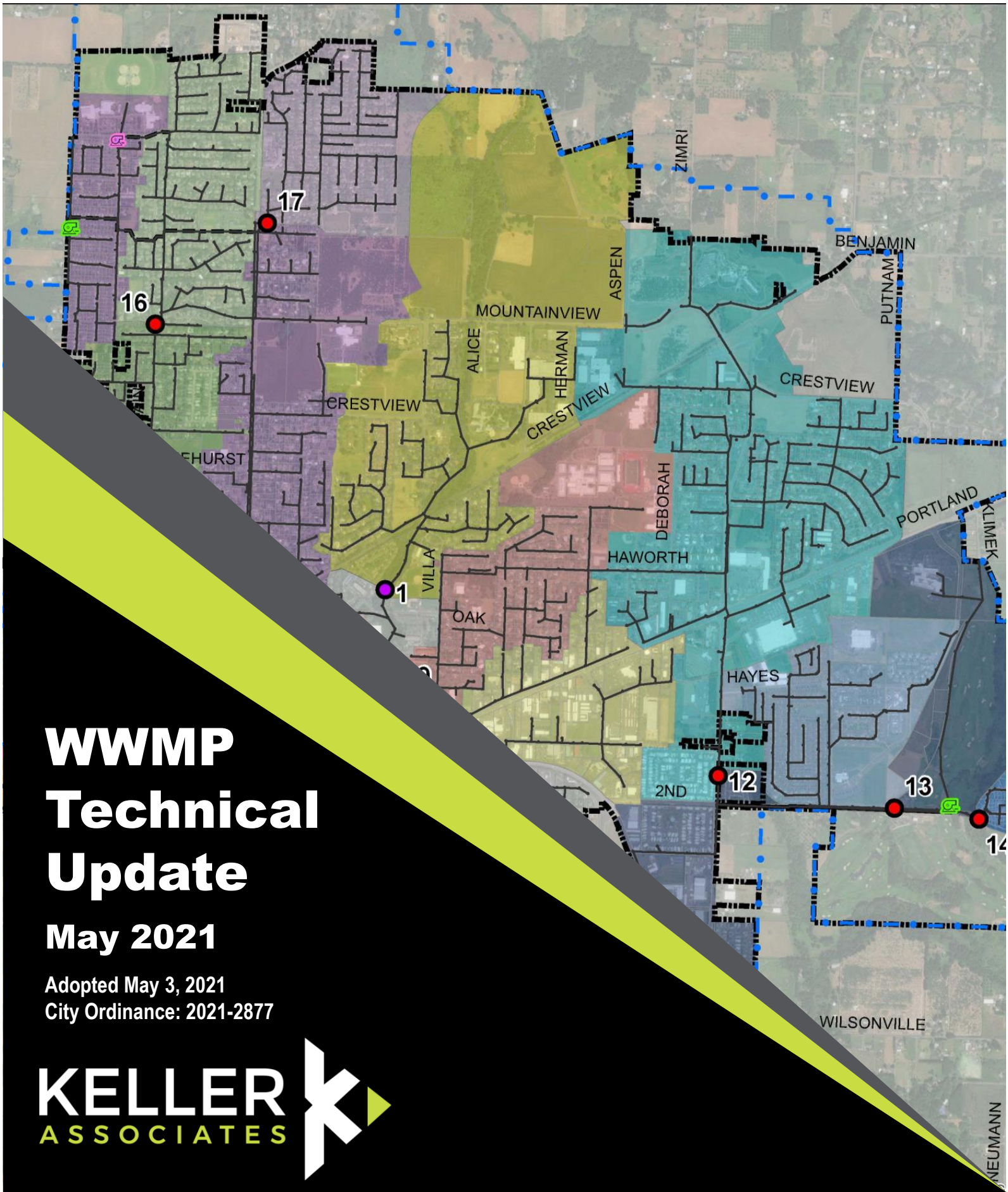
City of Newberg
OREGON

Appendix K



WWMP Technical Update

May 2021

Adopted May 3, 2021
City Ordinance: 2021-2877

KELLER ASSOCIATES

TECHNICAL MEMORANDUM/REPORT

CITY OF NEWBERG WASTWATER MASTER PLAN TECHNICAL UPDATE

ADDENDUM – RIVERFRONT MASTER PLAN

REGISTERED PROFESSIONAL ENGINEER
87384PE
Emily Flock
OREGON
NOV. 13, 2018
EMILY C. FLOCK
EXPIRES: 12/31/21

MAY 2021

PROJECT NO. 220045

PREPARED BY:

KELLER ASSOCIATES

245 Commercial St SE, Suite 210
Salem, OR 97301
(503) 364-2002

PREPARED FOR:

City of Newberg OREGON

City of Newberg
414 E. First Street
Newberg OR 97132
(503) 554-1223

TABLE OF CONTENTS

EXECUTIVE SUMMARY

ES.1 STUDY AREA ES-1
ES.2 POPULATION AND FLOWS ES-3
ES.3 PLANNING CRITERIA ES-3
ES.4 COLLECTION SYSTEM COMPUTER MODEL UPDATE ES-3
ES.5 UPDATED BUILDOUT SYSTEM CAPACITY LIMITATIONS ES-5
ES.6 ALTERNATIVES TO CONSIDER ES-5
ES.7 RECOMMENDED IMPROVEMENTS ES-7
ES.8 CAPITAL IMPROVEMENT PLAN (CIP) ES-7
ES.9 2018 WWMP REFERENCES ES-9

CHAPTER 1 PROJECT PLANNING

1.1 STUDY AREA 1-1
1.2 POPULATION AND FLOWS 1-1
1.3 PLANNING CRITERIA 1-2

CHAPTER 2 MODEL UPDATE & SYSTEM EVALUATION

2.1 COLLECTION SYSTEM COMPUTER MODEL UPDATE 2-1
2.2 UPDATED BUILDOUT SYSTEM CAPACITY LIMITATIONS 2-2

CHAPTER 3 ALTERNATIVES CONSIDERED

3.1 PLANNING CRITERIA 3-1
3.2 ALTERNATIVES DISCUSSION 3-1
3.3 INFILTRATION AND INFLOW (I/I) DISCUSSION 3-4

CHAPTER 4 RECOMMENDED IMPROVEMENTS

4.1 RECOMMENDED PIPELINE IMPROVEMENTS 4-1
4.2 RECOMMENDED PUMP STATION IMPROVEMENTS 4-11

CHAPTER 5 CAPITAL IMPROVEMENT PLAN (CIP)

5.1 BASIS FOR ESTIMATE OF PROBABLE COST 5-1
5.2 SUMMARY OF PROBABLE COSTS 5-1
5.3 PROJECT SCHEDULE 5-2
5.4 OTHER ANNUAL COSTS 5-3

APPENDICES

A Figures
B Riverfront MP Excerpts
C Cost Estimates Additional Information
D Priority 1 Project Sheets

ACRONYMS, ABBREVIATIONS, AND SELECTED DEFINITIONS

AACE	Association for the Advancement of Cost Engineering
AADF	average annual daily flow
AAGR	average annual growth rate
ac	acre
ADWF	average dry weather flow
AWWF	average wet weather flow
CAC	citizen advisory committee
CCTV	closed circuit television
CDBG	community development block grants
CIP	Capital Improvement Plan
CIPP	cured-in-place pipe
CMS	construction management services
DEQ	Oregon Department of Environmental Quality
EDU	equivalent dwelling unit
ft	feet or foot
ft^3	cubic feet or cubic foot
GIS	geographic information system
gpad	gallons per acre per day
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
I/I	infiltration and inflow
in	inch
KW	kilowatt
kwh	kilowatt hour
LF	linear foot
MG	million gallons
MGD	million gallons per day
MMDWF	max month dry weather flow
MMWWF	max month wet weather flow
O&M	operation and maintenance
OH&P	overhead and profit
PDAF	peak day flow
PkWF	peak week flow
PIF	peak instantaneous flow
PLC	programmable logic controller
PS	pump station
PVC	polyvinyl chloride
PWDS	public works design standards
SCADA	supervisory control and data acquisition
sqft	square feet or square foot
TDH	total dynamic head
UGB	urban growth boundary
VFD	variable frequency drive
WWMP	wastewater master plan
WWTP	wastewater treatment plant

EXECUTIVE SUMMARY

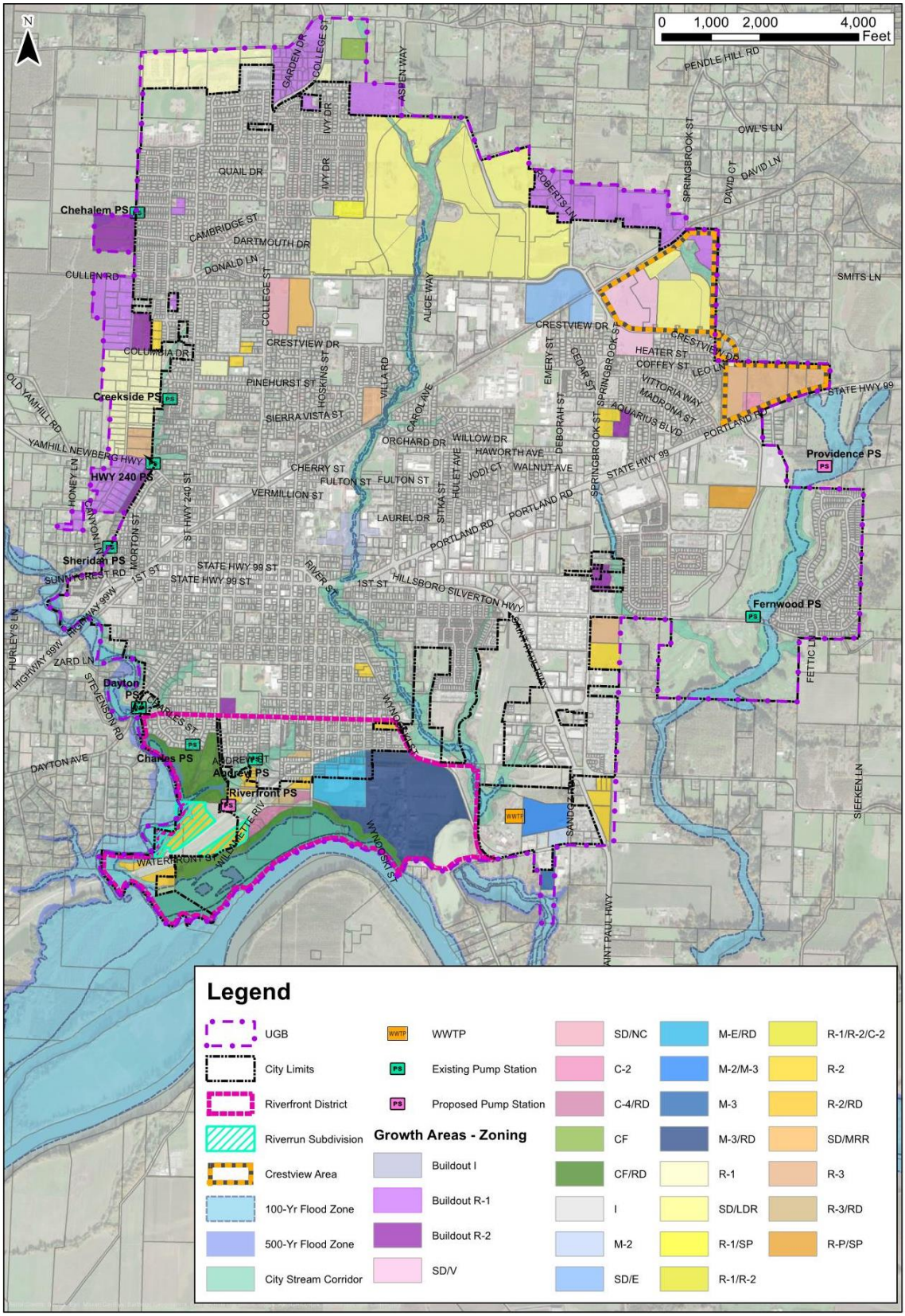
In 2018, the City of Newberg, Oregon (City) completed a wastewater master plan (WWMP) for the City's sanitary sewer collection system and wastewater treatment plant (WWTP). Since the adoption of the 2018 WWMP, the City accepted the Riverfront Master Plan in September 2019. This wastewater master plan technical update incorporates the new information on zoning, infrastructure, and development within the Riverfront district in alignment with the accepted master plan. The Riverrun Subdivision development within this area was reflected and updated during this process. Additionally, the City decided to include the E Crestview Drive and Crestview Crossing projects in the Springbrook Basin in the technical update evaluation. These projects in the Springbrook basin have resulted in the possibility of routing additional flow further east within the basin.

The technical update shall serve as a planning guide for operating, maintaining, constructing, and expanding the City's wastewater collection system. The technical update will be incorporated as an addendum to the 2018 WWMP as Appendix K. The update is consistent with buildout growth projections and design flows documented in the 2018 WWMP with updates specifically to the Riverfront and Springbrook basins. This update does not include an update to the evaluation of the WWTP. This section summarizes the major findings of the update, including brief discussions of alternatives considered and final recommendations.

ES.1 STUDY AREA

The 2018 WWMP study area consisted of all areas within the City of Newberg Urban Growth Boundary (UGB). This technical update was limited to the Riverfront and Crestview areas of the City and collection system infrastructure that serves these areas. Figure ES-1 (next page) shows the existing City limits, UGB, growth areas identified in the 2018 WWMP and highlights updated information for this technical update in the Riverfront and Crestview areas. Figure 2 (See Appendix A) shows the Riverfront Master Plan study area with proposed zoning and wastewater infrastructure. Figure 3 (See Appendix A) shows the Crestview area with proposed wastewater infrastructure. Both projects are currently under construction. Crestview Crossing is a private development.

FIGURE ES-1: STUDY AREAS



ES.2 POPULATION AND FLOWS

No additional population or flow analyses were completed as part of this update. Summary of the population and flow projections from the 2018 WWMP are shown in Section 1.2.

ES.3 PLANNING CRITERIA

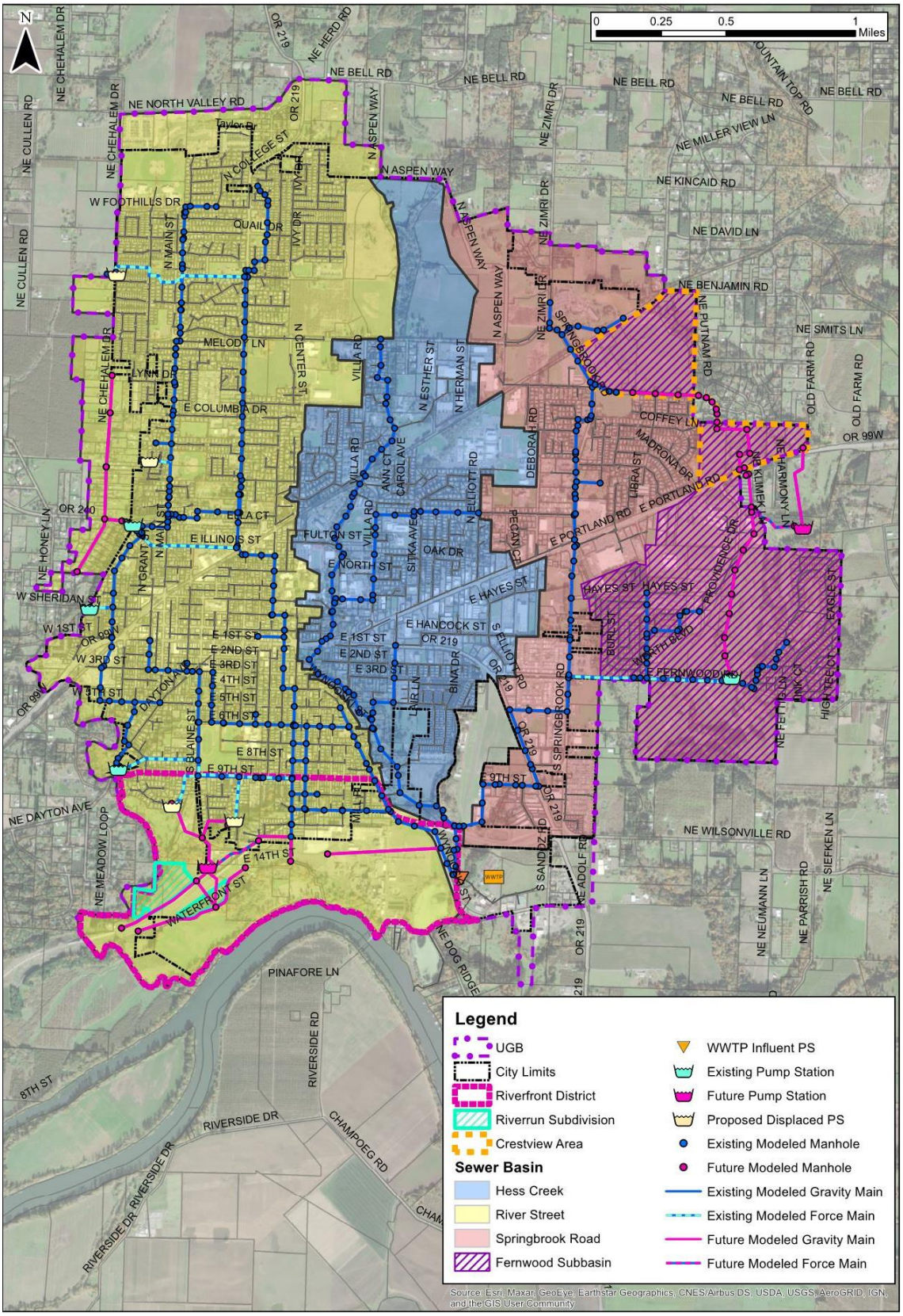
City-defined goals and objectives, Public Works Design Standards (PWDS), engineering best practices, and regulatory requirements form the basis for planning and design. The technical update limited evaluation to the Riverfront and Crestview areas and associated collection system infrastructure. The City's conveyance system was sized for the projected buildout peak instantaneous flow rates associated with the 5-year, 24-hour storm event. Consistent with the 2018 WWMP, the evaluation threshold for pipeline upsizing was wastewater flow level rising to within two feet of a manhole rim. Gravity pipelines were sized to carry peak design flows at 85% of pipeline depth. Pump stations were designed to handle the peak flows with the largest pump out of service (defined as firm capacity). Additional discussion of planning criteria is included in Section 1.3.

