ORDINANCE NO. 14-1006

AN ORDINANCE DECLARING A SIX-MONTH MORATORIUM ON LAND DEVELOPMENT AND BUILDING AND SEWER PERMIT APPROVALS IN CERTAIN AREAS WITHIN THE CITY OF OREGON CITY DUE TO A LACK OF SANITARY SEWER SYSTEM CAPACITY; AND DECLARING AN EMERGENCY

WHEREAS, the City of Oregon City is a home rule city under the laws of the State of Oregon and has a duly acknowledged Comprehensive Land Use Plan; and

WHEREAS, the City has contracted with Brown and Caldwell (B&C) to evaluate the City's sanitary sewer system and propose a Sanitary Sewer Master Plan (SSMP) which provides the hydraulic sanitary sewer system modeling results and the capital improvement projects list needed to evaluate the City's existing and future development needs; and

WHEREAS, the initial results from the draft SSMP identified four areas within the City's existing sanitary sewer collection system, as depicted on the maps attached as Exhibit A, to have significant existing capacity deficiencies during wet weather conditions for a design 10-yr-24-hr storm event; and

WHEREAS, B&C also modeled existing wet weather conditions for an Oregon Department of Environmental Quality required regulatory 5-year-24-hour storm event and the results confirmed the same four areas in the City's existing sanitary sewer collection system to currently have significant existing capacity deficiencies and these findings along with the City Engineer's summary of them are attached as Exhibit B and Exhibit C; and

WHEREAS, the City of Oregon City Sanitary Sewer Master Plan (2003) contains specifications for the existing wastewater collection system and although it concludes that the sewer system is in good condition, it identifies slight surcharging occurring within the four affected basins; and

WHEREAS, the City of Oregon City's acknowledged Comprehensive Land Use Plan requires that the rate of community growth and development may not exceed the community's ability to provide essential public services and facilities, including a sanitary sewer system; and

WHEREAS, Policy 11.2.1 requires that the City "plan, operate and maintain the wastewater collection system for all current and anticipated city residents"; and

WHEREAS, Policy 11.2.3 of the City's Comprehensive Plan requires that the City "…provide enough collection capacity to meet standards established by the Oregon Department of Environmental Quality (DEQ) to avoid discharging inadequately treated sewage into surfacewater"; and

WHEREAS, the City finds there is a demonstrated need to prevent sanitary sewer overflows that would occur if the proposed moratorium is not in place; and

WHEREAS, the identified sanitary sewer capacity deficiencies are limited to four areas within the City and thus, any moratorium shall be reasonably limited to restricting new sewer line connections to the properties identified on the maps attached as Exhibit A that are served by these sewer lines, and redevelopment of said properties that will cause an increase of wastewater discharge to the capacity deficient sewers; and

WHEREAS, based upon reasonably available information, the City makes the following findings in support of the above finding of demonstrated need as required by ORS 197,520(2):

A. While a moratorium can logically have a negative economic effect, the lack of sewer capacity infrastructure causes safety hazards and reduces the overall quality of life which may lead to the same results. Therefore, it makes more sense to control growth through a moratorium until a plan of correction can be identified.

B. The City Engineer's summary, attached as Exhibit B, and the B&C reports, attached as Exhibit C, explain that the City's sewer system is currently existing flow-constrained conditions that could lead to overflow conditions. Therefore, the City cannot allow any development or redevelopment that increases flows to these restricted areas.

C. The City has made every effort to reduce the impact the proposed moratorium could have on development. First, the area subject to the moratorium restrictions is quite small. Taken together, the sewer constrained area comprises 645.3 acres and represents approximately 11% of the total land area within the City. Second, the zoned capacity for these areas is only slightly greater than the developed capacity. In other words, much of this area has been developed to the maximum densities allowed. The developable land, that is either vacant or contains development that is less than the underlying land value as depicted on the maps attached as Exhibit D, is estimated at 64.2 acres. Third, nearly half of the potentially developable lots are designated for low density residential uses. If all of the vacant or underdeveloped land subject to the moratorium was to seek development approval during this period, this would result in delaying the development of approximately 490 residential homes. Putting this number into context, the Park Place Concept Plan approved 1,459 units and 1,747 to 2,637 was the range of units that could locate in South End. Other areas of the City are available in the short term to accommodate the needed housing demand. Similarly, those lands designated for economic development are largely built to capacity. Finally, none of the area affected is zoned to accommodate industrial and less than 4% of the area affected by the moratorium is zoned to accommodate employment or commercial uses. For these reasons, particularly as it relates to non-residential development, this moratorium is likely to have a negligible impact on the City's ability to satisfy its economic development demands.

D. Moreover, any development or redevelopment proposal that does not increase wastewater flows to these capacity restrained areas will be exempt and allowed to proceed.

E. Finally, the City has identified four development projects actively moving through the City's permit review process that could be adversely affected by this moratorium. These property owners have been notified of the moratorium and aware of the potential impacts to their projects. These projects include:

Permit Status	Assessor's Parcel Number (APN)	Property Address	Proposed Development Use	Existing Use	Zoning District	Planning File #(s)
Pre-Application Phase	3-2E-06AA-5100	545 Holmes Avenue	30 units multi-family residential	One single family house	R-2	PA 14-20
Land Use Approval Phase	3-2E-06CA-1700 and 1800	405 Warner Parrott Road	62 units dormitory resident facility plus separate office building	Church	R-10	SP 13-11, CU 13-01, LN 14-04, PA 13-09, LL 13-04
Building Permit Phase	2-2E-32CA-06601	no address-Eluria	one new Single Family House	Vacant Lot of Record	R-6	US 13-01, NR 13-06, LN 14-03
Building Permit Phase	2-2E-31AD-04700	721 Monroe St	4 units multi-family residential	Vacant Lot of Record	R3.5	PA 12-07, HR 13-01, SP 13-03

WHEREAS, to avoid exacerbating existing deficiencies within the City's sanitary sewer collection system and to allow time for completion of studies to identify solutions, funding mechanisms and the construction of necessary improvements, the City Commission finds there is immediate need to impose a moratorium on new development within four areas of the City for a period of six (6) months pursuant to ORS 197.520(2). The City Commission's determination of need for the moratorium is based on reasonable available information, the record of proceedings leading to adoption of this ordinance and the findings contained in this ordinance. The City Commission also determines that by exempting development or redevelopment projects located within the four areas that do not increase sewer flows into these capacity constrained areas from this moratorium serves to accommodate the housing and economic development needs of the area affected by the moratorium as much as possible; and

WHEREAS, pursuant to ORS 197.520(1)(a), the City has provided written notice to the Department of Land Conservation and Development on May 2, 2014, which is more than 45 days prior to the final public hearing for August 6, 2014, for adoption of this ordinance; and

WHEREAS, pursuant to ORS 197.520(1)(b), the City has made written findings justifying the need for the moratorium in accordance with ORS 197.520(2); and

WHEREAS, pursuant to ORS 197.520(1)(c), on August 6, 2014, the City Commission held a duly noticed public hearing on declaring a moratorium based on the lack of sanitary sewer capacity to allow new or expanded connections to the City's sewer system in four areas and the findings which support the moratorium.

NOW, THEREFORE, THE CITY OF OREGON CITY ORDAINS AS FOLLOWS:

Section 1. Moratorium Declared.

A. Based on the foregoing findings, a moratorium based on lack of sanitary sewer capacity for new development is declared for the areas identified in the map attached as Exhibit A.

B. All proposals for development of vacant properties or redevelopment of existing improved properties shall be reviewed by the City and the City shall determine if the proposed development will increase flows to the existing sanitary sewer system.

C. For the purposes of this ordinance, “development” shall mean: (1) an application for a Type I, II, III, or IV land use permit including land divisions; and (2) new construction, changes to the interior of an existing building, or an increase in the floor area of an existing building that require a building or plumbing permit, and/or a public works sewer or construction plan permit.

D. While this moratorium is in effect, all development shall be subject to the following notice and restrictions:

1. Property owners and representatives shall be notified by staff of the moratorium at the earliest opportunity either during pre-application conferences or before. However, the failure to provide notice shall not alter the development restrictions imposed by this moratorium.

2. Land use permit applications will continue to be processed during the moratorium period, and if approved, appropriate conditions shall be imposed restricting development until the flow-constrained sewer condition is remedied.

3. No building or plumbing permit, and/or a public works sewer or construction plan permit applications may be accepted or issued until flow-constrained sewer condition is remedied.

E. This moratorium shall not apply to development where the Community Development Director and Public Works Director find through written findings, either through the applicable Type III or IV procedures or, if Type I or no procedure is identified, through a Type II procedure, that either:

1. The proposed development will not increase the sanitary sewer flows into the flow-constrained area; or

2. Where a solution is identified to reduce the identified surcharging conditions to acceptable levels. Some examples may include a development agreement providing for pipe replacement or joint effort amongst property owners to replace sections of pipe and reimbursement through a local improvement district.

Section 2. Term. This moratorium shall expire six (6) months from the date of its enactment unless otherwise extended in accordance with state law.

Section 3. Effect on Unexpired Land Use Approvals. For properties subject to this moratorium that have an approved land use review that has not yet expired, the expirations date for the approved land use review specified by OCMC 17.50.200 shall be extended by the length of this moratorium and any moratorium extensions.

Section 4. Reporting. The City Engineer, in consultation with the City's Public Works Director and Community Development Director, shall regularly report to the City Commission on the impact of the moratorium on development and the sewer capacity overflow conditions.

Section 5. Severability. If any provision of this Ordinance or its application to any person or circumstance is held invalid, the invalidity does not affect other provisions or applications of this Ordinance that can be given effect without the invalid provision or application, and to this end the provisions of this Ordinance are severable.

Section 6. Emergency. This Ordinance being necessary for the immediate preservation of the public peace, health and safety, an emergency is declared to exist, and this Ordinance takes effect on its passage.

Read for the first time at a regular meeting of the City Commission held on the 6th day of August, and the City Commission finally enacted the foregoing ordinance this 6th day of August 2014.

DOUG NEELEY, Mayor

Attested to this 6th day of August 2014:

Nancy Ide, City Recorder

Approved as to legal sufficiency:

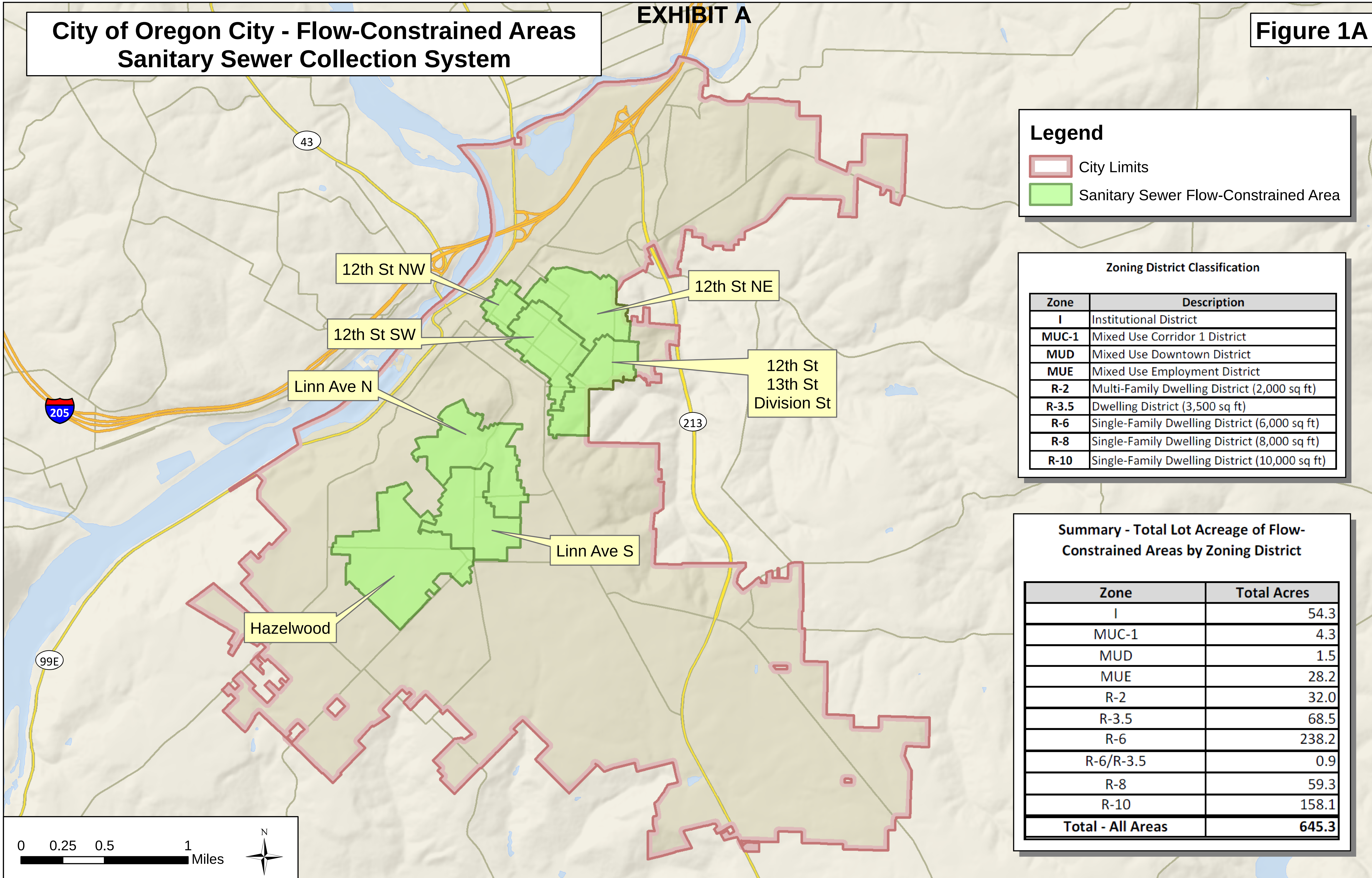
City Attorney

Exhibits:
Exhibit A - Maps identifying the areas affected by moratorium
Exhibit B - City Engineer Executive Summary
Exhibit C - Brown and Caldwell Technical Memoradum for Constrained Area Evaluation
Exhibit D - Maps identifying developable land within the areas subject to the moratorium

EXHIBIT A

City of Oregon City - Flow-Constrained Areas
Sanitary Sewer Collection System

Figure 1A



Zoning District Classification

Zone	Description
I	Institutional District
MUC-1	Mixed Use Corridor 1 District
MUD	Mixed Use Downtown District
MUE	Mixed Use Employment District
R-2	Multi-Family Dwelling District (2,000 sq ft)
R-3.5	Dwelling District (3,500 sq ft)
R-6	Single-Family Dwelling District (6,000 sq ft)
R-8	Single-Family Dwelling District (8,000 sq ft)
R-10	Single-Family Dwelling District (10,000 sq ft)

Summary - Total Lot Acreage of Flow-Constrained Areas by Zoning District

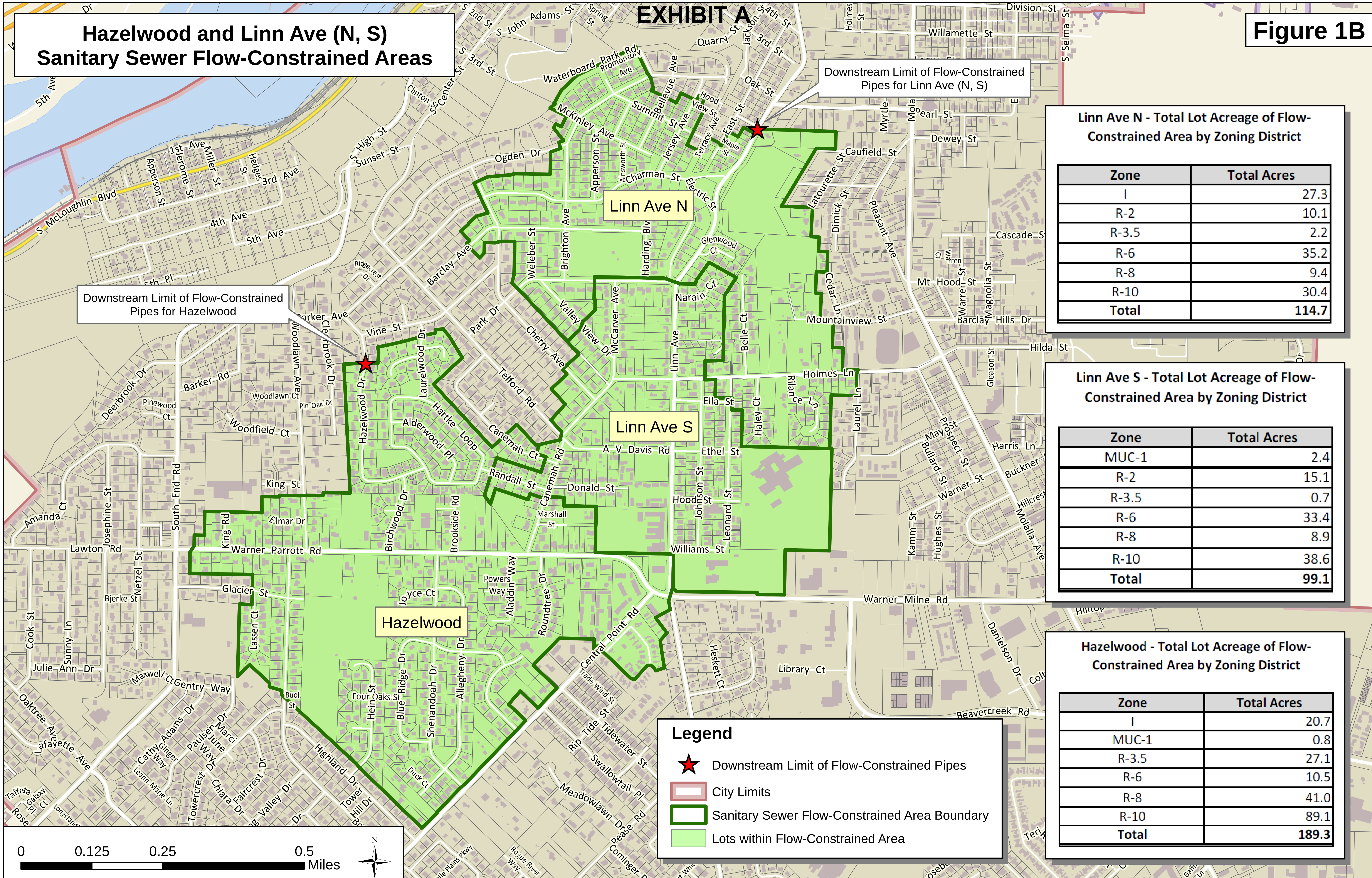
Zone	Total Acres
I	54.3
MUC-1	4.3
MUD	1.5
MUE	28.2
R-2	32.0
R-3.5	68.5
R-6	238.2
R-6/R-3.5	0.9
R-8	59.3
R-10	158.1
Total - All Areas	**645.3**

Date: June 5, 2014; Map: Sewer Capacity Deficient Areas - Figure 1A - 11x17L.mxd; Plot: Sewer Capacity Deficient Areas - Figure 1A - 11x17L - 20140605.pdf

EXHIBIT A

Hazelwood and Linn Ave (N, S) Sanitary Sewer Flow-Constrained Areas

Figure 1B



Linn Ave N - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
I	27.3
R-2	10.1
R-3.5	2.2
R-6	35.2
R-8	9.4
R-10	30.4
Total	**114.7**

Linn Ave S - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
MUC-1	2.4
R-2	15.1
R-3.5	0.7
R-6	33.4
R-8	8.9
R-10	38.6
Total	**99.1**

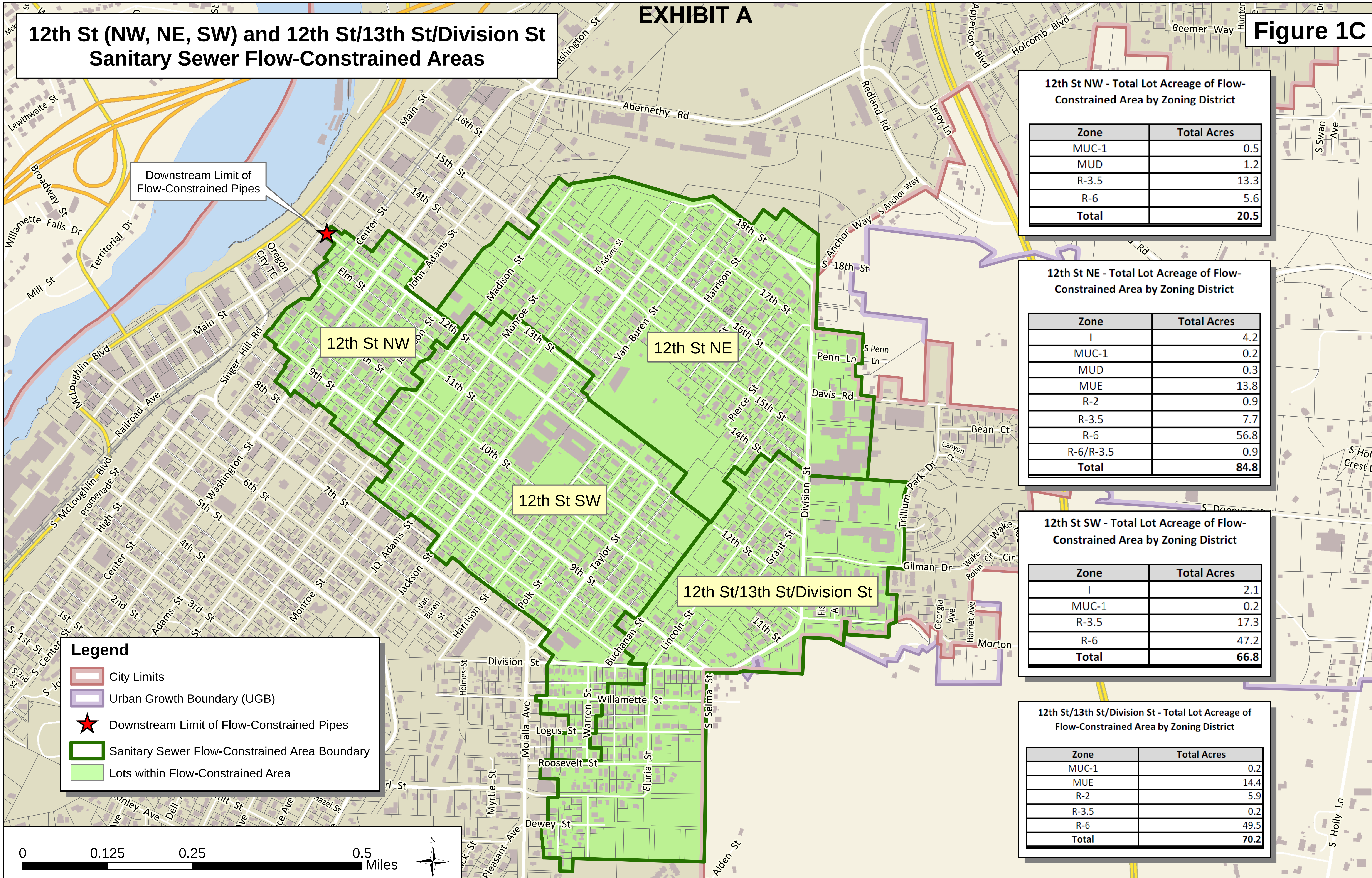
Hazelwood - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
I	20.7
MUC-1	0.8
R-3.5	27.1
R-6	10.5
R-8	41.0
R-10	89.1
Total	**189.3**

EXHIBIT A

12th St (NW, NE, SW) and 12th St/13th St/Division St Sanitary Sewer Flow-Constrained Areas

Figure 1C



12th St NW - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
MUC-1	0.5
MUD	1.2
R-3.5	13.3
R-6	5.6
Total	**20.5**

12th St NE - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
I	4.2
MUC-1	0.2
MUD	0.3
MUE	13.8
R-2	0.9
R-3.5	7.7
R-6	56.8
R-6/R-3.5	0.9
Total	**84.8**

12th St SW - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
I	2.1
MUC-1	0.2
R-3.5	17.3
R-6	47.2
Total	**66.8**

12th St/13th St/Division St - Total Lot Acreage of Flow-Constrained Area by Zoning District

Zone	Total Acres
MUC-1	0.2
MUE	14.4
R-2	5.9
R-3.5	0.2
R-6	49.5
Total	**70.2**

Date: June 5, 2014; Map: Sewer Capacity Deficient Areas - Figure 1C - 11x17L.mxd; Plot: Sewer Capacity Deficient Areas - Figure 1C - 11x17L - 20140605.pdf

EXHIBIT B

OREGON CITY

Public Works

625 Center Street | Oregon City OR 97045
Ph (503) 657-0891 | Fax (503) 657-7892

MEMORANDUM

PREPARED FOR:	City Commission, City of Oregon City
SUBJECT:	Executive Summary - Ordinance No. 14-1006 *Adopting a Moratorium on Land Development and Building Permit Approvals in Certain Areas Within the City of Oregon City Due to Lack of Sanitary Sewer System Capacity; and Declaring an Emergency*
PLANNING FILE:	L 14-03 Sanitary Sewer Moratorium
FROM:	Aleta Froman-Goodrich, P.E., City Engineer
DATE:	July 15, 2014

Background

The City of Oregon City (City) provides sanitary sewer collection services to nearly 33,000 people across an area of approximately 9.3 square miles. Currently there are over 10,400 service connections to the sanitary sewer collection system which includes approximately 9,740 residential, 520 commercial, and 130 industrial users. The City owns the following infrastructure: over 148 miles of gravity pipelines, ranging in size from approximately 2 to 36 inches in diameter; 3,700 manholes; 12 (major) pumping stations; and 6 miles of sanitary force mains. The City's buildout population is expected to reach 52,500 by the year 2035, with most of the growth occurring around the fringes of the existing city limits.

