



City of Tigard
Sanitary Sewer
Master Plan



May 2010



517-03-06-14

EXECUTIVE SUMMARY

The City of Tigard (City) provides sanitary sewer service to over 47,000 residents through a cooperative agreement with Clean Water Services (District). The Durham Advanced Wastewater Treatment Facility (AWWTF) operated by the District treats all wastewater from Tigard and discharges to the Tualatin River. Under the City's agreement with the District, the City maintains and operates collection system gravity sewers smaller than 24-inches in diameter. The City holds overall responsibility for planning public infrastructure needed by existing and planned residents and businesses, and thereby shares responsibility for overall wastewater collection system planning with the District.

Figure ES-1 shows the current City limits and adjacent areas, the current Urban Growth Boundary (UGB), and the current District boundary. In addition, Figure ES-1 depicts the study area boundary for this Sanitary Sewer Master Plan (Master Plan), which defines the area for which wastewater collection system capacity needs have been evaluated. Figure ES-1 also depicts the Sewer Reimbursement Districts established by the City to fund certain improvements.

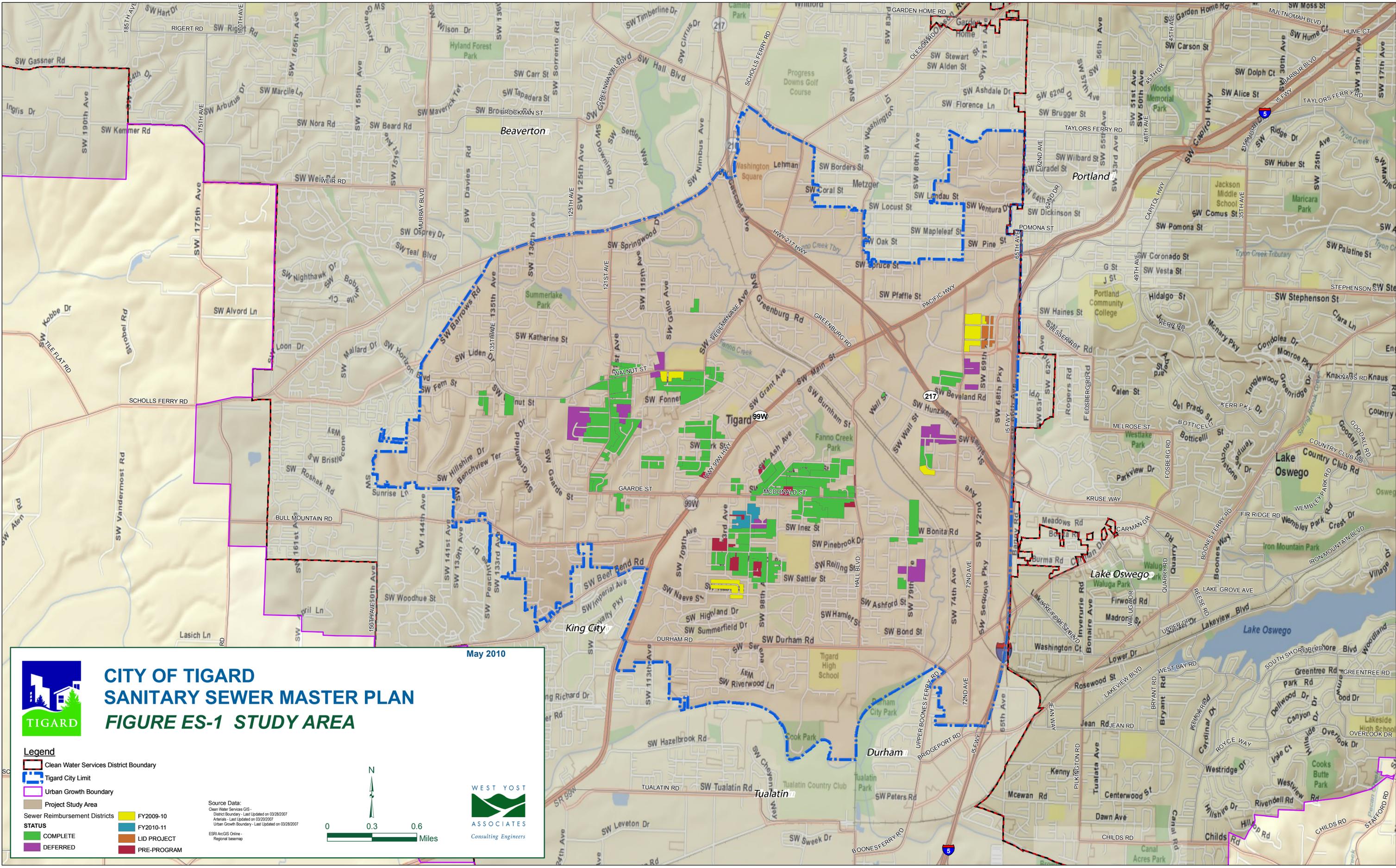
This Master Plan provides a prediction of current and future wastewater flows, and identifies the pipeline and pump station improvements needed to serve the project study area. The major topics covered in this Executive Summary include:

- Regulatory Setting
- Overview of Master Planning Process
- Sanitary Flows
- Conclusions and Recommendations
- Next Steps

REGULATORY SETTING

Oregon Water Quality Standards, administered by the Department of Environmental Quality, set forth two conditions restricting sanitary sewer overflows based on bacterial standards for waters of the State. The standards generally prohibit raw sewage discharges to waters of the State, except during a storm event greater than the one-in-five-year, 24-hour duration storm during the period of November 1 through May 21, and during a storm event greater than the one-in-ten-year, 24-hour duration storm during the period of May 22 through October 31. The regulations do not prescribe a required methodology for planning collection system capacity improvements. This Master Plan applies to City collection system planning the same planning practices employed by the District in its recently adopted master plan update. This document includes recommendations for additional efforts to further evaluate the anticipated actions needed to ensure conformance to the Oregon Water Quality Standards.

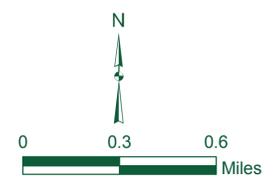
N:\Clients\17 Clean Water Services\05-06-14 Sanitary Sewer Master Plan\GIS\Figures\Master Plan\TC_SSM\Figures\TGMP_Figure1_1.mxd



CITY OF TIGARD SANITARY SEWER MASTER PLAN FIGURE ES-1 STUDY AREA

- Legend**
- Clean Water Services District Boundary
 - Tigard City Limit
 - Urban Growth Boundary
 - Project Study Area
- Sewer Reimbursement Districts**
- FY2009-10
 - FY2010-11
- STATUS**
- COMPLETE
 - LID PROJECT
 - DEFERRED
 - PRE-PROGRAM

Source Data:
Clean Water Services GIS - District Boundary - Last Updated on 03/28/2007
Aerials - Last Updated on 03/20/2007
Urban Growth Boundary - Last Updated on 03/28/2007
ESRI ArcGIS Online - Regional basemap



May 2010



1

OVERVIEW OF MASTER PLANNING PROCESS

The first step in the Master Plan update process was to establish a study area that encompasses the area of the City's responsibility for providing sewer service. The City's Master Plan employs the District's computer model of the sanitary sewer system. The model was recently updated first by adding 10-inch diameter and larger sewers constructed subsequent to the District's last update, and then by adding conceptual future trunk sewers extending into the growth areas. None of the District's planned sewer extensions are within the Tigard study area; however, flows from outlying growth areas will impact District trunk sewers that traverse the City.

The basis of sanitary flows simulated in the model was updated to reflect current land use information on a parcel-by-parcel basis. The land use update was based on information provided by the City and other member agencies, or by Metro in areas upstream of Tigard sewers where city-specific land use information was not available. Sanitary flows from significant industrial discharges (including process flows) were updated using current flow records and permit flow limits. Sanitary flows from all other areas were obtained by application of sanitary flow factors on a parcel-by-parcel basis based on the land-use category assigned to the parcel. This work resulted in estimates of current-day sanitary flows and projections of future flows.

Flow metering tailored to assess wet weather infiltration and inflow (I&I) within the Tigard study area was conducted in 2007 through 2009. This data allowed for a more detailed calibration of the peak wet weather flows simulated in the computer model.

Following completion of these updates, the computer model was used to simulate existing and future flow conditions within the sanitary sewer system, and to identify those locations where the existing pipe capacity may not be adequate. For each identified location, a ranking system was used to determine where improvements are warranted. The necessary improvements, along with future extensions of the collection system, were then described and documented to serve as a guide for annual capital improvement planning and extension of service to growth areas.

SANITARY FLOWS

The land use-based flow predictions of the computer model do not explicitly use population as a basis. However, the population implicit in the modeled wastewater flows may be estimated from the modeled average dry weather flow (ADWF). Specifically, by assuming a fixed flow per person value (67 gallons per person per day, in the case of this Master Plan), the portion of the modeled ADWF attributed to residential uses can be translated into an approximate population.

