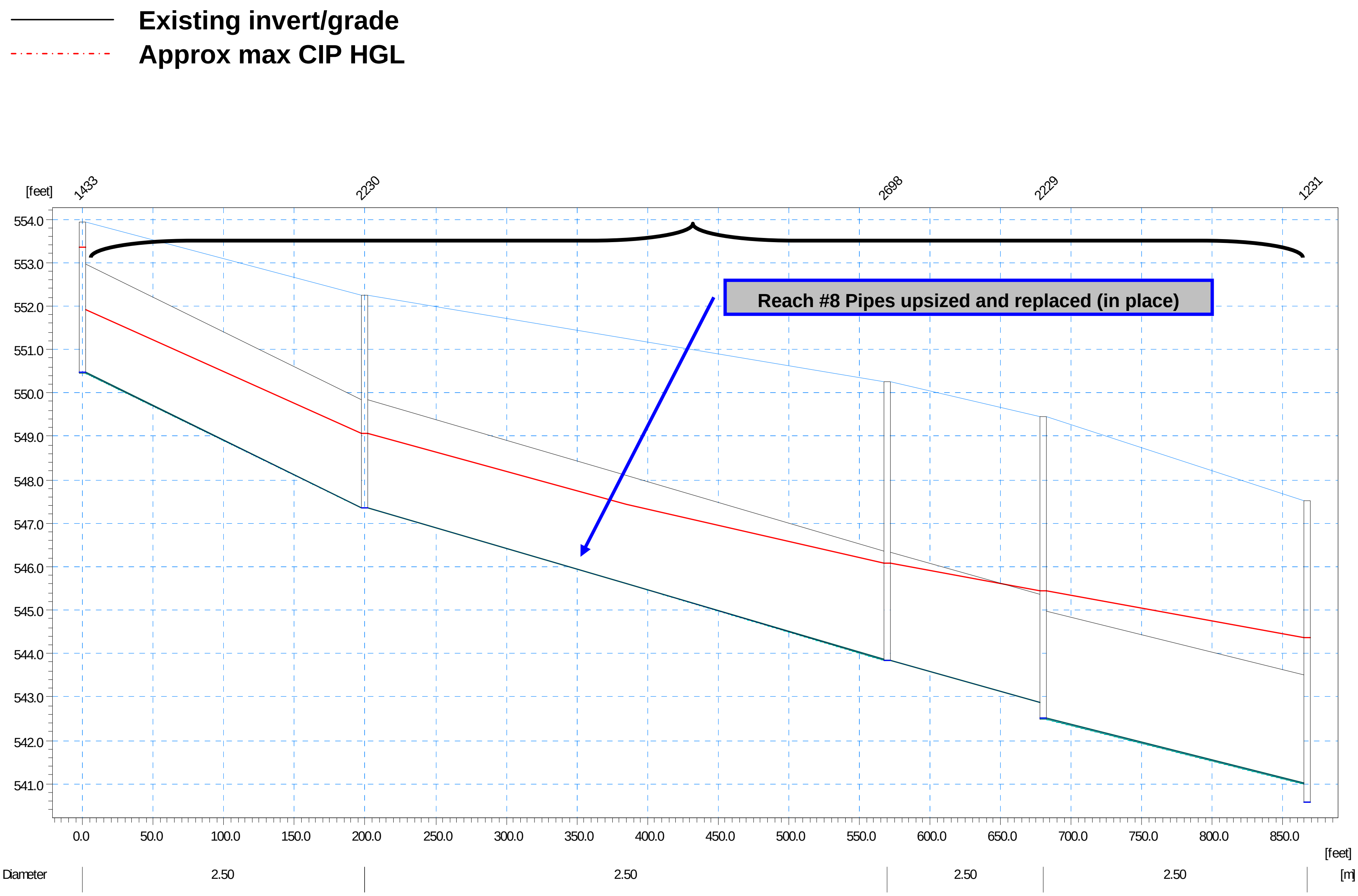


Figure E-13 Springfield2 – Reach #8 – Future Condition



CIP #3 Jasper Natron

Jasper Natron is located in the far south-central portion of the City (Figure 5-1, CIP#3). The area is currently undeveloped, with the exception of a small subdivision in the northeastern corner of the area and an existing lumber mill in the southeastern corner of the area. As further development is expected to occur in the future, the City wants to estimate costs for constructing the main drainage system to collect discharges from anticipated development east of the existing railroad tracks, and take the flows under the railroad tracks and into a North Fork Willamette River tributary prior to discharge to the Willamette River. The process for developing the CIP is described below:

1. Based on conversations with the City of Springfield, proposed alignments for two open channel conveyance systems were identified. Both alignments extend east to west towards the existing railroad tracks. One system would drain the northeastern portion of the site; the other would drain the southeastern portion of the site. There is an existing open channel system that is undersized and currently draining the northeastern portion of the site.
2. Based on future development conditions, both open channel systems were sized and costs developed (Figures E-14, E-15, and E-16, Reaches #1 and #2).
3. Two culverts were sized to convey discharge from each open channel system under the existing railroad tracks. Costs were developed for each culvert (Figures E-14, E-15, and E-16).

Note that conveyance system alignment and costs west of the railroad tracks towards the North Fork Willamette River were not developed. This is due to uncertainty associated with the final outfall location and limited information related to grading and contours in the area.

Capital Project Fact Sheet

Basin Name: Jasper Natron Basin

Project #: Springfield3

Project Identifier	**Springfield3**
Project Title	**Develop conceptual infrastructure costs for Jasper Natron**

Project Location

Jasper Natron is located along the southern city boundary. It comprises most of the peninsula area on the southeastern boundary. The area currently has little development and no stormwater infrastructure in place, except for an existing drainage ditch along the western side of the railroad tracks. Runoff from this area is expected to discharge to the North Fork Willamette River, either directly or via a tributary.

Refer to Figure 5-1, area 3, for the CIP location.

Drainage Area Served by Capital Project	**1005.1**	Acres
% Impervious (Existing Land Use)	**1.7**	
% Impervious (Future)	**16.4**	

Problems and/or Opportunities Identified

Problems

There is limited existing stormwater infrastructure in the Jasper Natron subbasin, but there are multiple development activities proposed for this area. Although more planning level assessment and a detailed development plan would be needed for this area to allow for full build-out, this CIP provides initial costs for required mainstem conveyance to the outfall.

Opportunities

With significant improvements to the piped and open channel conveyance system, there are opportunities to incorporate water quality during construction. Potential stormwater treatment could include traditional structural BMPs or low impact development (LID) BMPs.

Project Description to Address Identified Problems / Opportunities

Upgrade the existing 1615' of stormwater conveyance channel in the northern portion of the subbasin and add 2215' of new stormwater conveyance channel to the southern portion of the subbasin to serve as the primary mainstem conveyance (Figure 5-15, Reaches #1 and #2). Add two culverts under the railroad to convey stormwater to the existing wetland area and tributary to the North Fork Willamette River.

Project Elements

1615 LF – Open Channel Improvements (Type 1)
2215 LF – Open Channel Improvements (Type 2)
40 Ft – 42" SP (2-5 ft. cover)
48 Ft – 48" SP (2-5 ft. cover)

Maintenance Requirements

Facility Type	***Annual Maintenance Activities***
Open Channel Improvements (Type 1)	Inspect sediment loading and vegetation, remove sediment and debris.
Open Channel Improvements (Type 2)	Inspect sediment loading and vegetation, remove sediment and debris.
42" SP (2-5 ft. cover)	N/A
48" SP (2-5 ft. cover)	N/A

Objectives Addressed by the Capital Project

Flood Control

This CIP provides for a main or municipal collection system to convey and discharge flows from new development anticipated in this area.

Water Quality

When the conveyance system is designed, consideration should be given to including stormwater treatment devices including rain gardens, bioswales, and structural treatment systems.

Natural Resources

Open channel improvements or new construction should include riparian enhancements. The CIP was modeled with an increased roughness coefficient to account for additional vegetation that would be needed.

Other City Objectives Addressed by the Capital Project

The City wanted a cost for initial, planning level estimates for the mainstem conveyance system that would serve the Jasper Natron drainage area. Most development is expected to occur east of the railroad tracks so initial infrastructure was proposed to accommodate development in that location.