In 2012, the City retained Brown and Caldwell to develop a new Sanitary Sewer Master Plan (SSMP) including a calibrated model of the City's sanitary sewer collection system. The new SSMP identifies the capital improvement projects needed to convey the existing and future wastewater flows to the Tri-City Sewer District (TCSD) trunks and interceptors TCSD and eventually to the Tri-City Water Pollution Control Plant. The City is in the process of adopting the new SSMP.

Facts Found in SSMP Assessment of Current Conditions

The assessment of current conditions for the new SSMP found existing gravity sewers in some areas of the City experienced surcharging within 5 feet or less of the manhole rim elevation. In three particular areas of the City, the assessment indicated that the gravity sewers experienced flooding; i.e., sanitary sewer overflows (SSOs) under existing conditions. The focus of the SSMP was on identification of capital improvements throughout the system; however, the assessment created for the SSMP identified current problems that affect potential and proposed redevelopment in areas contributing to the above noted flow-constrained gravity sewers. That discovery required the City take a closer look at the existing flow conditions in these areas. The results of the existing condition scenario modeling provide insight into the severity of the capacity constraints.

The risk of SSOs and/or basement backups associated with surcharging pipes was considered during the existing conditions scenario modeling efforts. There are four flow-constrained areas identified, Linn Avenue, Hazelwood Drive, 12th Street, and 13th Street/Division Street, where the capacity of existing sewer pipes need to be increased to accommodate flows due to the predicted amount and frequency of surcharging. While the SSMP identifies capital improvements to fix the capacity problems for each area to help ensure that the City has adequate capacity for conveying the design flows, the underlying data provides factual information that must inform the City's consideration of development proposals in areas that lack adequate sewer capacity.

In summary, four flow-constrained areas, Linn Avenue, Hazelwood Drive, 12th Street, and 13th Street/Division Street, have sewers that are undersized and currently operate beyond existing capacity, during both the 1- in 5-year and 1- in 10-year storm events. The sewer diameters need to be increased to fix the capacity problems to convey both the existing and future design flows. Any additional flows introduced into these sewers prior to fixing the capacity problems will increase surcharging and increase the potential for SSOs with flooding and/or basement backups.

Exhibit C, Technical Memorandum by Brown and Caldwell, dated May 15, 2014, provides the findings of the flow-constrained areas, including the flow analysis methodology, identification and location of gravity sewer pipes with capacity deficiencies, capital improvement projects to fix the capacity problems to ensure the City has adequate capacity in the sanitary sewer collection system to convey existing and future design flows.

Local Comprehensive Plan, City Code, and State and Federal Regulations
Local land use planning and State and Federal regulations require the City to plan and design the City's sanitary sewer system infrastructure to prevent sanitary sewer overflows (SSOs). In addition to those long range responsibilities, the City must determine whether adequate sewer capacity is currently available to serve any development when an application is made.

- The City's Comprehensive Land Use Plan requires that the rate of community growth and development may not exceed the community's ability to provide essential public services and facilities, including a sanitary sewer system.
- Policy 11.2.3 of the City's Comprehensive Plan requires that the City "…provide enough collection capacity to meet standards established by the Oregon Department of Environmental Quality (DEQ) to avoid discharging inadequately treated sewage into surfacewater;"
- Oregon City Municipal Code (OCMC) 17.56.010.A.3 requires, "The site and proposed development are timely, considering the adequacy of transportation, public facilities and services existing or planned for the area affected by the use."
- OCMC 17.62.050.A.14 requires, "Adequate public water and sanitary sewer facilities sufficient to serve the proposed or permitted level of development shall be provided. The applicant shall demonstrate that adequate facilities and services are presently available or can be made available concurrent with development…"
- DEQ does not allow sanitary sewer overflows (SSOs), discharge of raw sewage.
    a. Definition: "Overflow" means any spill, release or diversion of sewage including:
        (1) An overflow that results in a discharge to waters of the United States; and
        (2) An overflow of wastewater, including a wastewater backup into a building, even if that overflow does not reach waters of the United States.
- The Clean Water Act (CWA) prohibits discharges of pollutants to waters of the United States. Unpermitted discharges from the sanitary sewer system to the waters of the United States constitute a violation of the CWA.

Flow-Constrained Areas, Zoning, and Developable Lots

A moratorium will control the growth in the flow-constrained areas until a plan of correction can be identified. The four areas Linn Avenue, Hazelwood Drive, 12th St, and 13th Street/Division Street, include properties that are primarily zoned for residential. The overall impact area is approximately 645 acres, 11% of the City. The percentage of the impact area based on zoning districts includes approximately 86% residential, 8% institutional, and 5% mixed use. The area of developable lots located in the overall impact area is approximately 64.2 acres, 1% of the City. These are properties that are either vacant or have a high potential for redevelopment. The percentage of the developable area based on zoning districts includes approximately 95% residential (60.7 acres) and 5% mixed use (3.5 acres).

Exhibit A, Figures 1A, 1B, and 1C, shows the overall impact area, each flow-constrained area, and summary tables for total area by land use zoning district.

Exhibit D, Figures 2A, 2B, and 2C, shows the overall impact area, each flow-constrained area and developable lots within the flow-constrained area, and summary tables for total area of developable lots by land use zoning district.

Moratorium on Land Development and Building Permit Approvals

The moratorium on land development and building permit approvals is based on lack of sanitary sewer capacity for new development in the areas identified in the map attached as Exhibit A. All proposals for development of vacant properties or redevelopment of existing improved properties shall be reviewed by the City and the City shall determine if the proposed development will increase flows to the existing sanitary sewer system. Any development or redevelopment proposal that does not increase wastewater flows to these capacity constrained areas will be exempt and allowed to proceed.

While the moratorium is in effect, all development shall be subject to the following notice and restrictions:

1. Property owners and representatives shall be notified by staff of the moratorium at the earliest opportunity either during pre-application conferences or before. However, the failure to provide notice shall not alter the development restrictions imposed by this moratorium.
2. Land use permit applications will continue to be processed during the moratorium period, and if approved, appropriate conditions shall be imposed restricting development until the flow-constrained sewer condition is remedied.
3. No building or plumbing permit, and/or a public works sewer or construction plan permit applications may be accepted or issued until flow-constrained sewer condition is remedied.

This moratorium shall not apply to development where the Community Development Director and Public Works Director find through written findings, either through the applicable Type III or IV procedures or, if Type I or no procedure is identified, through a Type II procedure, that either:

1. The proposed development will not increase the sanitary sewer flows into the flow-constrained area; or
2. Where a solution is identified to reduce the identified surcharging conditions to acceptable levels. Some examples may include a development agreement providing for pipe replacement or joint effort amongst property owners to replace sections of pipe and reimbursement through a local improvement district.

EXHIBIT B

Summary

1. Four flow-constrained areas, Linn Avenue, Hazelwood Drive, 12th Street, and 13th Street/Division Street, have some sewers that are undersized and currently operating beyond existing capacity, during both the 1- in 5-year and 1- in 10-year storm events. The sewers need to be increased in diameter to fix the capacity problems to convey both the existing and future design flows. Any additional flows introduced into these sewers prior to fixing the capacity problems will increase surcharging and increase the potential for flooding and/or basement backups.

2. Local, state and federal regulations require the City to take measures that ensure the prevention of sanitary sewer overflows, and the lack of sewer capacity infrastructure causes safety hazards and reduces the overall quality of life. The City finds a demonstrated need to adopt a moratorium on land development and building permit approvals in the four flow-constrained areas until the sanitary sewer capacity problems are fixed.

3. The area of developable lots located in the overall impact area is approximately 64.2 acres, 1% of the City. These properties are either vacant or have a high potential for redevelopment. Within the impact areas, the percentage of the 64.2 acres of developable lands based on zoning districts is approximately 95% residential (60.7 acres) and 5% mixed use (3.5 acres).

EXHIBIT C

Technical Memorandum

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Portland, OR 97239

T: 503.244.7005
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Prepared for: City of Oregon City, Oregon

Project Title: City of Oregon City Sanitary Sewer Master Plan

Project No.: 142029

Technical Memorandum

Subject: Constrained Area Evaluation

Date: May 15, 2014

To: Erik Wahrgren, City of Oregon City

From: James Hansen, BC-Portland

Prepared By: Janice Keeley, BC-Portland

Technical Reviewer: James Hansen, BC-Portland

EXHIBIT C

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EXHIBIT C

Section 1: Introduction

In 2012, the City of Oregon City (City) retained Brown and Caldwell to assist with the development of a new sanitary sewer master plan (SSMP). The new SSMP identifies capital improvements that are required for improving existing and future sanitary sewer service and for providing services to new areas as they are developed and annexed by the City. Initial modeling results for the SSMP found that the sewers in some areas of the city experienced surcharging within 5 feet of the manhole rim elevation and sewers in three areas of the city experienced flooding; i.e., sanitary sewer overflows (SSOs) under the existing conditions scenario. The Settler's Point Pumping Station is also undersized and unable to convey flows under the existing conditions scenario. Additional surcharging and flooding is predicted under the future conditions planning scenario. Results of the future conditions planning scenario were the focus of the SSMP document; however, potential and proposed redevelopment in areas contributing to the above noted constrained sewers required that the City take a closer look at the existing flow conditions in these areas. The results of the existing condition scenario modeling provide insight into the severity of the capacity constraints, which can be used as a basis for prioritizing improvements.

This technical memorandum (TM) presents the results of modeling the sanitary sewer collection system in nine flow-constrained areas for the existing conditions 1- in 5-year and 1- in 10-year, 24-hour storm events. The results of this modeling effort and TM will be used by the City to assess potential development in the areas contributing to constrained sewers, shown in Figure 1.

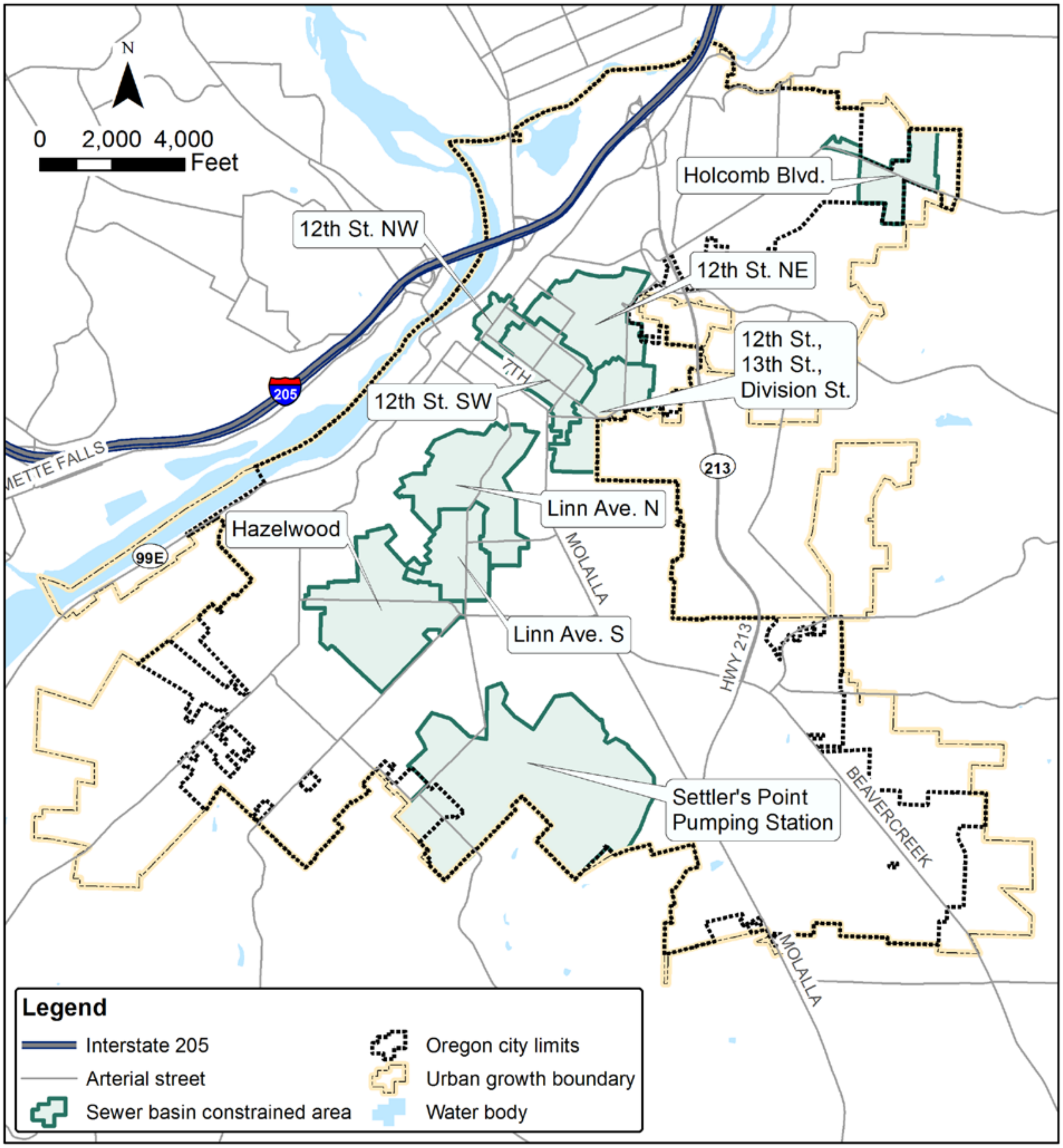

Figure 1. Constrained sewer contributing areas

Section 2: Analysis Methodology

Hydraulic analyses were conducted using Storm Water Management Model (SWMM) urban hydrology and conveyance system hydraulics software. A detailed explanation of how base flows and wet weather flows were developed is included in Section 3 and Appendix A of the SSMP. The SSMP uses the 1- in 10-year storm event (recurrence interval) as the basis of planning. This TM investigates the results of modeling both the 1- in 5-year and 1- in 10-year storm events.

2.1 Base Flows

Base flows include wastewater contributions from residential, commercial, and industrial sources and long-term groundwater infiltration that finds its way into sewers and manholes through cracks, joint separations, and other defects. Rainfall-derived infiltration/inflow (I/I) is not included in the base flow, whereas long-term groundwater is included. The groundwater contributions may include perched water sources that contribute groundwater infiltration during the wet season only. The flow monitoring record includes the groundwater sources so that with the addition of the wet weather I/I, the modeling represents the entire wet weather flow regime. Base flows are the same for the 1- in 5-year and 1- in 10-year storm events.

2.2 Wet Weather Flows

Wet weather flows are based on the results of flow monitoring during the wet season and pump station run time data. The wet weather data were used to calibrate the model such that modeled flow matched observations and measurements of actual flow in the collection system. Flow meter locations and model calibration are documented in Appendix A of the SSMP. Once calibrated, the model was used to simulate the two storm events and determine capacity deficiencies in the system. The rainfall depths associated with the two storm events are listed in Table 1.

Table 1. Storm Flow Volumes

Storm event	Flow volume, inches
5-year, 24-hour	3.0
10-year, 24-hour	3.5

2.3 Assessment Criteria

Two criteria are used to evaluate whether pipes are too small to convey the design flow. The percent of capacity used is a ratio of maximum predicted flow (Q) to pipe capacity (Qm) expressed as a percentage. The maximum predicted flow, Q, is the calculated peak flow in each pipe from the model. The pipe capacity (Qm) is the theoretical pipe capacity according to Manning's equation, which assumes unpressurized flow (no surcharging). A percentage of greater than 100 indicates that the pipe is carrying more flow than is theoretically possible for unpressurized flow for a given pipe slope, diameter, and internal roughness. A percent capacity of greater than 100 is an indication of a surcharged pipe.

Unfortunately, the percent capacity alone cannot be used for determining pipe capacity due to the way that SWMM-based models report their data. In some situations, peak flows reported by the model exist for extremely short periods of time, sometimes only for seconds. Consequently, some of these peak flow values should not be used as the basis for pipe replacement. The second criterion, the ratio of depth of water to pipe diameter (d/D) is often more reliable. Use of the d/D ratio is described in more detail below.

In an unpressurized pipe, or a pipe with open-channel flow characteristics, the hydraulic grade line (HGL) is the elevation of the water surface within the pipe, or the d value. In a pipe that is surcharged (pressurized flow), the HGL is defined by the elevation to which water would rise in an open pipe, or manhole, as shown in Figure 2. In hydraulic terms, the HGL is equal to the pressure head measured above the invert of the pipe.

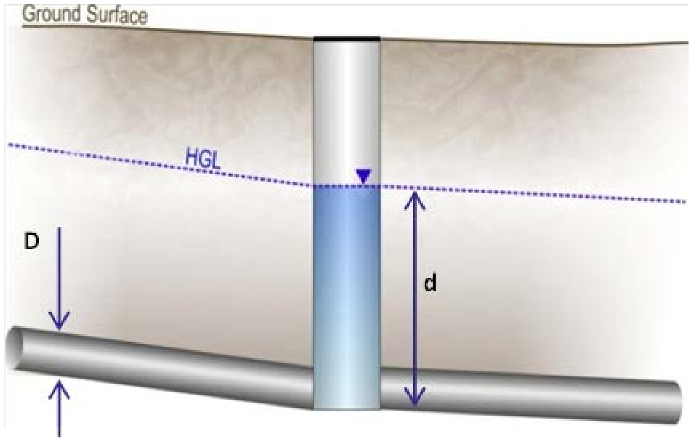

Figure 2. HGL for surcharged condition

The recommended approach for determining which pipes need to be upsized is to consider the amount and frequency of surcharging. For example, if minor surcharging (less than 1 to 2 feet) were to occur during large storm events only (i.e., the 1- in 10-year storm) and the surcharging did not impact property or create an SSO, City staff should not consider upsizing this pipe. However, if the frequency or amount of surcharging were to increase and endanger property or overflow, then the pipe should be upsized. Modeling of the 1- in 5-year storm event is used to help identify where surcharging occurs more frequently.

Pipes that surcharge frequently should be upsized since frequent surcharging has the potential to reduce their structural stability due to loss of pipe support from fine-grained soils washing into the sewer. Similarly, if the amount of surcharging is more than 1 or 2 feet, City staff should consider the amount of remaining freeboard (i.e., distance between water surface in manhole and ground surface, or to the elevation of basements in the area) with regard to the risk of SSOs or basement backups. This approach will help to ensure that the City has adequate capacity for conveying the design flows without spending more capital dollars than necessary.

In general, most sewers with d/D ratios of between 1 and 3 are not identified for replacement. City staff should monitor these sewers during large storm events to quantify the amount of surcharging that actually occurs. If the observed surcharging increases to the point of risking property or becoming an SSO, then the pipe or pipes should be upsized. Some pipes with minor surcharging are identified for replacement even though their d/D ratio is less than 1. Upsizing of these pipes will help to reduce more significant surcharging in the upstream system.

Section 3: Results

This section presents the results of the existing condition scenario 1- in 10-year and 1- in 5-year modeling for the constrained areas. Each sub-section describes a constrained area and includes a description of surcharged pipes, locations for potential SSOs (flooding), undersized pipes, and costs to upsize pipes.

3.1 Linn Avenue

Linn Avenue is located south of downtown Oregon City and parallels Singer Creek. The existing 12-inch gravity sewer within the Linn Avenue roadway alignment from Summit Street to 4th Street is discussed in this section.

3.1.1 Existing Condition: 1- in 10-year Modeling Results

The 1- in 10-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This storm event was modeled first since the 1- in 10-year storm is consistent with the modeling performed for the SSMP.

The model-predicted surcharging and flooding for the 1- in 10-year, existing conditions scenario, is shown in Figure 3. Surcharging starts at manhole (MH) 11564 and increases upstream to MH 11570. Surcharging is reduced in the steeper segment from MH 11570 to MH 11547, but occurs again in the segment from MH 11547 to MH 11546. In the profile view, Figure 4, the HGL is less than 5 feet from the rim elevations of MHs 11569, 13748, 11570, and 11546.