The aggregate flow at the Durham AWWTF is not directly relevant to City sewer planning since the plant serve substantial areas outside the City's study area. However, the estimated implied population for the year 2006 and buildout conditions at the Durham AWWTF help characterize, for future comparisons, the collection system planning that served as the basis of the City's Master Plan. Therefore, Table ES-1 summarizes the total acreage and flow, the residential portion of flow, and an estimated population value for the treatment plant based on the residential portion of flow.

**Table ES-1. Implied Population for Durham AWWTF Service Area
(2006 Model and Buildout Model)**

Modeled Condition	Modeled Service Area Acreage	Total Modeled ADWF, mgd	Modeled Residential Portion ^(a) of ADWF, mgd	Approximate Population Based on Residential ADWF
2006	21,911	19.0	12.2	181,580 ^{(b) (c)}
Buildout	27,325	38.7	22.2	331,100 ^(b)
Current (2009): City of Tigard	7,600 ^(d)	Not estimated ^(e)	3.2 ^(b)	47,460

- (a) Includes all residential land use categories and mixed use commercial categories.
- (b) Estimated based on a wastewater generation rate of 67 gallons per capita per day.
- (c) This approximate value is about two percent lower than the reported population for 2004 of 185,887, based on previous facilities planning by the District, indicating a good correlation between the modeled average flow and actual population.
- (d) Based on 11.8 square miles within the City limits.
- (e) Modeled service areas are based on pipe configurations and therefore cross City limits. Modeled flows from inside and outside the City are intermingled so a separate estimate for total ADWF exclusive to the city was not developed.

CONCLUSIONS AND RECOMMENDATIONS

The findings of this Master Plan are presented in Chapters 4, 5 and 6 of this report. The contents of these three chapters are summarized as follows:

Chapter 4. Collection System Evaluation

Chapter 4 presents the modeling results and recommended improvements for existing gravity sewer facilities. A ranking condition based on modeled flow versus capacity for each modeled pipe is illustrated on large format maps (Plates 1 through 3). Each improvement is described and depicted on a Project Data Sheet. The various Project Data Sheets are included at the end of Chapter 4. A Sample Project Data Sheet is included in this Executive Summary.

Chapter 5. System Maintenance Program

Chapter 5 provides an overview of current City maintenance practices. Maintenance performance standards are summarized. The chapter includes a recommendation to initiate an asset management program for the wastewater collection system in order to determine long-term funding needs for preserving the integrity of the collection system.

SAMPLE PROJECT DATA SHEET PROJECT - Shore Drive Trunk

Project ID: D-530

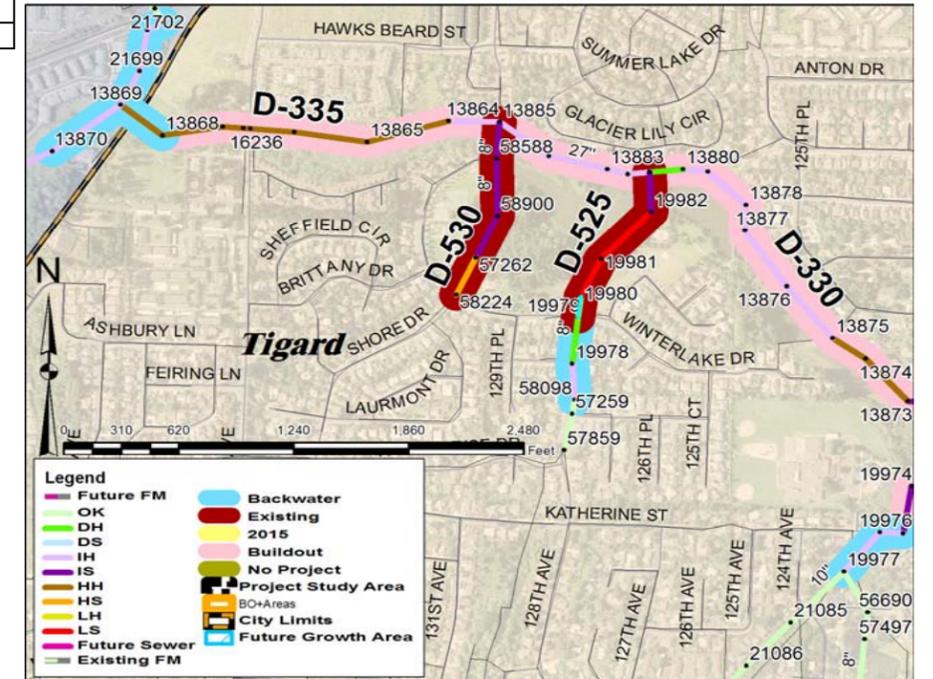
Base Construction Cost	193,000	NOTES: Available data indicates this is an 8-inch sewer at substandard slope (0.002 ft/ft); slope and diameter should be field verified. Modeled existing peak flows significantly exceed capacity, although outflows are not predicted. The tributary area is substantial, and additional 8-inch sewers upstream of MH 58224 to Wilton Ave. and possibly beyond may be similarly impacted because they carry much of the flow present in the modeled segments. Upstream sewers should be evaluated before or during preliminary design for this project.
Contingency (30%)	57,900	
Construction Budget Amount	251,000	
Engineering & Administration (25%)	63,000	
Capital Improvement Cost Total⁽¹⁾:	310,000	