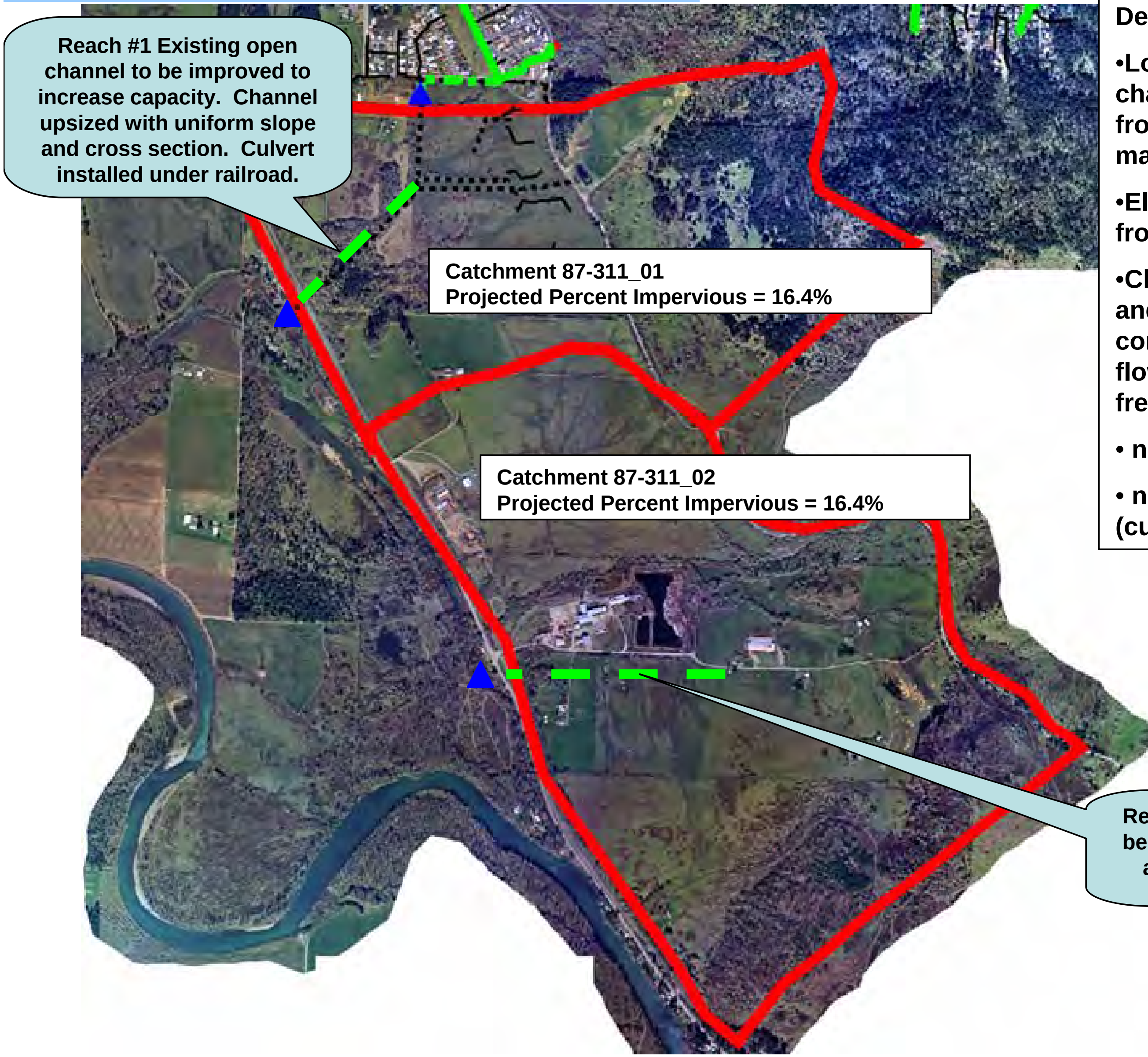
Costs

Cost Notes

Costs do not include open channel improvements west of the railroad tracks or permitting associated with the mainstem conveyance system. They also do not include costs associated with coordination with the Railroad to obtain permission to construct culverts. Facilities for water quality (e.g., bioswales, rain gardens, structural treatment) were not included for this phase of the project.

Construction Costs:	$2,206,500
Site Acquisition:	$0
Permitting:	TBD
Engineering / Administration:	$551,625
Capital Project Implementation Costs	**$2,647,800**
Annual Maintenance Costs	**$29,100**

Figure E-14 Springfield3 – CIP Overview



Design Assumptions:

- Location and length of channels estimated from aerial background map
- Elevations estimated from existing DEM
- Channel cross sections and slopes developed to convey the peak 1996 flow with ½ ft of freeboard
- n=0.08 (channels)
- n=0.013 and d/D=<8/10 (culverts)

Figure E-15 Springfield3 – Reach #1 – Future Condition

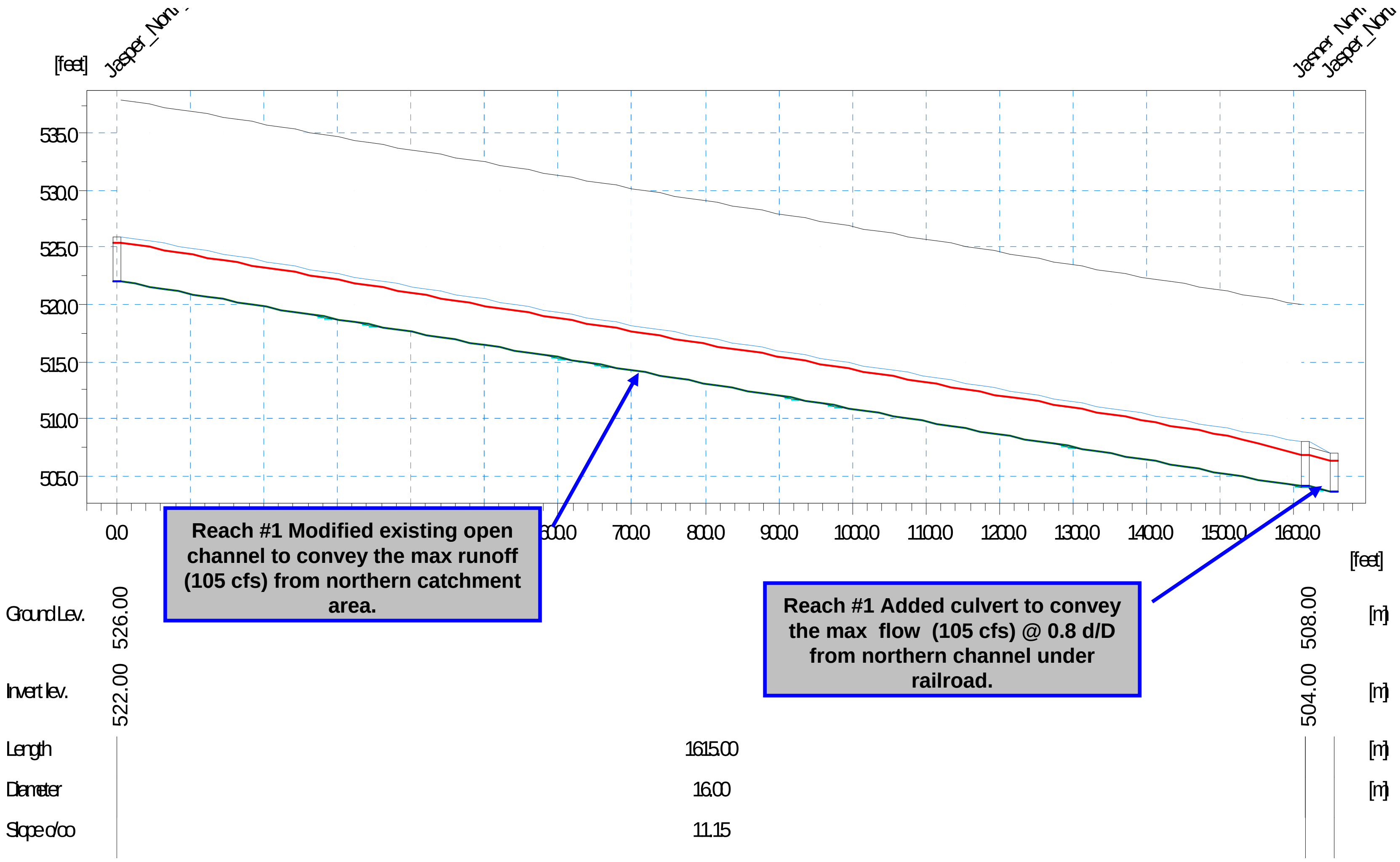
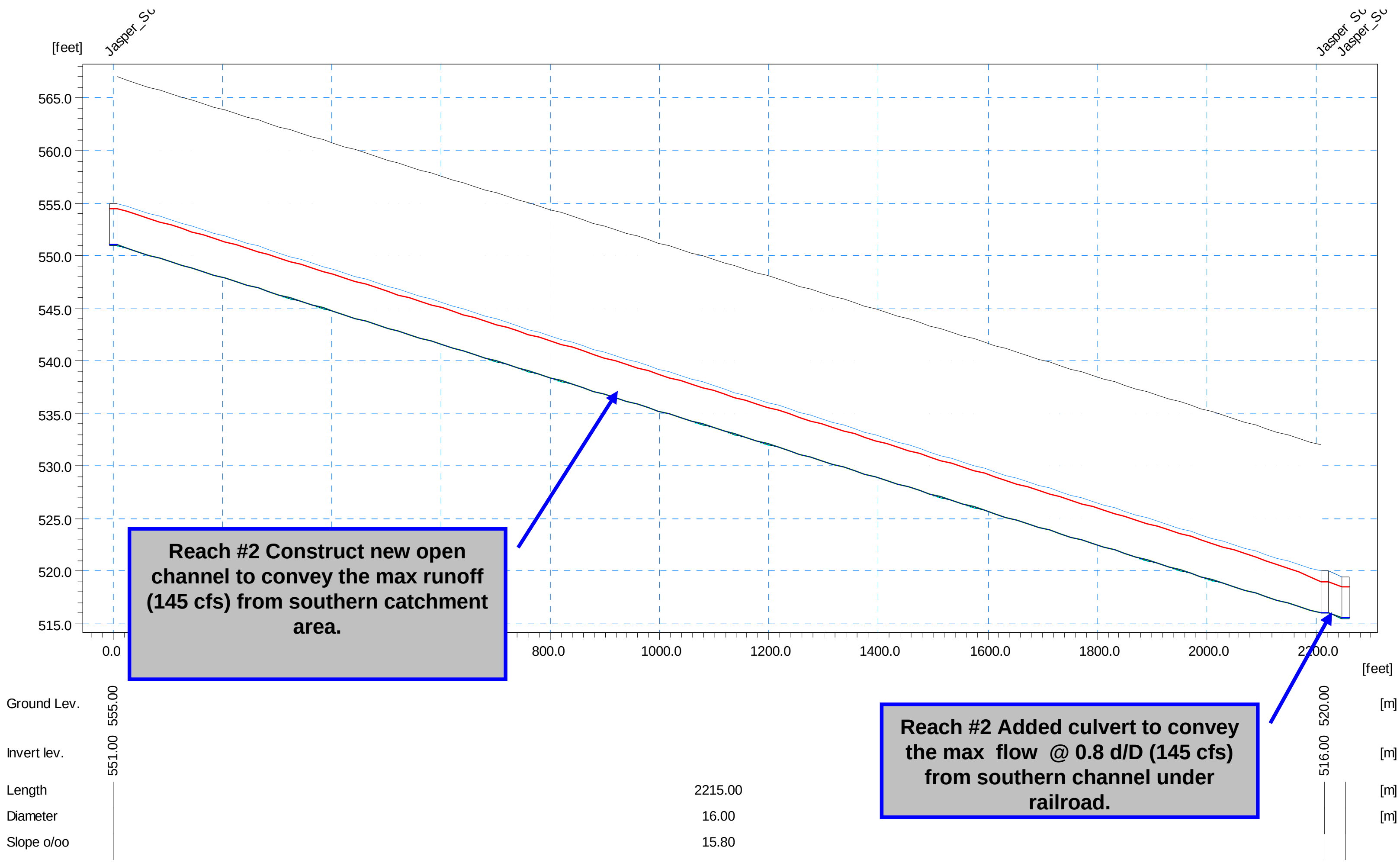