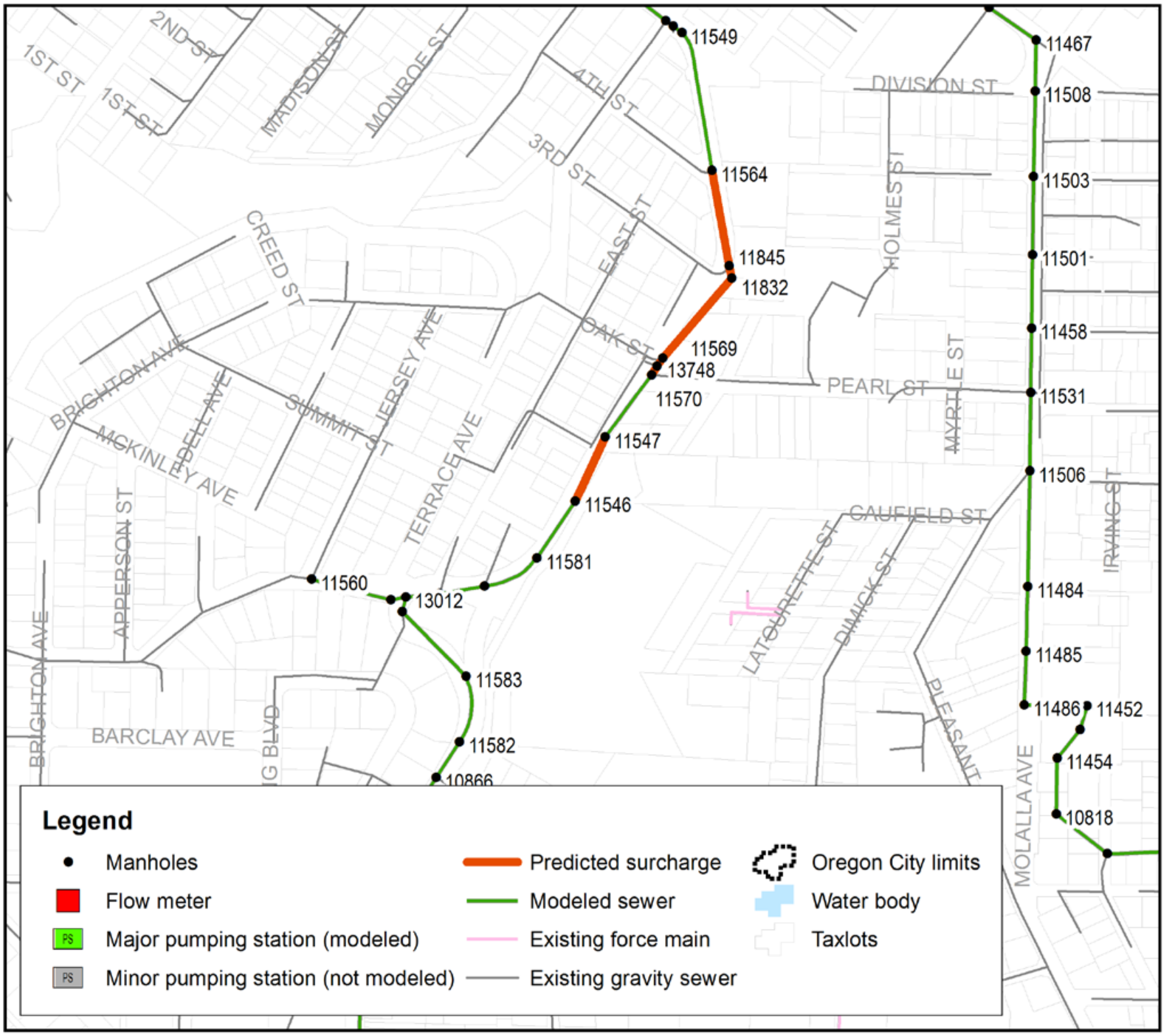

Figure 3. Surcharging and flooding along Linn Avenue sewer, 1- in 10-year storm event

EXHIBIT C

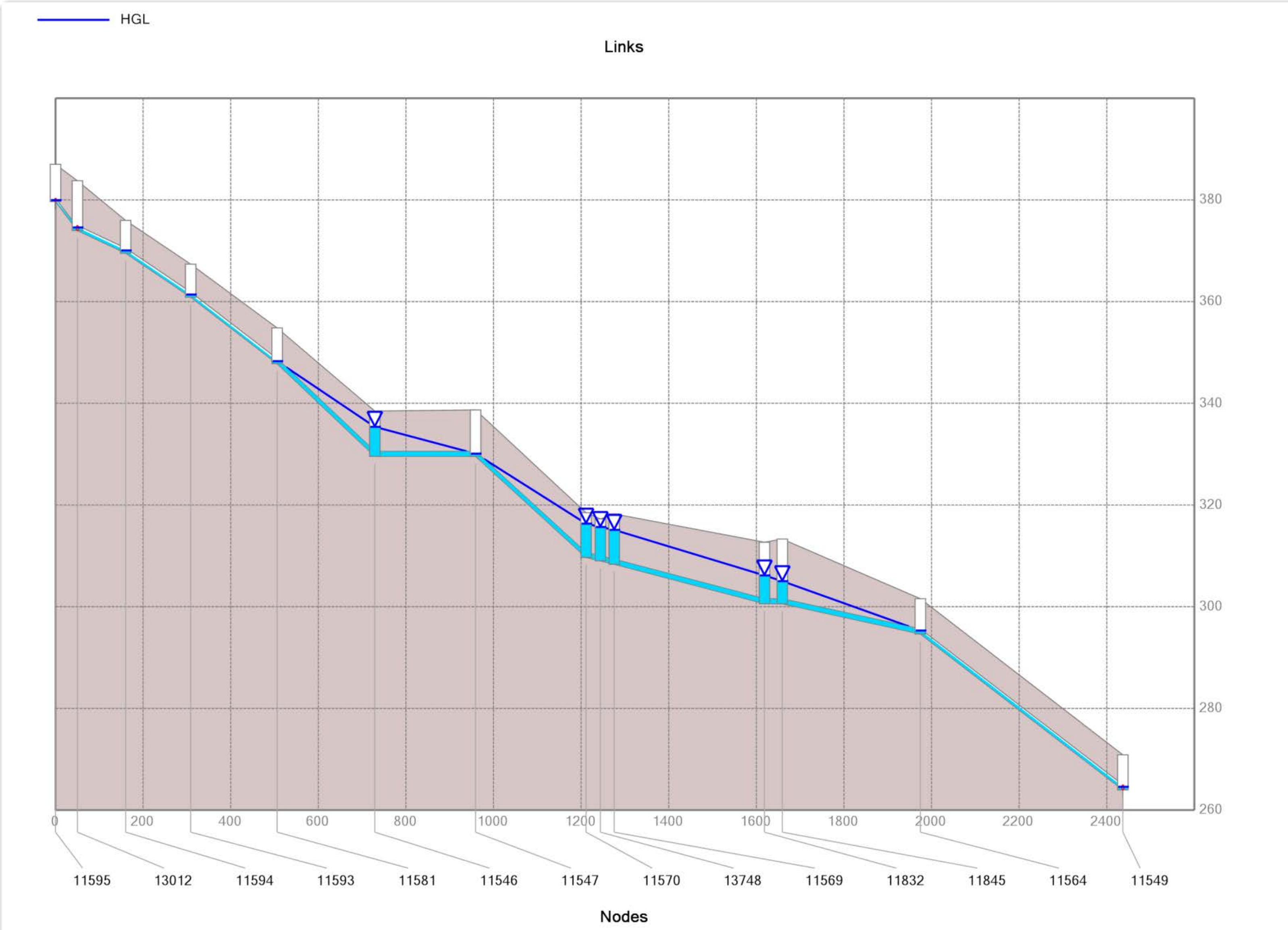

Figure 4. Linn Avenue sewer profile, 1- in 10-year storm event

3.1.2 Existing Condition: 1- in 5-year Modeling Results

The 1- in 5-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This modeling helps to identify the sewers that will surcharge more frequently than the 1- in 10-year design storm used in the SSMP. As shown in Figure 5, the surcharging extends over the same range of pipes as with the 1- in 10 year storm event modeling, but the surcharging depths are reduced. However, the HGL is less than 5 feet from the rim elevation of MH 11546.

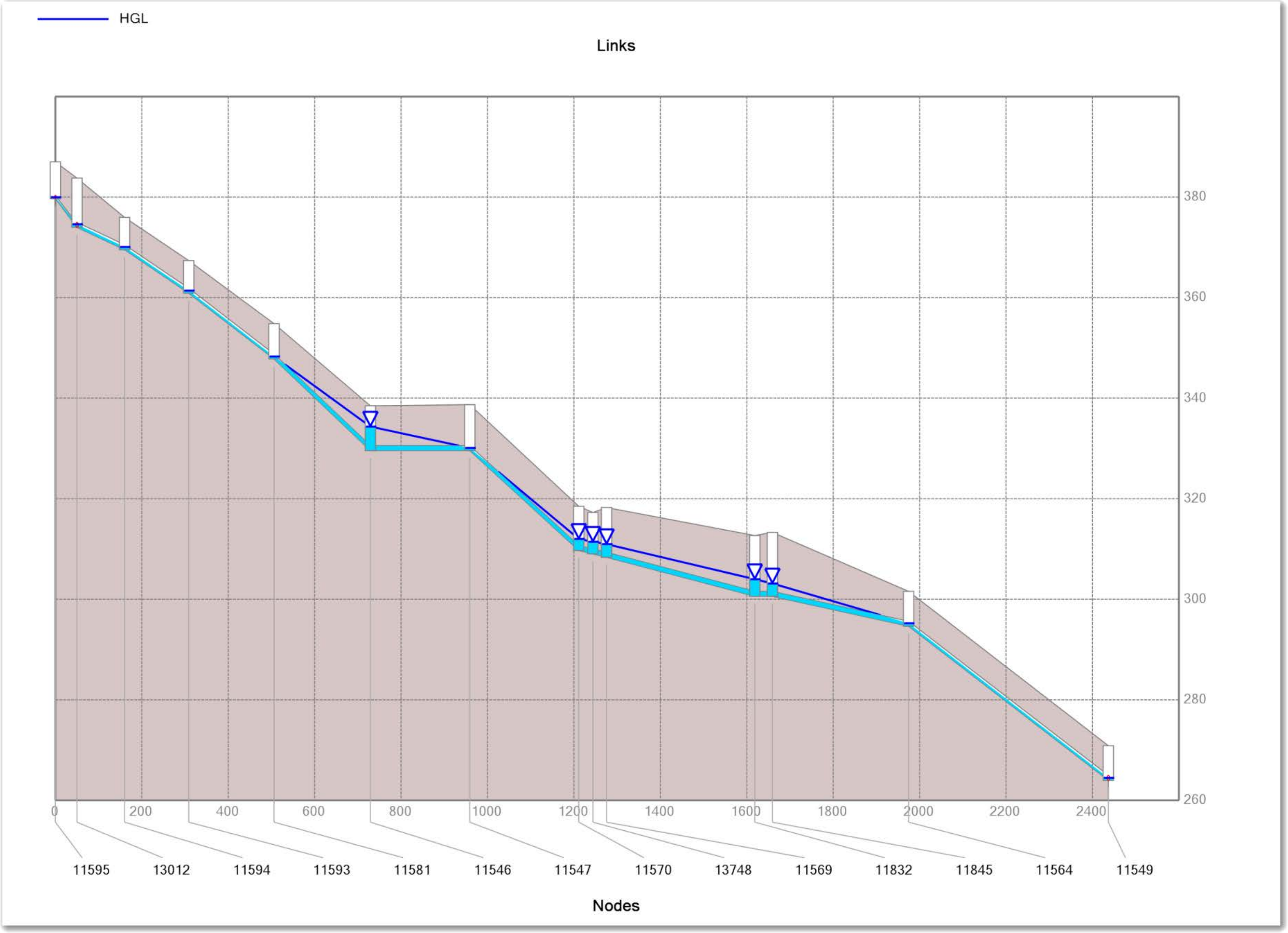

Figure 5. Linn Avenue sewer profile, 1- in 5-year storm event

3.1.3 Required Improvements: Existing Condition

There is one sewer segment that would need to be replaced to relieve the predicted surcharging and flooding for the existing condition, 1- in 5-year storm event, which is shown in Figure 6. Please note that not all pipes identified as surcharging need to be replaced since not all surcharging is excessive and the replacement of downstream constraints often reduces the surcharging in upstream sewers.

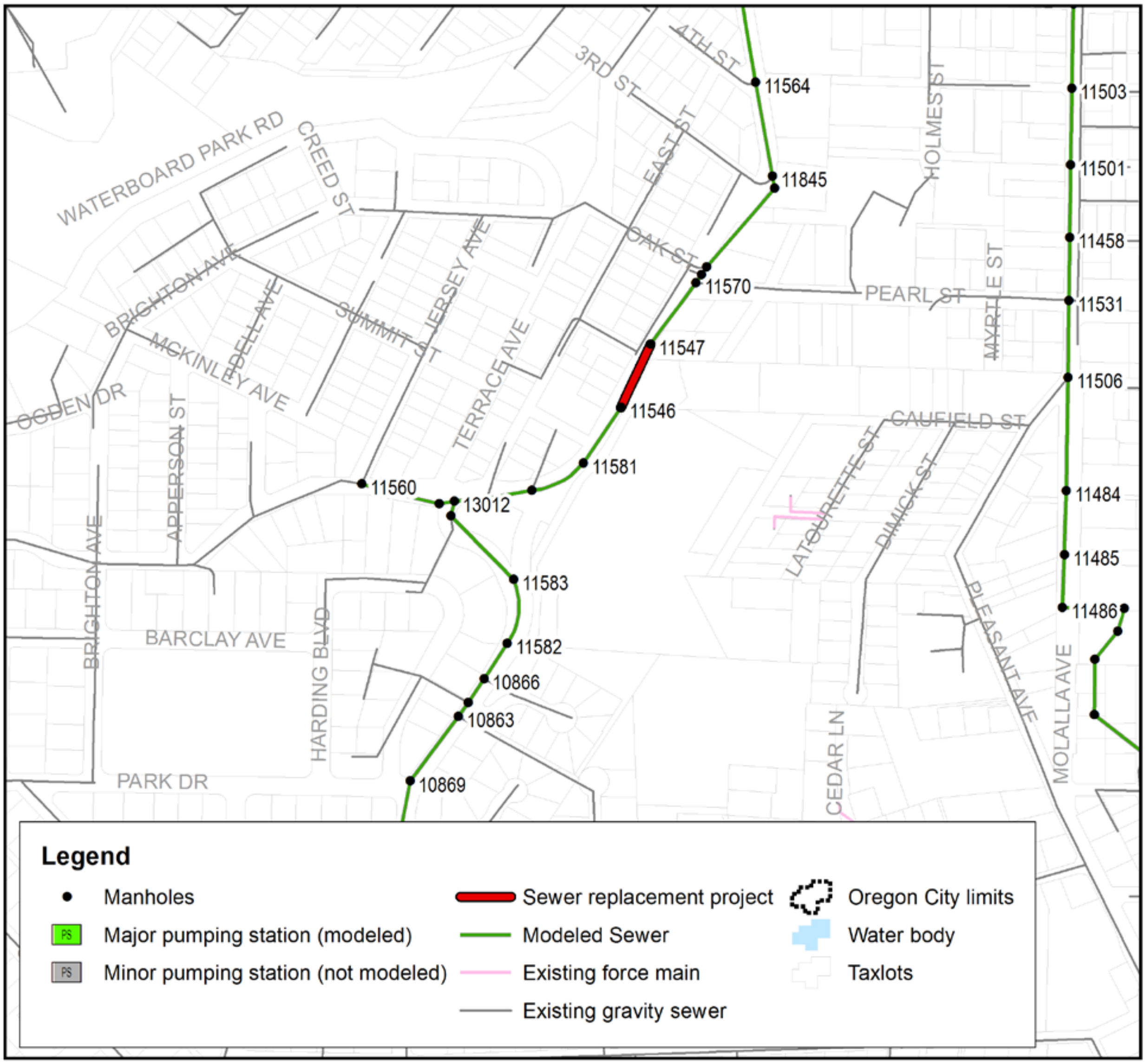

Figure 6. Required Linn Avenue sewer upgrades, 1- in 5-year storm event

Costs to upsize the sewers identified in Figure 6 are listed in Table 2. The costs are based on sizing replacement sewers to convey the 1- in 5-year storm event under existing conditions. Actual replacement of any of these pipes will be based on the 10-year storm event modeling for the future condition which is listed in Table 3. Table 2 does not include the benefits of potential I/I reduction measures.

Table 2. Sewer Upsizing Requirements – 5-year Storm Event, Existing Conditions Scenario						
Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
11546_11547	OC	230	12	15	101,788	(4) Linn Avenue
Total all pipe replacements					101,788	

The costs listed in Table 3 are based on sizing of replacement sewers to convey the 1- in 10-year storm event under the existing conditions scenario. The required pipe size does not change from what is required for the 1- in 5-year storm modeling, but the number of sewers that require replacement increases. Upsizing the pipes listed in Table 3 will convey the 1- in 10-year storm under existing conditions with little surcharging and no flooding, as shown in Figure 7.

Table 3. Sewer Upsizing Requirements – 10-year Storm Event, Existing Conditions Scenario						
Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
11546_11547	OC	230	12	15	101,788	(4) Linn Avenue
11832_11845	OC	41	12	15	24,341	(4) Linn Avenue
11845_11564	OC	315	12	15	139,464	(4) Linn Avenue
Total all pipe replacements					265,590	

EXHIBIT C

Figure 7. Linn Avenue sewer profile, 1- in 10-year storm event, pipes upsized

3.1.4 Linn Avenue Recommendations

Portions of the Linn Avenue sewer are undersized and currently operating beyond existing capacity, including the 1- in 5-year and 1- in 10-year storm events. The sewers in this area need to be increased in diameter and/or the flows need to be reduced via an I/I abatement program. **Any additional flows introduced into this sewer prior to implementation of the capital improvement recommendations will increase surcharging and increase the potential for flooding and/or basement backups in the area.** The sizing of replacement sewers should be based on the recommendations of the SSMP as determined to convey the future conditions scenario, 1- in 10-year storm event.

3.2 Hazelwood Drive

Hazelwood Drive is located south of downtown Oregon City, north of Warner-Parrott Road. The results in this section are also described in the Hazelwood Area (Warner-Parrott Road) Modeling TM, (Brown and Caldwell, April 28, 2014.

3.2.1 Existing Condition: 1- in 10-year Modeling Results

The 1- in 10-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This storm event was modeled first since the 1- in 10-year storm is consistent with the modeling performed for the SSMP.

The model predicted surcharging and flooding for the 1- in 10-year, existing conditions scenario, as shown in Figure 8. Surcharging starts at approximately MH 10928 and increases in the upstream direction until the HGL breaks the ground surface at MH 18025. At MH 18025, flooding is predicted and nearly occurs at MH 11046, as shown in the profile view in Figure 9. As shown, the HGL is high throughout the study area and flooding is predicted at MH 18025. City staff have observed significant surcharging along Warner-Parrett Road and in the sewer that runs up Shenandoah Drive and into Joyce Court. The five properties highlighted in Figure 10 experienced basement flooding during the storm event on January 2, 2009, and two of these same properties again had flooding during the storm event on January 19 to 20, 2012.