Capital Improvement Cost Total⁽¹⁾: 310,000
(1) Cost rounded. ENR CCI = 8602 average of 20 Cities, November 2008

Location:	Runs northeast from north of Amu St.
Treatment Plant Basin:	Durham
Jurisdiction:	Tigard
Local/Regional:	-
Brief Description:	Upsize ~1,050 ft of 8-inch diameter sanitary sewer to 12-inch diameter sanitary sewer.

Model G_ID	Manhole IDs USMH_DSMH	Condition Rating (yr)		Existing Diameter, inches	Existing Slope	Full-pipe Capacity, mgd	Peak Flows, mgd			HGL Rank			Buildout Peaking Ratio, PH/ADWF	Upsize Diameter, inches	Depth, ft	Length, ft	Unit Cost, \$	Unit	Base Construction Cost (w/o Contingency), \$
							Existing (2006)	2015	Buildout	Existing	2015	Buildout							
8121	58224_57262			8	0.0020	0.35	0.73	0.75	0.79	IS	IS	HS	4.7	12	16.4	239	188	ft	45,000
8119	27262_58900			8	0.0020	0.35	0.73	0.75	0.79	IS	IS	IS	4.7	12	19.4	272	208	ft	56,000
8117	58900_58588			8	0.0020	0.35	0.73	0.75	0.79	IS	IS	IS	4.7	12	16.0	334	186	ft	62,000
8002	58588_13885			8	0.0020	0.35	0.73	0.75	0.79	IS	IS	IS	4.7	12	9.6	203	147	ft	30,000

Special Considerations:	NA
-------------------------	----



Project Driver

- Residential development [in area _____]
- Industrial development
- High I/I
- Pump station upgrade

Chapter 6. Capital Improvement Cost Summary

Chapter 6 provides a capital improvement program (CIP) summarizing the recommended projects and estimated costs. Costs are allocated to either the City, the District, or both in accordance with the Intergovernmental Agreement (IGA). A preliminary allocation of costs to be funded by system development charges is also included.

Table ES-2 presents a summary of costs for the planned projects. The costs account for upsizing in existing gravity sewers needed to accommodate anticipated growth, as well as infiltration and inflow abatement for the Commercial Street area. Project cost estimates exclude land acquisition, financing, and inflation. The costs include a 30 percent contingency based on the level of planning, as well as a 25 percent allowance for engineering and administration. Costs are presented in current dollars for late 2009, but do not likely fully capture the effects of unusual economic conditions and bidding climates that can dramatically affect construction costs.

The conceptual alignments and preliminary sizing presented herein for upsizing existing facilities will be refined through the normal planning and design processes. It is understood that the City and the District will conduct additional project-specific planning and design activities, and in the future will periodically update their respective master plans. Through these activities, the City may identify collection system improvements different from, or in addition to, those presented in this report or the District's plan. Differences could arise from more detailed alignment studies, additional flow analysis and calibration, or identified non-capacity-related deficiencies.

Differences between City and District planning will be considered through the work of the CIP Prioritization Committee. Differing master planning conclusions regarding the need for, priority of, or description of a project will be resolved through review of prior analyses and documentation of actual flows.