Figure E-16 Springfield3 – Reach #2 – Future Condition



CIP #4 Channel 6

The Channel 6 system is located in the western portion of the City (Figure 5-1, CIP #4). The Channel 6 system runs east to west and discharges to the major storm conveyance system adjacent to Interstate 5. The area is currently heavily developed, but there are a number of open spaces or vacant parcels adjacent to the system. The existing system is very flat and is comprised of an upstream piped conveyance system (east from about 5th Street) with a downstream open channel conveyance system (west from about 5th Street). The piped conveyance system is significantly undersized. The downstream open channel system is flat and irregularly graded. There are some downstream pipe constrictions that create backwater and flooding in the system as well. The process for developing the CIP is described below:

1. To alleviate upstream flooding conditions, a storage facility with an upstream and downstream diversion pipe was configured on a vacant/ open space parcel at the far upstream end of Channel 6 (east of 9th Street). A total storage volume of approximately 100,000 cubic feet was added to the system to reduce flow in the existing upstream piped system (Figure E-18). Costs were developed for the storage facility and associated piping. Land acquisition costs were not available and not included in the cost estimate.
2. To alleviate downstream flooding conditions, a diversion pipe was configured to intercept some of the upstream flow in Channel 6 and divert it north along 5th Street to the northern drainage system (Figure E-17). Costs were developed for the associated piping necessary to route the flow.
3. The downstream system was analyzed to determine locations of significant flooding following implementation of the storage facility and diversion pipe. Most downstream flooding was alleviated by the upstream improvements, but there are four locations where flooding in the open channel is still occurring. Flooding is predicted to be minimal, and most of these locations are adjacent to an open space or park where flooding may be acceptable as it may not cause property damage. In addition, incorporation of regrading and open channel improvements to the downstream area would be very expensive due to the overall length of the open channel segments, and based on preliminary model results open channel improvements did little to alleviate the flooding that was still occurring. As a result, only the storage facility and diversion systems are currently proposed for this CIP. Following implementation of these facilities, if downstream flooding is still shown to be a problem, then additional evaluations of open channel improvements would need to be made.

Capital Project Fact Sheet

Basin Name: Channel 6 Basin

Project #: Springfield4

Project Identifier	**Springfield4**
Project Title	**Reduce flooding in the Channel 6 area**

Project Location

The Channel 6 drainage system is located in the western portion of the City of Springfield, running east to west and eventually discharging to a stormwater drainage system along the I-5 corridor. Improvement projects associated with this CIP are located at the upstream end of the system and include a storage facility and diversion pipes..

Refer to Figure 5-1, area 4, for the CIP location

Drainage Area Served by Capital Project	**510.1**	Acres
% Impervious (Existing Land Use)	**40.7**	
% Impervious (Future)	**41.1**	

Problems and/or Opportunities Identified

Problems

Roadway and property flooding are expected to occur throughout the Channel 6 area as a result of an undersized piped and channelized conveyance system that currently exists to collect runoff and also due to some pipe constrictions. The system conveys runoff from a fairly large drainage area. The conveyance system itself is very flat and is affected by downstream constrictions and undersized pipe networks.

Opportunities

With significant improvements to the piped system and incorporation of a storage system, there are opportunities to incorporate water quality during construction. Potential stormwater treatment could include upsizing the proposed storage system for water quality or incorporating traditional structural BMPs or low impact development (LID) BMPs into construction.

Project Description to Address Identified Problems / Opportunities

Construct a storage facility and associated piping along the upstream Channel 6 system (at approximately node 1739) to reduce downstream flows (Figure 5-18). Divert a portion of the Channel 6 drainage at node 642 to the northern drainage system using 2580 feet of 36" pipe (Figure 5-18) to further reduce downstream flows.

Project Elements

4 Ac-Ft – Flood Control Facility
249 Ft – 24" SP (2-5 ft. cover)
2875 Ft – 36" SP (2-5 ft. cover)

Maintenance Requirements

Facility Type	***Annual Maintenance Activities***
Flood Control Facility	Inspect and clean inlet and outlet, maintain vegetation, inspect sediment loading, remove sediment, remove debris, inspect and repair separation berm.
24" SP (2-5 ft. cover)	N/A
36" SP (2-5 ft. cover)	N/A

Objectives Addressed by the Capital Project

Flood Control

The CIP addresses most modeled existing and projected future flooding problems associated with undersized and/or improperly graded portions of the existing stormwater system.

Water Quality

When the piped conveyance system and storage facility is designed, consideration should be given to retrofitting the system to include stormwater treatment including use of a wet pond, rain garden, bioswales, and structural treatment systems.

Natural Resources

Construction of the storage facility should consider use of appropriate vegetation and riparian enhancement.

Other City Objectives Addressed by the Capital Project

TBD

Costs

Cost Notes

Facilities for water quality (e.g., bioswales, rain gardens, wet pond, structural treatment) were not included for this phase of the project. Acquisition costs were also not included at this time. Costs for system modifications (e.g., new manholes, etc) associated with the diversion piping were also not included at this time.