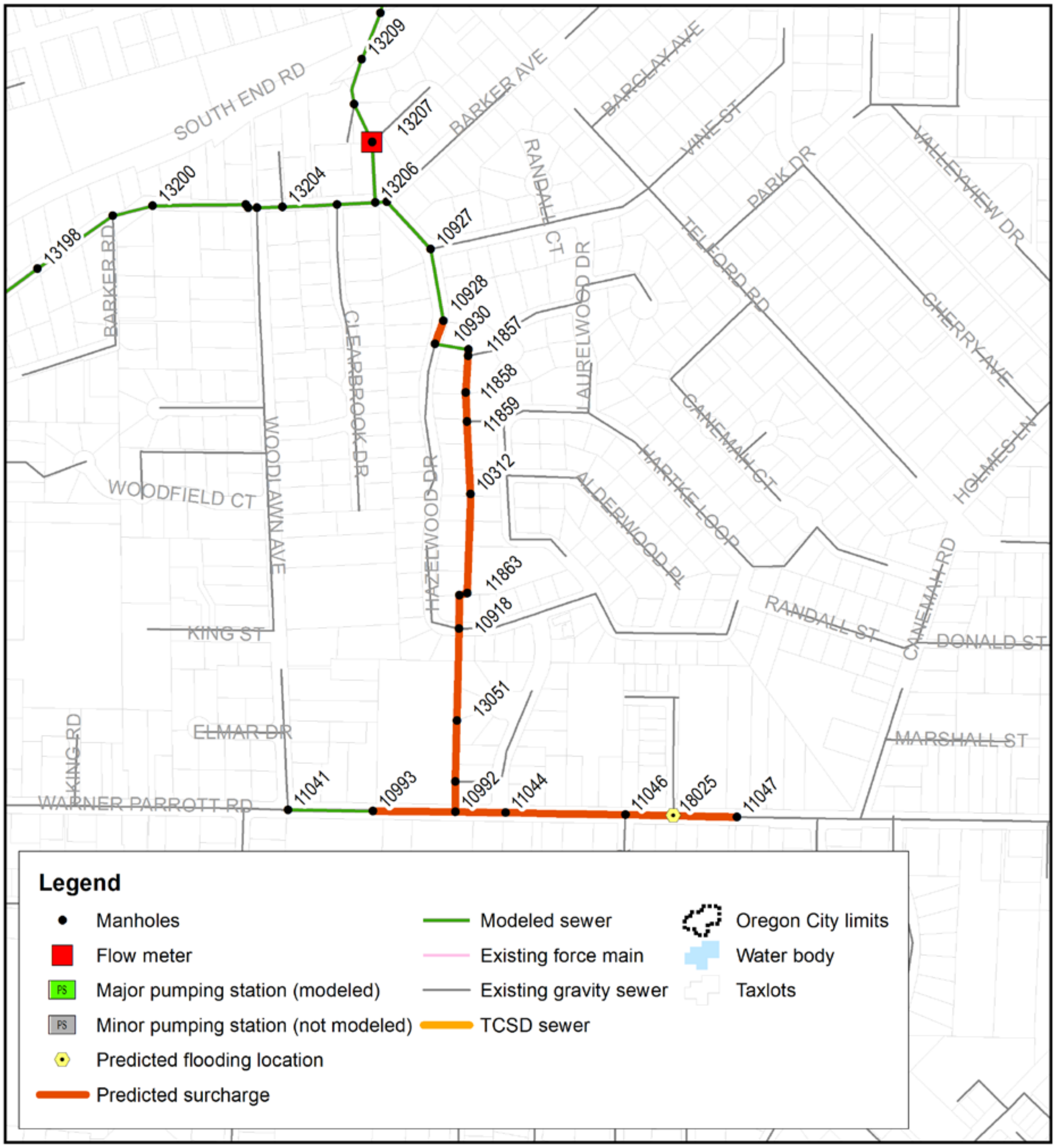

Figure 8. Surcharging and flooding along Hazelwood sewer, 1- in 10-year storm event

EXHIBIT C

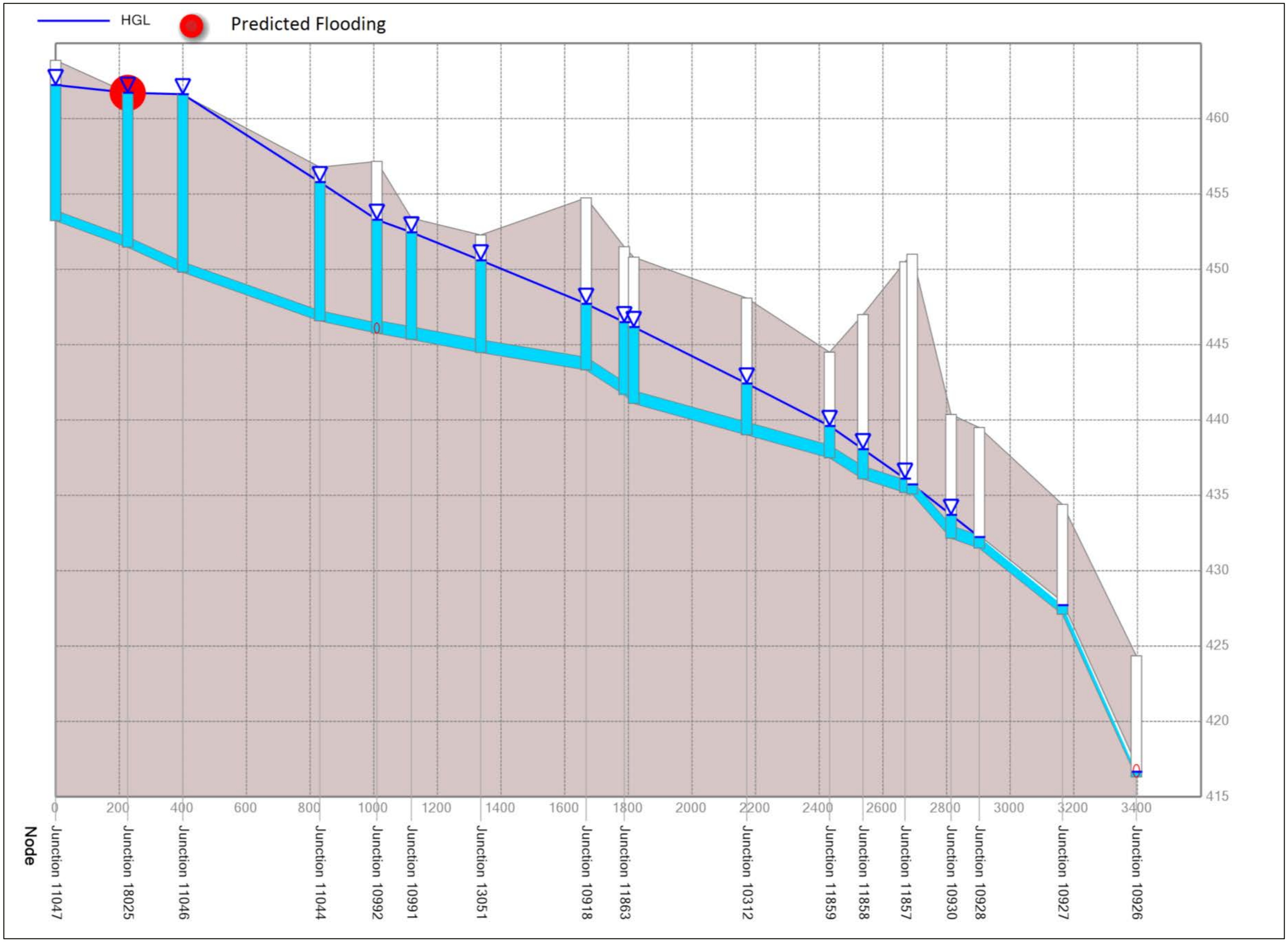

Figure 9. Hazelwood sewer profile, 1- in 10-year storm event

EXHIBIT C

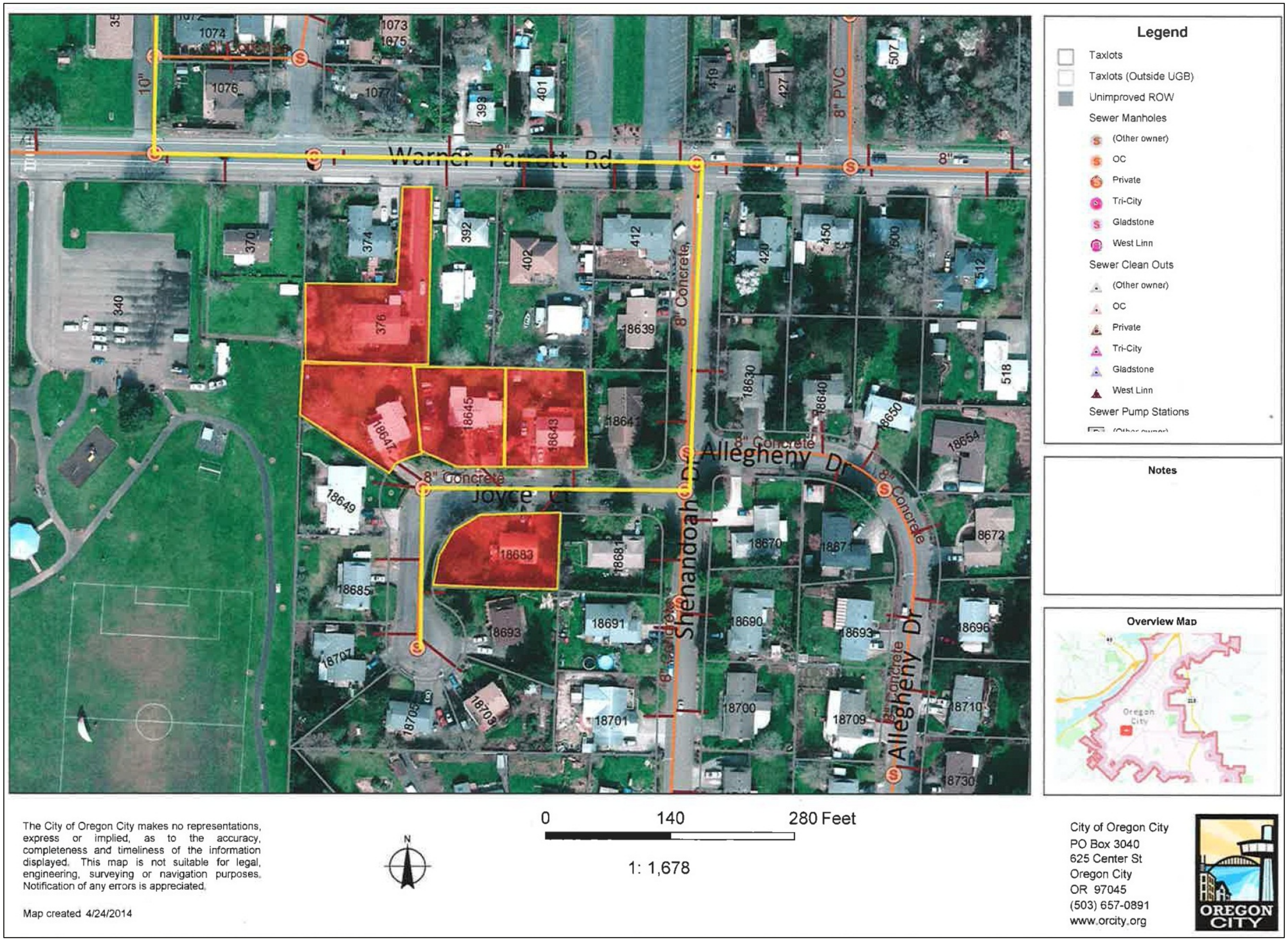

Figure 10. Recorded basement flooding

3.2.2 Existing Condition: 1- in 5-year Modeling Results

The 1- in 5-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This modeling helps to identify the sewers that will surcharge more frequently than the 1- in 10-year design storm used in the SSMP. As shown in Figure 11, the profile is nearly the same as the 1- in 10-year storm event modeling. The HGL is only slightly lower for the 5-year event than the larger 10-year storm. Surcharging extends over the same range of pipes and flooding occurs at the same location as with the 1- in 10-year storm event modeling.

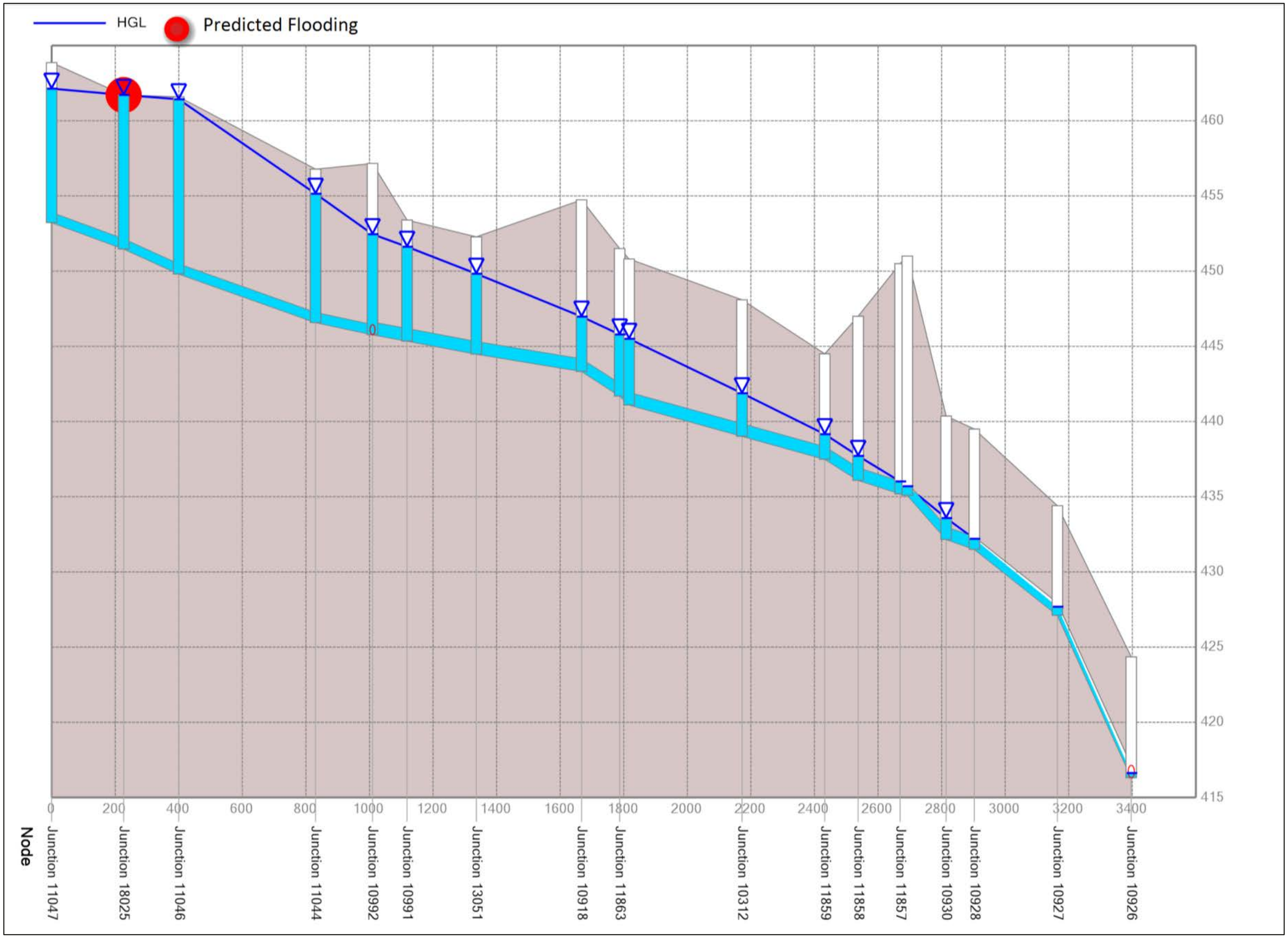

Figure 11. Hazelwood sewer profile, 1- in 5-year storm event

3.2.3 Required Improvements: Existing Conditions

Sewers that would need to be replaced to relieve the predicted surcharging and flooding for the existing condition, 1- in 5-year storm event are shown in Figure 12. Please note that not all pipes identified as surcharging need to be replaced since not all surcharging is excessive and the replacement of downstream constraints often reduces the surcharging in upstream sewers.

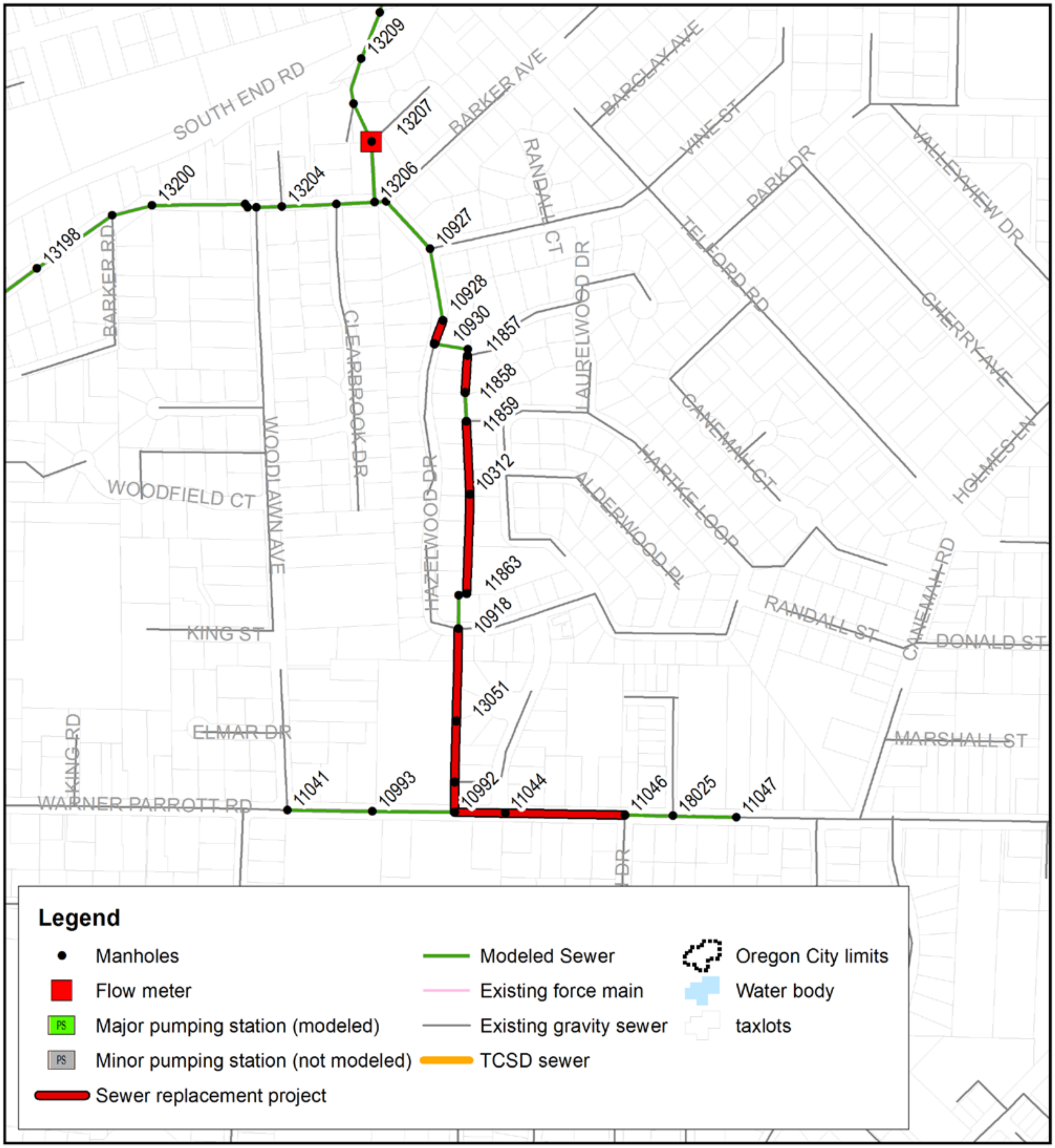

Figure 12. Required Hazelwood sewer upgrades, 1- in 5-year storm event

Costs to upsize the sewers identified in Figure 12 are listed in Table 4. The costs are based on sizing replacement sewers to convey the 1- in 5-year storm event under existing conditions. Actual replacement of any of these pipes will be based on the 10-year storm event modeling for the future condition. Table 4 does not include the benefits of potential I/I reduction measures.

Table 4. Sewer Upsizing Requirements – 5-year Storm Event, Existing Conditions Scenario

Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
10930_10928	OC	89	10	12	35,100	Hazelwood
11858_11857	OC	132	10	12	83,522	Hazelwood
10312_11859	OC	260	10	12	127,524	Hazelwood
11862_10312	OC	355	10	12	173,929	Hazelwood
13051_10918	OC	331	10	12	162,156	Hazelwood
10991_13051	OC	218	10	12	106,766	Hazelwood
10992_10991	OC	109	10	12	53,202	Hazelwood
11044_10992	OC	179	8	10	92,088	Hazelwood
11046_11044	OC	431	8	10	221,253	Hazelwood
Total all pipe replacements					1,055, 539	

The costs listed in Table 5 are based on sizing of replacement sewers to convey the 1- in 10-year storm event under the existing conditions scenario. The required pipe sizes do not change from what is required for the 1- in 5-year storm modeling, but the number of sewers that require replacement increases. Upsizing the pipes listed in Table 5 will convey the existing condition 1- in 10-year storm with little surcharging and no flooding, as shown in Figure 13.

Table 5. Sewer Upsizing Requirements – 10-year Storm Event, Existing Conditions Scenario

Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
10928_10927	OC	261	10	12	103,447	Hazelwood
10930_10928	OC	89	10	12	35,100	Hazelwood
11857_11856	OC	23	10	12	18,052	Hazelwood
11858_11857	OC	132	10	12	83,522	Hazelwood
11859_11858	OC	105	10	12	51,370	Hazelwood
10312_11859	OC	260	10	12	127,524	Hazelwood
11862_10312	OC	355	10	12	173,929	Hazelwood
11863_11862	OC	30	10	12	14,549	Hazelwood
10918_11863	OC	120	10	12	75,758	Hazelwood
13051_10918	OC	331	10	12	162,156	Hazelwood
10991_13051	OC	218	10	12	106,766	Hazelwood
10992_10991	OC	109	10	12	53,202	Hazelwood
11044_10992	OC	179	8	10	92,088	Hazelwood
11046_11044	OC	431	8	10	221,253	Hazelwood
Total all pipe replacements					1,318,715	

EXHIBIT C

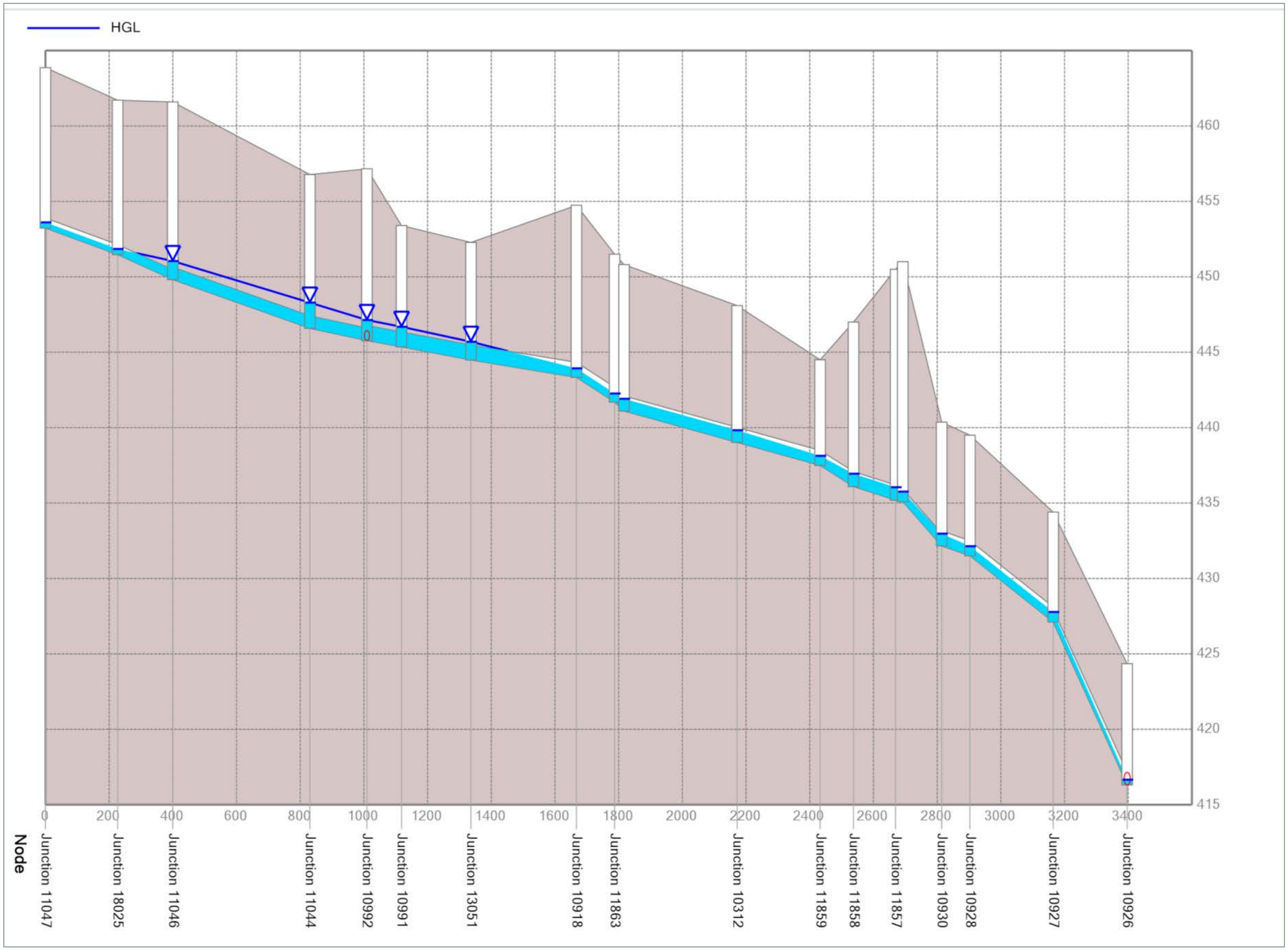

Figure 13. Hazelwood sewer profile, 1- in 10-year existing conditions storm event, pipes upsized

Additional analyses were performed to determine if upsizing only a few of the sewers (either upstream or downstream) would reduce the surcharging to an acceptable level and eliminate the potential for flooding. Modeled pipes were upsized between MH 11046 and MH 10918. The pipe upsizing eliminated the flooding at MH 18025 but produced flooding at MH 13051, a manhole farther downstream. This is attributed to the upsizing of the upstream pipes which allows more flow to be moved downstream, thereby increasing the surcharging and flooding downstream of the improvements. Conversely, modeled pipes were upsized for several of the downstream sewers from MH 10928 through MH 10991. No flooding was predicted for this alternative, but excessive surcharging still was found at MH 11046 and MH 18025. In summary, all sewers identified in Table 5 need to be upsized to reduce surcharging effectively and eliminate the potential for flooding under existing conditions.