ES.4 COLLECTION SYSTEM COMPUTER MODEL UPDATE

The computer model update was completed in InfoSWMM (Version 14.7, Update #2) using the 2018 WWMP buildout scenario as the basis. As discussed in previous sections, the Riverfront and Crestview areas were the focus and revised as part of this technical update. Modeled infrastructure shown in Figure ES-2 (next page) reflects buildout conditions. Sanitary Sewer drainage basins are also shown in Figure ES-2. Chapter 2 provides additional information on the model update.

The Riverfront Master Plan proposed wastewater infrastructure and Riverrun Subdivision as-builts for Phases 1 and 2 and preliminary plans for Phase 3 were incorporated into the model as part of this update. Base loads from the updated growth areas were estimated by zoning designations and area using flows presented in Section 1.2. Updates to Springbrook Basin included infrastructure added to E Crestview Drive and Crestview Crossing. E Crestview Drive is currently under construction and construction drawings were used to add manholes and pipelines along E Crestview Drive. The new infrastructure on E Crestview Drive redirects some future flows from growth areas north to the east and downstream to the Fernwood Pump Station, changing the Fernwood drainage basin from the 2018 WWMP. Crestview Crossing preliminary utility report was used to add infrastructure and base loads to the model update.

FIGURE ES-2: MODELED INFRASTRUCTURE



ES.5 UPDATED BUILDOUT SYSTEM CAPACITY LIMITATIONS

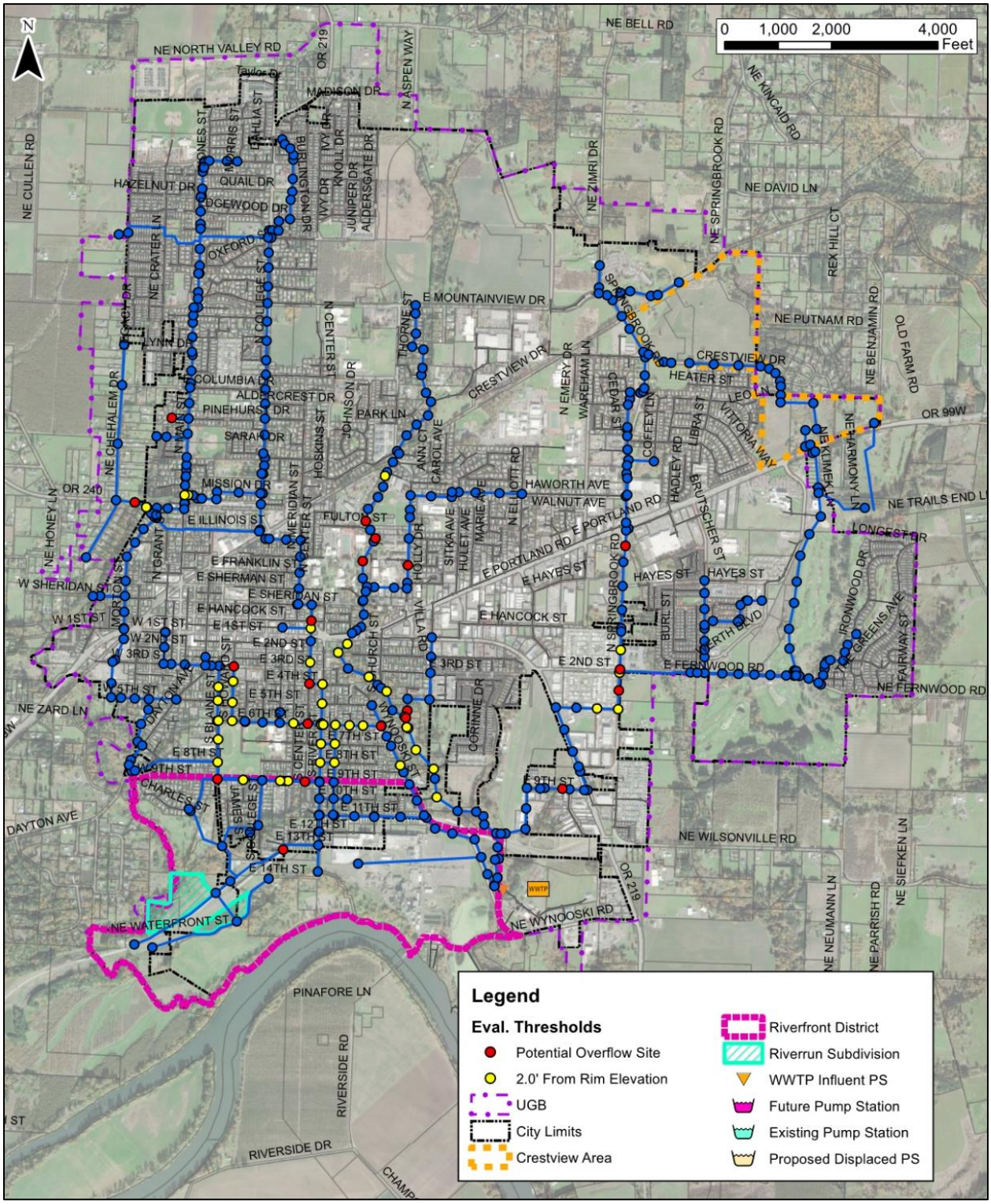
Results of the updated model simulation for buildout conditions are shown in Figure ES-3 (next page). The red manholes indicate potential overflow locations in the system. Overflows have been observed historically by the City staff on Hess Creek, N Villa Road, and S Springbrook Road. These locations are the highest priority and concern for the system as overflows pose public health risks, environmental concerns, and possible Oregon Department of Environmental Quality (DEQ) action. Comparing the model results of the updated system and the 2018 model, the flow redirection at E Crestview Drive does not resolve the capacity limitations on the Springbrook trunk line that were identified in the 2018 WWMP. Additional areas of interest in the updated evaluation, but not in the 2018 WWMP include backwater in the Riverfront district and Fernwood Pump Station undersized pumps. Additional information on the updated evaluation is included in Section 2.2.

ES.6 ALTERNATIVES CONSIDERED

Chapter 3 discusses alternatives that were considered to address the collection system deficiencies in the Riverfront and Springbrook areas. Multiple, feasible alternatives to address capacity deficiencies along the S River Street and E Eleventh Street trunk line were not identified given existing infrastructure and development. Additional discussion and recommended improvements to upsize existing trunk lines are described in Chapter 4.

Two alternatives were evaluated for the Springbrook basin to direct flow from the new E Crestview Drive infrastructure. Alternative 1 would entail directing flow from E Crestview Drive to the east and then south through Crestview Crossing, eventually flowing to the Fernwood Pump Station. A new parallel pipeline south of E Fernwood Road would alleviate capacity issues in the existing Springbrook trunkline and/or convey flow from the Fernwood Pump Station. This alternative includes upsizing the firm capacity at the Fernwood Pump Station. Alternative 2 would entail directing flow from E Crestview Drive through the Aquarius Blvd subdivision and then flow west to the Springbrook Road trunk line near Haworth Avenue. The parallel gravity main south of E Fernwood Road follows the same proposed alignment as Alternative 1. This alternative does not include any upsizing to the Fernwood Pump Station. Additional details and lifecycle cost comparison for the alternatives are shown in Chapter 4. The 20-year lifecycle costs for Alternative 1 are lower than those for Alternative 2, therefore Alternative 1 improvements are the recommended improvements for the Springbrook basin.

FIGURE ES-3: UPDATED SYSTEM EVALUATION



ES.7 RECOMMENDED IMPROVEMENTS

Recommended improvements to collection system infrastructure that vary from the recommendations of the 2018 WWMP are summarized below. All recommended collection system improvements are described in Chapter 4, including recommendations that match the 2018 WWMP. This was done so that system-wide, collection system recommendations are in one location in the WWMP for easy reference. Project cost estimates are included in Chapter 4 and have been updated from the 2018 WWMP, even if a recommended project has not changed.

Updated Recommended Pipelines Improvements

The recommended alternative for Springbrook Road has been updated since the 2018 WWMP and is Alternative 1 as described in the previous section. The improvements include upsizing the firm capacity of Fernwood Pump Station, upsizing a portion of the existing Springbrook line from E Fernwood Road to north of Hayes Street, and a new parallel gravity line added west on E Second Street from the E Fernwood Road intersection.

The recommended improvements on S River Street and E Eleventh Street have also been updated since the 2018 WWMP. The improvements include upsizing the existing trunkline from upstream of the influent pump station on S Wynooski Road up through E Eleventh Street and S river Street to E Fourth Street. The extents of these recommendations have increased since the 2018 WWMP as the recommended size has increased one nominal pipe size and a few additional segments are now included in the improvements to match pipe size along the trunk line.

Future infrastructure recommended in the Riverfront and Crestview areas have been updated to match the model updated infrastructure as described in Chapter 2. These areas generally include additional pipe length from the approximations in the 2018 WWMP. The firm capacities have been updated for the Riverfront and Providence proposed pump stations. Their firm capacities have decreased slightly with the flow changes in the updated infrastructure. The Riverfront infrastructure still includes the recommendation to displace the Charles and Andrews Pump Stations in the future.

Additional descriptions and cost estimates for the updated recommended improvements as well as additional collection system improvements (matching the 2018 WWMP) are included in Chapter 4. Figure 7 (See Appendix A) shows the locations of all recommended collection system improvements.

Recommended Pump Station Improvements

Additional pump station condition assessments were not included in the scope of this update. The main modification in the technical update was to remove the Dayton Pump Station Replacement project from the CIP as it has been completed since the 2018 WWMP. Upsizing the Fernwood Pump Station was included in the Springbrook Basin recommendations. Otherwise, pump station recommendations have not changed from the 2018 WWMP, though the cost estimates have been increased to 2021 dollars using the ENR index.

ES. 8 CAPITAL IMPROVEMENT PLAN (CIP)

The updated opinion of probable cost of the recommended collection system improvements is listed in Table ES-1 (Capital Improvement Plan). This plan includes all recommended collection system improvements including the projects that have not changed in scope from the 2018 WWMP. This was done for ease of reference for future planning use. Capital costs developed for

the recommended improvements are Class 5 estimates as defined by the Association for the Advancement of Cost Engineering (AACE) in alignment with the 2018 WWMP. Actual construction costs may differ from the estimates presented, depending on specific design requirements and the economic climate at the time a project is bid. The range of accuracy for a Class 5 cost estimate is broad, but these are typical levels of accuracy for planning work and match the process from the 2018 WWMP. It is important to communicate this level of accuracy to policy- and decision-makers. Costs shown are planning-level estimates and should be updated as the project is further refined in the project development, pre-design, and design phases. Contractor's overhead and profit are worked into the base construction cost and the other indirect costs are identified and included, where required, as a specific line item. The CIP is based on modeling data that was available during the completion of this master plan. When projects are carried forward to predesign and design phases, the model, data, assumptions, etc., should be re-evaluated to make any necessary adjustments to the basis of the project. An estimated schedule for the next six years is shown in Table ES-2.

TABLE ES-1: 20-YEAR CAPITAL IMPROVEMENT PLAN (CIP)

ID#	Item	Primary Purpose	Total Estimated Cost (2021)	SDC Growth Apportionment		City's Estimated Portion
				%	Cost	
Priority 1 Improvements						
1.a	Hess Creek Phase 1 - CIPP	Capacity & I/I reduction	$ 1,351,000	2%	$ 27,020	$ 1,323,980
1.b	Hess Creek Phase 2 - Parallel Gravity Main	Capacity	$ 7,460,000	2%	$ 149,200	$ 7,310,800
1.c	Springbrook Road	Capacity	$ 5,314,000	20%	$ 1,062,800	$ 4,251,200
1.d	E Pinehurst Court	Capacity	$ 318,000	0%	$ -	$ 318,000
1.e	Pump Station Improvements (Short-term)	Condition	$ 118,000	1%	$ 1,180	$ 116,820
1.f	I/I Projects	Capacity & Condition	$ 2,700,000	50%	$ 1,350,000	$ 1,350,000
1.g	E Crestview Drive Infrastructure	Future Development	$ 928,000	100%	$ 928,000	$ -
1.h	Crestview Crossing Infrastructure	Future Development	$ 1,414,000	100%	$ 1,414,000	$ -
1.i	Maintenance Yard Improvements	Capacity & Condition	$ 804,000	20%	$ 160,800	$ 643,200
		Priority 1 Total (rounded):	**$ 20,407,000**		**$ 5,093,000**	**$ 15,314,000**
Priority 2 Improvements						
2.a	Hess Creek Phase 3 - Pump Station	Capacity	$ 2,539,000	2%	$ 50,780	$ 2,488,220
2.b	S River and E Eleventh Streets	Capacity	$ 5,103,000	17%	$ 867,510	$ 4,235,490
2.c	HWY 240 Pump Station Upsize	Capacity	$ 642,000	19%	$ 121,980	$ 520,020
2.d	N Main and S Wynooski Streets	Capacity	$ 616,000	1%	$ 6,160	$ 609,840
2.e	Pump Station Improvements (Long-term)	Condition	$ 459,000	11%	$ 50,490	$ 408,510
2.f	I/I Projects	Capacity & Condition	$ 3,150,000	50%	$ 1,575,000	$ 1,575,000
2.g	Wastewater Master Plan	Planning	$ 300,000	100%	$ 300,000	$ -
		Priority 2 Total (rounded):	**$ 12,809,000**		**$ 2,972,000**	**$ 9,838,000**
Priority 3 Improvements						
3.a	NE Chehalem Drive Phase 1	Future Development	$ 2,217,000	100%	$ 2,217,000	$ -
3.b	Riverfront Infrastructure	Future Development	$ 4,787,000	100%	$ 4,787,000	$ -
3.c	Riverfront Industrial Infrastructure	Future Development	$ 1,154,000	100%	$ 1,154,000	$ -
3.d	Providence PS Infrastructure	Future Development	$ 1,734,000	100%	$ 1,734,000	$ -
3.e	NE Chehalem Drive Phase 2	Future Development	$ 990,000	100%	$ 990,000	$ -
3.f	I/I Projects	Capacity & Condition	$ 3,150,000	50%	$ 1,575,000	$ 1,575,000
		Priority 3 Total (rounded):	**$ 14,032,000**		**$ 12,457,000**	**$ 1,575,000**
Priority 4 Improvements						
4.a	Chehalem & Creekside PS Displacement/Future Trunk Line	Operations	$ 3,498,000	44%	$ 1,539,120	$ 1,958,880
4.b	Charles & Andrew PS Displacement	Operations	$ 1,109,000	44%	$ 487,960	$ 621,040
		Priority 4 Total (rounded):	**$ 4,607,000**		**$ 2,028,000**	**$ 2,580,000**
		Total Wastewater Collection System Improvement Costs (rounded):	**$ 51,855,000**		**$ 22,550,000**	**$ 29,307,000**

Notes:

1. The opinion of probable cost herein is concept level information only based on our perception of current conditions at the project location and its accuracy is subject to significant variation depending upon project definition and other factors. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. This cost opinion is in 2021 dollars and does not include escalation to time of actual construction. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.
2. All costs in 2021 Dollars. Costs include mobilization (5%), contractor overhead and profit (OHP; 15%), contingency (30%), engineering and construction management services (CMS; 20-30%), and legal, administrative, and permitting services (2%).
3. Acronyms: Cure-in-place pipe (CIPP), infiltration and inflow (I/I), pump station (PS)
4. The Capital Improvement Plan does not include annual pipeline replacement, pipeline cleaning and inspection, and lift station maintenance budgets. These budgets are discussed in Chapter 5.

TABLE ES-2: PRIORITY 1 CAPITAL IMPROVEMENT PLAN

ID#	Item	Total Estimated Cost (2021)	Opinion of Probable Costs (2021)					
			2022	2023	2024	2025	2026	2027
Priority 1 Improvements								
1.a	Hess Creek Phase 1 - CIPP	$ 1,351,000	$ 337,750	$ 1,013,250	$ -	$ -	$ -	$ -
1.b	Hess Creek Phase 2 - Parallel Gravity Main	$ 7,460,000	$1,865,000	$ 2,797,500	$2,797,500	$ -	$ -	$ -
1.c	Springbrook Road	$ 5,314,000	$ -	$ -	$ -	$1,328,500	$1,992,750	$1,992,750
1.d	E Pinehurst Court	$ 318,000	$ 318,000	$ -	$ -	$ -	$ 318,000	$ -
1.e	Pump Station Improvements (Short-term)	$ 118,000	$ -	$ -	$ -	$ 118,000	$ -	$ -
1.f	I/I Projects	$ 2,700,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000
1.g	E Crestview Drive Infrastructure	$ 928,000	$ 232,000	$ 348,000	$ 348,000	$ -	$ -	$ -
1.h	Crestview Crossing Infrastructure	$ 1,414,000	$ 353,500	$ -	$ -	$ 353,500	$ 353,500	$ 353,500
1.i	Maintenance Shops Improvements	$ 804,000	$ -	$ -	$ 201,000	$ 201,000	$ 201,000	$ 201,000
	Priority 1 Total (rounded):	**$ 20,407,000**	**$3,557,000**	**$ 4,609,000**	**$3,797,000**	**$2,451,000**	**$3,316,000**	**$2,998,000**

Note: The opinion of probable cost herein is concept level information only based on our perception of current conditions at the project location and its accuracy is subject to significant variation depending upon project definition and other factors. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. This cost opinion is in 2021 dollars and does not include escalation to time of actual construction. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.

ES. 9 2018 WWMP REFERENCES

Table ES-3 (next page) summarizes the sections and references in the 2018 WWMP that have been modified by this technical update. The table correlates the technical update section and/or references with the corresponding modified section and/or references (including page numbers) of the 2018 WWMP. Brief descriptions of the modifications from the technical update are included in the last column of the table.