Construction Costs:	$901,100
Site Acquisition:	$0
Permitting:	TBD
Engineering / Administration:	$225,275
Capital Project Implementation Costs	**$1,081,300**
Annual Maintenance Costs	**$4,800**

Figure E-17 Springfield4 – CIP Overview

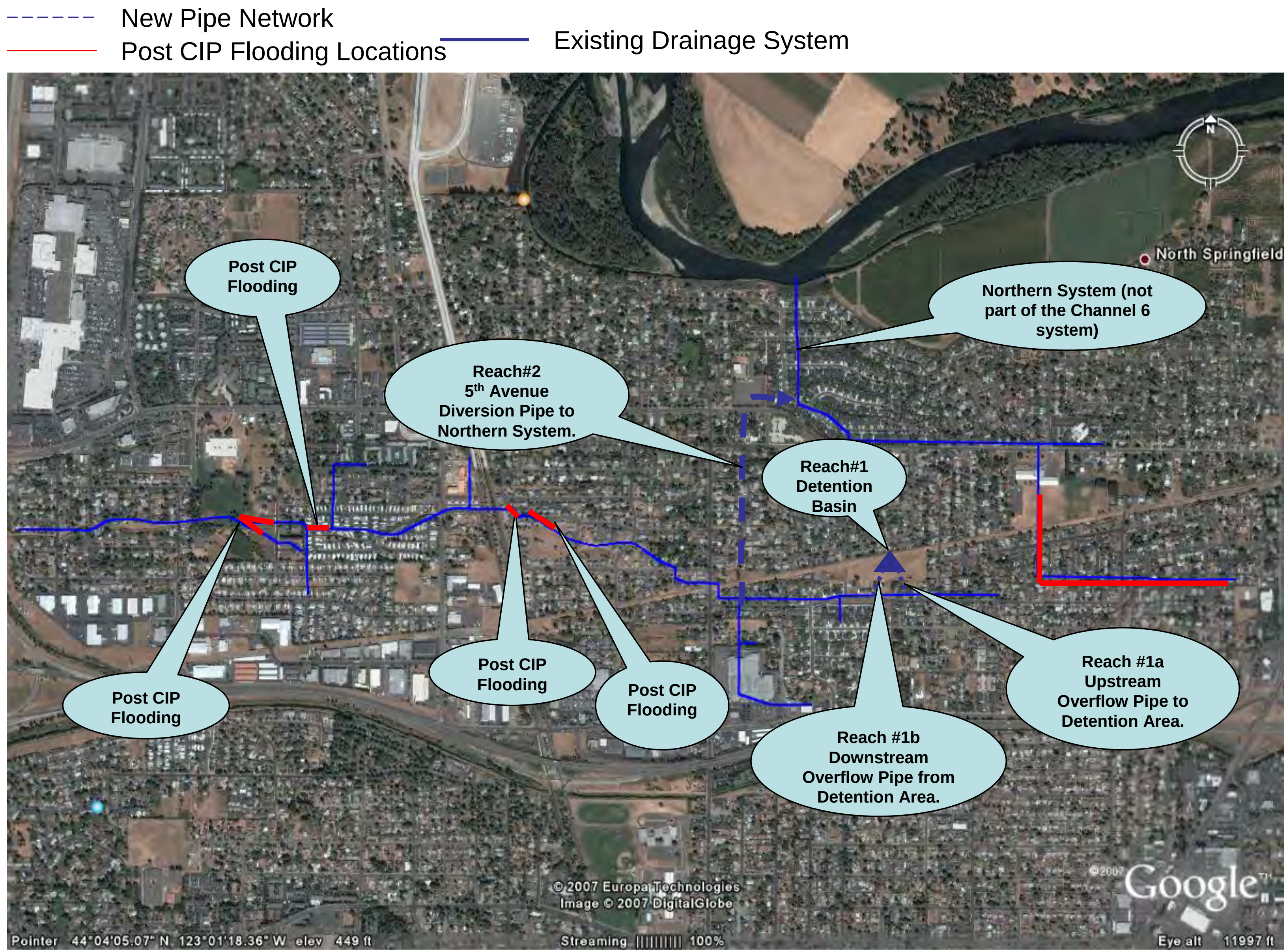
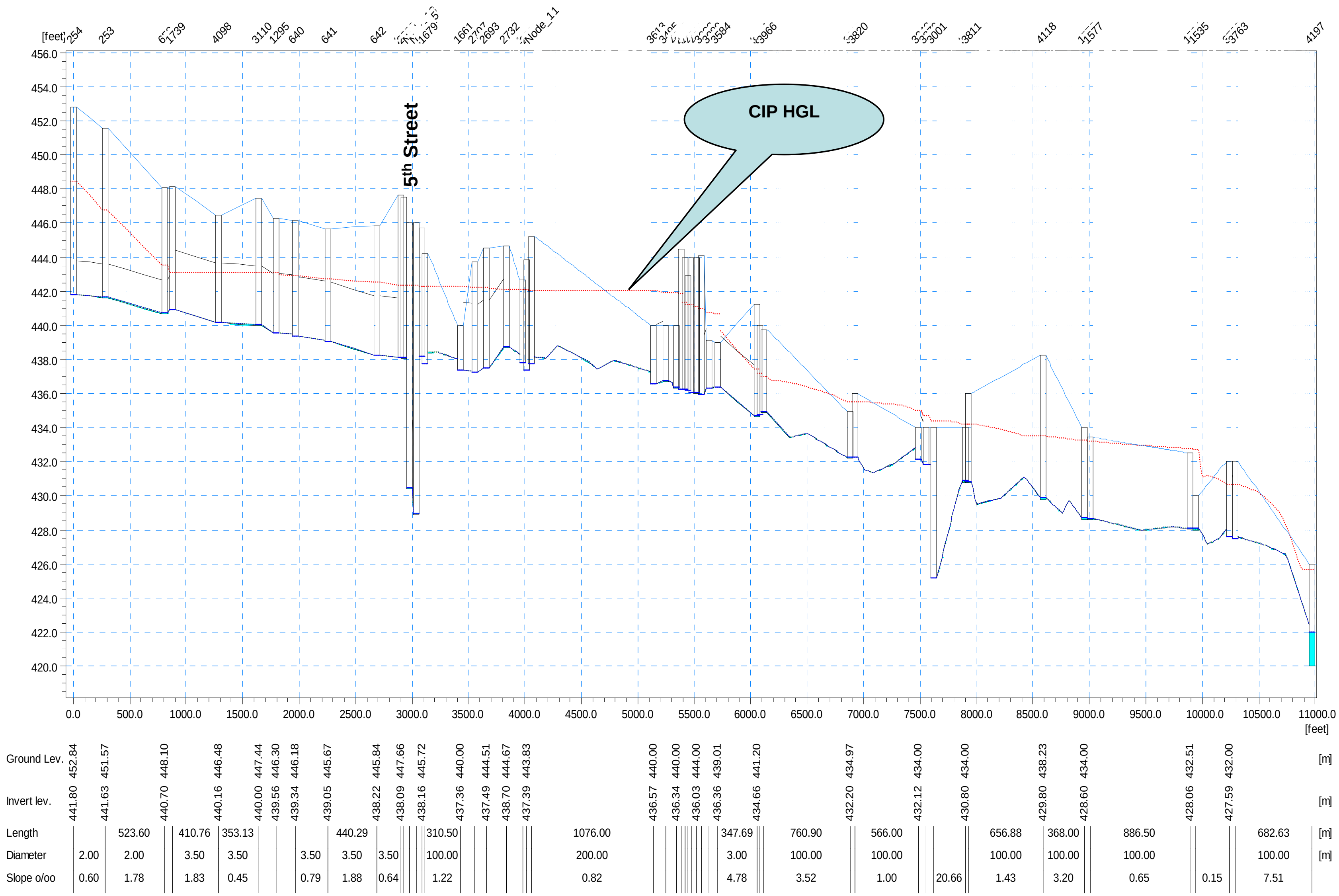


Figure E-18 Springfield4 – Future Condition



APPENDIX F

DETAILED SUMMARY OF RECOMMENDED CHANGES TO STANDARDS AND CODES

-DRAFT- TECHNICAL MEMORANDUM

DATE: August 20, 2008

TO: Krista Reininga, P.E., Project Manager
URS Corporation

FROM: Lori Faha, P.E., Water Resources Engineer

PROJECT: City of Springfield Stormwater Facilities Master Plan,
Code, Standards & Policies Review

1.0 INTRODUCTION

This memorandum offers recommendations for code and standards changes related to stormwater management, water quality and related natural resources protections for the City of Springfield. The goal is to assist the City in aligning its stormwater related practices with the Goals, Policies and Implementation Actions identified in the City of Springfield Stormwater Management Plan (January 2004, Chapter 4).

Review and recommendations for changes were prepared for the following documents as part of this task:

- City of Springfield Development Code (September 18, 2007 version)
- City of Springfield Engineering Design Standards and Procedures (April 2006 version)
- City of Springfield Pollution Control Manual for Routine Maintenance Activities (2007)

Specific content change recommendations are offered in this memorandum for the first two documents. The latter document is new, with no apparent history or track record for implementation; therefore the recommendations focus on implementation issues and policies related to maintenance practices.

2.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

Following is a discussion of the key types of findings after review of the Springfield code and standards documents listed above. Specific and detailed recommendations for the Development Code and Engineering Design Standards and Procedures are listed in Chapter 3.

2.1 Up-to-date Standards, With Regional Consistency

One goal of the Springfield Stormwater Management Plan is to provide regulatory certainty for the development community. While regulations do and will change over time, one way to provide some level of certainty for the development community is to have consistency wherever possible in development standards in the region.

The City should work with Eugene to adopt consistent, up-to-date stormwater standards for new development. This could include standards for stormwater quality facilities, stormwater quantity management, erosion control, hillside, trees and riparian area protection.