3.2.4 Hazelwood Recommendations

Portions of the Hazelwood Drive sewer are undersized and currently operating beyond existing capacity, including the 1- in 5-year and 1- in 10-year storm events. The sewers in this area need to be increased in diameter and/or the flows need to be reduced via an I/I abatement program. **Any additional flows introduced into this sewer prior to implementation of the capital improvement recommendations will increase surcharging and increase the potential for flooding and/or basement backups in the area.** The sizing of replacement sewers should be based on the recommendations of the SSMP as determined to convey the future conditions scenario, 1- in 10-year storm event.

3.3 12th Street

The 12th Street sewer refers to the gravity sewers located in downtown Oregon City on 12th Street from Jefferson Street to Highway (Hwy) 99E and also the two tributary sewers on Madison and Monroe Streets.

3.3.1 Existing Condition: 1- in 10-year Modeling Results

The 1- in 10-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This storm event was modeled first since the 1- in 10-year storm is consistent with the modeling performed for the SSMP.

Model-predicted surcharging and flooding for the 1- in 10-year, existing conditions scenario, is shown in Figure 14. A significant decrease in slope from MH 11402 to the Tri-City Service District (TCSD) sewer results in surcharging from MH 11402 to MH 11397 and flooding at MH 11402 on Center Street. In the profile view on Figure 15, the HGL is shown from Madison Street on the northeast side of 12th Street to MH 11387 (Meter 5). In the profile view on Figure 16, the HGL is shown from Monroe Street on the southwest side of 12th Street to MH 11387 (Meter 5).

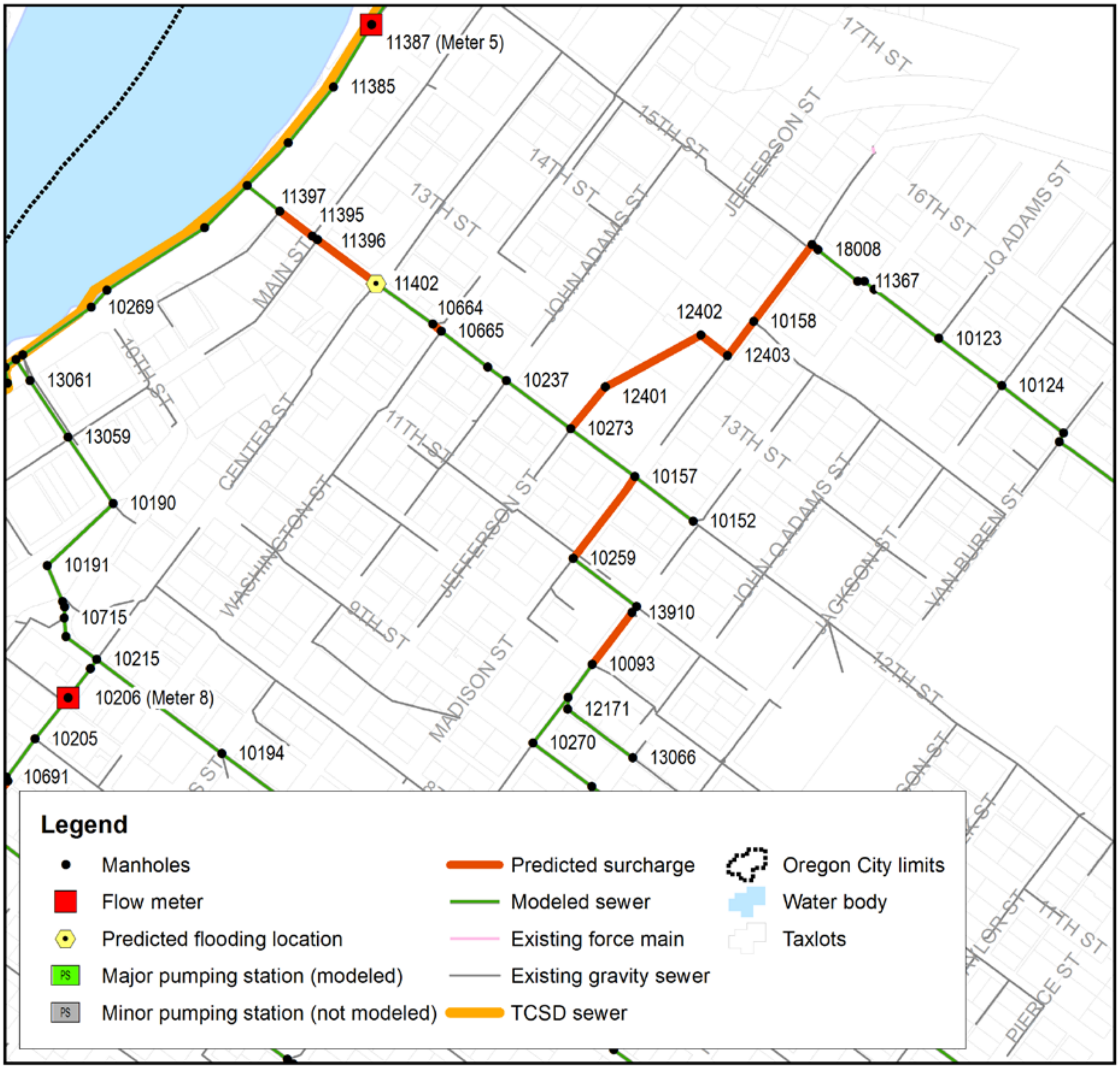

Figure 14. Surcharging and flooding along 12th Street sewer, 1- in 10-year storm event

EXHIBIT C

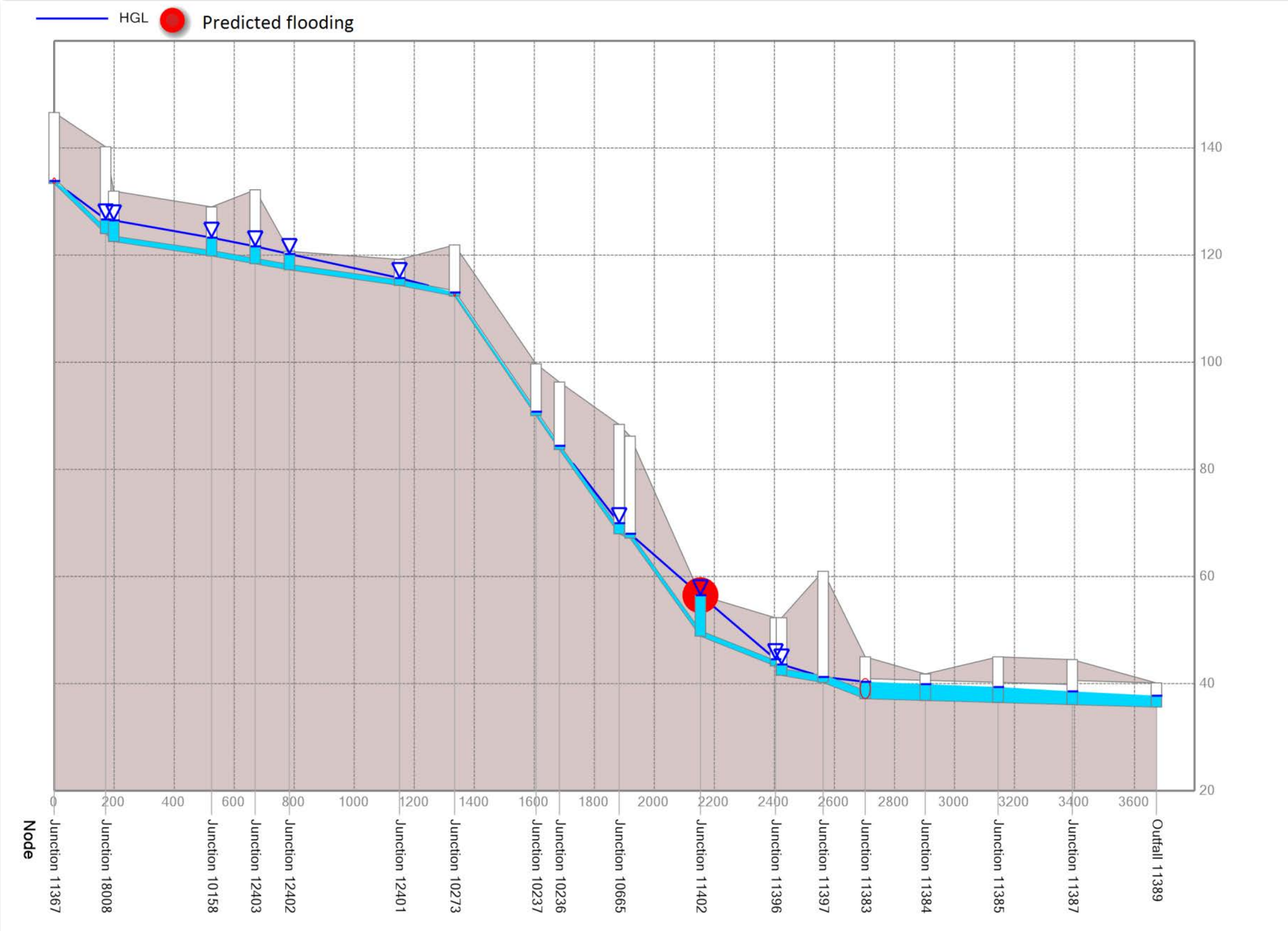

Figure 15. 12th Street sewer profile (1 of 2), 1- in 10-year storm event

EXHIBIT C

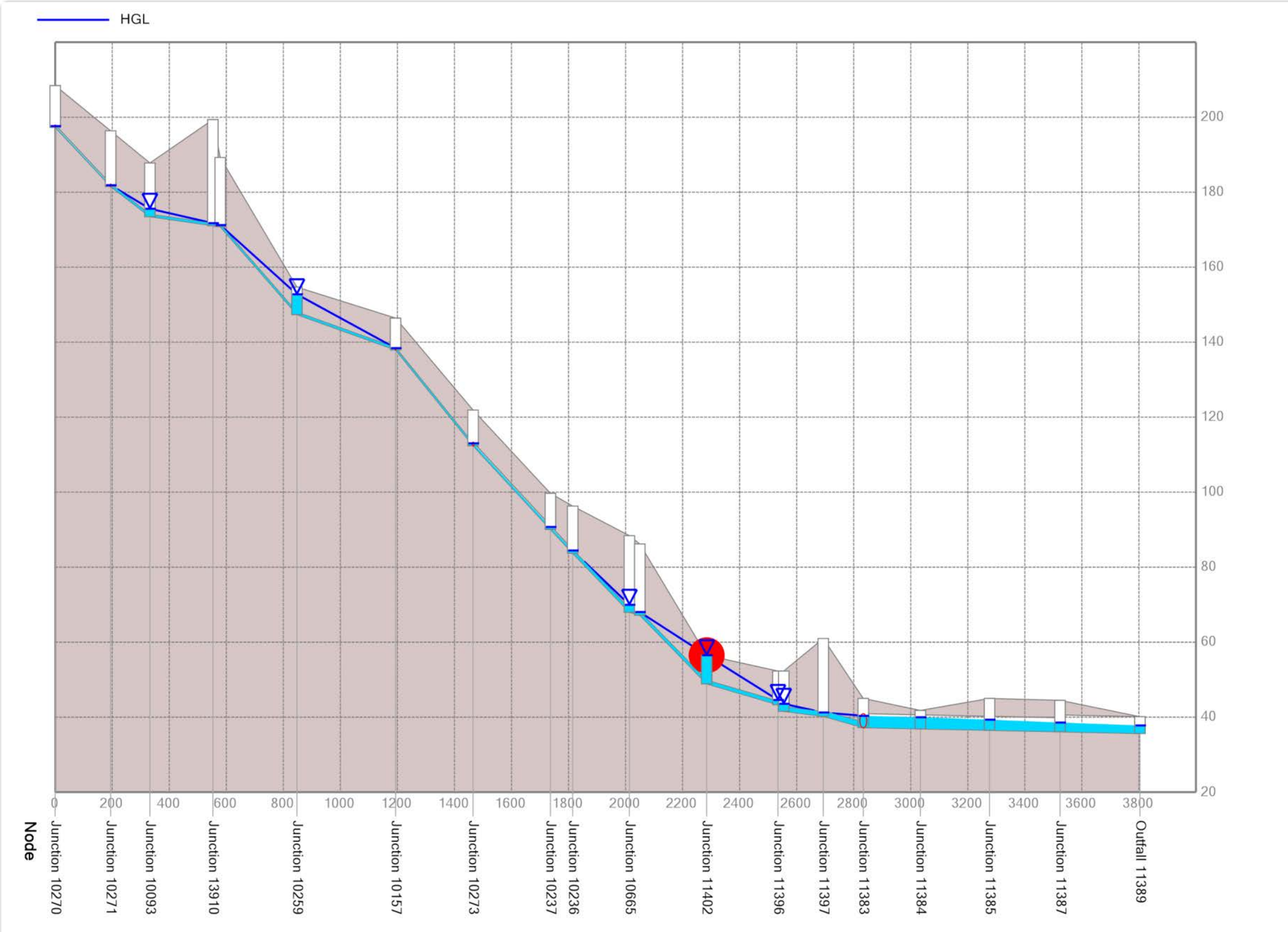

Figure 16. 12th Street sewer profile (2 of 2), 1- in 10-year storm event

3.3.2 Existing Condition: 1- in 5-year Modeling Results

The 1- in 5-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This modeling helps to identify the sewers that will surcharge more frequently than the 1- in 10-year design storm used in the SSMP. As shown in Figures 17 and 18, the 12th Street profiles are nearly the same as the 1- in 10-year storm event modeling. The HGL is only slightly lower for the 5-year event than for the larger 10-year storm. Surcharging extends over the same range of with the 1- in 10-year storm event modeling, however, flooding is no longer predicted at MH 11402.

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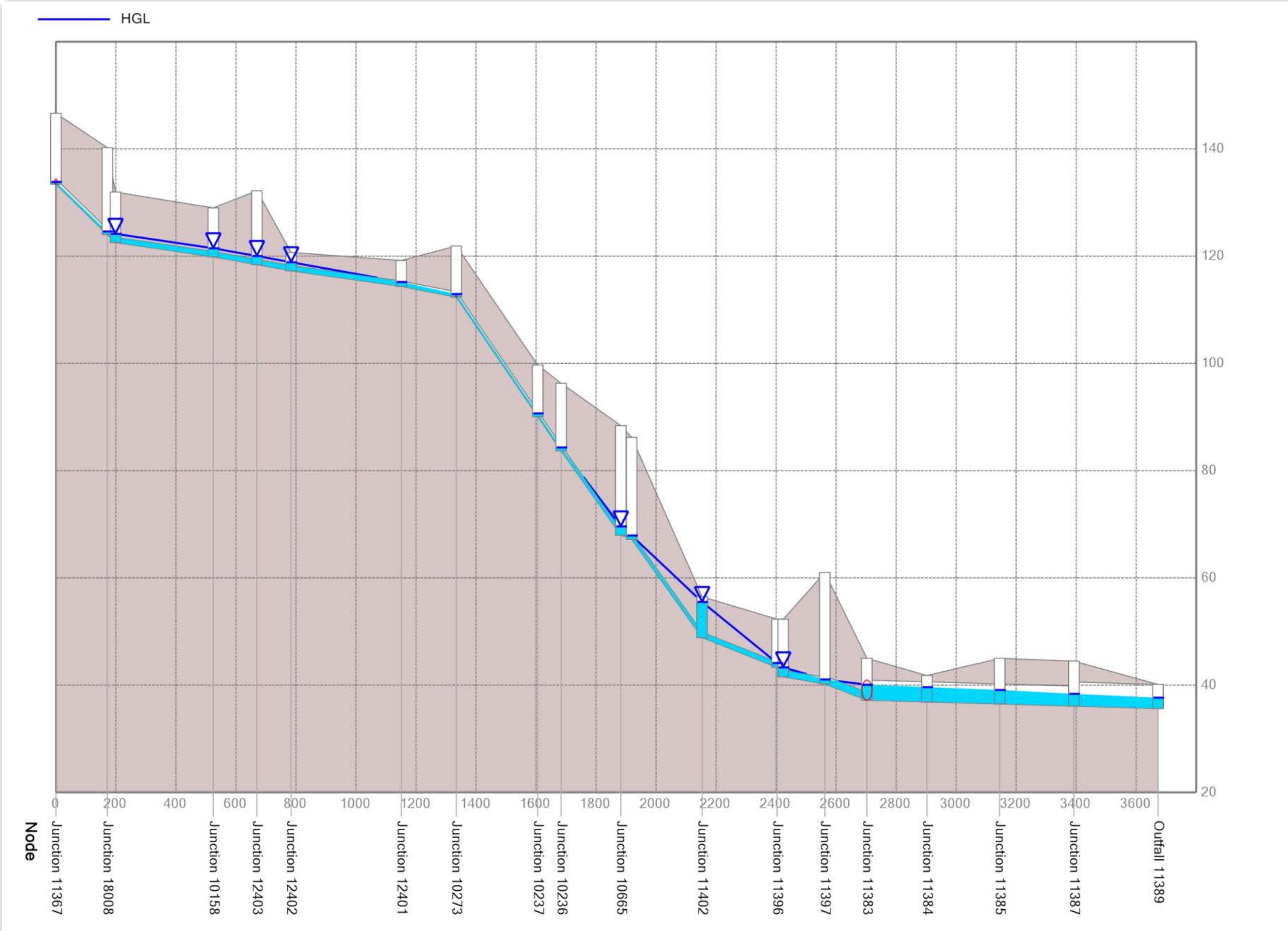

Figure 17. 12th Street sewer profile (1 of 2), 1- in 5-year storm event

EXHIBIT C

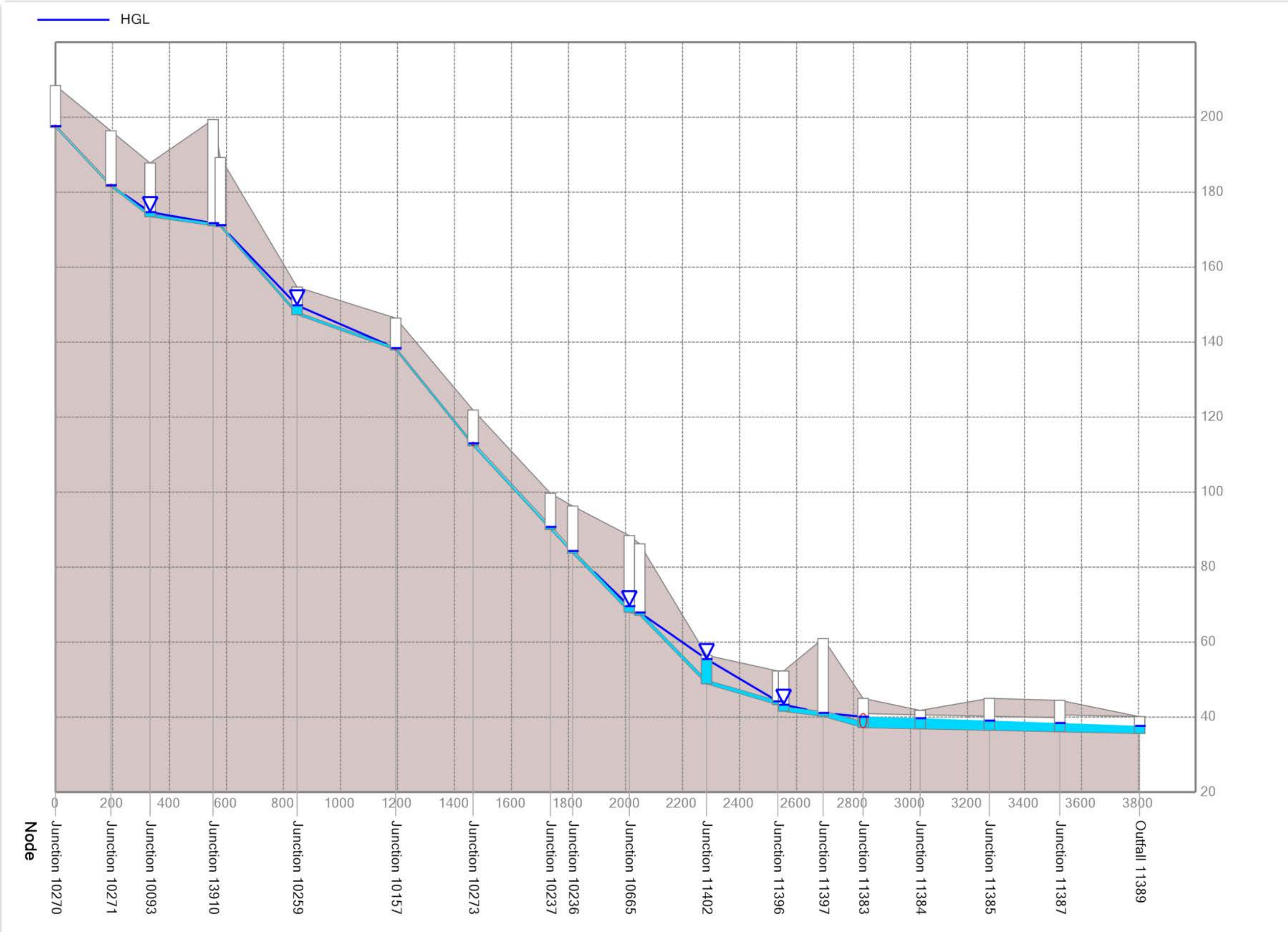

Figure 18. 12th Street sewer profile (1 of 2), 1- in 5-year storm event

3.3.3 Required Improvements: Existing Condition

Sewers that would need to be replaced to relieve the predicted surcharging for the existing condition, 1- in 5-year storm event are shown in Figure 19. Please note that not all pipes identified as surcharging need to be replaced since not all surcharging is excessive and the replacement of downstream constraints often reduces the surcharging in upstream sewers.