TABLE ES-3: 2018 WWMP REFERENCES

Technical Update Section or Reference	2018 WWMP Report Section or Reference	Page/s	Description
1.3	2.5.1	2-11	Summary of additional discussion on evaluation threshold.
2.1.1, Figure 2	4.2.1, Figure 12	4-7, App A	Riverfront Master Plan and Riverrun Subdivision updates to proposed wastewater infrastructure and estimated future loading for Riverfront District.
2.1.2, Figure 3	4.2.1, Figure 12	4-7, App A	E Crestview Drive and Crestview Crossing updates to proposed wastewater infrastructure and estimated future loading for Crestview Area in the Springbrook sewer basin.
2.1, Figure 1	4.2.1, Figure 12	4-7, App A	Buildout system loading updated with additional information on Riverfront District and Crestview areas.
2.2, Figure 6	4.2.3, Figure 15	4-8, App A	Updated buildout capacity evaluation.
3.2, Figure 3.1 & Figure 3.2 (pg 3-2 & 3-3)	5.2.2, Figure 17	5-6 to 5-8, App A	Additional evaluation and alternatives have been added to the Springbrook basin evaluation with the Crestview area updates.
4.2	5.1.1	5-1	Dayton PS replacement has been completed, so recommendation for replacement was eliminated.
Chapter 4, Figure 7	6.1, 6.2, Figures 18 & 28	6-1 to 6-10, App A	Updated recommended inprovements to the collection system. All recommended project cost estimates have been updated (those in report body and in cost estimate appendix). Recommended projects with updates to scope include Priority 1 Lift Station Improvements (Dayton PS replacement has been removed), Springbrook Road, S River Street, Providence LS future infrastructure, Riverfront future infrastructure, and Crestview future infrastructure (added since 2018 WWMP).
Chapter 5, Table 5-1	12.1, 12.2, Table 12-2	12-1, 12-2, 12-3	Capital Improvement Plan (CIP) has been updated.
Appendix C	Appendix E	-	Cost estimate additional information has been updated.
Appendix D	Appendix F	-	Priority 1 Collection System Project Sheets have been updated.

CHAPTER 1 – PROJECT PLANNING

The City of Newberg owns and operates a municipal wastewater collection system and a wastewater treatment plant (WWTP). In 2018, the City of Newberg completed a Wastewater Master Plan (WWMP) to assess the needs of the City for the wastewater system, evaluate if the existing collection system and WWTP could meet those needs, and provide a plan to implement improvements to the wastewater system so the City could continue to meet their level of service goals. Since the adoption of the WWMP, the City accepted the Riverfront Master Plan in September 2019. The City acceptance of the Riverfront Master Plan initiated the WWMP technical update process. The technical update included evaluating the Riverfront Master Plan recommendations for zoning and wastewater infrastructure within the Riverfront area. The Riverrun Subdivision development within this area was also reflected and updated during this process. Additionally, the City decided to include the E Crestview Drive and Crestview Crossing projects in the Springbrook Basin in the technical update evaluation. These projects in the Springbrook basin have resulted in the possibility of routing additional flow further east within the basin.

The City desired a technical update to the 2018 WWMP that evaluated the Riverfront and Crestview area updates as they pertain to the collection system. The technical update shall serve as a planning guide for operating, maintaining, constructing, and expanding the City's wastewater collection system. The technical update will be incorporated as an addendum to the 2018 WWMP as Appendix K. The update provides recommendations for buildout conditions to continue to meet the wastewater collection needs of the City. The update reflects buildout growth projections and design flows documented in the 2018 WWMP with updates specifically to the Riverfront and Springbrook basins. This update does not include an update to the evaluation of the WWTP.

1.1 STUDY AREA

The 2018 WWMP study area consisted of all areas within the City of Newberg Urban Growth Boundary (UGB). This technical update was limited to the Riverfront and Crestview areas of the City and collection system infrastructure that serves these areas. Figure 1 Appendix A shows the existing City limits, UGB, growth areas identified in the 2018 WWMP and highlights updated information available on the Riverfront and Crestview areas. Figure 2 shows the Riverfront Master Plan study area with proposed zoning and wastewater infrastructure. Figure 3 shows the Crestview area with proposed wastewater infrastructure. Both projects are currently under construction. Crestview Crossing is a private development.

1.2 POPULATION AND FLOWS

The update uses the population projections and flow analysis presented in the 2018 WWMP. No additional population or flow analyses were completed as part of this update. A summary of the population and flow projections from the 2018 WWMP are shown in Tables 1-1 and 1-2.

TABLE 1-1: POPULATION AND PROJECTIONS

Year	Population	Source
1980	10,394	U.S. Census, Population Research Center: PSU
1990	13,086	U.S. Census, Population Research Center: PSU
2000	18,064	U.S. Census, Population Research Center: PSU
2010	22,110	U.S. Census, Population Research Center: PSU
2017	23,480	PSU Preliminary Population (Nov. 2017)
2022	25,797	Projected Using Coordinated Growth Rate of 1.9%
2027	28,343	Projected Using Coordinated Growth Rate of 1.9%
2032	31,139	Projected Using Coordinated Growth Rate of 1.9%
2037	33,811	Projected Using Coordinated Growth Rate of 1.3%

Notes: PSU - Portland State University; Coordinated Growth Rates (AAGR) from PSU Coordinated Population Forecast 2017-2067 Yamhill County.
Source: City of Newberg 2018 WWMP

TABLE 1-2: FLOW PROJECTION SUMMARY

	Design Flow (MGD)	Design Unit Flow (gpcd)	Projected Unit Flow (gpcd)[2]	Projected Design Flow (MGD)				
Year	2015	2015	-	2017	2022	2027	2032	2037
Population	22,900	22,900	-	23,480	25,797	28343	31,139	33,811
ADWF	2.27	99	99	2.33	2.56	2.81	3.09	3.35
$MMDWF_{10}$	4.48	196	196	4.60	5.05	5.55	6.09	6.62
AADF	3.32	145	145	3.40	3.74	4.11	4.51	4.90
AWWF	4.38	191	191	4.49	4.94	5.42	5.96	6.47
$MMWWF_5$	9.66	422	250	9.81	10.4	11.0	11.7	12.4
PWkF	10.0	438	275	10.2	10.8	11.5	12.3	13.0
$PDAF_5$	21.5	941	325	21.7	22.5	23.3	24.2	25.1
PIF_5[1]	28.0	1,223	425	28.2	29.2	30.3	31.5	32.6

Notes: 1. MGD - million gallons per day, gpcd - gallons per capita per day, ADWF - average dry weather flow, MMDWF - max month dry weather flow, AADF - average annual flow, AWWF - average wet weather flow, MMWWF max month wet weather flow, PWkF - peak week flow, PDAF - peak day flow, PIF - peak instantaneous flow
2. The DEQ method produces a design flow of 67.1 MGD. PIF5 flow was adjusted based on continuous flow data from peak days between 2012 and 2015.
3. Projected unit flow scaled down to reflect reduced I/I in future developments.
Source: City of Newberg 2018 WWMP

1.3 PLANNING CRITERIA

The City's conveyance system was evaluated for the projected buildout peak instantaneous flow rates associated with the 5-year, 24-hour storm event. Based on the Comprehensive Plan updated in September 2015, buildout for the UGB and URA are projected to occur at approximately the same time as the planning period for the 2018 WWMP (2037).

Evaluation Threshold

The evaluations performed as part of this technical update were used to update and prioritize recommended improvements to address deficiencies in the collection system. These improvements are organized into the Capital Improvement Plan (CIP). The evaluation threshold is used to identify deficiencies in infrastructure and trigger improvement projects. Different thresholds can be used to help prioritize deficiencies in the system. Evaluation thresholds can progressively be lower in subsequent studies as a City makes progress on improvements. Some examples of evaluation thresholds for pipelines include 85% full depth of pipe, top of pipe, 1-foot above top of pipe, 2-feet below rim, at rim elevation. Part of this update was to reconsider different evaluation thresholds. A key component to this discussion was the Citizen Advisory Committee (CAC). This committee is made up of citizens of the City who were involved throughout the development of this update, reviewed draft documents, and provided feedback to be considered in this update. The committee discussed the various options for the evaluation threshold and decided to continue with the evaluation threshold used in the 2018 WWMP of 2.0 feet below rim elevation. The committee was interested in looking more closely at the impacts to the recommended improvements and subsequent CIP resulting from the various evaluation thresholds. The committee recommended to the City that a study be completed with this information in the future. Providing recommendations and CIP for multiple evaluation thresholds was not in the scope of this update. Further discussion on the evaluation threshold and impacts to the system evaluation are in Chapter 2. It should be noted that the evaluation threshold is not a design standard (though they can align) and the CIP pipeline projects are all sized to conform to design criteria as described below.

Design Criteria

The design criteria govern the design of improvements and new infrastructure. Often many of the design criteria are included in the Public Works Design Standards (PWDS). For this update, gravity collection pipelines will be sized to carry peak design flows at 85% depth of the pipe. Where appropriate, new lines will be sized one nominal pipe size larger than what is needed for areas that may not be at buildout by the end of the planning period. Additionally, it should be noted that efforts to reduce I/I in the collection system could further extend the service population. Pump stations will be designed to handle the peak flows with the largest pump out of service (defined as firm capacity). These are consistent with industry and the Oregon DEQ design guidelines.

Growth Areas

The future buildout growth areas identified in the 2018 WWMP serve as the basis for the scenario evaluated in this master plan update. The growth areas updated as part of the evaluation were limited to the Riverfront and Crestview areas. These areas and flow assumptions were updated with information provided by the City for the Riverfront area including the Riverfront Subdivision and the Crestview area including the Crestview Drive and Crestview Crossing projects. Additional discussion of these areas is included in Chapter 2.

Residential flows were projected using growth area, average lot size, population density, and ADWF per capita attributed with residential contributions. Commercial, industrial, and institutional flows were projected using growth areas identified in the 2018 WWMP and typical flow per acre values (Metcalf and Eddie, 3rd Edition). Projected flows per zoning designation used in this update to estimate flows for growth areas are summarized in Table 1-3.

TABLE 1-3: PROJECTED FLOWS BY ZONING

Zoning	Dwelling Units per Acre	Average Lot Size[A] (sqft)	Average Lot Size[A] (ac)	Pop. Density[A, B] (people/ac)	Flow[C, D] (gpad)
R-1	4.4	9,900	0.227	12	880
R-2	9.0	4,840	0.111	24	1,800
R-3, R-4	16.5	2,640	0.061	44	3,301
M-1, M-2, M-3, M-E	N/A	N/A	N/A	N/A	1,250
C-1, C-2, C-3, C-4	N/A	N/A	N/A	N/A	1,250
I	Institutional (Providence, GFU, etc.)	N/A	N/A	N/A	2,000

Note: sqft - square feet, ac - acre, gpad - gallons per acre per day, GFU - George Fox University

[A]Allocates 25% of area for roads and other public dedication, except on industrial and commercial area where 20% is allocated.

[B]Assume 2.69 people/dwelling unit (2010 US Census).

[C]Residential flows based on Design ADWF per capita from Table 1-2 (99 gpcd). Industrial, commercial, and institutional values from Metcalf and Eddie, 3rd Edition.

[D]Utilizes average annual dry-weather flows.

CHAPTER 2 – MODEL UPDATE & SYSTEM EVALUATION

This chapter contains a description and evaluation of the model update for the collection system, including pump stations and pipelines, evaluation for the City of Newberg.

2.1 COLLECTION SYSTEM COMPUTER MODEL UPDATE

This section summarizes the updates to the wastewater collection system model. The computer model developed for the 2018 WWMP buildout scenario was used as the basis. The 2018 model used City GIS database as well as survey data collected as part of the project to update the elevation data in the model. The 2018 model was completed in InfoSWMM Suite 14.5, Update #9. InfoSWMM is a fully dynamic model which allows for evaluation of complex hydraulic flow patterns. This update was completed in InfoSWMM (Version 14.7, Update #2). Modeled infrastructure is shown in Figure 4 and reflects buildout conditions. The three main trunkline basins area also shown on Figure 4. The following sections provide additional descriptions of the updated areas of the model.

2.1.1 Riverfront Master Plan and Riverrun Subdivision

The Riverfront Master Plan proposed wastewater infrastructure and Riverrun Subdivision as-builts for Phases 1 and 2 and preliminary plans for Phase 3 were incorporated into the model as part of this update. Appendix D in the Riverfront Master Plan provides recommended utility improvements to serve the Riverfront area as proposed in the master plan (included in Appendix B). Figure 2 shows the updated growth areas and model infrastructure to reflect the Riverfront Master Plan. The Riverfront Master Plan does not include wastewater flow estimations or evaluation. Base loads from the growth areas were estimated by zoning designations and area using flows presented in Table 1-3.

The Riverrun Subdivision is within the Riverfront area (as seen in Figure 2). The subdivision has three planned phases. Phases 1 and 2 are on the north side of the bypass and include 91 lots. Phase 3 is on the south side of the bypass and includes 41 lots. Wastewater loads for these two areas were estimated using the number of proposed lots in the subdivision, people per dwelling unit and the previously established unit flows.

2.1.2 Springbrook Basin

E Crestview Drive and Crestview Crossing

E Crestview Drive is currently under construction. Construction drawings for E Crestview Drive were used to add manholes and pipelines along E Crestview Drive. A preliminary wastewater report for Crestview Crossing PUD has previously been completed. This report was used to update growth areas and proposed infrastructure. Base loads for Crestview Crossing were provided in the report and used the 2018 WWMP unit flows as a basis. Infiltration and inflow (I/I) was added in the model rather than from the report as the model I/I is more conservative and has been calibrated to field conditions as part of the 2018 WWMP process. Updated growth areas and infrastructure for the Crestview area are shown in Figure 3.

Updated Sanitary Sewer Subbasin

The new infrastructure on E Crestview Drive redirects some future flows from growth areas north to the east and down to the Fernwood Pump Station (see northern portion of Crestview area on Figure 3). In the 2018 WWMP, the flow from these growth areas was directed west towards the Springbrook Road trunkline. The updated Fernwood Pump Station drainage basin is reflected in Figure 4. The subbasin is still part of the larger Springbrook basin. The Fernwood Pump Station discharges flow to the Springbrook trunkline at the intersection of S Springbrook Road and E Fernwood Road.

2.2 UPDATED BUILDOUT SYSTEM CAPACITY LIMITATIONS

After the updates described above were incorporated into the computer model, the model was exercised to perform an updated system evaluation and identify capacity limitations throughout the system. Figure 5 shows the results of this evaluation. Various evaluation thresholds, as introduced in Chapter 1, are shown by the different color manholes. The different colored manholes indicate at what evaluation threshold the area would trigger evaluation of improvements. The red manholes indicate potential overflow locations in the system. Overflows have been observed historically by the City staff on Hess Creek, N Villa Road, and S Springbrook Road. These locations are the highest priority and concern for the system as overflows pose public health risks, environmental concerns, and possible Oregon Department of Environmental Quality (DEQ) action.

As discussed in Chapter 1, the CAC recommended using 2.0 feet below rim elevation be used as the evaluation threshold for this update, which matches the threshold used in the 2018 WWMP. Figure 6 shows the system evaluation with annotations on the areas of interest/evaluation based on this evaluation threshold (2.0 feet below rim elevation). Most of the capacity limitations impact a group of manholes as indicated by the areas of interest/evaluation. A summary of the areas identified is listed below along with the probable cause of capacity limitation.

A. E Pinehurst Ct, topographic low point
B. N Main St, downstream bottleneck
C. Excess flows from HWY240 cause backups
D. HWY240 PS, undersized pumps
E. S River/E Eleventh St, undersized
F. Riverfront District, backwater (S River/E Eleventh St)
G. S Wynooski St, undersized
H. N Villa Rd, downstream bottleneck
I. Hess Creek, undersized and limited or no access to line
J. S Springbrook Rd, undersized and topographic low point
K. E Fernwood/Springbrook Rd, undersized
L. Fernwood PS, undersized pumps

The areas identified above match the areas identified in the 2018 WWMP, except the Riverfront District and Fernwood PS areas have been added from the technical update evaluation.

2.2.1 Springbrook Basin

As mentioned previously, the Crestview area updates result in redirecting some growth area flow away from the Springbrook trunk line north of the Fernwood Pump Station discharge in comparison

to the 2018 WWMP. Comparing the model results of the updated system and the 2018 model, the flow redirection at E Crestview Drive does not resolve the capacity limitations on the Springbrook trunk line that were identified in the 2018 WWMP. Improvements for both options of flow direction will be evaluated in the alternatives (see Chapter 3 for more discussion).

2.2.2 Pipeline Conditions

In-field pipeline material condition inspection and review were not included as part of this update. However, it is important to note that one of the basic assumptions of the hydraulic model is that all the lines are free from physical obstructions such as roots and accumulated debris. Such maintenance issues, which certainly exist, must be discovered and addressed through consistent maintenance efforts. The modeled capacities discussed in this chapter represent the capacity assuming the sewer lines are in good working order.

CHAPTER 3 – ALTERNATIVES CONSIDERED

The primary driver of the WWMP update was to incorporate the Riverfront Master Plan to evaluate the impacts and subsequent improvements recommended for this area of the collection system. This update also reviews the Springbrook basin and impacts from the E Crestview Drive and Crestview Crossing developments. This chapter discusses alternatives that were considered to address the collection system deficiencies in the Riverfront and Springbrook areas. Multiple, feasible alternatives to address capacity deficiencies along the S River Street and E Eleventh Street trunk line were not identified for this area given existing infrastructure and development. Redirecting flow to another basin or a parallel line that provides cost savings were not identified along the existing alignment. The recommended improvements to upsize existing trunk line and additional discussion are described in Chapter 4. The alternatives evaluation and recommended improvements from the 2018 WWMP remain applicable to the other capacity deficiencies identified outside of the Riverfront and Crestview areas in this update and are summarized in Chapter 4.

3.1 PLANNING CRITERIA

The planning criteria used for this collection system facilities planning effort are summarized as follows and discussed in Chapter 1. The City's conveyance system will be sized for the projected, buildout peak instantaneous flow rates associated with the 5-year, 24-hour storm event. The City and CAC decided that the criteria for requiring improvements (evaluation threshold) is when the water surface reaches within 2 feet of a manhole rim elevation. Recommended improvements will be sized per design criteria to flow at 85% depth or less for the buildout peak flows. Additionally, it should be noted that efforts to reduce I/I in the collection system could further extend the life of the pipeline with regards to capacity.

3.2 ALTERNATIVES DISCUSSION

Alternatives are described and discussed below. Maps of the alternatives accompany each description below. Overall planning level project cost estimates for alternatives are presented in Chapter 4. For each set of alternatives, there is also an unstated option to do nothing and make no changes. This option perpetuates existing deficiencies and increases the risk of surcharging, overflows, environmental damages, DEQ violations, and subsequent fines. Deficiencies identified in Section 2 that do not have multiple, feasible alternatives for improvements are addressed in Section 4. Alternatives are organized by location. As a general policy, all pipelines that are replaced in the alternative, at a minimum, match the upstream pipeline size. This is considered an industry good practice. Some specific cases are noted where existing downstream pipe segments are smaller in size than the improvements recommended in the alternative. Advantages and disadvantages of alternatives, including capital cost and operations and maintenance (O&M) considerations, are also discussed below. Detailed cost estimates of the improvements summarized in this section are presented in Appendix C.