Both Cities currently require use of the City of Portland's 2004 Stormwater Management Manual (Springfield also allows use of Clean Water Services' standards). The Cities should consider concurrent adoption of the most up-to-date City of Portland manual (July 2008). Both cities currently allow or require use of the Portland 2004 manual, and Portland's standards include a preference for infiltration stormwater quality facilities, matching Springfield's goals for reduction as well as treatment of runoff.

Springfield should also amend its code and standards to clearly stipulate a threshold amount of new impervious area (or replaced impervious area in the case of redevelopment) that triggers onsite stormwater quality facilities. The City should consider adopting Eugene's standard of 1000 square feet per site, or otherwise work with Eugene to develop a consistent threshold standard.

2.2 Reduce Impacts of Streets and Parking Lots

Updated stormwater quality standards must include streets and parking lots, which produce substantial runoff and pollutants. Green streets should be included in standards, especially features such as swales, stormwater planters and rain gardens (the City of Gresham's new Green Streets Standards should be considered as a model). Pervious pavements should be considered, especially in parking lots. Maximum caps on parking spaces should be clearly identified. Skinnier pavement widths should be considered for some streets as well, especially lower volume residential streets.

2.3 Specifically Allow & Encourage Vegetated Stormwater Facilities in Development Site Landscaping

The City of Springfield Development Code has been recently updated (2007) and includes many references to and some incentives for required or recommended stormwater quality management measures. A next round of updates should include explicit statements for all land uses that vegetated stormwater facilities are allowed and encouraged in required landscaping for buildings, parking lots, parking strips and open spaces. Similar amendments should be made in the Engineering Design Standards and Procedures.

2.4 Improve Water Quality Protection Requirements in Drinking Water Protection District

Both the Development Code and the Engineering Design Standards and Procedures should include greater protections for the City's groundwater drinking water source. This should include stronger best management practices such as spill containment facilities for higher risk land uses and streets, and prohibitions of underground injection systems such as dry wells. The City should consider the City of Portland and/or City of Gresham codes and standards for the Columbia Shore well field area as a model.

2.5 Improve Tree & Vegetation Protection Standards

Enhanced protections for existing trees, understory and groundcover vegetation will reduce runoff and associated pollutants, reduce erosion potential, better protect habitat, and provide air and water temperature management. The City currently allows removal of up to 5 significant trees per parcel per year. The City should have a permit process for all significant tree removal (including street trees), including criteria to ensure tree removal is minimized and mitigated.

Clearing of existing vegetation should be discouraged as much as possible for all land uses, and a threshold amount of clearing should be established (such as 500 or 1000 sq. ft., similar to a threshold trigger for stormwater quality requirements). Clearing beyond the threshold would require a permit, including standards for time and area limitations, erosion control, and groundcover establishment. This could be combined with an expanded Land and Drainage Alteration Permit (LDAP) procedure.

Protective measures should be strengthened for City-defined riparian areas that include stream corridors to increase water quality protection. Riparian area width averaging (increased width in some areas, making up for allowed reductions in other areas on the site) should be used when needed rather than outright reductions in riparian areas when some development encroachment cannot be avoided. Riparian area restrictions should be applied to all land uses, and existing development should not be allowed to increase an existing encroachment further into a riparian area. Riparian area width should be increased as possible when pathways are allowed in the riparian area.

2.6 Improve Erosion Prevention

The Springfield Engineering Design Standards and Procedures include a full copy of an old version of DEQ's 1200-C erosion control permit. The City standards should be updated to reflect current requirements. Development of an updated erosion control handbook for the region, or adoption of another jurisdiction's handbook should be coordinated with Eugene.

2.7 Expand and Fully Implement the LDAP

Springfield's Land and Drainage Alteration Permit (LDAP) provides an opportunity to better protect water quality through erosion controls, construction-period and permanent stormwater quality management measures, and regulation of land disturbing activities including excavation, fill, grading and clearing. However, the LDAP is only mentioned in a couple locations in the Development Code and the Engineering Design Standards, and the current LDAP regulatory threshold is very high, at 50 cubic yards of excavation. The City should consider full adoption of the LDAP program, and trigger this permit at a significantly reduced amount of excavation, as well as for clearing and grading. The LDAP could be an important tool to help the City reduce environmental impacts of development practices and meet multiple water quality requirements for stormwater and instream water quality.

2.8 Maintenance Practices Recommendations

The City of Springfield has a new maintenance manual for City crews (City of Springfield Pollution Control Manual for Routine Maintenance Activities, 2007). It is not appropriate at this time to evaluate the details of the maintenance practices in the manual. The City should first fully train its field maintenance crews in the content and use of the manual, and ensure that the maintenance practices are implemented. As noted in the City's Stormwater Management Plan (BMP OM-1), staff should evaluate the implementation success for the manual on a bi-annual basis, making adjustments to maintenance activities as needed.

Maintenance responsibility and ownership for stormwater quality and quantity facilities should be clearly established in the City's code and standards. Any facilities that the City takes on for maintenance should be located in a right of way, tract or easement, providing for City access and management. The City needs to define which privately constructed facilities are the responsibility of the property owner for maintenance. Many jurisdictions require private owner maintenance of all onsite stormwater facilities. Some, such as Clean Water Services, take on the maintenance responsibility for stormwater facilities serving single-family residential properties and which are located in separate tracts or easements (homeowner associations often do not provide adequate long-term care of stormwater facilities).

When private property owners are responsible for stormwater facility maintenance, the City should require an operation and maintenance plan and agreement, tied to the property deed. The City should define a standard format and minimum maintenance practices. Examples for such plans and agreements can be found in City of Portland, City of Gresham and Clean Water Services standards.

The City will also need to establish an inspection system to regularly check and ensure that both public and private stormwater management facilities are being adequately maintained. An enforcement mechanism will be necessary for private facilities that are not meeting maintenance standards. The enforcement process should include notification and education procedures as a first step, as well as the ability to fine and/or charge the owner for City-provided maintenance.

3.0 SPECIFIC RECOMMENDEDATIONS FOR CODE AND DESIGN STANDARDS

Table 1 presents specific recommendations for changes to City of Springfield Development Code and Engineering Design Standards and Procedures, listed by section number. These are the details for the summarized recommendations in Chapter 2.

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
Springfield Development Code (Sept 2007) – Chapter 3: LAND USE DISTRICTS				
	3.2-230.H Open Space in Cluster Subdivisions	At least 20% of site shall be common open space, can be wetlands, slopes, woods, playgrounds, etc.	Add allowing vegetated stormwater management/water quality facilities to be located in the required open space.	
	3.2-235J.8 Manufactured Dwelling Parks	Requires 2 paved parking spaces per unit.	Allow pervious pavers/pavement	
	3.2-240.D.1.b Multi-unit Design Standards	Open courtyard exception to frontage requirements – defined as hard surface space	Amend to allow pervious space, vegetation, including stormwater quality features such as rain gardens	
	3.2-240.D.3.b Multi-unit Design Standards	25-foot buffer shall be provided between development & property lines, lists standards	Add allowing vegetated stormwater management/water quality facilities in the buffer	
	3.2-240.D.5.b.vi Multi-unit Design Standards	Common Open Space shall be provided, landscaping and/or natural vegetation shall cover a minimum of 50%	Add allowing stormwater quality features such as rain gardens in the Open Space landscaping	
	3.2-240.D.6 Multi-unit Design Standards	Landscaping, Fences and Walls, lists standards	Add allowing vegetated stormwater quality facilities as part of landscaping	See 3.2-240.D.8.c as example
	3.2-240.D.8.d Multi-unit Design Standards	Parking design standards, min 6-foot wide planter for screening	Add allowing vegetated stormwater quality facilities as part of planter design	See 3.2-240.D.8.c as example
	3.2-240.D.8.f Multi-unit Design Standards	Parking stalls, curb required to protect sidewalks & planters	Allow no curb and/or curb-cuts to allow stormwater drainage into landscaping	
	3.2-240.D.8.h Multi-unit Design Standards	Planting strips required for parking/loading areas along property line	Add allowing vegetated stormwater quality facilities as part of planter design	Refer to 3.2-240.D.8.j
	3.2-245.G Multi-unit Alternative Design criteria	Landscaping	Add allowing vegetated stormwater quality features in the landscaping	
	3.2-445.B Campus Industrial Design Standards	Landscaping	Add allowing vegetated stormwater quality features in the landscaping	