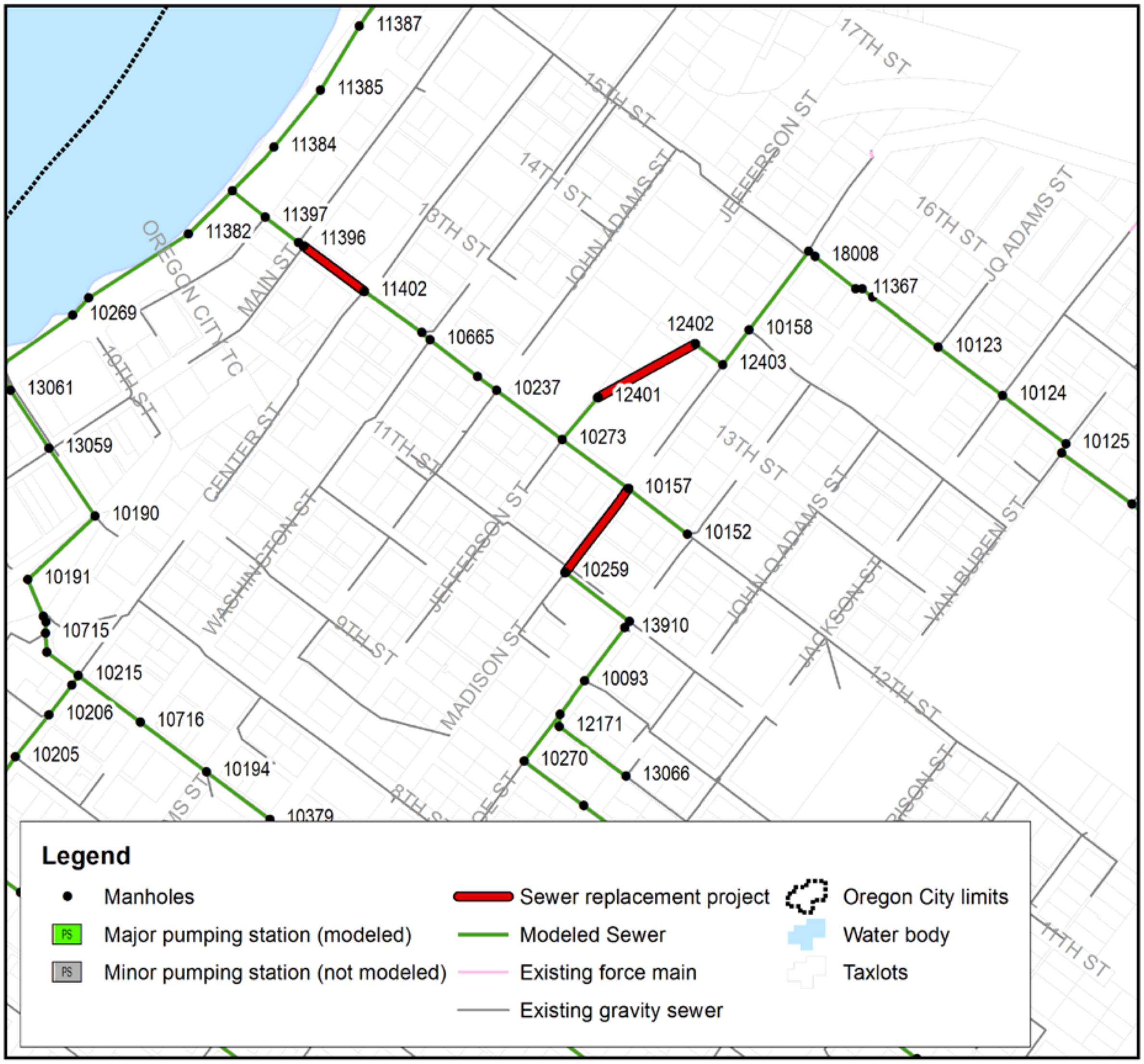

Figure 19. Required 12th Street sewer upgrades, 1- in 5-year storm event

Costs to upsize the sewers identified in Figure 19 are listed in Table 6. The costs are based on sizing replacement sewers to convey the 1- in 5-year storm event under existing conditions. Actual replacement of any of these pipes will be based on the 10-year storm event modeling for the future condition. Table 6 does not include the benefits of potential I/I reduction measures.

Table 6. Sewer Upsizing Requirements – 5-year Storm Event, Existing Conditions Scenario						
Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
10259_10157	OC	346	8	10	128,789	(1) 12th Street
12402_12401	OC	367	12	15	86,858	(1) 12th Street
11402_11396	OC	250	12	15	110,616	(1) 12th Street
Total all pipe replacements					326,260	

The costs listed in Table 7 are based on sizing of replacement sewers to convey the 1- in 10-year storm event under the existing conditions scenario. The required pipe sizes do not change from what is required for the 1- in 5-year storm modeling, but the number of sewers that require replacement increases. Upsizing the pipes listed in Table 7 will convey the 1- in 10-year storm under the existing conditions with little surcharging and no flooding, as shown in Figures 20 and 21.

Table 7. Sewer Upsizing Requirements – 10-year Storm Event, Existing Conditions Scenario						
Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
10259_10157	OC	346	8	10	128,789	(1) 12th Street
12402_12401	OC	367	12	15	86,858	(1) 12th Street
12401_10273	OC	183	12	15	81,202	(1) 12th Street
11402_11396	OC	250	12	15	110,616	(1) 12th Street
Total all pipe replacements					407,470	

EXHIBIT C

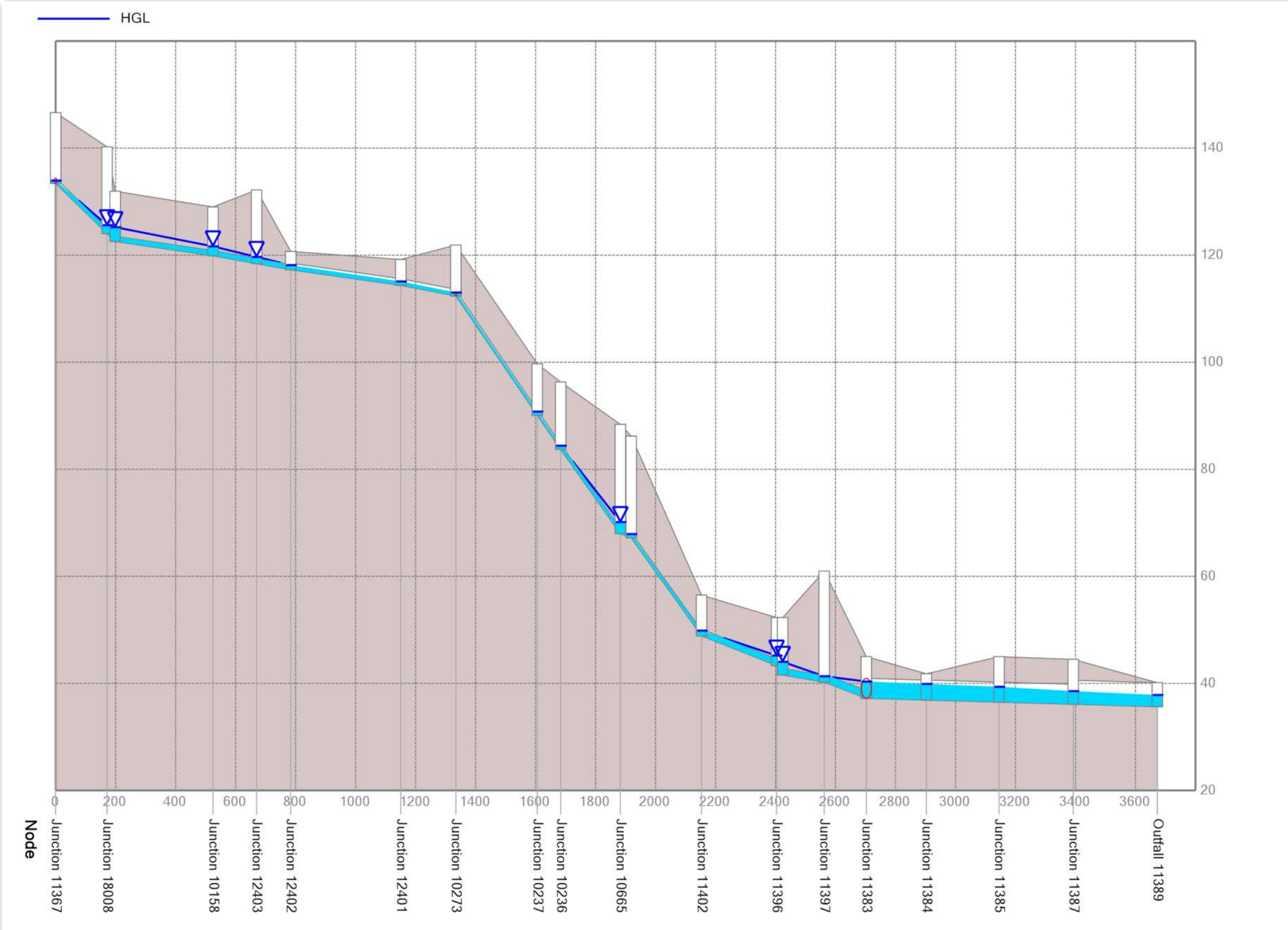

Figure 20. 12th Street sewer profile (1 of 2), 1- in 10-year storm event, pipes upsized

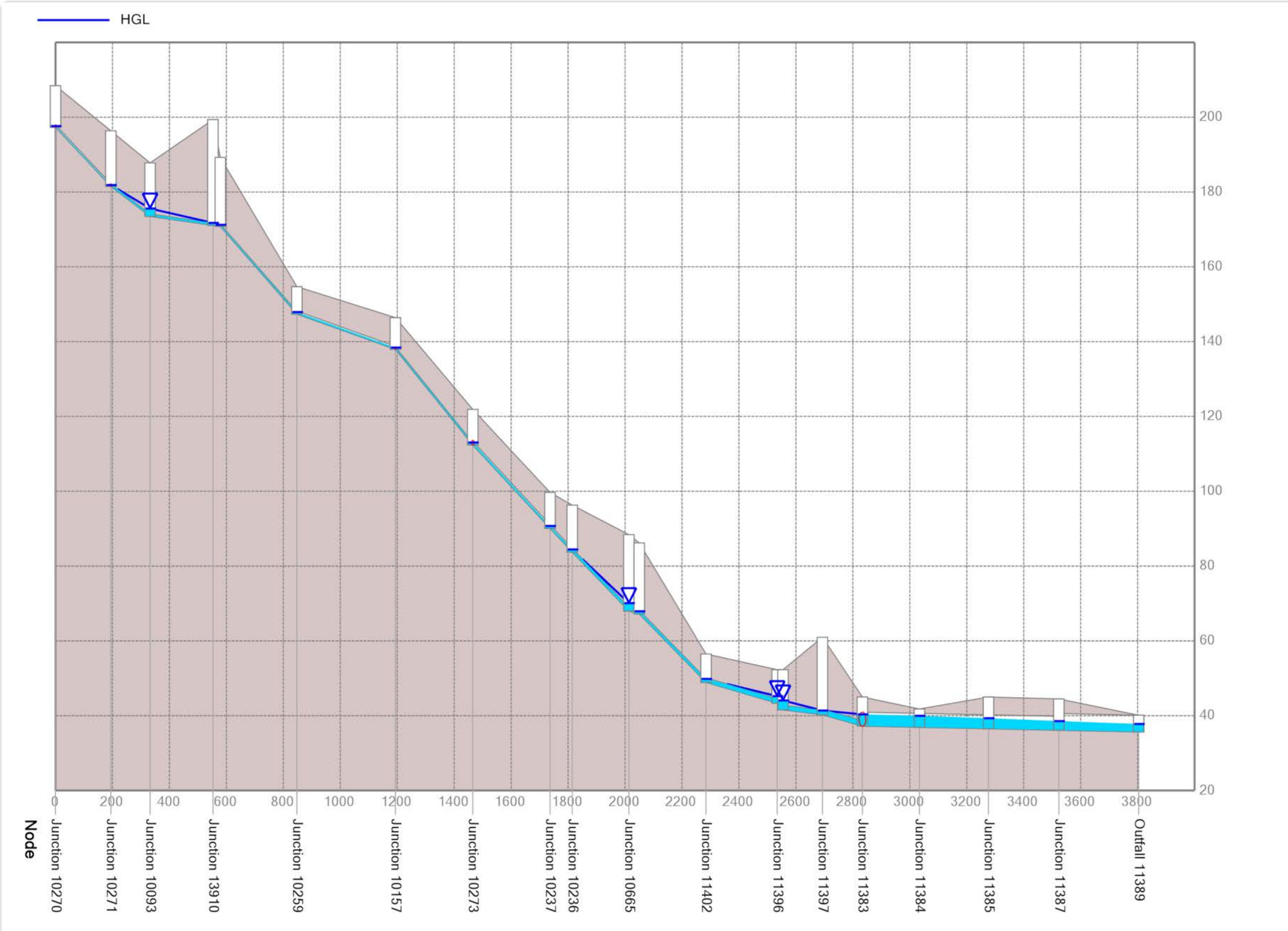

Figure 21. 12th Street sewer profile (2 of 2), 1- in 10-year storm event, pipes upsized

3.3.4 12th Street Recommendations

Portions of the 12th Street sewer are undersized and currently operating beyond existing capacity, including the 1- in 5-year and 1- in 10-year storm events. The sewers in this area need to be increased in diameter and/or the flows need to be reduced via an I/I abatement program. **Any additional flows introduced into this sewer prior to implementation of the capital improvement recommendations will increase surcharging and increase the potential for flooding and/or basement backups in the area.** The sizing of replacement sewers should be based on the recommendations of the SSMP as determined to convey the future conditions scenario, 1- in 10-year storm event.

3.4 13th Street and Division Street

The capacity constraints on 13th Street and Division Street are grouped together in this TM because they are sequential and share some common tributary area. The 13th Street and Division Street projects were identified individually in the SSMP for the purpose of grouping costs into manageable projects.

3.4.1 Existing Condition: 1- in 10-year Modeling Results

The 1- in 10-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This storm event was modeled first since the 1- in 10-year storm is consistent with the modeling performed for the SSMP.

The model predicted surcharging and flooding for the 1- in 10-year, existing conditions scenario, is shown in Figure 22. Surcharging extends from MH 10173 on 14th Street, upstream to MH 11516 on Division Street. As shown on the profile view on Figure 23, the HGL increases from MH 10172 to MHs 11426 and 11427 where flooding is predicted. The surcharging extends upstream from the flooded manholes to the increase in pipe slope at the pipe segment between MH 11516 and MH 11515.

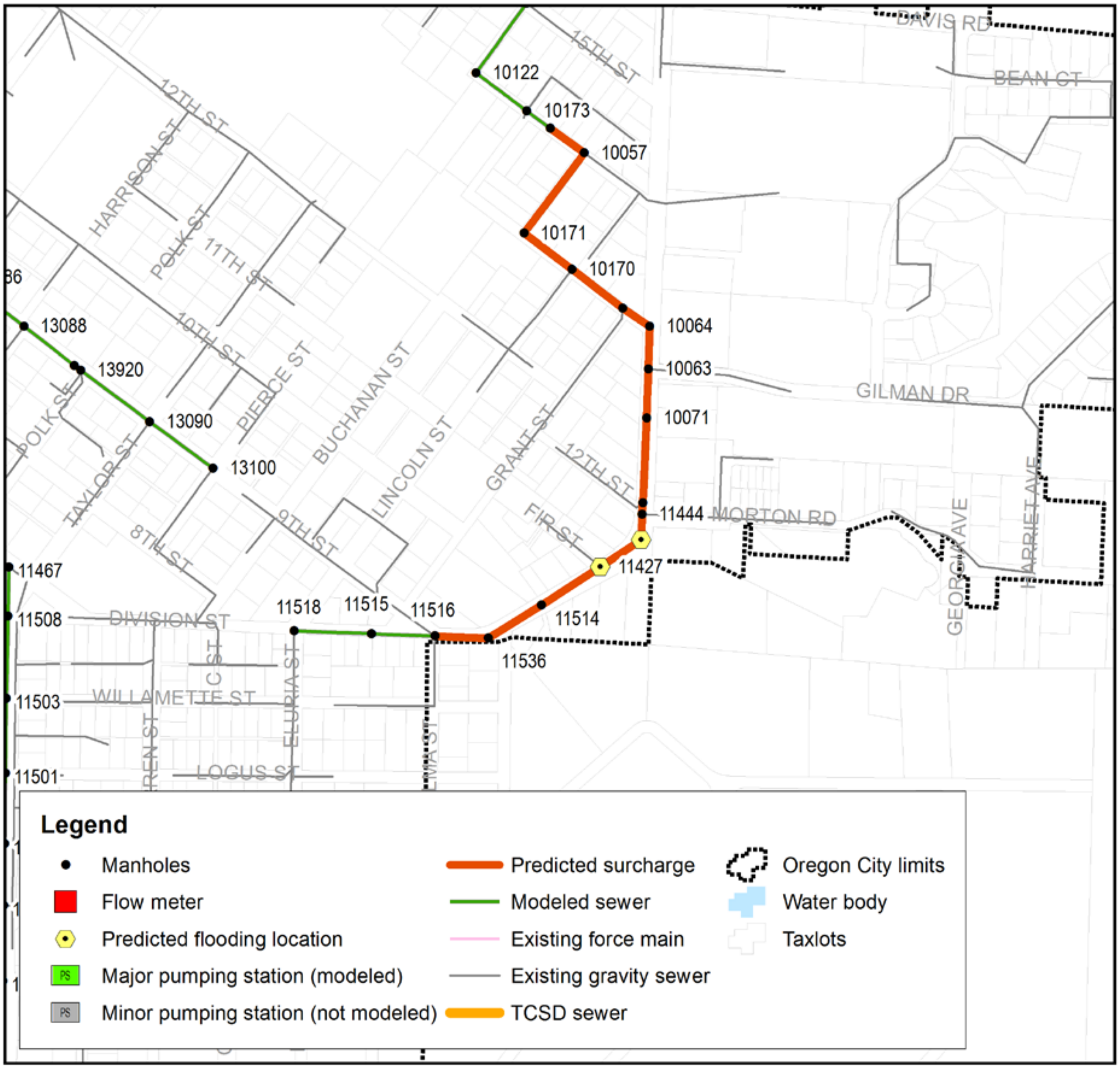

Figure 22. Surcharging and flooding along 13th Street sewer, 1- in 10-year storm event

EXHIBIT C

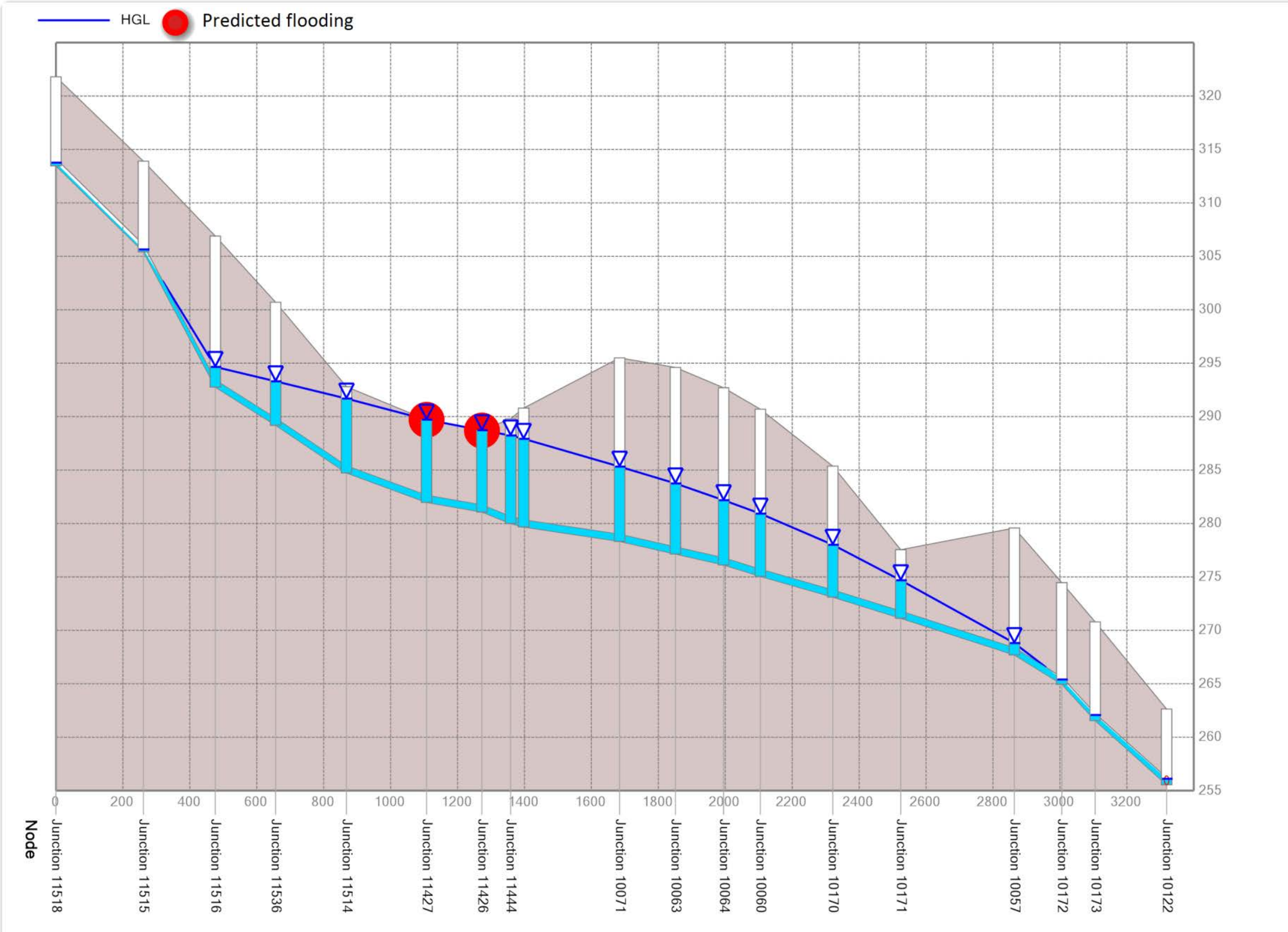

Figure 23. 13th Street sewer profile, 1- in 10-year storm event

Brown AND Caldwell

3.4.2 Existing Condition: 1- in 5-year Modeling Results

The 1- in 5-year storm event modeling was performed with the existing conditions scenario (i.e., 2014 conditions). This modeling helps to identify the sewers that will surcharge more frequently than the 1- in 10-year design storm used in the SSMP. As shown in Figure 24, the profile is nearly the same as the 1- in 10-year storm event modeling. The HGL is only slightly lower for the 5-year event than the larger 10-year storm. Surcharging extends over the pipe segments from MH 10057 to MH 11516 and flooding occurs at MH 11427.