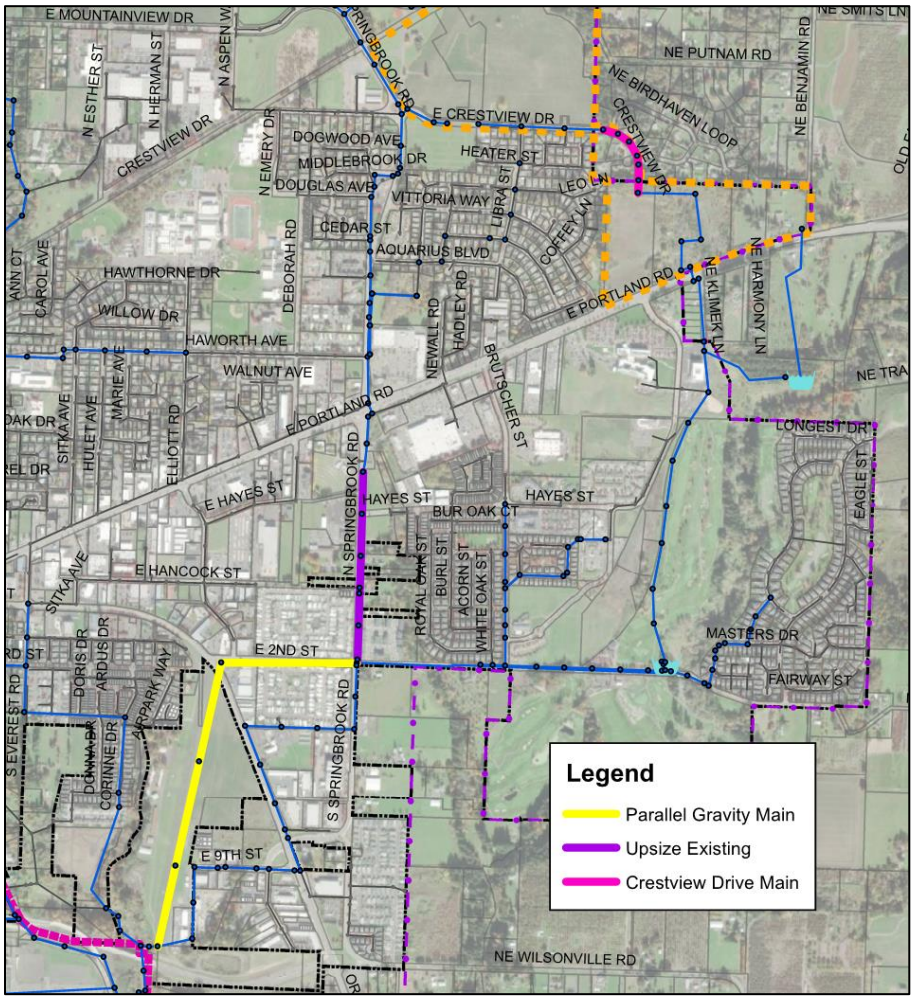
Springbrook Basin

The two alternatives evaluated for the Springbrook basin were to direct the flow from E Crestview Drive to the east or to the west. The improvements in the full Springbrook basin were evaluated collectively for each of the alternatives. The two alternatives are described and evaluated in the following sections.

Alternative 1 – E Crestview Drive East

The main portion of flow draining to E Crestview Drive would be directed to the east, and then south through Crestview Crossing, eventually flowing to the Fernwood Pump Station (as shown in Figure 3-1). This alternative includes a small portion of new 8-inch line on E Crestview Drive to connect to Crestview Crossing to the SE, upsizing the firm capacity at the Fernwood Pump Station by approximately 250 gallons per minute (gpm), upsizing approximately 2,300 linear feet (LF) of existing 15-inch line on Springbrook Road from E Fernwood Road to north of Hayes Street to 18-inch, and a new, 24-inch parallel gravity main to the south. The parallel gravity main that would run west on E Second Street to HWY 219, then turn south and route through the Sportsman Airpark property and reconnect to the existing trunk line south of the airport before it drops into the creek bottom. This parallel line could be designed to receive all flows from either the Fernwood Lift Station force main or from the S Springbrook Road trunk line. These connections could be designed with overflow capabilities to transfer flow from one trunk line to the other if needed. Otherwise, a flow split downstream of the existing manhole in E Fernwood Road and S Springbrook Street could be utilized to send most of the flow down the new airport trunk line. The extents of the improvements are shown in Figure 3-1.

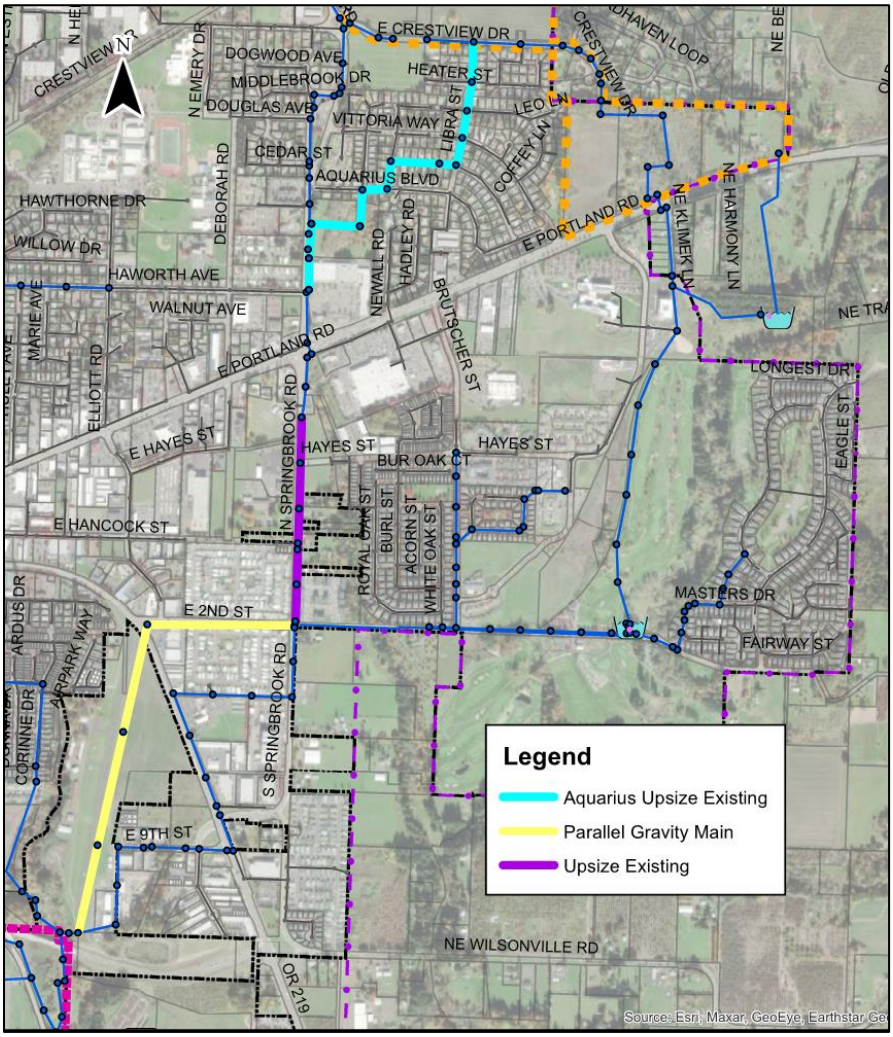
FIGURE 3-1: ALTERNATIVE 1, E CRESTVIEW DRIVE EAST



Alternative 2 – E Crestview Drive West

The main portion of flow from E Crestview Drive would be directed south through the Aquarius Blvd subdivision and then flow west to the Springbrook Road trunk line near Haworth Avenue (as shown in Figure 3-2). This alternative includes upsizing approximately 4,400 LF in Aquarius Blvd subdivision to 15-inch pipe. Additional improvements downstream would include upsizing approximately 2,300 LF of existing 15-inch line on Springbrook Road to 21-inch, and a new, 24-inch parallel gravity main to the south. The parallel gravity main follows the same proposed alignment as Alternative 1. This alternative does not include any upsizing to the Fernwood Pump Station, but the improvements on Springbrook Road are one nominal pipe size larger than those in Alternative 1. The extents of the improvements are shown below in Figure 3-2.

FIGURE 3-2: ALTERNATIVE 2, E CRESTVIEW DRIVE WEST



Lifecycle Cost Evaluation

A 20-year lifecycle cost evaluation was completed for the two alternatives. Two of the three pumps at the existing Fernwood Pump Station were installed in 2001 and the third was installed in 2010. The typical lifecycle of pumps is estimated at 20 years. Pump replacement was assumed in the 20-

year lifecycle for both alternatives. The same base pump can be used for both alternatives. The impeller size and the average efficiencies of the pumps vary between the alternatives. Annual pump electrical demands and maintenance costs were estimated for each alternative. The annual O&M cost is converted to a 20-year total using a net present value approach with a rate of 1.2%. Table 3-1 shows the 20-year lifecycle cost comparison. Alternative 1, directing Crestview Drive east, has the lower 20-year lifecycle cost despite its higher annual O&M.

TABLE 3-1: SPRINGBROOK ALT. 20-YEAR LIFECYCLE COSTS

Alternative 1 - Crestview East		
Item	**Annual Cost**	
Annual electricity	$	9,600
Pump maintenance	$	3,200
Annual O&M (rounded)	$	13,000
20-Year O&M (rounded)	$	230,000
Pump capital cost	$	202,000
Pipe improvements capital cost	$	5,314,000
20-Year Lifecycle Cost (rounded):	**$**	**5,746,000**
Alternative 2 - Crestview West		
Item	**Annual Cost**	
Annual electricity	$	8,100
Pump maintenance	$	3,200
Annual O&M (rounded)	$	12,000
20-Year O&M (rounded)	$	212,300
Pump capital cost	$	202,000
Pipe improvements capital cost	$	6,617,000
20-Year Lifecycle Cost (rounded):	**$**	**7,032,000**

Both alternatives include continued use of two, 15-inch diameter segments (approximately 200 feet) downstream of the improvements (north of the Newberg-Dundee Bypass and south of the Airpark). These segments drop down into the Hess Creek corridor and increase in slope, preventing them from being capacity limiting. The City can choose to replace and upsize the downstream portion of this trunk line during preliminary design to avoid the downstream pipeline from being smaller than the upstream pipeline. The average useful life of a pipeline is roughly 50-75 years; longer than the projected growth of this study. It is advisable to review growth beyond this study's buildout conditions and consider the impacts to the Springbrook Road gravity main during the preliminary design phase.

3.3 INFILTRATION AND INFLOW (I/I) DISCUSSION

Infiltration and inflow (I/I) are concerns in the Newberg collection system. The City completed an I/I Study in 2015 that included pump run time analysis, continuous flow monitoring, night-time monitoring, smoke testing, and CCTV inspection. The study provided a prioritized list of improvements and areas of high I/I for the City to focus their mitigation efforts. The 2018 WWMP collected additional data and updated the I/I evaluation and prioritization areas. The City has made concerted efforts to fund and complete annual I/I mitigation projects, particularly since the 2015 I/I Study was completed. Operators have noted that surcharging and peak flows seen at the WWTP

during large storm events has decreased with the continued I/I mitigation efforts. Additional information and details on the City's I/I efforts and prioritization can be found in the 2018 WWMP (Sections 7 and 8).

CHAPTER 4 – RECOMMENDED IMPROVEMENTS

This section consists of the recommended plan to address the wastewater collection system deficiencies identified in previous chapters, as well as recommendations from the 2018 WWMP that have not been modified in scope in this technical update. This was done so that system-wide, collection system recommendations are in one location in the WWMP for easy reference. A location map showing the improvements to the collection system is shown in Figure 7 (Appendix A).

4.1 RECOMMENDED PIPELINE IMPROVEMENTS

This section summarizes the recommended pipeline improvements to address deficiencies from Chapter 2, including recommended alternatives from Chapter 3 and recommendations from the 2018 WWMP that have not changed in scope. Project cost estimates are included in this chapter and have been updated from the 2018 WWMP, even if a recommended project scope has not changed with the technical update. Cost estimates with additional information for all recommended improvements can be found in Appendix C.

4.1.1 Priority 1 – Address Existing Deficiencies

Priority 1 addresses short-term, existing capacity deficiencies. Primary existing deficiencies were identified in the 2018 WWMP. There was no additional information from this update that would change the existing deficiencies. The recommended alternatives from Chapter 3 are summarized and additional improvements from the 2018 WWMP are expanded upon below. Individual project summary sheets for Priority 1 projects, including location maps, are included in Appendix D.

Hess Creek Trunk Line and N Villa Road

The recommended improvements for the Hess Creek trunk line and N Villa Road have not been changed from the 2018 WWMP. The recommended project includes a new pump station, parallel gravity main, and partial abandonment of the Hess Creek Line (Figure 7). These improvements will alleviate some of the O&M challenges with the Hess Creek trunk line by utilizing a new pump station near E Portland Road to direct flow to a proposed parallel line on S Church Street, E Third Street, and Corinne Drive; and abandon the trunk line in the southern portion of Hess Creek.

These improvements can be completed as one project but is recommended to be divided into three phases. Phase 1 includes cured-in-place-pipe (CIPP) of the upper portion of Hess Creek trunk line followed by flow monitoring of the basin to evaluate flows for pre-design of the pump station and parallel line. There are two segments of pipeline in the upper portion that should not be lined as they will be upsized in Phase 2. Phase 2 includes design and construction of the parallel line, as well as improvements to two sections of the existing Hess Creek trunk line that are undersized for existing flows. The final phase is design and construction of the pump station and force main, and connection to the parallel gravity line. Phase 1 and 2 are included in Priority 1 improvements. Phase 3 is included as a Priority 2 improvement. Phase 1 and 2 will provide I/I reduction and re-direct flow from the east side of the canyon away from the Hess Creek trunk line down the parallel line. A summary of the estimated costs of Phase 1 and 2 is presented in Table 4-1.

TABLE 4-1: HESS CREEK IMPROVEMENTS, PHASE 1 & 2 COST ESTIMATE

	Item	Unit	Unit Price	Quantity	Cost
Phase 1					
	CIPP, 8 to 18-inch[1]	LF	$ 145	6,800	$ 986,000
	Flow monitoring	LS	$ 30,000	1	$ 30,000
				Subtotal (rounded)	$ 1,016,000
	Mobilization	%	5	-	$ 50,800
				Subtotal (rounded)	$ 1,067,000
	Contingency	%	10	-	$ 106,700
				Subtotal (rounded)	$ 1,174,000
	Engineering and CMS	%	15	-	$ 176,100
				Phase 1 Cost (rounded):	**$ 1,351,000**
	[1]Additional 30% added to unit price for Hess Creek accessibility constraints				
Phase 2					
	Parallel gravity main				$ 2,915,500
	Upsize existing pipeline				$ 1,435,000
				Subtotal (rounded)	$ 4,351,000
	Mobilization	%	5	-	$ 217,550
				Subtotal (rounded)	$ 4,569,000
	Contingency	%	30	-	$ 1,370,700
				Subtotal (rounded)	$ 5,940,000
	Engineering (25%) and Soft Costs				$ 1,520,000
				Phase 2 Cost (rounded):	**$ 7,460,000**

Springbrook Road

The recommended alternative for Springbrook Road is Alternative 1 – E Crestview Drive directed east. The improvements include a small portion of new 8-inch line from E Crestview Drive to connect to Crestview Crossing to the SE, upsizing the firm capacity of Fernwood Pump Station, upsizing a portion of the existing Springbrook line north of E Fernwood Road, and a new parallel gravity line added west on E Second Street from the E Fernwood Road intersection. The parallel gravity line will be bored under Highway 219 and then run through Sportsman Airpark. The City Community Development Department had been in discussion with Airpark for other projects during the 2018 WWMP process and the City thinks it is probable that the Airpark would be willing to negotiate an easement for the gravity sewer. The upsized portion on Springbrook Road and new parallel line match the extents of the 2018 WWMP recommendations, though the size of the improvements has changed with the flow modifications in the technical update. During preliminary design it should be determined if the downstream pipeline should be replaced to match the upstream pipeline size. Table 4-2 shows the estimated costs. It is advisable to review growth beyond this study's buildout conditions and consider the impacts to the Springbrook Road gravity main when the next Buildable Lands Study is completed.

TABLE 4-2: SPRINGBROOK IMPROVEMENTS COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
Parallel gravity main				$ 1,562,200
Upsize existing pipeline				$ 1,314,500
Upsize Fernwood PS				$ 202,000
			Subtotal (rounded)	$ 3,079,000
Mobilization	%	5	-	$ 153,950
			Subtotal (rounded)	$ 3,233,000
Contingency	%	30	-	$ 969,900
			Subtotal (rounded)	$ 4,203,000
Engineering (25%) and Soft Costs				$ 1,110,750
			Project Total Cost (rounded):	**$ 5,314,000**

E Pinehurst Court

The recommended improvements for E Pinehurst Court have not changed from the 2018 WWMP. E Pinehurst Court in the Highway 240 basin has overflow concerns due to road elevations and the N Main Street trunk line invert elevation. It is recommended that the line on E Pinehurst Court be disconnected from the N Main Street trunk line, re-graded to the west, and extended south to connect to the existing line on Creekside Court (Figure 7). Preliminary design should confirm Creekside Pump Station has capacity to handle E Pinehurst Court flows. E Pinehurst Court flows should also be considered when evaluating Creekside Pump Station displacement (see Section 4.1.3 for more discussion). Estimated costs are summarized in Table 4-3.

TABLE 4-3: E PINEHURST COURT IMPROVEMENTS COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
Pinehurst Court				
Disconnect and re-direct to Creekside LS				$ 183,000
Mobilization	%	5	-	$ 9,150
			Subtotal (rounded)	$ 193,000
Contingency	%	30	-	$ 57,900
			Subtotal (rounded)	$ 251,000
Engineering (25%) and Soft Costs				$ 66,400
			Project Total Cost (rounded):	**$ 318,000**

Additional Improvement Projects

The additional improvements projects summarized here have not changed from the 2018 WWMP. The City completed a master plan on expanding and upgrading the City maintenance yard facilities. The recommended improvements project includes remodel of the building (completed in 2016/2017), major site work, a new fleet building, and new administration building. This project is being funded over multiple years and through multiple sources as it is relevant to several City divisions. The cost reflected in the CIP (Chapter 5) was provided by the City in 2018 as the portion of the project costs to be allocated from the sewer funds and has been updated to 2021 dollars with the ENR index. The City is allocating $450,000-$600,000 annually for I/I specific projects. These projects will be directed by the I/I based priority improvements recommended in the 2018 WWMP and coordination with other utility projects. This work is considered part of the

annual replacement budget work for pipelines and manholes (see Chapter 5 for additional discussion).