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	3.2-625.D.1 Mixed-Use District Development Standards	Landscaping and Screening	Add allowing vegetated stormwater quality features in the landscaping	
	3.3-235 Drinking Water Protection District - Standards for Hazardous Materials within Time of Travel Zones (TOTZ)		In this section, or in 3.3-240, establish containment facility design requirements and requirements for stormwater quality facilities for high risk land uses and roadways.	Reference City of Portland BES SWMM Manual sections 1.3.4 & 1.3.5. Also City of Portland and City of Gresham Columbia South Shore Wellfield Wellhead Protection Program Reference Manuals
	3.3-235.A.5.c Standards for Hazardous Materials within 0-1 year TOTZ	Exception to prohibition of dry wells – allowing for dry wells for roof drainage	Limit use of dry wells for roof drainage to low hazard roof materials and land uses (e.g. residential)	
	3.3-235.B.5.b Standards for Hazardous Materials within 1-5 year TOTZ	Exception to prohibition of dry wells – allowing for dry wells for roof drainage	Limit use of dry wells for roof drainage to low hazard roof materials and land uses (e.g. residential)	
	3.3-240 Drinking Water Protection District - Conditions	Director may attach conditions of approval, including special stormwater facilities	In this section, or in 3.3-235, establish containment facility design requirements and requirements for stormwater quality facilities for high risk land uses and roadways.	
	3.3-415.A Floodplain Overlay District - Review	Requires Type I review, and requires Land & Drainage Alteration Permit	Land & Drainage Alteration Permit (LDAP) appears to only be mentioned here and in Definitions. LDAP requirements should be citywide, and requirements listed clearly in the Development Code.	Note: See further recommendations for LDAP at end of this table.
	3.3-420 Floodplain Overlay District Development Standards		Add a balanced cut and fill requirement (any fills allowed in floodplain/floodway areas must be balanced by a nearby equivalent cut)	Reference: Clean Water Services Design & Construction Standards section 5.10
	3.3-525.B Hillside Development Overlay District – Reports Required	Grading Plan Report requirements	Include location of existing trees	To encourage maintaining & protecting trees in slope areas for erosion control, water quality

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	3.3-525.B.7 Hillside Development Overlay District – Reports Required	Grading Plan Report requirements, schedule required	Add a reference to City erosion control plan requirements, LDAP requirements (see recommendations on LDAP at end of table)	
	3.3-525.C Hillside Development Overlay District – Reports Required	Vegetation and Re-vegetation report requirement	Change to require a report for areas proposed to be cleared of vegetation in addition to tree felling. Include requirement for plan with clearing limits (area limits and time/seasonal limits). Or require city LDAP permit.	Protecting existing vegetation in slope areas is critical for erosion control
	3.4-250.D.2 Glenwood District, General Development Standards	Landscaping guidelines	Add allowing vegetated stormwater quality facilities as part of landscaping	
	3.4-255.B.1 Glenwood District, Residential Standards	Open Space requirements	Add allowing vegetated stormwater quality facilities in open space areas	
	3.4-265 Glenwood District, Street, Sidewalk and Alley Standards		Allow green streets and alleys (with reference to street standards in section 4.2-105)	Reference: City of Gresham Green Development Practices for Stormwater Management
	3.4-270 Glenwood District, Drainage System Standards	References use of Glenwood District Storm Drainage Master Plan	Update when City adopts new Stormwater Master Plan and standards	
Springfield Development Code (Sept 2007) – Chapter 4: DEVELOPMENT STANDARDS				
	4.2-100.A Infrastructure Standards - Transportation	General Provisions for streets	Add provision encouraging green streets designs (use of swales, planters, rain gardens and other features to reduce runoff and pollutants)	Reference: City of Gresham Green Development Practices for Stormwater Management, Pleasant Valley and Springwater District development code standards

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	4.2-105.C, Table 4.2-1, Street Right-of-Way and Curb-to-Curb Width		Review minimum widths, consider width reductions. Allow reduced widths with parking bays per Note (2) for additional street types.	Reduced pavement width maybe feasible for lower traffic streets especially, reducing impervious area, runoff, and pollution. Reduced pavement widths may also more easily allow for green street elements such as swales, rain gardens, planters.
	4.2-120.C, Table 4.2-2, Driveway Design Specifications	Table of minimum and maximum driveway widths for various land uses	Review Single Family residential widths, consider reduction of minimum and max widths, encourage reduced widths	Reduce required impervious area to reduce runoff and pollutants
	4.2-135.C Sidewalks	Planter strips requirement	Amend, allowing stormwater quality facilities (planters, swales).	Allows for implementation of green streets
	4.3-110.E Infrastructure Standards – Stormwater Management	Drainage management practices that may be required for development	Add specific minimum threshold(s) for development size at which stormwater management practices (for quantity and water quality) are required. (e.g. current standard from Engr. Design Standards manual of 500 sq.ft. or more new non-building imperviousness, OR City of Eugene standard of 1000 sq.ft. of impervious area)	
	4.3-110.E Stormwater Management	Drainage management practices that may be required of development.	Change “drainage” to “stormwater”.	
	4.3-110.E.6 Stormwater Management	Stabilizing natural drainageways as necessary	Add “and as permitted/allowed by the City, state and federal regulations”	Work in stream corridors and wetlands may require 404 permits, etc.
	4.3-110.F.2.a Identification of Water Quality Limited Watercourses	Tributary to WQLW definition, including exception for piped connections greater than 200’	Delete exception, at least in cases where watercourse is open upstream of piped section	Will provide for better head waters protection

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	4.3-115 Water Quality Protection		Amend title to reflect content, which is protection of instream water quality and related habitat functions, to not confuse with stormwater management for water quality, in section 4.3-110. Clarify introductory language as to purpose of this section, again reflecting content.	
	4.3-115 Water Quality Protection	Introductory paragraph on applicability, exceptions for Low Density Residential District and existing buildings in riparian areas	Remove exception to riparian area protections for Low Density Residential District. Require properties with existing buildings in riparian areas to encroach no further into the riparian area.	Allows for more complete riparian protections for water quality
	4.3-115.A.2.a Water Quality Protection	Exceptions to 50 foot riparian area for WQLW with less than 1000 cfs average annual flow	Add riparian area width-averaging allowance (with a minimum allowable width such as 35') as a preferred approach vs. outright reduced riparian area widths, require enhancement if width reduction allowed	Reference: Clean Water Services Design & Construction Standards for vegetated corridors
	4.3-115.A.3 Water Quality Protection	Allowing for relocation of degraded watercourse	Add definition for degraded condition. Add standards for first avoiding impacts, then, if relocated watercourse is allowed, including native vegetation, erosion control, sizing for low and high flows, creation of riparian area	
	4.3-115.B.6 & 7 Permitted Uses in Riparian Areas	Standards for pedestrian trails and bikeways in Riparian Areas	Require Riparian Area width to be increased by area equivalent to trail width, require restoration/enhancement and encourage pervious trails	Reference: Clean Water Services Design & Construction Standards for vegetated corridors
	4.4-105.A Landscaping	Purpose of landscaping regulations	Add that the purpose is also to protect and improve water quality and moderate temperature	
	4.4-105-B Landscaping	Three types of landscaping that may be required	Add a 4th type: Vegetated stormwater management facilities	
	4.4-105-D Landscaping	Lists the areas of a parcel that shall be landscaped	Add vegetated stormwater management facilities	

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	4.4-105-E Landscaping	65% plant coverage requirement in 5 years	Add exception that vegetated stormwater management facilities and riparian areas may be required to have greater vegetation coverage in less time	To provide necessary biofiltration and/or shading, and erosion control, more dense vegetation coverage is required
	4.4-105.F.2 Landscaping	Parking lot landscaping standards – 5% landscaping coverage required	Increase the required landscaping in parking lots and specifically allow incorporation of stormwater quality facilities	To encourage incorporation of swales, stormwater planters, rain gardens, etc. in parking areas. Reference: City of Portland parking lot standards
	4.4-105.I Landscaping	Planting Installation Standards	Landscaping for stormwater management facilities and riparian areas should have a 2-year maintenance warranty period	Need to ensure the long-term viability of vegetation integral to biofiltration, temperature moderation and other water quality benefits/requirements
	4.6-115 Vehicle Parking – Parking Lot Design	Figure 4.6-A, Parking Lot Design	Revise or add additional sketch depicting parking lot that incorporates stormwater quality facilities	Reference: Portland BES Stormwater Solutions Handbook - Introduction
	4.6-120.A Vehicle Parking – Parking Lot Improvements	Parking lot surface material	Amend to allow permeable materials properly designed to reduce runoff and/or for stormwater storage	
	4.6-120.B Vehicle Parking – Parking Lot Improvements	Parking lot drainage requirements	Amend to allow/encourage onsite management/minimizing of runoff via vegetated stormwater management facilities and infiltration as possible	
	4.6-120.C Vehicle Parking – Parking Lot Improvements	Wheel bumpers, curbs required	Amend to allow curb cuts or no curb w/ wheel bumpers to allow runoff into stormwater quality facilities incorporated in parking lot landscaping	
	4.6-125 Vehicle Parking – Parking Space Requirements	Table 4.6-2, minimum parking requirements	Compare minimum parking requirements to other jurisdictions, consider reductions in requirements as possible	Reduce required impervious area and associated runoff and pollutants as possible
	4.6-125 Vehicle Parking – Parking Space Requirements	Table 4.6-2, minimum parking requirements	Add a column for maximum allowed parking spaces	Places a cap on impervious area