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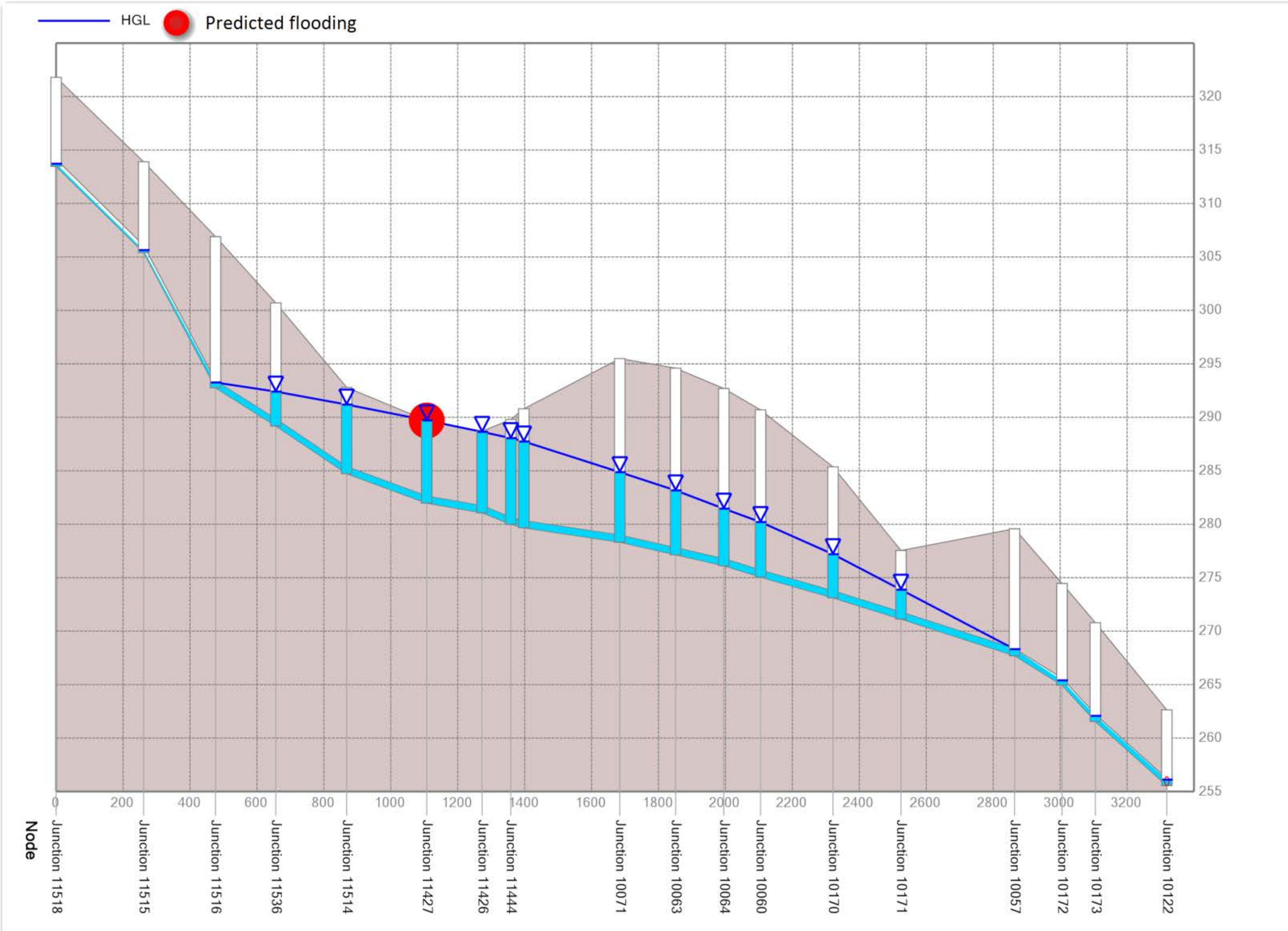


Figure 24. 13th Street sewer profile, 1- in 5-year storm event

3.4.3 Required Improvements: Existing Condition

Sewers that would need to be replaced to relieve the predicted surcharging and flooding for the existing condition, 1- in 5-year storm event are shown in Figure 25. Please note that not all pipes identified as surcharging need to be replaced since not all surcharging is excessive and the replacement of downstream constraints often reduces the surcharging in upstream sewers.

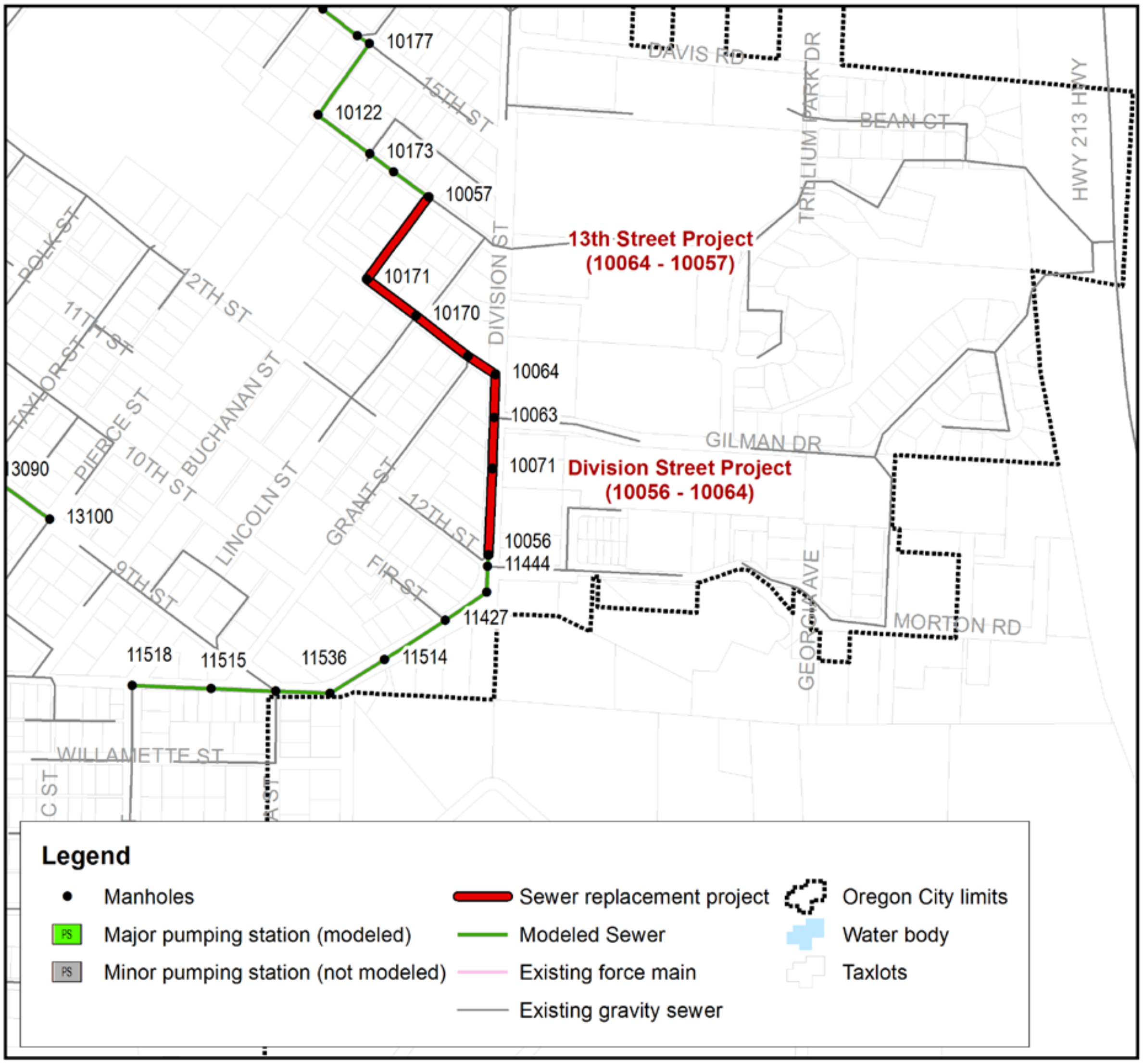


Figure 25. Required 13th Street and Division Street sewer upgrades, 1- in 5-year storm event

Costs to upsize the sewers identified in Figure 25 are listed in Table 8. The costs are based on sizing replacement sewers to convey the 1- in 5-year storm event under existing conditions. Actual replacement of any of these pipes will be based on the 10-year storm event modeling for the future condition. Table 8 does not include the benefits of potential I/I reduction measures.

Table 8. Sewer Upsizing Requirements – 5-year Storm Event, Existing Conditions Scenario						
Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
10171_10057	OC	339	8	10	126,350	(2) 13th Street
10170_10171	OC	203	8	10	75,618	(2) 13th Street
10060_10170	OC	216	8	10	111,222	(2) 13th Street
10064_10060	OC	110	8	10	74,337	(2) 13th Street
10063_10064	OC	144	8	10	97,388	(3) Division Street
10071_10063	OC	167	8	10	112,880	(3) Division Street
10056_10071	OC	287	8	10	194,127	(3) Division Street
Total all pipe replacements					791,920	

The costs listed in Table 9 are based on sizing of replacement sewers to convey the 1- in 10-year storm event under the existing conditions scenario. The required pipe sizes do not change from what is required for the 1- in 5-year storm modeling, but the number of sewers that require replacement increases. Upsizing the pipes listed in Table 9 will convey the 1- in 10-year storm with little surcharging and no flooding, as shown in Figure 26.

Table 9. Sewer Upsizing Requirements – 10-year Storm Event, Existing Conditions Scenario						
Pipe ID	Owner	Length, feet	Existing pipe diameter, inches	Upsize diameter, inches	Current total cost, $	SSMP project name
10057_10172	OC	142	8	10	72,918	(2) 13th Street
10171_10057	OC	339	8	10	126,350	(2) 13th Street
10170_10171	OC	203	8	10	75,618	(2) 13th Street
10060_10170	OC	216	8	10	111,222	(2) 13th Street
10064_10060	OC	110	8	10	74,337	(2) 13th Street
10063_10064	OC	144	8	10	97,388	(3) Division Street
10071_10063	OC	167	8	10	112,880	(3) Division Street
10056_10071	OC	287	8	10	194,127	(3) Division Street
11444_10056	OC	38.8	8	10	19,941	(3) Division Street
Total all pipe replacements					884,780	

EXHIBIT C

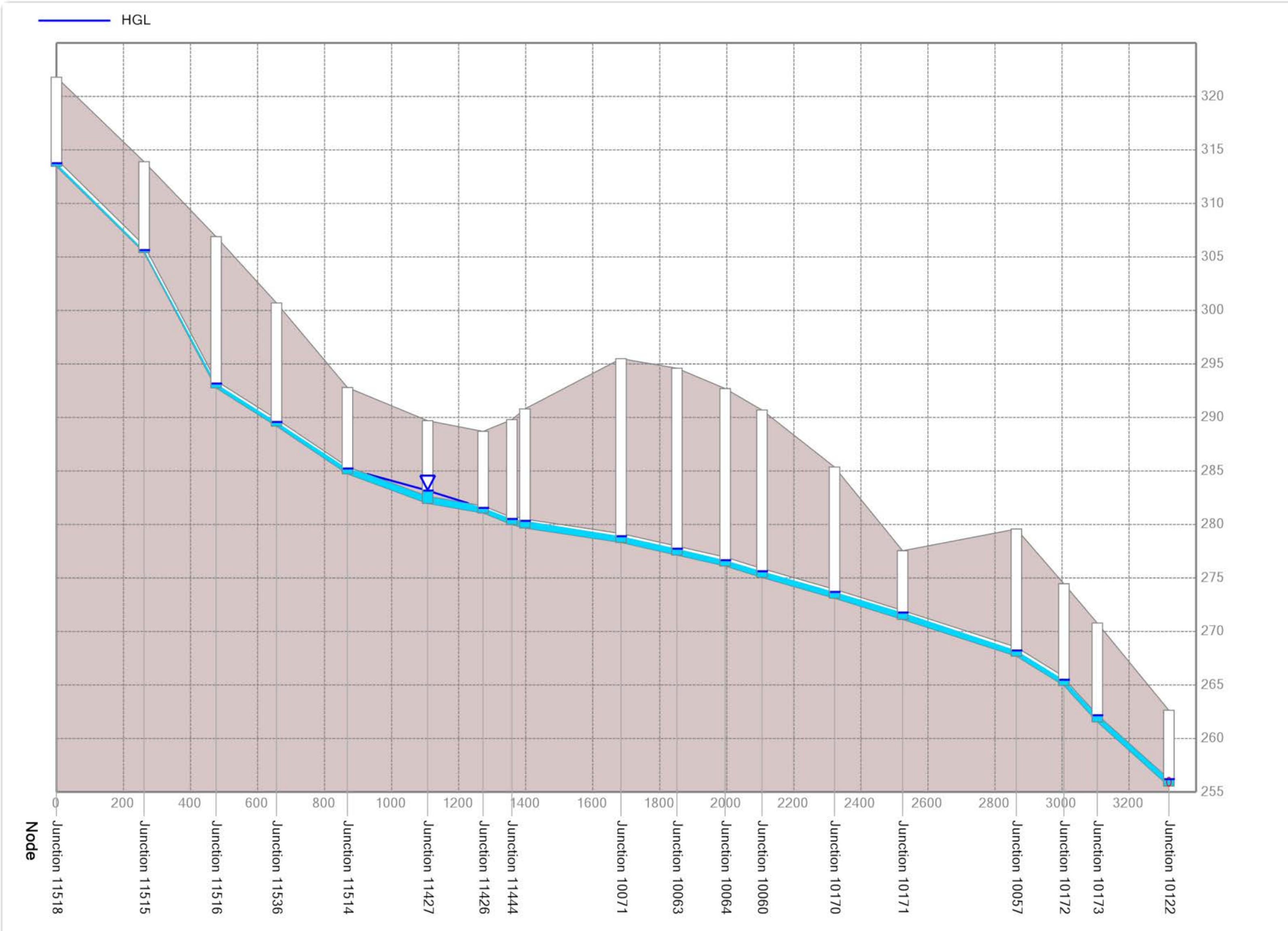


Figure 26. 13th and Division Street sewer profile, 1- in 10-year storm event, pipes upsized

3.4.4 13th and Division Street Recommendations

Portions of 13th and Division Street sewer are undersized and currently operating beyond existing capacity, including the 1- in 5-year and 1- in 10-year storm events. The sewers in this area need to be increased in diameter and/or the flows need to be reduced via an I/I abatement program. **Any additional flows introduced into this sewer prior to implementation of the capital improvement recommendations will increase surcharging and increase the potential for flooding and/or basement backups in the area.** The sizing of replacement sewers should be based on the recommendations of the SSMP as determined to convey the future conditions scenario, 1- in 10-year storm event.

3.5 Holcomb Boulevard

Holcomb Boulevard is located in the northeastern portion of Oregon City, east of Hwy 213 and north of Redland Road. The Holcomb Boulevard sewer evaluated in the SSMP is included in the north zone model and extends from MH 10505 to MH 10458.

The Holcomb Boulevard sewer does not surcharge during the 1-in 10-year storm event, existing conditions scenario. The SSMP provides information on the pipe replacement project required to meet future flow requirements on Holcomb Boulevard. A detailed map of the tributary area to the Holcomb Boulevard sewer is provided in Attachment A.

3.6 Settler's Point

The Settler's Point Pumping Station is located at the southern boundary of Oregon City near the intersection of Frontier Parkway and South Meyers Road. The force main extends from the pumping station to the intersection of South Deer Meadows Road and South Meyers Road, where the force main discharges to a gravity sewer conveying flows to the TCSD Hwy 213 interceptor sewer. Capacity constraints at the pumping station and along the force main and gravity sewer are discussed in this section and shown in Figure 27.

3.6.1 Settler's Point Pumping Station

The pumping station was originally constructed in 1999 and is challenged with capacity constraints and operations and maintenance issues, as documented in the SSMP. The current pumping capacity is 831 gallons per minute (gpm). Modeled existing flows for the 1-in 5 year storm event are approximately 820 gpm, 1-in 10-year storm event flows are approximately 931 gpm, and projected future flows are predicted to be 1,092 gpm. At a minimum, the pumps should be upgraded at this station to address the frequent maintenance problems and the projected capacity issue.

The existing 8-inch-diameter, 1,210-foot-long force main is slightly undersized to convey the projected future flows and could be upsized to improve energy efficiency at the pumping station. The SSMP did not assume replacement of the force main.

The estimated cost of improvements to the Settler's Point Pumping Station is approximately $300,000 based on information provided by a City consultant, who was engaged to evaluate this pumping station at the time of the writing of the SSMP.

3.6.2 Existing Condition: 1- in 10-year Modeling Results

The gravity sewer from MH 12620 at South Deer Meadows Road and South Meyers Road to MH 11784 near the Molalla Avenue and Hwy 213 interchange experiences minimal surcharging in the 1- in 10-year storm event. The surcharging shown between MH 12621 and MH 12620 is the result of model instability where the force main discharges into the gravity sewer and is not presented in the SSMP as a surcharging location. The profile view in Figure 28 shows the HGL along the gravity sewer alignment in the 1-in 10-year storm event.

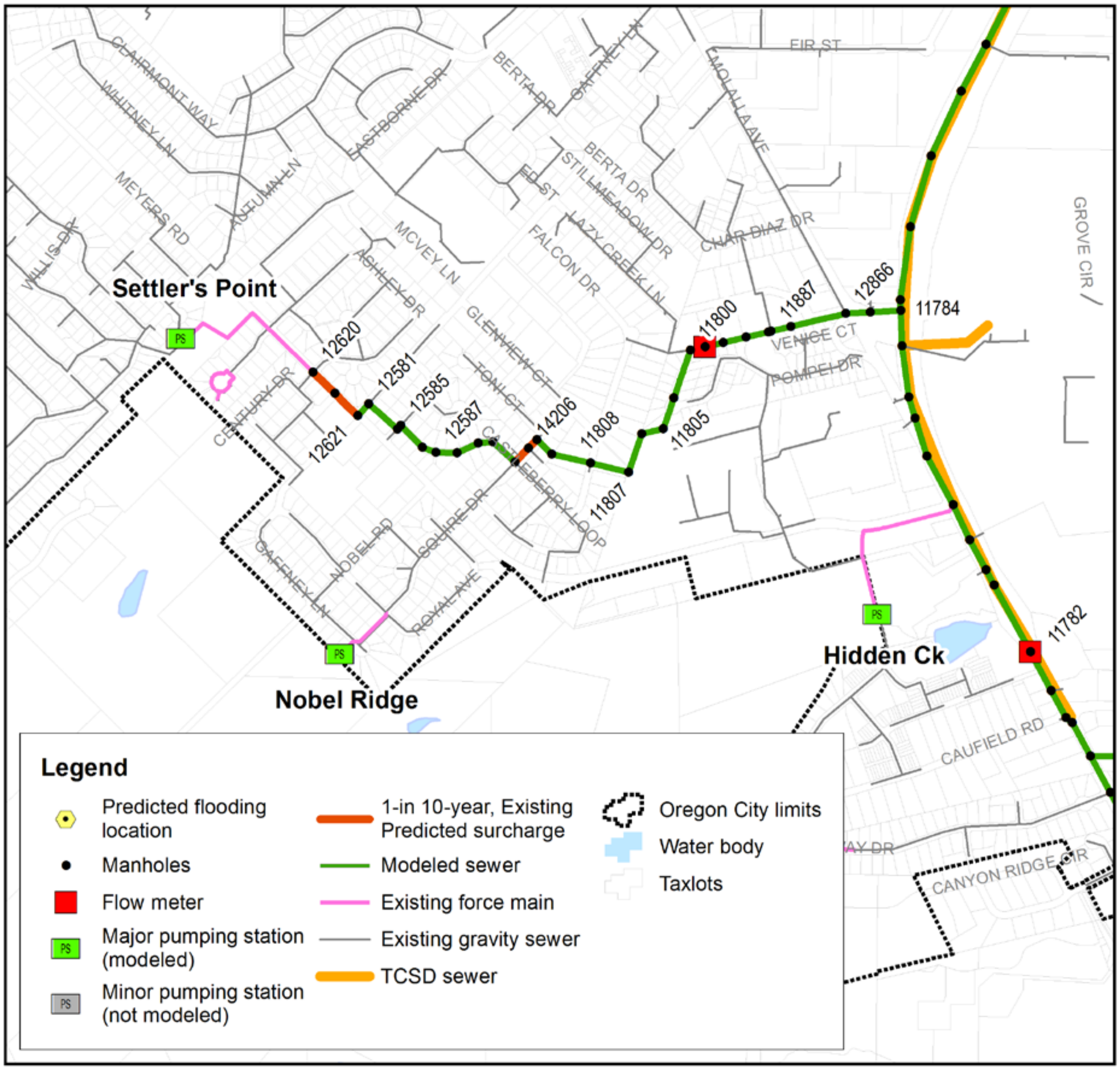


Figure 27. Surcharging along Settler's Point gravity sewer, 1- in 10-year storm event

3.6.3 Existing Condition: 1- in 5-year Modeling Results

The gravity sewer from MH 12620 at South Deer Meadows Road and South Meyers Road to MH 11784 near the Molalla Avenue and Hwy 213 interchange experiences no surcharging in the 1-in 5-year storm event. The profile view in Figure 29 shows the HGL along the gravity sewer alignment in the 1-in 5-year storm event

3.6.4 Settler's Point Recommendations

The Settler's Point Pumping Station meets the demand of the existing conditions 1-in 5-year storm event but is capacity limited in the existing conditions, 1-in 10-year storm event. It is recommended that the City plan for improvements to the pumping station based on recommendations of the SSMP as determined to convey the future conditions scenario, 1-in 10-year storm event, while continuing to monitor the pumping station's capacity in the interim. Surcharging in the manholes upstream of the station should be observed during large storm events to determine the extent of surcharging caused by limitations in the pumping capacity during these events. **Any additional flows introduced to this pumping station prior to implementation of the capital improvement recommendations will increase surcharging in the upstream sewer once the capacity of the pumping station is exceeded and increase the potential for flooding and/or basement backups in the area.**

The gravity sewer downstream of the pumping station has sufficient capacity to convey flows for the existing conditions 1-in 10-year storm event and no immediate recommendations are made for this sewer. However, upsize of the TCSD sewer in Hwy 213 documented in the SSMP does significantly reduce surcharging in this sewer for the future conditions scenario.