Table ES-2. Capital Improvement Program

Project ID	Description	Approximate Length, feet	Planned Pipe Diameter, inches	Total Capital Cost, dollars						
				All Funding Sources		District Share		City Share		
				Near-Term Projects	Future Projects	SDC Funded	Local	SDC Funded	Local	
I&I Abatement	Commercial St. Area (Tributary to MH 19993, NW of Hwy 99W; see Figure 2-4); approximately 100 acres; area may be adjusted based on condition assessment data. Assume \$40,000/acre, including contingency, eng. and admin. (2 year budget)				4,000,000		2,000,000		2,000,000	
Commercial Street Sag	Correct sag from MH 19987 to 19988 (City MH SS02A010 to -012); identified by City staff. Consider upsizing per Table 4-2 of this master plan; however, upsizing a single segment will have little benefit; recommended as part of more extensive replacement.	358	10	90,000					90,000	
D-120	East Tigard Trunk (replacement, upsize from 12-inch)	1,470	15	351,000				156,000	195,000	
D-130	72nd Avenue Lateral (divert flow to Bonita Trunk at 72nd Ave.; cost represents an allowance)	60	10		200,000			-	200,000	
D-330	Scholl Trunk (replacement, upsize from 27-inch); serves growth outside City of Tigard	3,343	42		4,100,000	2,800,000	1,300,000			
D-335	Scholl Trunk (replacement, upsize from 27-inch); serves growth outside City of Tigard	1,853	42		2,160,000	1,370,000	790,000			
D-340	Metzger Interceptor (replacement, upsize from 30-inch)	714	36	353,000		151,000	202,000			
D-350/351	Elmwood Lateral / Locust Street Re-Route (redirects portion of flow from existing 21-inch) Note: District Project. Diameter and length is for relief sewer, parallel to existing. SDC split at percentage based on Appendix I.	6,330	18/21	1,983,000		1,360,000	623,000			
D-410	SW Katherine Lateral (replacement, upsize from 12-inch)	1,465	15		389,000			175,000	214,000	
D-525	128th Avenue Lateral (replacement, upsize from 8-inch)	1,175	10	320,000				143,000	177,000	
D-530	Shore Drive Trunk (replacement, upsize from 8-inch)	1,048	12	314,000				207,000	107,000	
Total (including one year of annual budget line-items)					3,411,000	10,849,000	5,681,000	4,915,000	681,000	2,983,000

Notes:

- (1) Costs include 30% Project Contingency and 25% Engineering & Administration.
- (2) Costs for Special Considerations included.
- (3) Totals are rounded.
- (4) Project descriptions based on model calibration for Tigard area subsequent to Clean Water Services Sanitary Sewer Master Plan.

NEXT STEPS

The City's ongoing sanitary sewer system management and planning activities will build on the analysis and conclusions of this Master Plan. These activities may include the following:

1. I&I Analysis in the Downtown (Commercial Street) Area: Significant infiltration and inflow from the area tributary to the Commercial Street sewer is evident from flow metering. This Master Plan includes a recommended I&I abatement project for the area based on the tributary area boundary. Additional field work within the downtown area, such as smoke testing, could help identify the areas most likely to contribute excessive I&I, and might reveal point sources of inflow that could be corrected relatively easily.
2. Evaluation of Additional Wet Weather Conditions: Regulatory requirements are changing with respect to sanitary sewer overflows and the theoretical wet weather conditions considered to be adequate for assessing the likelihood of outflows. Additional modeling using more severe simulated storms could be used in a sensitivity analysis to determine what additional facilities may have risk of outflows under the larger storms.
3. Prioritization of Collection System Improvements: The City participates in the District-wide CIP Prioritization Committee, and through that committee will implement a priority ranking system for collection system improvements. This Master Plan focuses on capacity, relative to existing and anticipated flows, which is an important consideration in the project ranking process. The ranking should also take into account other factors important to the City, such as opportunities to combine sewer improvements with other infrastructure replacements or redevelopment, maintenance needs, structural repair needs, and basin infiltration and inflow rehabilitation. Prioritization is dynamic. This Master Plan will be used as a tool during the periodic project prioritization procedures. Over the course of time, projects identified herein may be modified or eliminated, and additional projects may be added.
4. Collection System Model Refinement: The City anticipates that the District will maintain and upgrade the collection system model because it must reflect the influence of many areas outside the City's planning area. A number of recommended model refinement activities are under consideration by the District. Model refinement in response to facility construction and development, or to take advantage of evolving modeling technologies and data improvements, may be warranted. This Master Plan relied heavily on collection system configuration data compiled in the 1990s for the District, supplemented by data from recent projects. Improved and updated data are identified on a regular basis.
5. Periodic Master Plan Updates: Periodic updates to the Master Plan are anticipated, with the next update anticipated in 2015. Such updates will be necessary to refine sizing and conceptual alignments for long-term projects, and to reflect evolving planning. Significant land use changes or additional calibration work could trigger the need for special studies or accelerate the need for a full update.

6. System Preservation Program: The oldest portions of the City's collection system have reached a life of nearly 60 years. As the system ages beyond the 50-year mark, structural failures should be expected with increased frequency. Some sewers will last 100 years or more without failures, while others could fail much sooner. Over time, the City will need to fund ongoing renewal and replacement to preserve the structural integrity of the collection system. An asset management program that uses TV inspection data already being collected and information about pipe age and material should be used to predict the long-term funding needs for system preservation.