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	4.6-125 Vehicle Parking – Parking Space Requirements	Table 4.6-2, minimum parking requirements	For single-family dwellings, allow combination of street and driveway to be used for parking requirement, allow for shared driveways/parking	
	4.6-125.D.2 Vehicle Parking – Parking Space Requirements	CI District special provisions allowing 5% extra impervious surface with berms	Delete or discourage use of this provision	This provision adds imperviousness, runoff & pollutants, and reduces landscape area that could be used for stormwater quality facilities
Springfield Development Code (Sept 2007) – Chapter 5: DEVELOPMENT REVIEW PROCESS				
	5.1-110.G&H Development Exemptions	Exemptions for certain single family homes	Amend to ensure stormwater quality requirements are not exempted	Single family homes that will add more than the threshold new impervious area (1000 sq ft is recommended above), should not be exempted from stormwater quality requirements
	5.5-125 Accessory Dwelling Units – Development Standards		Add stormwater quality facility requirements when threshold impervious area is exceeded (see comment for 4.3-110.E)	
	5.8-125 Non-Conforming Uses, Expansion or Modification	Criteria for approval of expansion/modifications	Add requirements for parking lot retro-fits to add stormwater quality facilities as appropriate	Reference: City of Portland BES SWMM Manual Chapter 1.5 and Title 33 of Portland Planning & Zoning Code
	5.8-150 Ballot Measure 37 Demands		Update for Measure 49	

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	5.12-130.G Land Divisions - Tentative Plan Conditions	Submittal of a Land and Drainage Alteration Permit	Provide more detail or reference to the LDAP requirements (when required, what is required)	
	5.15-120 Minimum Development Standards	Applicable standards for compliance	Add minimum stormwater standards that must be met (see comment for 4.3-110.E)	Stormwater conveyance and stormwater quality facility requirements should be required if minimum thresholds are met such as 500 or 1000 Sq ft of new/replaced impervious
	5.17-105.B.1.a Site Plan Review	Exceptions to site plan review requirements, single family & duplex	Amend to require review for stormwater management requirements	
	5.17-105.B.2.b Site Plan Review	When site plan review is required for multi-family, commercial, public, industrial	Amend to ensure review required for addition/replacement of threshold amount of impervious area (e.g. 1000 sq. ft.)	
	5.17-105.B.2.c.v.a Site Plan Review	Exceptions to review requirements	Ensure review required for addition/ replacement of threshold amount of impervious area (e.g. 500 or 1000 sq. ft. – see comment for 4.3-110.E)	
	5.17-155 Maintaining the Use	Long term maintenance requirements	Add subsection requiring maintenance of stormwater facilities including associated vegetation. Maintenance requirements should be specified in Design Standards and maintenance agreements. An extended maintenance warranty period (2 years) should be established for vegetated stormwater facilities to ensure that vegetation is fully established.	References: City of Portland BES SWMM Manual (2008), City of Gresham Green Development Practices guide (2007), and Clean Water Services Design and Construction Standards (2007)

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	5.19-110.A Tree Felling Permit – Applicability	Permit required for felling more than 5 trees, 5” dbh, per year	Change to require permit for removal of any regulated tree (5” dbh or larger)	5 significant trees removed per year per parcel, unregulated and without mitigation can have a substantial impact on water quality, erosion, temperature, habitat
	5.19-120.B Tree Felling Permit – Submittal Requirements	Requires a description of any plan to replace, landscape, etc.	Amend to specifically require a mitigation plan for most situations, with exceptions for hazard trees, public improvements, etc.	
	5.19-125.C Tree Felling Permit - Criteria	Criteria for approval – whether it is necessary to remove trees for proposed improvements	Add criteria to determine if the tree felling could be avoided by adjusting locations of site improvements	
Springfield Engr. Design Stds. & Procedures (April 2006) -	ALL SECTIONS AND CHAPTERS		Update all references to Springfield Development Code sections to match with current (2007) numbering system	
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 1 – Streets and Sidewalks			
	1.02.3 Right of Way and Paving Width	Refers to other documents such as Development Standards for widths	See comments for Development Code sections 4.2-100 and 4.2-105 above regarding possible width reductions and green streets alternatives.	
	1.02.7 Pavement Design		Amend to include process to allow alternative pavement designs, including pervious and pavers as appropriate, and green streets	Reference for green streets standards: City of Gresham Green Street Standards
	1.02.11.E Sidewalks	Local residential streets may have either integral or setback sidewalk	Amend to require setback sidewalks with planter strips.	Planter strips can be used to manage sidewalk, driveway and street runoff, and provide for street trees (for shade, runoff reduction)
	1.02.11.I Sidewalks	Concrete sidewalk specifications	Amend to allow pervious-paver options	

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 3 – Stormwater Quality			
	3.00 Design Standards		General comment: Review this section and related sections of Development Code for consistency in terminology. For example, the terms "stormwater quality facility" and "Best Management Practice" are used somewhat interchangeably in this document.	Should have defined, consistent terms throughout all documents.
	3.01 Stormwater Quality Design Standards	City's intent for future design standards and maintenance	Replace with a Purpose statement regarding stormwater quality standards. Create a separate section for maintenance requirements with specific designations of who maintains (City vs. private owner), and maintenance agreement/O&M plan requirements.	Reference for maintenance agreements/O&M plans: Portland BES SWMM manual, Gresham Green Development Practices manual
	3.02 Interim Design Standards	Interim standard allowing use of Portland BES SWMM manual and Clean Water Services Design & Construction Standards	Replace section with permanent standards. Recommend adopting City of Eugene standards (which are the City of Portland BES standards). Recommend to Eugene that they update their code to include the latest BES SWMM Manual (July 2008).	
	3.03 Stormwater Quality Design Criteria	Findings, basis for requirements	Update to reflect adopting permanent standards. Consider moving the findings paragraph to section 3.01 as part of a purpose statement.	

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	3.03 Stormwater Quality Design Criteria		Add section defining threshold(s) for requiring water quality facilities, including a clear impervious area threshold for all new development and re-development at which water quality facilities are required (e.g. 500 sq ft impervious such as listed in 3.03.5 for parking lots, or 1000 sq ft total site impervious similar to City of Eugene)	Need to clarify stormwater quality requirements for all projects.
	3.03.2 Retention/Protection/ Preference for Open Watercourses and Water Bodies		Add references to Development Code section 4.3-115 (riparian area protections), ensure terminology and requirements are consistent	
	3.03.3 Water Quality Pollutants of Concern		Move discussion of pollutants of concern and basic goals to a Purpose section at beginning of chapter. Keep specific design criteria in section 3.03.3	
	3.03.03A Temperature Standard	Design features to moderate temperature.	Delete item C (Underground Injection)	Underground injection should not be encouraged, especially given Springfield's groundwater drinking water source
	3.03.03A Temperature Standard		Items A, B & C should have more specific design criteria. Adoption of City of Portland SWMM manual will provide criteria and methodology.	
	3.03.03B Total Suspended Solids Standard	Requires site design with BMP's designed to achieve 70% TSS reduction	Amend to state that designs based on the adopted standard (e.g. Eugene/Portland BES SWMM) are assumed to meet the 70% reduction and other City pollution reduction standards	Reference: Portland BES SWMM manual (2008) section 1.3.3
	3.03.3.C DEQ Stormwater Discharge Benchmarks	All development projects shall use BMPs designed to achieve DEQ discharge benchmarks	Delete this section or amend and move to Purpose section, stating that the City standards are designed to achieve relevant DEQ requirements. Reference to DEQ Industrial permits for relevant businesses is fine.	Developers should be able to assume that they can be in compliance by meeting City defined design standards, except for sites that require their own permits from DEQ

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	3.03.4.A BES Stormwater Manual Chapter 4	Lists higher risk activities from older version of BES SWMM manual that require additional BMPs	Update to reflect latest BES manual (July 2008). Maybe rename this section “Source Controls Required”, and then combine at least with section 3.03.4.C Roof-mounted Equipment.	
	3.03.4.B Underground Injection Control (UIC)	References DEQ UIC rules, establishes Springfield UIC standards	Update item B to reflect updated standards (Eugene/Portland BES SWMM)	
	3.03.4.D Drinking Water Protection Overlay District	References Development Code requirements	See comments above for Development Code section 3.3-235 – consider Portland or Gresham Columbia South Shore Wellfield protection standards	
	3.03.5 Parking Lots/Paved Areas	Background information, requirements for parking lot runoff treatment	This section should be part of basic site design requirements rather than a subsection of “Special Considerations for Higher-Risk Activities”. Combine with a definition of a threshold amount of new/replaced imperviousness at which the stormwater quality requirements kick in (e.g. 500 sq ft as listed here, or 1000 sq ft for entire site – per City of Eugene)	
	3.03.6 Vegetative Treatment Requirements	Requirement for 50% of non-roof impervious area to be treated via vegetated methods, most facilities not allowed in Public Utility Easements.	This section should be part of basic site design requirements rather than a subsection of “Special Considerations for Higher-Risk Activities”. Ensure that requirements allow vegetated facilities in ROW, planter strips (amend prohibition of facilities in Public Utility Easements to allow more vegetated facilities)	