E Crestview Drive and Crestview Crossing

The Crestview area as shown in Figure 3, includes the E Crestview Drive and Crestview Crossing infrastructure. While this infrastructure is development driven, construction on both projects is currently moving forward. With this timeline, the projects have been included in the Priority 1 CIP, which differs from the priority of the 2018 WWMP. The scopes of these projects have been modified from the 2018 WWMP to reflect the most current information the City has on the ongoing projects. E Crestview Drive includes approximately 2,500 linear feet on 8-inch gravity main. Crestview Crossing is a private development and includes approximately 3,200 linear feet of gravity main. The development is currently in the design phase. The estimated costs for this infrastructure are summarized in Table 4-4.

TABLE 4-4: E CRESTVIEW DRIVE AND CRESTVIEW CROSSING INFRASTRUCTURE COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
E Crestview Drive				
New pipeline				$ 521,000
Subtotal (rounded)				$ 521,000
Mobilization	%	5	-	$ 26,050
Subtotal (rounded)				$ 548,000
Contingency	%	30	-	$ 164,400
Subtotal (rounded)				$ 713,000
Engineering (25%) and Soft Costs				$ 214,250
E Crestview Drive Total Cost (rounded):				**$ 928,000**
Item	**Unit**	**Unit Price**	**Quantity**	**Cost**
Crestview Crossing				
New pipeline				$ 801,000
Subtotal (rounded)				$ 801,000
Mobilization	%	5	-	$ 40,050
Subtotal (rounded)				$ 842,000
Contingency	%	30	-	$ 252,600
Subtotal (rounded)				$ 1,095,000
Engineering (25%) and Soft Costs				$ 318,750
Crestview Crossing Total Cost (rounded):				**$ 1,414,000**

4.1.2 Priority 2 – Address Future Deficiencies

Hess Creek Trunk Line and N Villa Road

As mentioned previously, Phase 3 of the Hess Creek and Villa Road Improvements – New Pump Station – is included in the Priority 2 projects. The cost estimate for Phase 3 is summarized in Table 4-5.

TABLE 4-5: HESS CREEK IMPROVEMENTS, PHASE 3 COST ESTIMATE

Phase 3					
	Pump Station				$ 1,369,000
	Mobilization	%	5	-	$ 68,450
				Subtotal (rounded)	$ 1,438,000
	Contingency	%	30	-	$ 431,400
				Subtotal (rounded)	$ 1,870,000
	Engineering (25%) and Soft Costs				$ 668,500
				Phase 3 Cost (rounded):	**$ 2,539,000**

S River and E Eleventh Streets

Capacity deficiencies along the S River and E Eleventh Streets trunk line cause capacity issues upstream along S Blaine, Howard, and Chehalem Streets; and E Sixth and Ninth Streets. To alleviate these capacity issues, approx. 900 linear feet would be upsized from 21-inch to 30-inch diameter along S River Street between E Fourth and Sixth Streets. In addition, approximately 1,900 linear feet of 36-inch diameter pipeline would replace existing 21- and 30-inch diameter pipeline along S River Street south of E Sixth Street to Eleventh Street. Approximately 4,700 linear feet of existing 30- and 36-inch pipe along E Eleventh and S Wynooski Street is to be upsized to 42-inch pipe (Figure 7). The extents of these recommendations have increased since the 2018 WWMP as the recommended size has increased one nominal pipe size and a few additional segments are now included in the improvements to match pipe size along the trunk line. The new 42-inch diameter pipeline on E Eleventh Street and S Wynooski Street would result in smaller diameter downstream pipelines (further south on S Wynooski Street and to the influent pump station). There is one 24-inch diameter segment (approximately 300 feet in length, just upstream of the influent pump station) downstream of the improvements, which has a significantly higher slope than the other segments preventing it from being capacity limiting. During preliminary design it should be assessed if the downstream pipeline should be replaced to match the upstream pipeline size. The cost estimate for these improvements is summarized in Table 4-6.

TABLE 4-6: S RIVER AND E ELEVENTH STREET IMPROVEMENTS COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
Upsize existing pipeline				$ 2,972,000
Mobilization	%	5	-	$ 148,600
			Subtotal (rounded)	$ 3,121,000
Contingency	%	30	-	$ 936,300
			Subtotal (rounded)	$ 4,058,000
Engineering (25%) and Soft Costs				$ 1,044,500
			Project Total Cost (rounded):	**$ 5,103,000**

As noted in the 2018 WWMP, City staff are aware there is at least one connection between the S River Street trunk line and the S Chehalem Street pipeline (former trunk line) at E Sixth Street. It is known that there are likely additional connections between the S River Street trunk line and the S Chehalem Street pipeline. The model was calibrated with observed flow monitoring data and closely matched flow, depth, and velocity data upstream at Vermillion Street during the 2018 WWMP process. Additional flow monitoring (number of locations focused in this area) and data collection could be beneficial to further characterize flow throughout the S River Street trunk line.

This is recommended as part of the preliminary design of any improvements related to the S River Street trunk line. Parallel lines could be investigated during preliminary design as a potential alternative alignment as these existing, adjacent lines may be in worse condition and benefit from replacement and upsizing.

Highway 240 Pump Station

The recommended improvements for the Highway 240 Pump Station have not changed from the 2018 WWMP. Highway 240 Pump Station will need upsized pumps as part of Priority 2. Prior to reaching the firm capacity at Highway 240, the pumps at the pump station should be upsized to handle peak flows at buildout (approximately 3,000 gpm at buildout with pump station displacement, recommended below). It is recommended the pump station controls/telemetry be adjusted now to add an alarm to alert operations staff when all pumps are running. This information will indicate if flows at Highway 240 are beyond the firm capacity of the pump station. The cost estimate is summarized in Table 4-7. This estimate assumes pumps can be replaced while maintaining the operations and does not require bypass pumping.

It should be noted that prior to upsizing Highway 240, the recommended S River and E Eleventh Streets improvements should be completed to prevent additional surcharging and overflows in the area. When the Highway 240 pumps are upsized, the Highway 240 diversion structure should be adjusted to prevent flow from being re-directed to the Dayton Pump Station, eliminating potential surcharging and overflows in the downstream pipeline or at the Dayton Pump Station. Operations at Highway 240 Pump station should be adjusted when the pumps are upsized to utilize both 10-inch force mains to maintain velocities of 7 feet per second or lower.

TABLE 4-7: HWY 240 PUMP STATION IMPROVEMENTS COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
Upsize pump	EA	$ 130,000	3	$ 390,000
Mobilization	%	5	-	$ 19,500
			Subtotal (rounded)	$ 410,000
Contingency	%	25	-	$ 102,500
			Subtotal (rounded)	$ 513,000
Engineering and CMS	%	25	-	$ 128,250
			Project Total Cost (rounded):	**$ 642,000**

N Main and S Wynooski Streets Pipeline Improvements

The recommended improvements for N Main and S Wynooski Streets have not changed from the 2018 WWMP. N Main Street exceeds the surcharge threshold in future scenarios along Clifford Court. There is a single 12-inch diameter pipeline segment just upstream of the Highway 240 diversion structure. It is recommended this pipeline be upsized to be a 15-inch diameter to match the upstream pipeline and alleviate surcharging on N Main Street (Figure 7). While replacing this segment, it should be regraded with the segment upstream (WWGM1566) to resolve an inverse slope highlighted by survey data collected in 2017 for the 2018 WWMP. In addition, there is another pipeline segment upstream (WWGM1568) that has an inverse slope based on survey data and should be regraded to correct the slope (Figure 7).

It is recommended the pipeline segment on S Wynooski Street north of E Eleventh Street be upsized from 10-inch to 15-inch diameter pipeline to alleviate surcharging along S Wynooski

Street (Figure 7). There is a short segment of 10-inch diameter pipeline downstream of this segment that has a steep slope that prevents it from causing capacity deficiencies. During preliminary design it can be determined if this segment should be replaced to match the new upstream pipeline size. Cost estimates for both N Main Street and S Wynooski Street Improvements are summarized in Table 4-8.

TABLE 4-8: N MAIN AND S WYNOOSKI STREETS IMPROVEMENTS COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
N Main Street Improvements				
Upsize/regrade existing pipeline				$ 224,000
Mobilization	%	5	-	$ 11,200
Subtotal (rounded)				$ 236,000
Contingency	%	30	-	$ 70,800
Subtotal (rounded)				$ 307,000
Engineering and CMS	%	25	-	$ 76,800
Project Total Cost (rounded):				**$ 384,000**
Item	**Unit**	**Unit Price**	**Quantity**	**Cost**
S Wynooski Street Improvements				
Upsize existing pipeline				$ 135,000
Mobilization	%	5	-	$ 6,800
Subtotal (rounded)				$ 142,000
Contingency	%	30	-	$ 42,600
Subtotal (rounded)				$ 185,000
Engineering and CMS	%	25	-	$ 46,300
Project Total Cost (rounded):				**$ 232,000**

Additional Improvement Projects

The additional improvements projects summarized here have not changed from the 2018 WWMP. The City will continue to budget $450,000-$600,000 annually for I/I related improvements. This work will continue to be directed by the I/I based priority improvements highlighted in the 2018 WWMP and any additional I/I evaluations completed. Continued coordination with other utility projects could provide cost savings for the City. This work is considered part of the annual replacement budget work for pipelines and manholes. Further discussion of annual replacement budgets is included in Chapter 5.

In addition, a master plan update is recommended within Priority 2 to re-evaluate the existing system and system needs as growth occurs. This will assist the City staff in directing their funds to the highest priority improvement projects to continue delivering wastewater services to the rate payers.

4.1.3 Future Infrastructure and Pump Stations

There are three areas where future infrastructure is recommended to service future growth. In two of these areas, pump station displacement options are recommended in conjunction with the addition of future infrastructure. These projects are summarized below. During any subsequent phases of any pump station abandonments, a return-on-investment analysis should be completed.

Providence PS Future Infrastructure

These improvements have minor changes since the 2018 WWMP with the updated information on the Crestview Crossing development. North of the Fernwood Pump Station, a regional pump station is recommended to serve future development northeast of the intersection of E Portland Road and Harmony Lane (east portion of Crestview Crossing). The approximate location of this future pump station is located on Figure 3. The approximate location of the pump station was assessed during the 2018 WWMP process considering future development and elevation contours and has not been modified from the 2018 WWMP. The new force main will discharge into the existing line on Providence Drive. During pre-design, exact location and size should consider any Buildable Lands Study and future developments. The preliminary Crestview Crossing development indicates that the two properties NE of Harmony Lane are unable to flow by gravity to the existing line on Providence Drive and will require pumping with the new pump station. The estimated loading to the proposed Providence Pump Station has been reduced sine the 2018 WWMP with the information on Crestview Crossing. The future infrastructure estimated costs are summarized in Table 4-9.

TABLE 4-9: PROVIDENCE PS FUTURE INFRASTRUCTURE COST ESTIMATE

Item	Unit	Unit Price	Quantity	Cost
Gravity Main				$ 507,000
Pump Station (including Force Main)				$ 478,000
Subtotal (rounded)				$ 985,000
Mobilization	%	5	-	$ 49,250
Subtotal (rounded)				$ 1,035,000
Contingency	%	30	-	$ 310,500
Subtotal (rounded)				$ 1,346,000
Engineering (25%) and Soft Costs				$ 387,500
Providence PS Total Cost (rounded):				**$ 1,734,000**

NE Chehalem Drive Future Infrastructure and Pump Station Displacement

The future infrastructure along NE Chehalem Drive summarized here has not changed from the 2018 WWMP. Future infrastructure along NE Chehalem Drive will be necessary to service growth predicted through buildout. It is recommended the gravity pipelines discharge to the Highway 240 wet well. There is an existing stub out for an inlet from the west that can be utilized to connect the future pipeline. Near-future infrastructure, includes a pipeline from approximately E Mountainview Drive, south on NE Chehalem Drive to Highway 240 (W Illinois Street) and east to the pump station (Figure 7). This infrastructure cost estimate is in Table 4-10 as Phase 1. The design of this infrastructure is nearly complete. The most recent engineer's opinion of probable cost is reflected in Table 4-10. See pump station displacement considerations below that impact the vertical alignment of this pipeline. Additional infrastructure for buildout growth includes pipeline extensions to the north and south of the Phase 1 pipeline along NE Chehalem Drive (Figure 7). These improvements are summarized as Phase 2 in Table 4-10.

In addition to serving future growth, this infrastructure could allow for the displacement of Chehalem and Creekside Pump Stations. Additional gravity pipelines with approximate alignments shown in Figure 7 could transport Chehalem and Creekside Pump Station flows to the Highway 240 Pump Station. This infrastructure is recommended to decrease the capital cost and O&M required to continue operation and maintenance of the two pump stations. The vertical

alignment of Phase 1 improvements would need to be lower in general to facilitate the displacement of Chehalem and Creekside Pump Stations. Phase 3 in Table 4-10 summarizes the cost estimate for these changes.

TABLE 4-10: NE CHEHALEM DRIVE FUTURE INFRASTRUCTURE AND PUMP STATION DISPLACEMENT COST ESTIMATE

	Item	Unit	Unit Price	Quantity	Cost
Phase 1					
	NE Chehalem Drive Infrastructure				$ 1,683,000
	Subtotal (rounded)				$ 1,683,000
	Contingency	%	10	-	$ 169,000
	Subtotal (rounded)				$ 1,852,000
	Engineering and CMS	LS	-	1	$ 365,000
	Phase 1 Cost (rounded):				**$ 2,217,000**
Phase 2					
	New pipeline				$ 580,000
	Mobilization	%	5	-	$ 29,000
	Subtotal (rounded)				$ 609,000
	Contingency	%	30	-	$ 182,700
	Subtotal (rounded)				$ 792,000
	Engineering and CMS	%	25	-	$ 198,000
	Phase 2 Cost (rounded):				**$ 990,000**
Phase 3 (Chehalem and Creekside PS displacement)					
	New pipeline				$ 1,931,000
	Pump station demolition/removal				$ 33,000
	Subtotal (rounded)				$ 1,964,000
	Mobilization	%	5	-	$ 98,200
	Subtotal (rounded)				$ 2,063,000
	Contingency	%	30	-	$ 618,900
	Subtotal (rounded)				$ 2,682,000
	Engineering (25%) and Soft Costs				$ 815,600
	Phase 3 Cost (rounded):				**$ 3,498,000**
	Project Total Cost (rounded):				**$ 6,705,000**

Riverfront Future Infrastructure and Pump Station Displacement

Future infrastructure in the Riverfront area will be necessary to service growth planned for the Riverfront Master Plan. Approximate regional pump station, force main, and gravity main locations based on the Riverfront Master Plan are shown in Figure 2. See pump station displacement considerations below that impact the vertical alignment of the pump station. The force main discharge near E Twelfth Street will require upsize of the downstream pipeline. For planning and development purposes, the industrial gravity main (identified as GM D1 in the Riverfront Master Plan) across the old mill property that is anticipated to serve the industrial area in the Riverfront District has been separated from other infrastructure in the Riverfront area. Cost estimates for the recommended infrastructure and improvements are in summarized as Phase 1 and Riverfront Industrial Line in Table 4-11.

In addition to serving future growth, this infrastructure could allow for the displacement of Andrew and Charles Pump Stations. Additional gravity pipelines with approximate alignments shown in Figure 2 could transport Andrew and Charles Pump Station flows to the new, regional Riverfront Pump Station. This infrastructure is reflected in the Riverfront Master Plan and is recommended to decrease the capital cost and O&M required to continue operation of the two existing pump stations. The vertical alignment of Phase 1 improvements should consider the displacement of

Andrew and Charles Pump Stations during design phase. The estimated cost of displacement and new gravity pipelines for Andrew and Charles Pump Stations is summarized in Phase 2 in Table 4-11.

TABLE 4-11: RIVERFRONT INFRASTRUCTURE AND PUMP STATION DISPLACEMENT COST ESTIMATE

	Item	Unit	Unit Price	Quantity	Cost
Phase 1					
	New pipeline				$ 2,047,000
	Pump Station				$ 691,000
	Subtotal (rounded)				$ 2,738,000
	Mobilization	%	5	-	$ 136,900
	Subtotal (rounded)				$ 2,875,000
	Contingency	%	30	-	$ 862,500
	Subtotal (rounded)				$ 3,738,000
	Engineering (25%) and Soft Costs				$ 1,048,900
	Phase 1 Cost (rounded):				**$ 4,787,000**
Riverfront Industrial Line					
	New pipeline				$ 654,000
	Subtotal (rounded)				$ 654,000
	Mobilization	%	5	-	$ 32,700
	Subtotal (rounded)				$ 687,000
	Contingency	%	30	-	$ 206,100
	Subtotal (rounded)				$ 894,000
	Engineering (25%) and Soft Costs				$ 259,400
	Riverfront Industrial Line Cost (rounded):				**$ 1,154,000**
Phase 2 (Charles and Andrew PS displacement)					
	New pipeline				$ 513,000
	Pump station demolition/removal				$ 22,000
	Subtotal (rounded)				$ 535,000
	Mobilization	%	5	-	$ 26,750
	Subtotal (rounded)				$ 562,000
	Contingency	%	30	-	$ 168,600
	Subtotal (rounded)				$ 731,000
	Engineering (25%) and Soft Costs				$ 377,750
	Phase 2 Cost (rounded):				**$ 1,109,000**
	Project Total Cost (rounded):				**$ 5,896,000**

4.2 RECOMMENDED PUMP STATION IMPROVEMENTS

Additional pump station condition assessments were not included in the scope of this technical update. The main modification in the technical update was to remove the Dayton Pump Station Replacement project from the short-term improvements in the CIP as it has been completed since the 2018 WWMP. Upsizing the Fernwood Pump Station was included in the Springbrook Basin recommendations. Otherwise, pump station recommendations have not changed from the 2018 WWMP. Pump stations that are recommended to be displaced, do not have long-term condition improvements associated with them. Costs presented in the following tables are planning level estimates and are in 2021 dollars (updated from the 2018 WWMP using the ENR index). Actual costs may vary and should be refined further in the pre-design process. Engineering costs assume that multiple pump station projects will be grouped together for project administration efficiencies.