EXHIBIT C

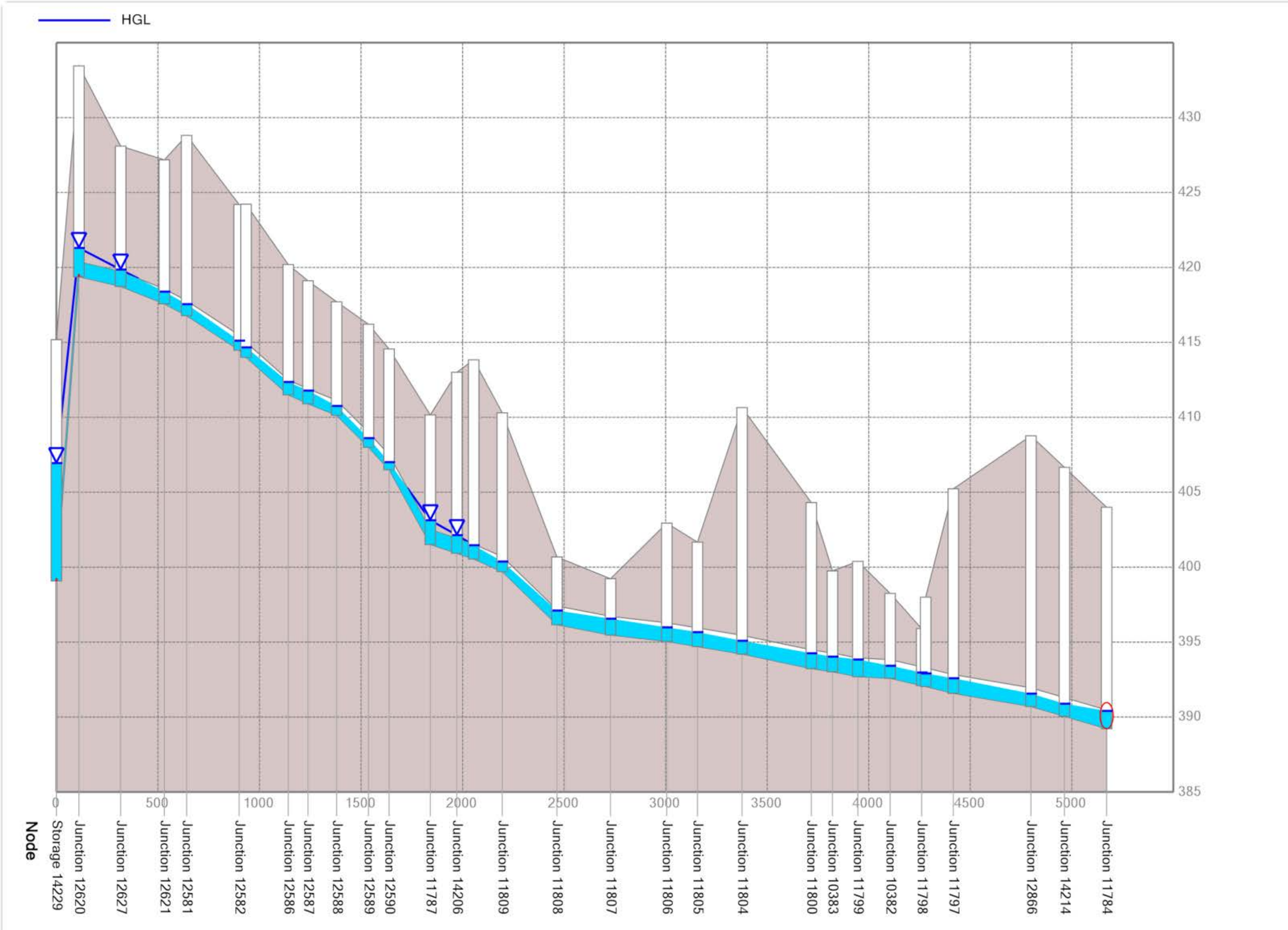


Figure 28. Settler's Point sewer profile, 1- in 10-year storm event

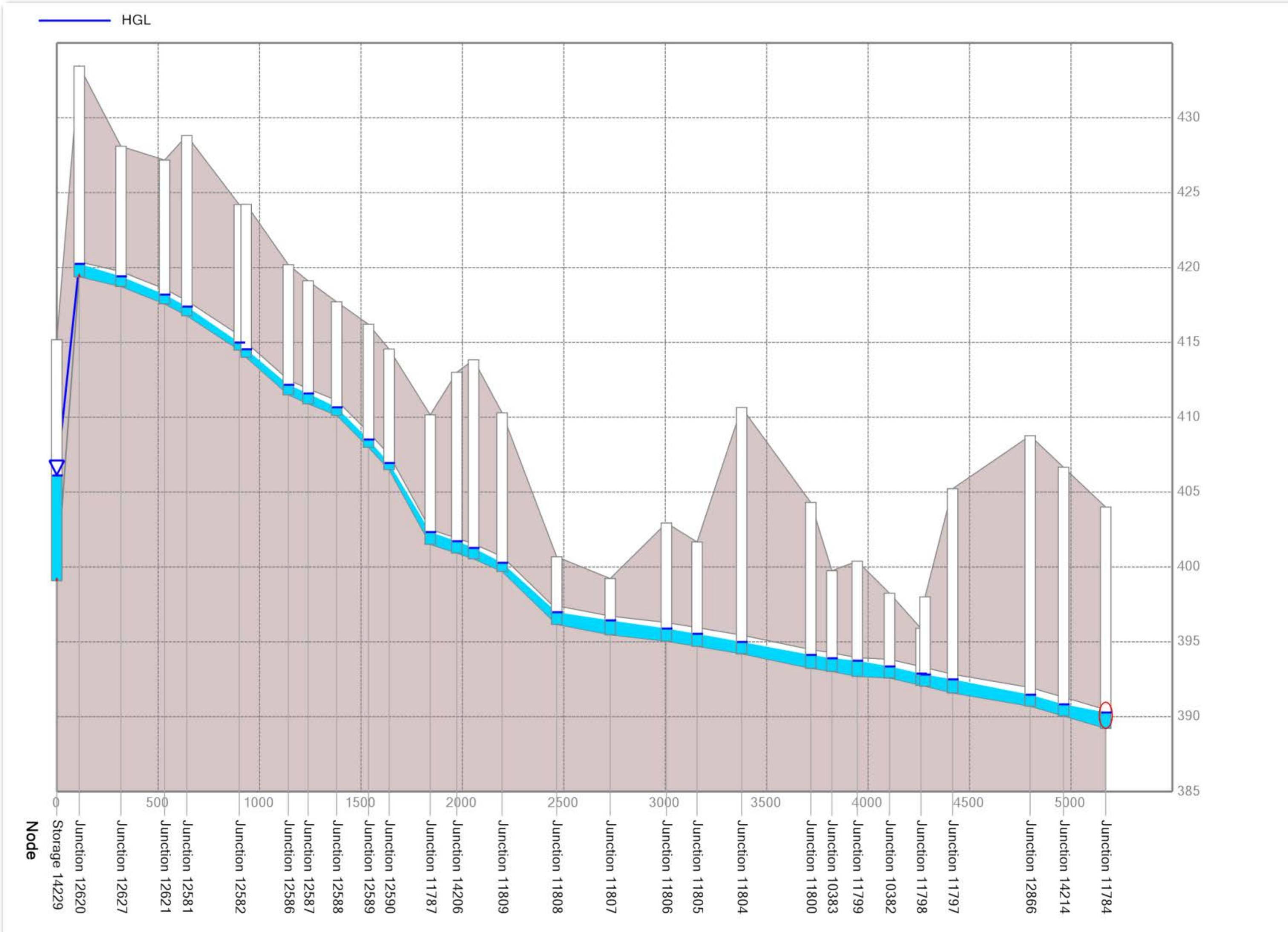


Figure 29. Settler’s Point sewer profile, 1- in 5-year storm event

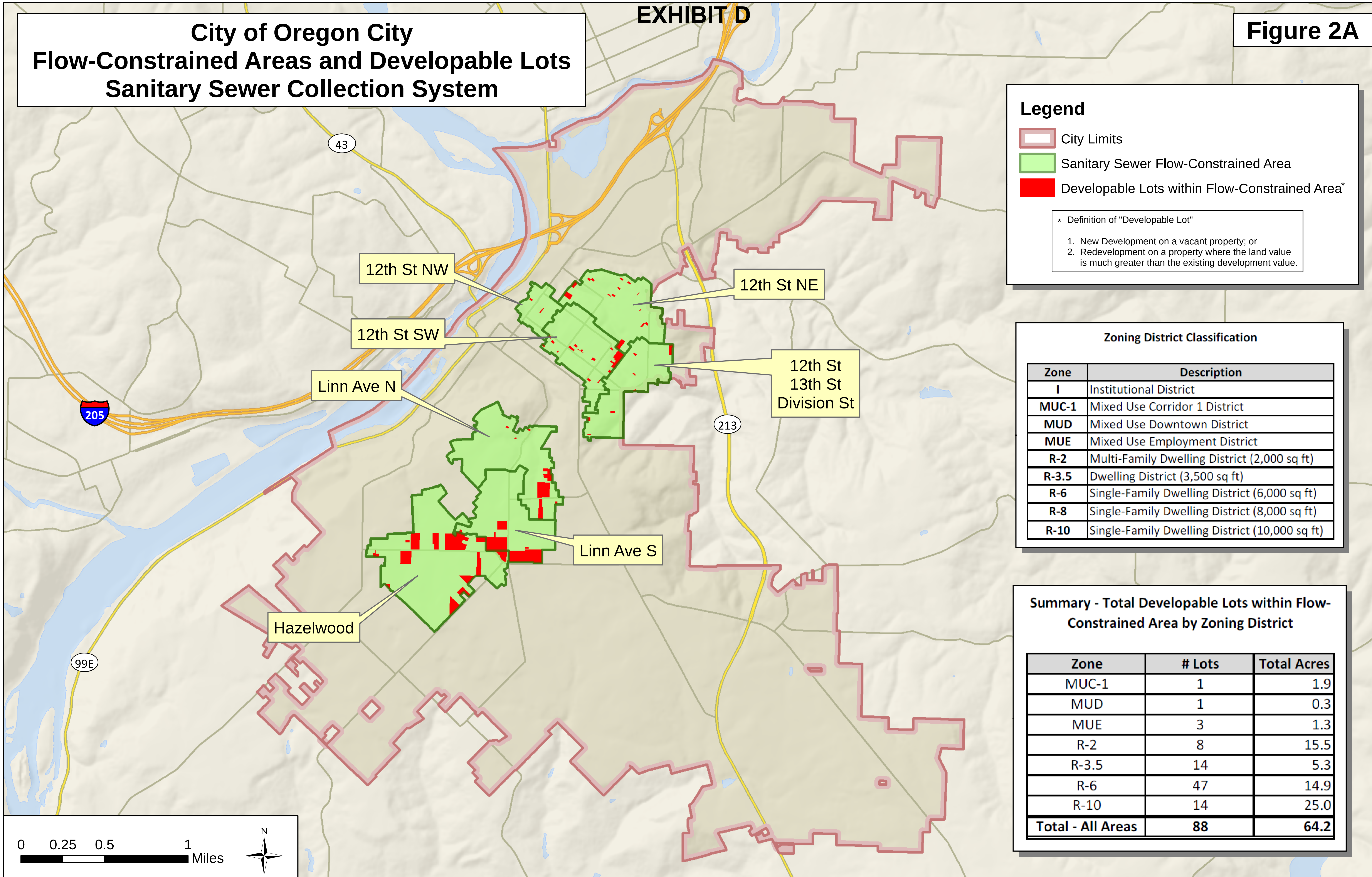
Section 4: Recommendations Summary

The sewers described in Section 3 were reviewed in more detail based on capacity constraints identified in the SSMP. The gravity sewers at Linn Avenue, Hazelwood Avenue, 12th Street, 13th Street, and Division Street are all undersized for existing conditions, including the 1- in 5-year and 1- in 10-year storm events. The Settler's Point Pumping Station is also undersized for existing condition flows. The capacity of sewers and the Settler's Point Pumping Station described in this TM need to be increased and/or the flows need to be reduced via an I/I abatement program to meet existing condition flows. Portions of the Linn Avenue sewer are undersized and currently operating beyond existing capacity. Any additional flows introduced into these sewers and pumping station prior to implementation of the capital improvement recommendations **will increase surcharging and increase the potential for flooding and/or basement backups in the area.** The sizing of replacement sewers should be based on the recommendations of the SSMP as determined to convey the 1- in 10-year storm event under the future conditions scenario.

EXHIBIT D

City of Oregon City
Flow-Constrained Areas and Developable Lots
Sanitary Sewer Collection System

Figure 2A



Legend

- City Limits
- Sanitary Sewer Flow-Constrained Area
- Developable Lots within Flow-Constrained Area*

* Definition of "Developable Lot"

1. New Development on a vacant property; or
2. Redevelopment on a property where the land value is much greater than the existing development value.

Zoning District Classification

Zone	Description
I	Institutional District
MUC-1	Mixed Use Corridor 1 District
MUD	Mixed Use Downtown District
MUE	Mixed Use Employment District
R-2	Multi-Family Dwelling District (2,000 sq ft)
R-3.5	Dwelling District (3,500 sq ft)
R-6	Single-Family Dwelling District (6,000 sq ft)
R-8	Single-Family Dwelling District (8,000 sq ft)
R-10	Single-Family Dwelling District (10,000 sq ft)

Summary - Total Developable Lots within Flow-Constrained Area by Zoning District

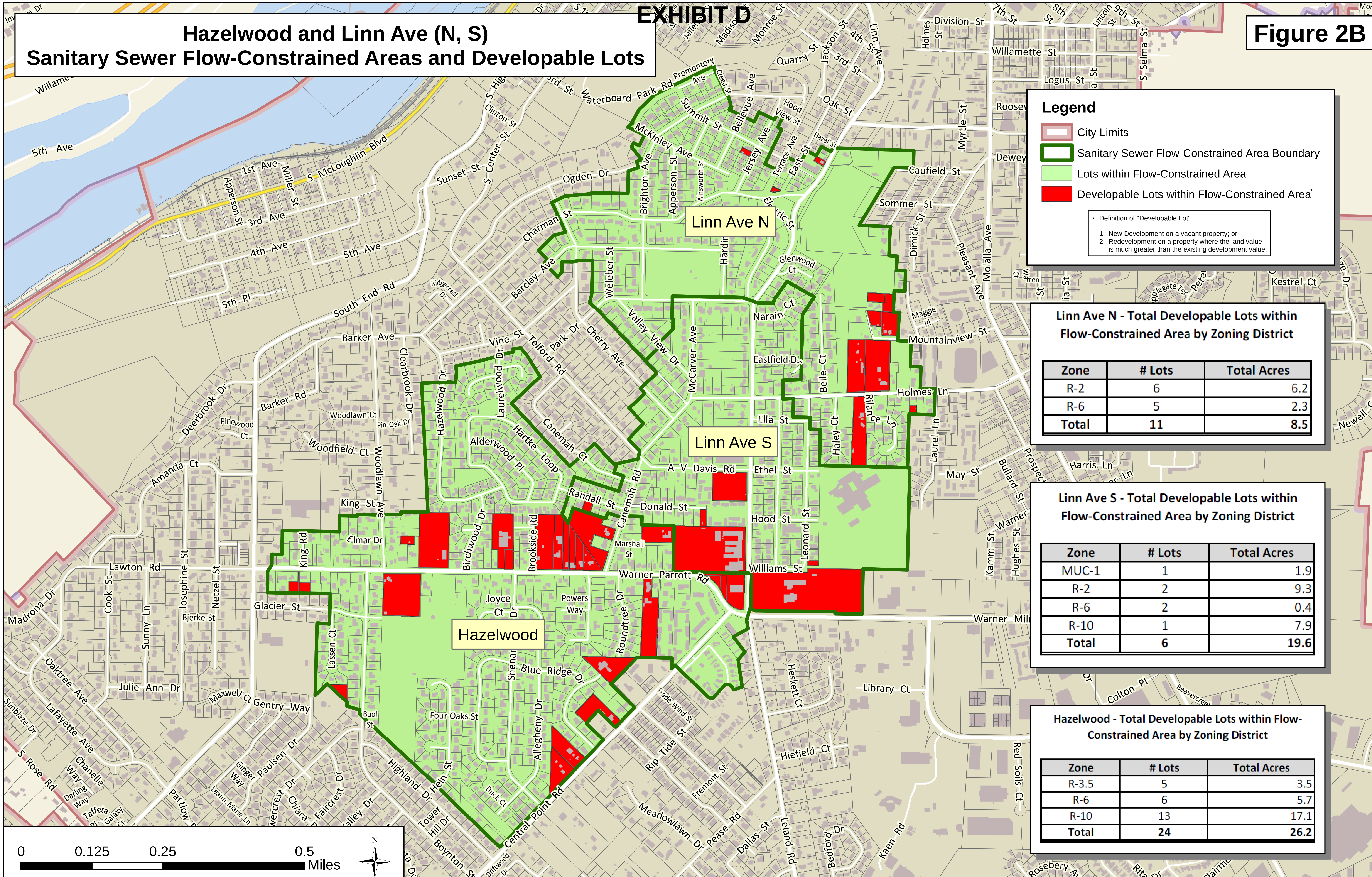
Zone	# Lots	Total Acres
MUC-1	1	1.9
MUD	1	0.3
MUE	3	1.3
R-2	8	15.5
R-3.5	14	5.3
R-6	47	14.9
R-10	14	25.0
Total - All Areas	**88**	**64.2**

Date: June 5, 2014; Map: Sewer Capacity Deficient Areas - Figure 2A - 11x17L.mxd; Plot: Sewer Capacity Deficient Areas - Figure 2A - 11x17L - 20140605.pdf

EXHIBIT D

Hazelwood and Linn Ave (N, S)
Sanitary Sewer Flow-Constrained Areas and Developable Lots

Figure 2B



Linn Ave N - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
R-2	6	6.2
R-6	5	2.3
Total	**11**	**8.5**

Linn Ave S - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
MUC-1	1	1.9
R-2	2	9.3
R-6	2	0.4
R-10	1	7.9
Total	**6**	**19.6**

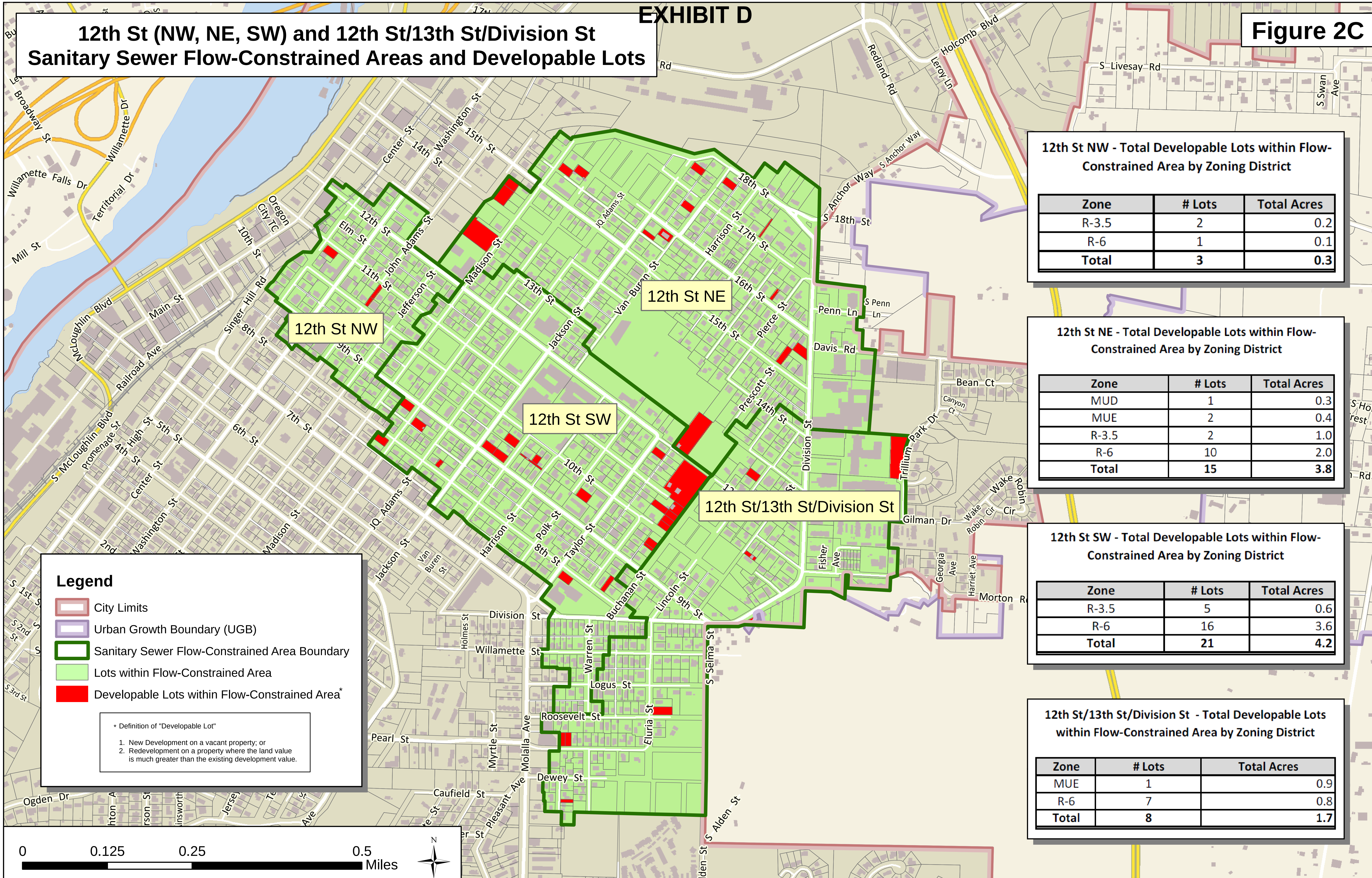
Hazelwood - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
R-3.5	5	3.5
R-6	6	5.7
R-10	13	17.1
Total	**24**	**26.2**

EXHIBIT D

12th St (NW, NE, SW) and 12th St/13th St/Division St Sanitary Sewer Flow-Constrained Areas and Developable Lots

Figure 2C



12th St NW - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
R-3.5	2	0.2
R-6	1	0.1
Total	**3**	**0.3**

12th St NE - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
MUD	1	0.3
MUE	2	0.4
R-3.5	2	1.0
R-6	10	2.0
Total	**15**	**3.8**

12th St SW - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
R-3.5	5	0.6
R-6	16	3.6
Total	**21**	**4.2**

12th St/13th St/Division St - Total Developable Lots within Flow-Constrained Area by Zoning District

Zone	# Lots	Total Acres
MUE	1	0.9
R-6	7	0.8
Total	**8**	**1.7**