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	3.03.7 Parking Lot Maintenance	Recommendations for parking lot cleaning	Create a separate Maintenance section for all stormwater management facilities. Define ownership, who maintains, require maintenance plans and agreements for privately maintained facilities. Include parking lot maintenance procedures in this section, and add procedures for pervious pavements.	References: City of Portland BES SWMM manual, Chapter 3
	3.04 Best Management Practices for Public Street Designs	Reserved for future use	Here, or in Chapter 1.00, add Green Street Design criteria.	Reference: City of Gresham Green Street Standards and Green Development Practices Manual
	3.05 Wetlands Banking	Reserved for future use	Delete or move to new chapter	Wetlands banking is for mitigation of wetland destruction – this is not a stormwater quality management measure
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 4 – Stormwater Capacity			
	4.00 Design Standards		General Comment: Review this chapter for additional update needs after the City adopts the Stormwater Facilities Master Plan. Specifically consider updates to ensure development projects provide appropriate drainage systems given downstream conditions. Review especially Drainage Study requirements, on-site detention/infiltration requirements. Consider aligning more closely with Eugene standards as well.	
	4.07.1 Roadside Ditches		Require vegetation/grass-lined ditches in addition to rock protection as necessary to provide erosion control	

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	4.09 Downstream Protection Requirement	Requires mitigation of downstream quantity and quality impacts via detention or downstream system improvement	Add water quality mitigation methods (e.g. onsite water quality facilities)	
	4.10 Criteria for Requiring On-site Detention	Lists conditions requiring on-site detention	Review, and add more specificity to when and where detention is required after adoption of Stormwater Facilities Master Plan to ensure detention is required where needed due to downstream deficiencies.	
	4.10.C Criteria for Requiring On-site Detention	Requires onsite detention for water quality	Delete subsection C	Detention is a water quantity method, not water quality. Water quality requirements should be addressed in previous Chapter
	4.10.D Criteria for Requiring On-site Detention	Requires detention if there is a need to mitigate flow impacts on receiving streams	Add specificity – how to determine which streams need such mitigation. For example, it could be the waters designated as Water Quality Limited Watercourses in the Springfield Development Code	Other reference: City of Eugene requirement for no increase in peak flows from development areas above 500’
	4.12.B Detention Pond Design – Water Quality Considerations		Delete Heading B, and add these criteria to the previous subsection (A. Facility Geometrics)	These are basic detention pond design criteria – not water quality criteria
	4.12.E Detention Pond Design –	Access roads criteria	Add allowance/encouragement for access roads to be pervious	
	4.15 Underground Detention Facilities		Allow underground detention under pervious paved parking lots	
	4.16.1 Infiltration Facilities – Overview		Need a clear distinction between infiltration for quantity vs. water quality. The former requiring greater infiltration capacity than the latter. Amend to clarify purpose of geotechnical evaluation (e.g. infiltration testing, groundwater depth evaluation, hillside stability as needed)	

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	4.16.2 Underground Injection Control	Refers to DEQ regulations. States that drywells may be considered/required by City.	Remove encouragement/possible requirement for drywells. Encourage non-drywell infiltration methods using surface rather than sub-surface disposal to provide for water quality and reduce future regulatory issues with DEQ.	
	4.16.3.A Surface Infiltration Facility Requirements	Water Quality heading	Change heading to "Pretreatment" to better reflect contents	
	4.16.3.D Design Infiltration Rate		Amend to clarify infiltration rates for quantity vs. water quality, including minimum infiltration rates allowed.	Reference: Portland BES SWMM manual 2008
	4.17 Low Impact Development	Currently blank	Move and incorporate into Chapter 3. Can be a reference to another jurisdiction's standards.	References: Portland BES SWMM manual 2008, City of Gresham Green Development Practices manual
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 5 – Traffic Standards			
	5.05.3 Medians – Design Standards		Amend to allow water quality facilities (swales, rain gardens, stormwater planters) as appropriate in medians (Green Streets)	
	5.08.1 City Owned Parking Lot Design	General design basis statement	Add that these parking lots shall incorporate stormwater quality requirements including vegetation water quality facilities, and pervious pavements (as allowed)	
	5.08.3 City Owned Parking Lot Design	End Islands and Landscaped Areas	Amend to specifically allow/encourage use of islands and landscape areas for vegetation water quality facilities.	
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 6 – Street Trees			

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	6.02 General Design Considerations	3rd paragraph – tree felling permit requirements	See recommendations for tree permits above (Springfield Development Code section 5.19-110). Require permit/approval for any street tree removal, and require replacement/mitigation.	Street trees provide runoff reduction/control, and shading on roadways and other impervious surfaces, decreasing runoff temperature
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 7 – Hillside Development			
	7.03 Sanitary Sewer		Remove references to storm drainage/storm sewer systems in this section (should be in 7.04 – Storm Drainage)	
	7.04.2 Storm Drainage – Storm Sewer Laterals	Requires storm sewer lateral to every lot	Amend to allow for alternative system if certain low impact development practices are allowed/approved onsite (will need to assess soil/stability in steep areas)	
	7.07.1 Tree or Understory Removal	Restrictions to tree/understory removal on some hillside areas	Also restrict groundcover removal. Add cross-reference to Riparian Area protections in Springfield Development Code. Add requirements to preserve as much existing vegetation as possible on development sites, and restrict allowed removal seasonally and with erosion control and mitigation/re-planting requirements.	
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION 1 – Design Standards, CHAPTER 8 – Erosion and Sediment Control Plan Design			

TABLE 1: SPRINGFIELD CODE & STANDARDS REVIEW – SPECIFIC RECOMMENDATIONS

CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
	8.00 Design Standards		Insert a section establishing a standard for erosion and sediment control, even when a permit is not required, such as "No visible or measurable erosion off site" – A clear standard for enforcement action, whether or not the site has an EPSC plan/permit (can be applied then to existing development as well as sites under construction)	Reference: Clean Water Services Design & Construction Standards – Chapter 6
	8.01 Purpose	Requires Erosion and Sediment Control Plan for public projects	Seems to imply that EPSC plans are only required for public projects. Amend to clearly required EPSC plans for all public and private development projects. AND set a minimum threshold for plan requirement (e.g. Eugene requirement for permit for 1 acre+ and sensitive areas disturbance)	Reference: Eugene municipal code section 6.635
	8.02 Designer Responsibilities	Gives specific reference to older DEQ 1200-CA permit	Update reference to current 1200-C permit, or make language more general, remove DEQ permit copy from this manual, and have available at permit counter/website	
	8.03 Plan Preparation		Consider replacing part or all of sections 8.03 through 8.07 with reference to an Erosion Prevention and Sediment Control Manual. Consider joint regional manual with Eugene, County for consistency, AND/OR adopt by reference other up-to-date manual	Reference: City of Portland BES Erosion and Sediment Control Manual (2008) or Clean Water Services Design & Construction Standards (2007) Chapter 6 and Appendix B
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION III - Procedures CHAPTER 11 – Pre-design			
	11.03 Ordering Tests	Types of possible site condition field tests that may be needed	Add infiltration/depth to groundwater testing.	
	11.06 Research	Includes list of City reports available for review as needed	Add Springfield Stormwater Facilities Master Plan	

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CODE/PLAN	SECTION	EXISTING LANGUAGE/CONTENT	RECOMMENDED CHANGE	NOTES
Springfield Engr. Design Stds. & Procedures (April 2006) -	SECTION III - Procedures CHAPTER 12 – Permit Application Process			
	12.05.2 Permits from other agencies	List of other possible permits from outside agencies – includes Springfield Land & Drainage Alteration Program (LDAP) permit	Move listing of city LDAP permit to 12.02 Permit Application Process and 12.05.1 Submittal Requirement	NOTE: LDAP permit is not referenced elsewhere. LDAP requirements should be listed in the Design Standards.
Land & Drainage Alteration Program	Permit requirements	LDAP appears to be mentioned only in Floodplain Overlay District Code and once in Permit Application process for public projects in City Design Standards. LDAP requirements are unclear.	Amend code and standards to require LDAP for all land uses and clarify requirements and where to get further information (refer to fact sheets/forms on Springfield Public Works LDAP web page). Reduce threshold for requiring LDAP permit from 50 cubic yards disturbance to smaller quantity (at a minimum for any grading, clearing and/or excavation that would trigger erosion control requirements).	