4.2.1 Priority 1 – Address Existing Deficiencies

Priority 1 pump station improvements address existing, short-term condition deficiencies that should be addressed in the next six years. Improvement costs are summarized by pump station in Table 4-12. Cost estimate details can be found in Appendix C. There are no recommended short-term improvements for the Andrew Pump Station.

TABLE 4-12: PUMP STATION SHORT-TERM IMPROVEMENTS COST ESTIMATE

Site	Recommended Improvements Cost
Charles Pump Station	$ 3,700
Chehalem Pump Station	$ 900
Creekside Pump Station	$ 16,600
Fernwood Pump Station	$ 15,900
HWY 240 Pump Station	$ 12,600
Sheridan Pump Station	$ 15,500
Pump Station Improvements Subtotal	*$ 66,000*
Contingency (30%)	*$ 19,800*
Engineering (35%)	*$ 30,100*
Administration (2%)	*$ 1,800*
Total Improvements Cost (rounded)	***$ 118,000***

4.2.2 Priority 2 – Address Future Deficiencies

The following table summarizes recommended, long-term Priority 2 improvements by pump station (Table 4-13). These recommended improvements assume that Andrew, Charles, Chehalem, and Creekside pump stations are displaced through other CIP projects (discussed above) and therefore no long-term improvements are necessary. The Dayton Pump Station has recently been replaced as noted previously, so it is assumed that the new pump station will not need long-term improvements. Cost estimate details can be found in Appendix C.

TABLE 4-13: PUMP STATION LONG-TERM IMPROVEMENTS COST ESTIMATE

Site	Recommended Improvements Cost
Fernwood Pump Station	$ 72,600
HWY 240 Pump Station	$ 46,900
Sheridan Pump Station	$ 138,100
Pump Station Improvements Subtotal	*$ 257,600*
Contingency (30%)	*$ 77,300*
Engineering (35%)	*$ 117,300*
Administration (2%)	*$ 6,700*
Total Improvements Cost (rounded)	***$ 459,000***

4.2.3 Future Infrastructure and Pump Station Displacement

Two new pump stations to service future growth are recommended within the planning period. They were discussed in conjunction with future pipelines above in Section 4.1.3. Recommended pump station displacement options were also discussed in Section 4.1.3.

CHAPTER 5 – CAPITAL IMPROVEMENT PLAN (CIP)

This section consists of the recommended capital improvement plan (CIP) to address the wastewater collection system deficiencies identified in previous chapters. A location map showing the improvements to the collection system is shown in Figure 7 (Appendix A).

5.1 BASIS FOR ESTIMATE OF PROBABLE COST

Capital costs developed for the recommended improvements are Class 5 estimates as defined by the Association for the Advancement of Cost Engineering (AACE) in alignment with the 2018 WWMP. Actual construction costs may differ from the estimates presented, depending on specific design requirements and the economic climate at the time a project is bid. An AACE Class 5 estimate is normally expected to be within -50 and +100 percent of the actual construction cost. As a result, the final project costs will vary from the estimated presented in this document. The range of accuracy for a Class 5 cost estimate is broad, but these are typical levels of accuracy for planning work and they apply to all alternatives so that the relative estimated costs of the alternatives are comparable and can be used for decision-making. It is important to communicate this level of accuracy to policy- and decision-makers. Costs shown are planning-level estimates and can vary depending on market conditions; they shall be updated as the project is further refined in the project development, pre-design, and design phases. Contractor's overhead and profit are worked into the base construction cost and the other indirect costs are identified and included, where required, as a specific line item. The CIP is based on modeling data that was available during the completion of this facilities plan. When projects are carried forward, the model, data, assumptions, etc., should be re-evaluated to make any necessary adjustments to the basis of the project. Individual project sheets for Priority 1 projects are included in Appendix D ([to be completed]). Each project sheet consists of a project objective, description, location map, and cost estimate.

5.2 SUMMARY OF PROBABLE COSTS

The summary of the Newberg collection system improvement costs is in Table 5-1 (Capital Improvement Plan (CIP)). These costs include all improvements described in Chapter 4, which include those modified with the technical update as well as those unmodified from the 2018 WWMP. As summarized previously, the primary projects with changes to their scope since the 2018 WWMP include Springbrook Road (1.c), short-term pump station improvements (1.e), E Crestview Drive (1.g, Crestview Crossing (1.h), S River and E Eleventh Streets (2.b), and Riverfront infrastructure (3.b and 3.c). The percent system development charge (SDC) eligibility for each project factored in the existing design flow, existing capacity, and capacity after the improvements are completed. The amount of capacity that can be utilized for future connections is divided by the future capacity. For projects that did not have an increase in flows, the percent SDC eligible is derived from the percent growth in population over the 20-year planning period (aligns with 2018 WWMP population projections).

TABLE 5-1: 20-YEAR CAPITAL IMPROVEMENT PLAN (CIP)

ID#	Item	Primary Purpose	Total Estimated Cost (2021)	SDC Growth Apportionment		City's Estimated Portion
				%	Cost	
Priority 1 Improvements						
1.a	Hess Creek Phase 1 - CIPP	Capacity & I/I reduction	$ 1,351,000	2%	$ 27,020	$ 1,323,980
1.b	Hess Creek Phase 2 - Parallel Gravity Main	Capacity	$ 7,460,000	2%	$ 149,200	$ 7,310,800
1.c	Springbrook Road	Capacity	$ 5,314,000	20%	$ 1,062,800	$ 4,251,200
1.d	E Pinehurst Court	Capacity	$ 318,000	0%	$ -	$ 318,000
1.e	Pump Station Improvements (Short-term)	Condition	$ 118,000	1%	$ 1,180	$ 116,820
1.f	I/I Projects	Capacity & Condition	$ 2,700,000	50%	$ 1,350,000	$ 1,350,000
1.g	E Crestview Drive Infrastructure	Future Development	$ 928,000	100%	$ 928,000	$ -
1.h	Crestview Crossing Infrastructure	Future Development	$ 1,414,000	100%	$ 1,414,000	$ -
1.i	Maintenance Yard Improvements	Capacity & Condition	$ 804,000	20%	$ 160,800	$ 643,200
		Priority 1 Total (rounded):	**$ 20,407,000**		**$ 5,093,000**	**$ 15,314,000**
Priority 2 Improvements						
2.a	Hess Creek Phase 3 - Pump Station	Capacity	$ 2,539,000	2%	$ 50,780	$ 2,488,220
2.b	S River and E Eleventh Streets	Capacity	$ 5,103,000	17%	$ 867,510	$ 4,235,490
2.c	HWY 240 Pump Station Upsize	Capacity	$ 642,000	19%	$ 121,980	$ 520,020
2.d	N Main and S Wynooski Streets	Capacity	$ 616,000	1%	$ 6,160	$ 609,840
2.e	Pump Station Improvements (Long-term)	Condition	$ 459,000	11%	$ 50,490	$ 408,510
2.f	I/I Projects	Capacity & Condition	$ 3,150,000	50%	$ 1,575,000	$ 1,575,000
2.g	Wastewater Master Plan	Planning	$ 300,000	100%	$ 300,000	$ -
		Priority 2 Total (rounded):	**$ 12,809,000**		**$ 2,972,000**	**$ 9,838,000**
Priority 3 Improvements						
3.a	NE Chehalem Drive Phase 1	Future Development	$ 2,217,000	100%	$ 2,217,000	$ -
3.b	Riverfront Infrastructure	Future Development	$ 4,787,000	100%	$ 4,787,000	$ -
3.c	Riverfront Industrial Infrastructure	Future Development	$ 1,154,000	100%	$ 1,154,000	$ -
3.d	Providence PS Infrastructure	Future Development	$ 1,734,000	100%	$ 1,734,000	$ -
3.e	NE Chehalem Drive Phase 2	Future Development	$ 990,000	100%	$ 990,000	$ -
3.f	I/I Projects	Capacity & Condition	$ 3,150,000	50%	$ 1,575,000	$ 1,575,000
		Priority 3 Total (rounded):	**$ 14,032,000**		**$ 12,457,000**	**$ 1,575,000**
Priority 4 Improvements						
4.a	Chehalem & Creekside PS Displacement/Future Trunk Line	Operations	$ 3,498,000	44%	$ 1,539,120	$ 1,958,880
4.b	Charles & Andrew PS Displacement	Operations	$ 1,109,000	44%	$ 487,960	$ 621,040
		Priority 4 Total (rounded):	**$ 4,607,000**		**$ 2,028,000**	**$ 2,580,000**
		Total Wastewater Collection System Improvement Costs (rounded):	**$ 51,855,000**		**$ 22,550,000**	**$ 29,307,000**

Notes:

1. The opinion of probable cost herein is concept level information only based on our perception of current conditions at the project location and its accuracy is subject to significant variation depending upon project definition and other factors. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. This cost opinion is in 2021 dollars and does not include escalation to time of actual construction. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.
2. All costs in 2021 Dollars. Costs include mobilization (5%), contractor overhead and profit (OHP; 15%), contingency (30%), engineering and construction management services (CMS; 20-35%), and legal, administrative, and permitting services (2%).
3. The Capital Improvement Plan does not include annual pipeline replacement, pipeline cleaning and inspection, and lift station maintenance budgets. These budgets are discussed in Section 5.4.

5.3 PROJECT SCHEDULE

An estimated schedule for Priority 1 improvements is shown in Table 5-2. Individual schedules for each project will be further refined at a later date by the City during the pre-design phase for each proposed improvement. Costs presented here are planning-level estimates. Actual costs may vary depending on market conditions and must be updated as projects are further refined in the project development, pre-design, and design phases.

TABLE 5-2: PRIORITY 1 CAPITAL IMPROVEMENT PLAN

ID#	Item	Total Estimated Cost (2021)	Opinion of Probable Costs (2021)					
			2022	2023	2024	2025	2026	2027
Priority 1 Improvements								
1.a	Hess Creek Phase 1 - CIPP	$ 1,351,000	$ 337,750	$ 1,013,250	$ -	$ -	$ -	$ -
1.b	Hess Creek Phase 2 - Parallel Gravity Main	$ 7,460,000	$1,865,000	$ 2,797,500	$2,797,500	$ -	$ -	$ -
1.c	Springbrook Road	$ 5,314,000	$ -	$ -	$ -	$1,328,500	$1,992,750	$1,992,750
1.d	E Pinehurst Court	$ 318,000	$ 318,000	$ -	$ -	$ -	$ 318,000	$ -
1.e	Pump Station Improvements (Short-term)	$ 118,000	$ -	$ -	$ -	$ 118,000	$ -	$ -
1.f	I/I Projects	$ 2,700,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000	$ 450,000
1.g	E Crestview Drive Infrastructure	$ 928,000	$ 232,000	$ 348,000	$ 348,000	$ -	$ -	$ -
1.h	Crestview Crossing Infrastructure	$ 1,414,000	$ 353,500	$ -	$ -	$ 353,500	$ 353,500	$ 353,500
1.i	Maintenance Shops Improvements	$ 804,000	$ -	$ -	$ 201,000	$ 201,000	$ 201,000	$ 201,000
	Priority 1 Total (rounded):	**$ 20,407,000**	**$3,557,000**	**$ 4,609,000**	**$3,797,000**	**$2,451,000**	**$3,316,000**	**$2,998,000**

Note: The opinion of probable cost herein is concept level information only based on our perception of current conditions at the project location and its accuracy is subject to significant variation depending upon project definition and other factors. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. This cost opinion is in 2021 dollars and does not include escalation to time of actual construction. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.

5.4 OTHER ANNUAL COSTS

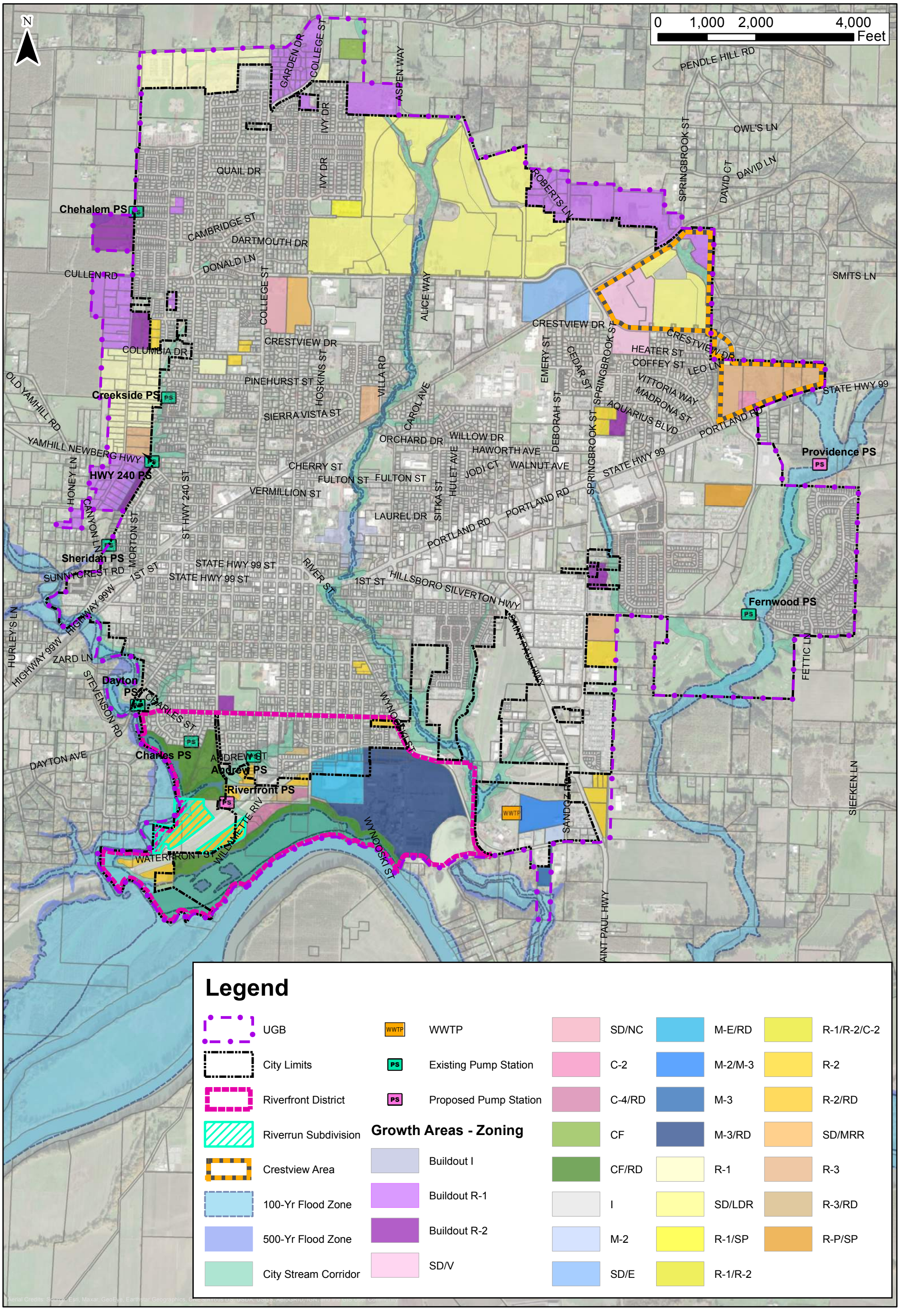
Additional evaluation of other annual costs was not included in the scope of the technical update. The section below summarizes recommendations from the 2018 WWMP. In addition to the capital improvement costs presented in Table 5-1, the following expected annual operating costs are recommended for consideration in setting annual budgets for the collection system:

- Additional collection system replacement/rehabilitation needs: Based on linear feet of pipeline, and number of manholes and cleanouts, the City should budget a total of $1,285,000/year for pipeline replacement/rehabilitation (to be either contracted out or completed using City crews). The City already budgets $450,000 for I/I related pipeline replacement/rehabilitation projects. This amount, combined with the other priority capital improvement projects, the City will be targeting enough manholes, pipelines, etc. to cover the recommended average annual amount.
- Pump station annual costs will go down as the City prepares to abandon four small pump stations and build one large and one medium pump station.
- Collection system cleaning and CCTV needs: City maintenance staff currently follow a five-year timeline to clean and CCTV inspect the entire system. No change is recommended to the current practice of cleaning and CCTV inspection.
- Annual O&M costs for the collection system may increase due to the increase in linear feet of pipeline. However, lowering the need to enter into the Hess creek area to service the Hess creek trunk line may amount to a net zero impact to O&M costs due to Priority 1 improvements.

Report Appendices

Appendix A

Figures



KELLER ASSOCIATES

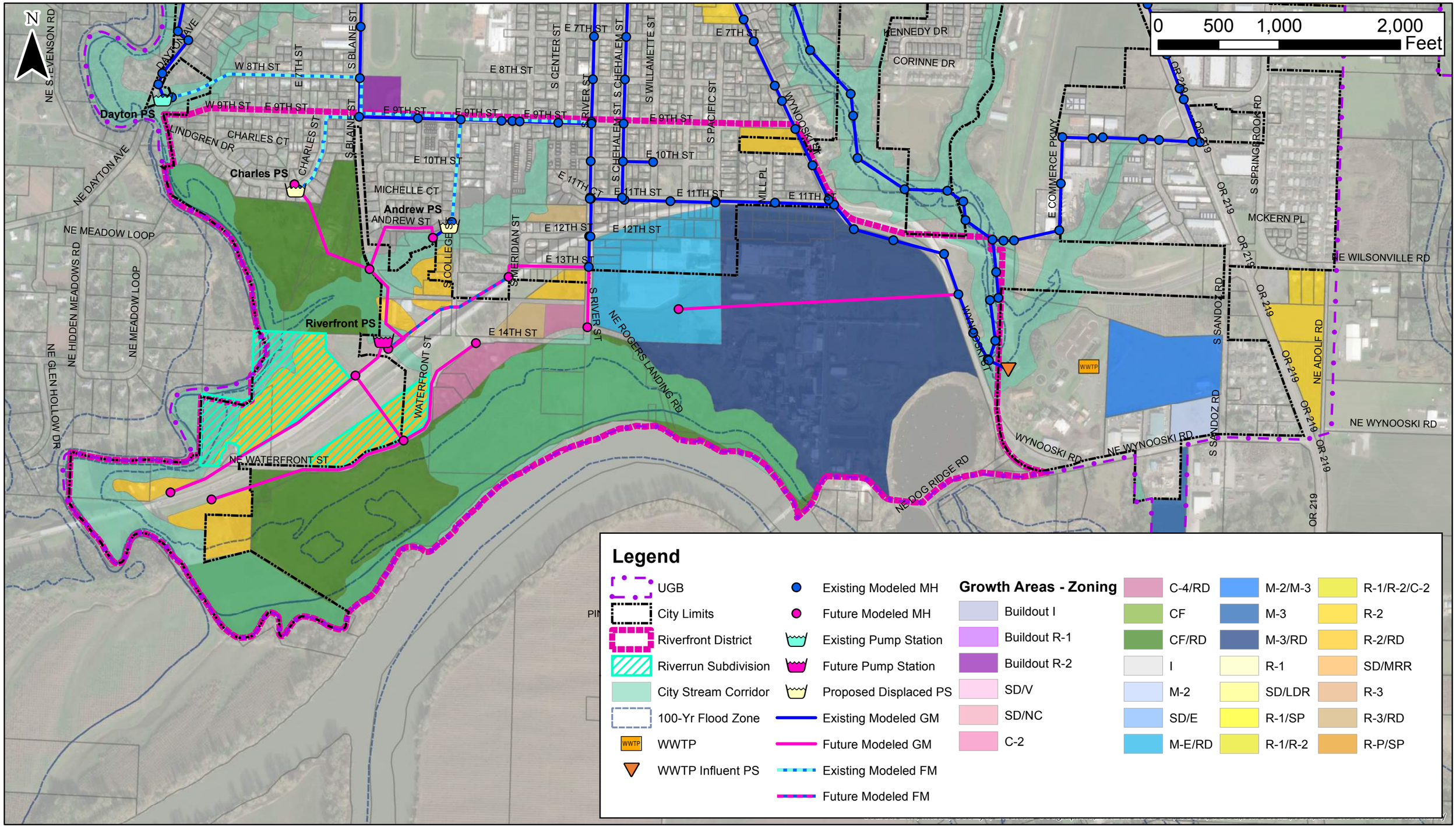
Study Area and Growth Areas

Wastewater Master Plan Update

City of Newberg OREGON

Figure 1

City of Newberg, OR



KELLER ASSOCIATES

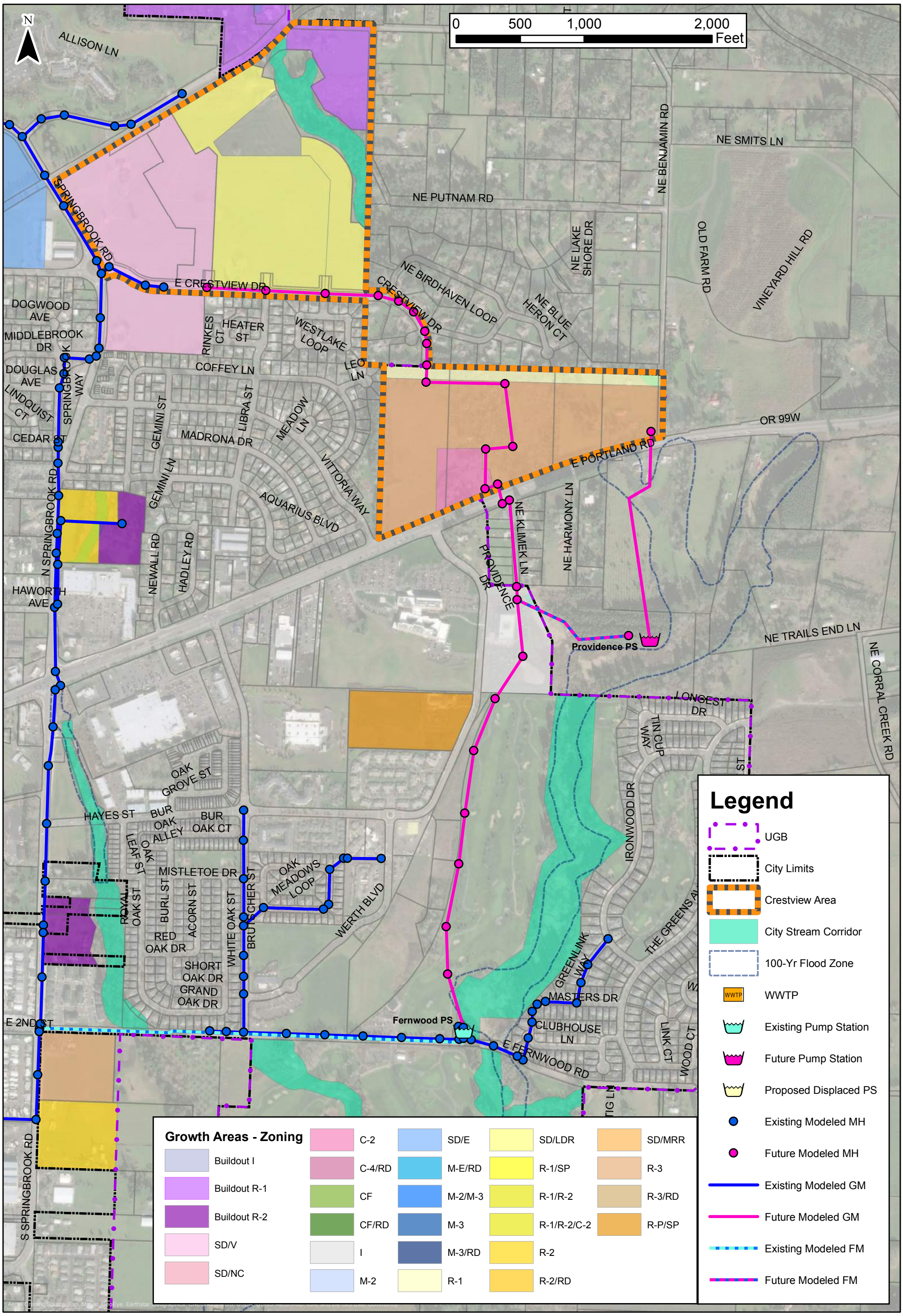
Riverfront and Riverrun Areas

Wastewater Master Plan Update

City of Newberg OREGON

Figure 2

City of Newberg, OR



KELLER ASSOCIATES

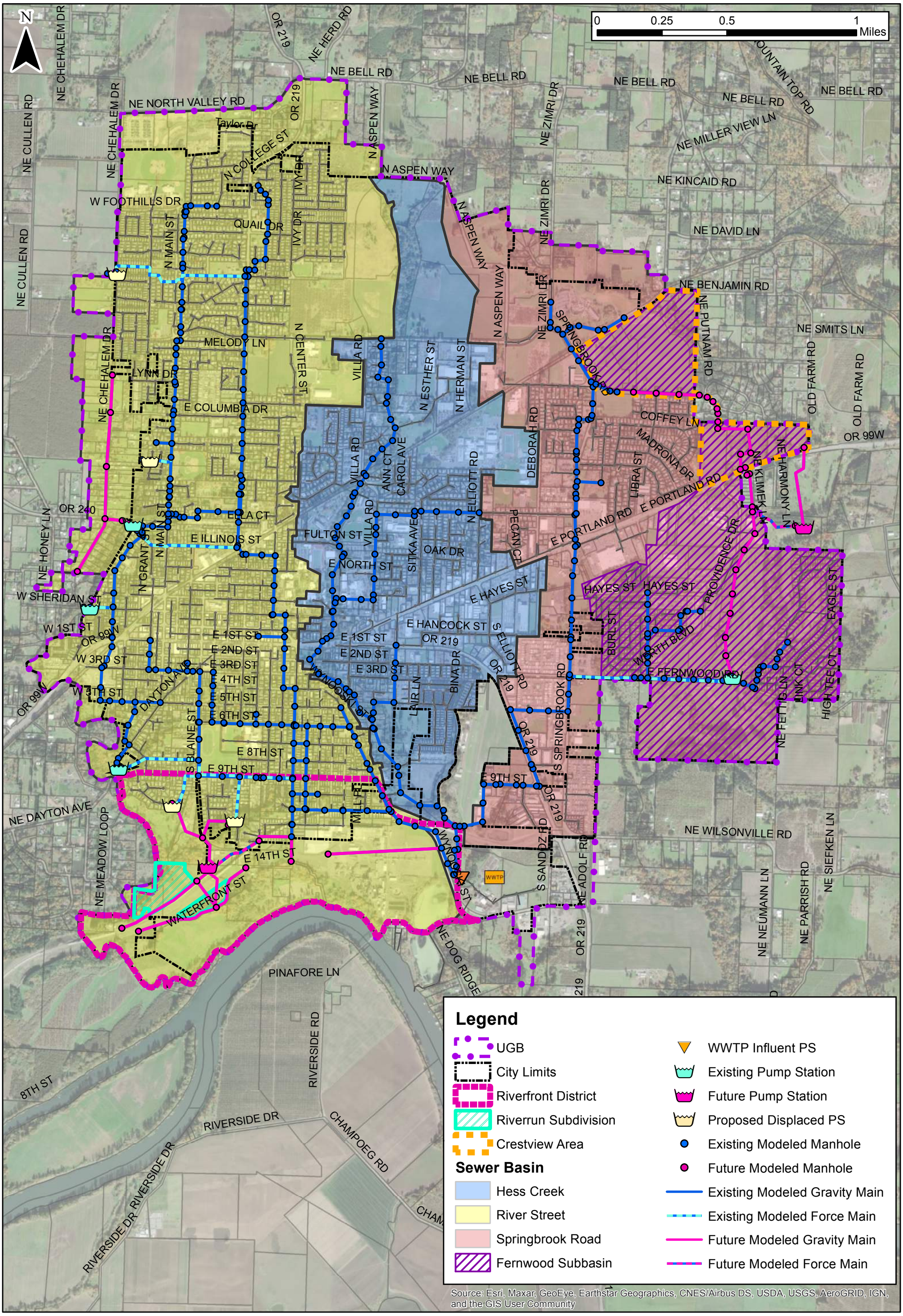
Crestview Area

Wastewater Master Plan Update

City of Newberg OREGON

Figure 3

City of Newberg, OR



KELLER ASSOCIATES

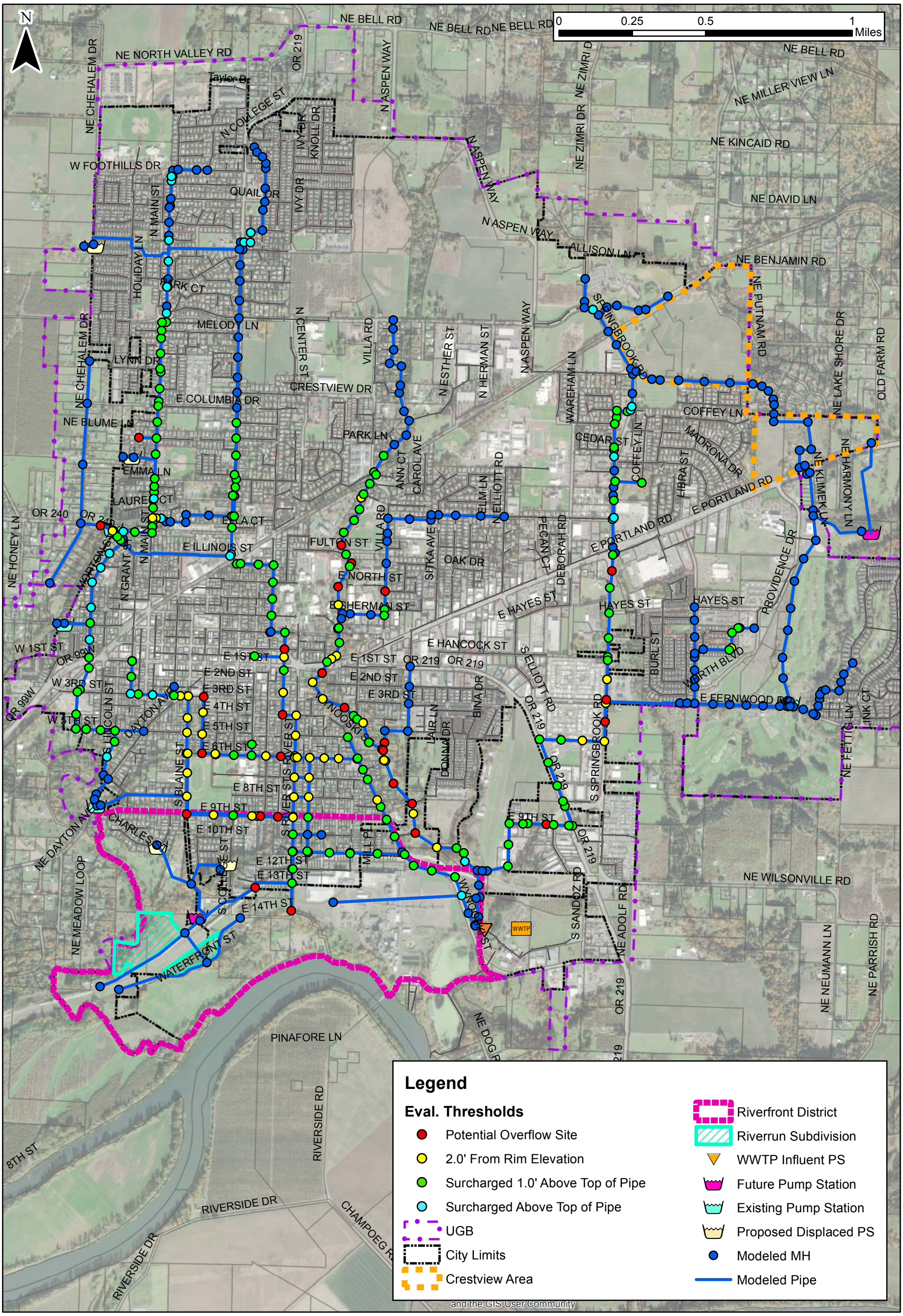
Modeled Facilities and Basins

Wastewater Master Plan Update

City of Newberg OREGON

Figure 4

City of Newberg, OR



KELLER ASSOCIATES

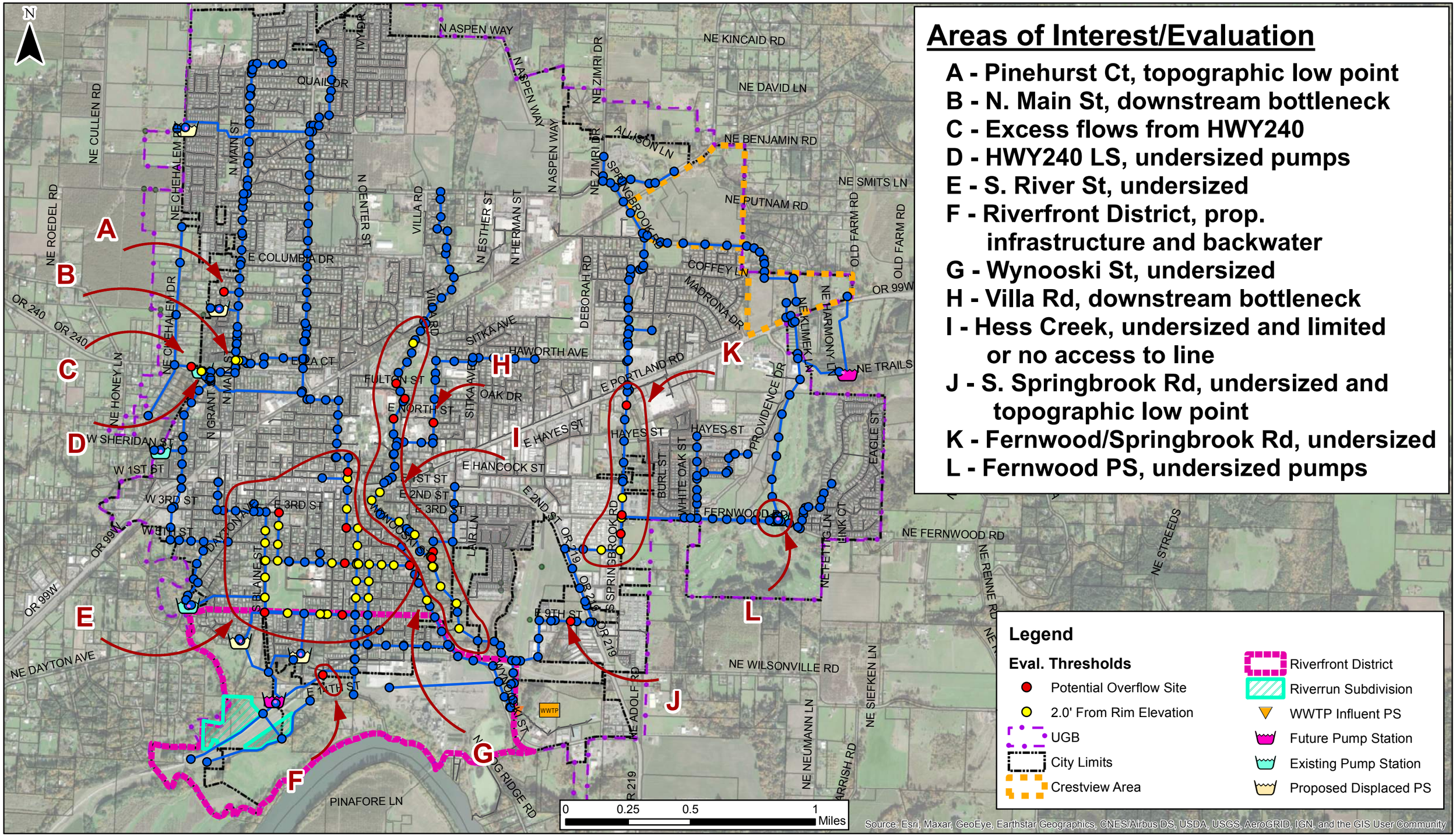
Updated System Evaluation

Wastewater Master Plan Update

City of Newberg OREGON

Figure 5

City of Newberg, OR



KELLER ASSOCIATES

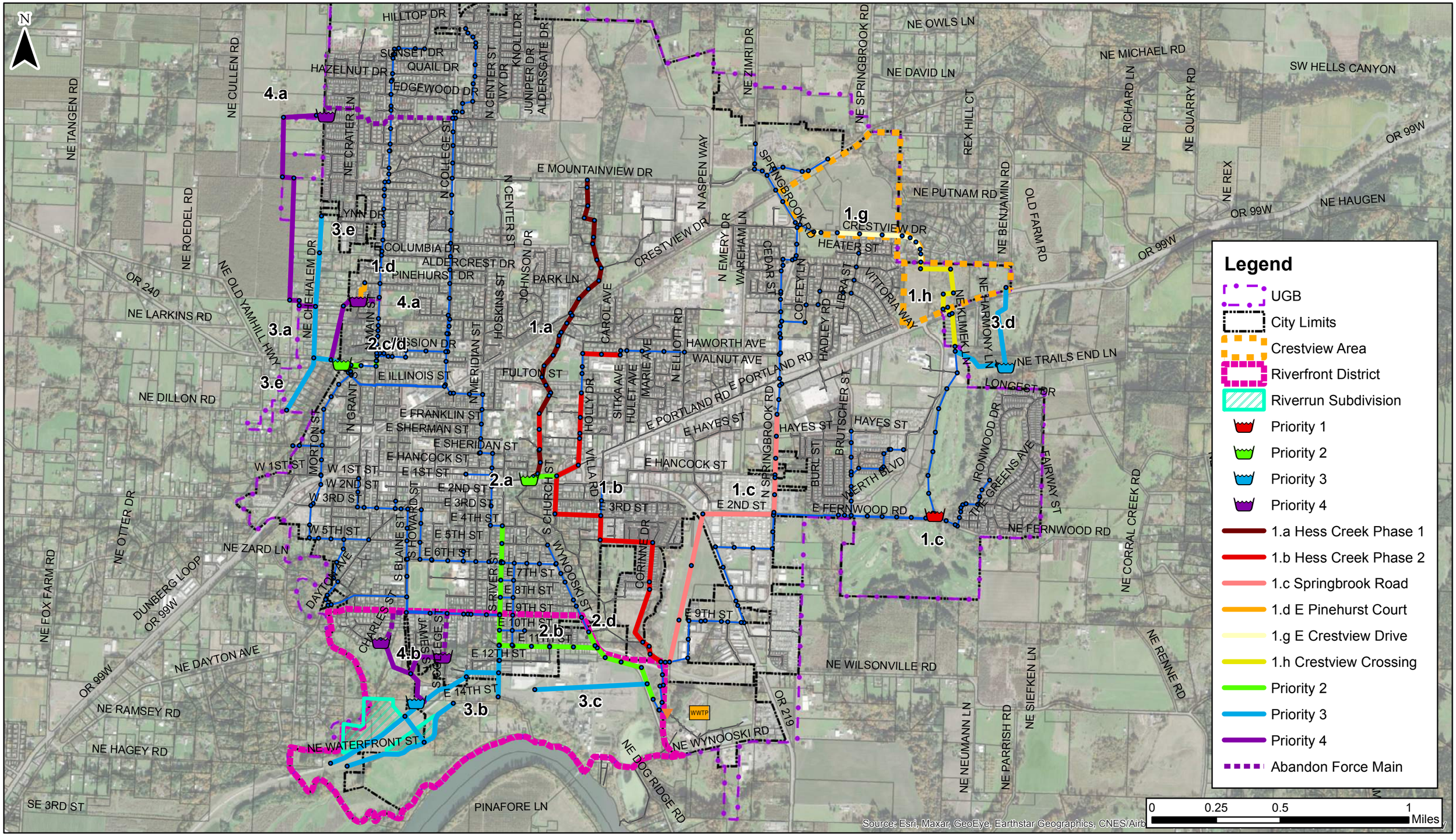
Updated System Evaluation - Annotated

Wastewater Master Plan Update

City of Newberg OREGON

Figure 6

City of Newberg, OR



Updated CIP

Wastewater Master Plan Update

KELLER ASSOCIATES

City of Newberg OREGON

Figure 7

City of Newberg, OR

Appendix B

Riverfront MP Excerpts

REGULATORY ACTIONS

Regulatory actions are an essential first step toward realizing the vision of the Riverfront Master Plan. Changing City regulations is also squarely within the City's authority, whereas other actions described later require the City to work with other public agencies or private entities to effect change.

Amend the Comprehensive Plan to Reflect the Intent of the Riverfront Master Plan

The City of Newberg's Comprehensive Plan is a set of policies and map of land use designations that guide growth and development within the Newberg Urban Growth Boundary (UGB). It includes several existing policies related to the Riverfront District, put into place by the 2002 Riverfront Master Plan, many of which need to be revised because they are out of date or inconsistent with the current vision for the area.

Updates include:

- Removing references to the "Smurfit Newsprint Processing Plant"
- Revising policies to more closely match the vision and goals of this plan
- Updating references to the Newberg-Dundee Bypass
- Amending the boundary of the Riverfront District classification to include the Riverfront Industrial Site and lands north of the Bypass.

Detailed changes to the Comprehensive Plan are provided in the Appendix F (TM6 - Comprehensive Plan Amendments).

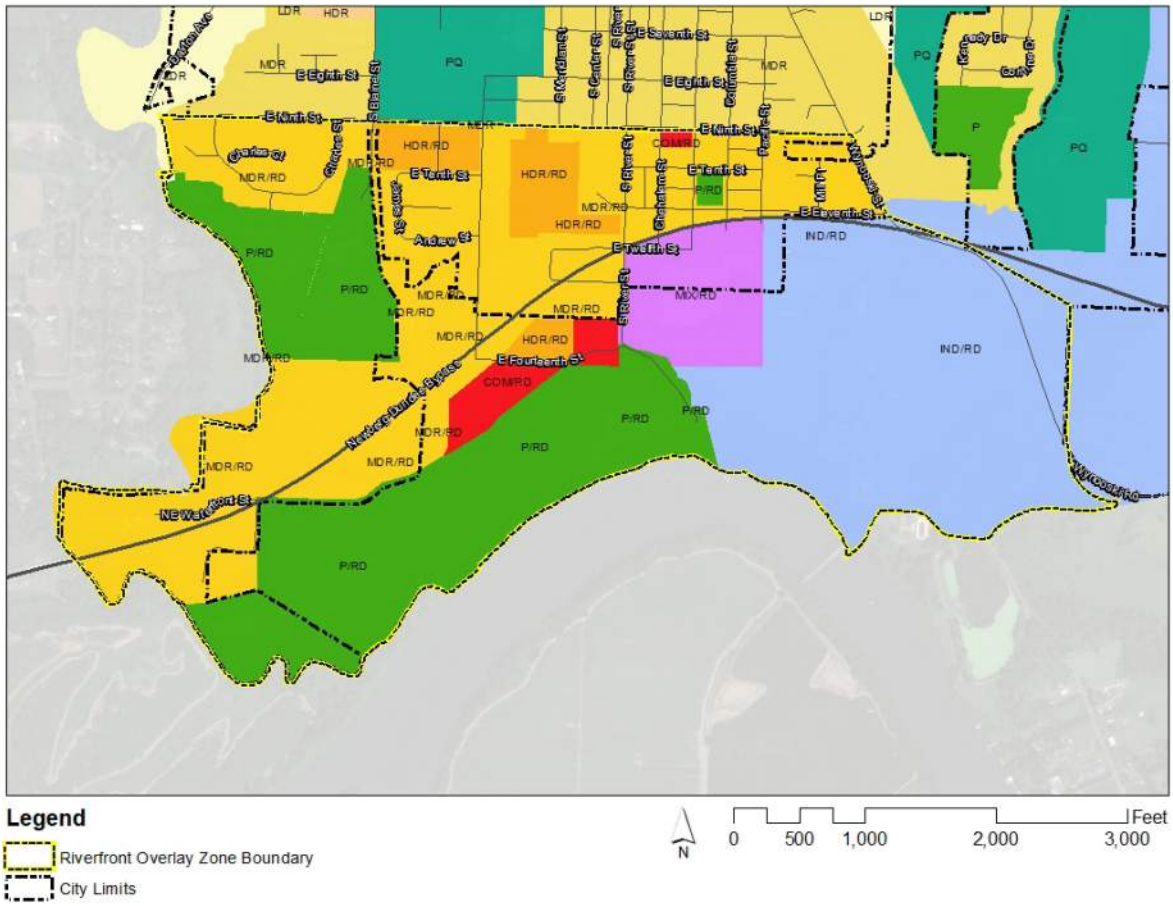


FIGURE 38. PROPOSED COMPREHENSIVE PLAN DESIGNATIONS

APPENDIX D

Technical Memorandum 4:

Infrastructure Needs

MEMORANDUM

DATE:	April 12, 2019
TO:	Andrew Parish, AICP Angelo Planning
FROM:	Jane Vail, P.E. Wallis Engineering
RE:	Infrastructure Needs for Newberg Riverfront Master Plan Update Job No. 1441A
EXHIBITS:	*Exhibit A – Existing Water System Map* *Exhibit B – Existing Wastewater System Map* *Exhibit C – Existing Storm Drainage Map* *Exhibit D – Recommended Water System Improvements* *Exhibit E – Wastewater System Sub-Basins* *Exhibit F – Recommended Wastewater System Improvements*

BACKGROUND

The City of Newberg's Riverfront Master Plan Update has included the creation and evaluation of several land use/transportation alternatives for the Riverfront Area. Through discussion with the project's advisory committees, stakeholders, and property owners in the Riverfront Area, the process has resulted in the selection of a preferred alternative, "Alternative E." This land use/transportation program includes a variety of uses in the study area, including single-family and multi-family residential developments, mixed-use nodes of activity, parks and passive open space, and employment uses.

This memorandum describes the existing utility infrastructure and previously-planned improvements to this infrastructure within the planning area. It also provides recommendations for improvements to the water, wastewater, and stormwater infrastructure as the area develops.

The current planning effort will update the 2002 Newberg Riverfront Master Plan. That previous plan made specific recommendations as to infrastructure improvements based on anticipated phasing and land use.

At the time of the 2002 Riverfront Master Plan, the riverfront industrial site (WestRock) was not included in the riverfront planning area, and the Newberg-Dundee Bypass was in the conceptual design phase - and at a different alignment than constructed. In other words, the 2002 Master Plan's recommended street and utility improvements were based on different conditions than the current existing conditions. However, from the perspective of total water demand and wastewater flow, there are few differences between the land uses shown in the 2002 Master Plan and Yamhill County zoning efforts and the preferred land use alternatives identified in the current planning effort. The overall water demand and projected wastewater flow values from past land use planning efforts are reflected in the City's 2017 Water Master Plan and 2018 Wastewater Master Plan. The recommendations made in these two utility master plans are still relevant to the current planning effort.

In the course of preparing this memorandum, the following planning documents were reviewed:

- 2002 Newberg Riverfront Master Plan
- 2002 City of Newberg Water Treatment Facilities Plan
- 2007 City of Newberg Wastewater Treatment Plant Facilities Plan Update
- 2007 City of Newberg Sewerage Master Plan Update
- 2014 City of Newberg Stormwater Master Plan Update
- 2015 Newberg Wastewater I&I Study
- 2016 City of Newberg Comprehensive Plan Text (Ordinance 1967)
- 2017 City of Newberg Water Master Plan
- 2018 City of Newberg Wastewater Master Plan
- 1996 Yamhill County Comprehensive Land Use Plan

EXISTING AND PLANNED UTILITY INFRASTRUCTURE

Existing utilities within the project area include wastewater, stormwater, potable water, and private utilities (electricity, natural gas, and telecommunications). Much of the project area is relatively underdeveloped, so utilities are limited in extent and size.

Water System

The existing water system is owned and operated by the City of Newberg. The study area is located within Zone 1, which is served by three reservoirs: the North Valley Reservoir Nos. 1 and 2 located on the north side of the City, and the Corral Creek Reservoir, located east of the City. These reservoirs are fed by transmission mains from the water treatment plant, which is located on the southeast corner of the study area. A well field south of the study area supplies a portion of the City's water, which is conveyed to their water treatment plant. A water transmission main conveys treated drinking water from the treatment plant north through the riverfront industrial site to the rest of the City.

The area north of the Bypass is served by an existing water distribution network, with distribution mains 2 to 8 inches in diameter. Several properties just south of the Bypass, including the riverfront industrial site, are also served by water main extensions from the distribution system north of the Bypass.

Non-potable water system elements were not reviewed as part of this memorandum effort. The City of Newberg has a re-use water system, which is currently confined to the City's Wastewater Treatment Plant. The riverfront industrial site property has water rights to water from the Willamette River, and this privately-owned non-potable water was used in the past

for mill operations. Additional details about this non-potable water system were not available.

A map of the existing potable water system within the project limits is included as *Exhibit A* on the following page.

No planned improvements to the water system within the planning area are described in the City's 2017 Water Master Plan. The 2002 Newberg Riverfront Master Plan proposed water distribution mains along the roads proposed and recommended for improvement by that planning effort.

Wastewater System

Existing wastewater infrastructure within the project limits is largely limited to the area north of the Bypass. The City of Newberg's wastewater treatment plant is located just east of the project study area.

The portion of the study area north of the Bypass is currently served by two lift stations (the Charles Lift Station and the Andrew Lift Station) and a network of gravity sewer mains and trunk lines, which ultimately convey wastewater west to the City's wastewater treatment plant. A small lift station also serves Rogers Landing, conveying wastewater to the gravity sewer system to the north. The riverfront industrial site is served by a single gravity sewer connection at the northwest corner of the site.

A map of the existing wastewater system within the project limits is included as *Exhibit B*.

The City's 2018 Wastewater Master Plan recommends improvements to the existing wastewater system within the planning area. The Wastewater Master Plan proposed abandoning the Charles Lift Station and Andrew Lift Station in the northeast portion of the study area, and replacing them with a single lift station (the Riverfront Lift Station) and a series of gravity mains (projects C4.b and C3.b in the Wastewater Master Plan). The Riverfront Lift Station would also serve a portion of the southeast portion of the study area with several gravity sewer extensions to the south and the east. The Wastewater Master Plan also recommended upsizing several gravity mains within the study area to convey future flows. No wastewater improvements are described for the eastern portion of the study area. The 2002 Riverfront Master Plan proposed some gravity mains along the roads proposed and recommended for improvement by that planning effort.

Stormwater System

The study area is drained by a system of natural drainages, open channels, and storm drain lines. Currently, the study area drains in three directions: west to Chehalem Creek, south to the Willamette River, and east to Hess Creek.

The southern portion of the site lies within the 100-year flood plain of the Willamette River, and Chehalem Creek.

Underground stormwater lines are few in number, and largely confined to the northern portion of the study area. A stormwater main bisects the study area, conveying stormwater from the drainage lines in the northern portion of the study area south to outfall at the Willamette River. This line was previously the wastewater outfall from the former wastewater treatment plant.

A map of the existing drainage and stormwater system within the project limits is included as *Exhibit C*.

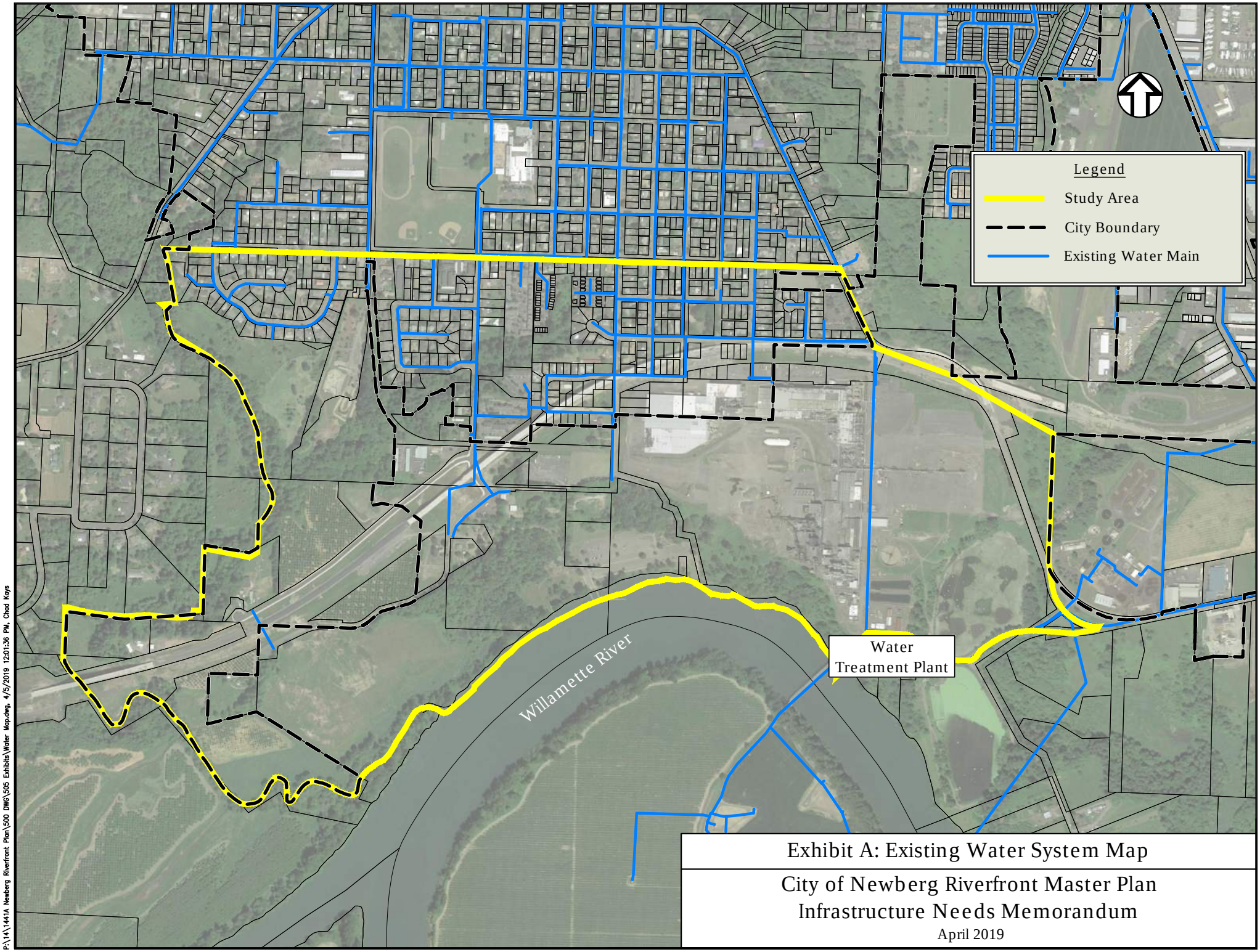


Exhibit A: Existing Water System Map

City of Newberg Riverfront Master Plan
Infrastructure Needs Memorandum
April 2019

P:\14\1441A Newberg Riverfront Plan\500 DWG\505 Exhibits\Water Map.dwg, 4/5/2019 12:01:36 PM, Chad Kays

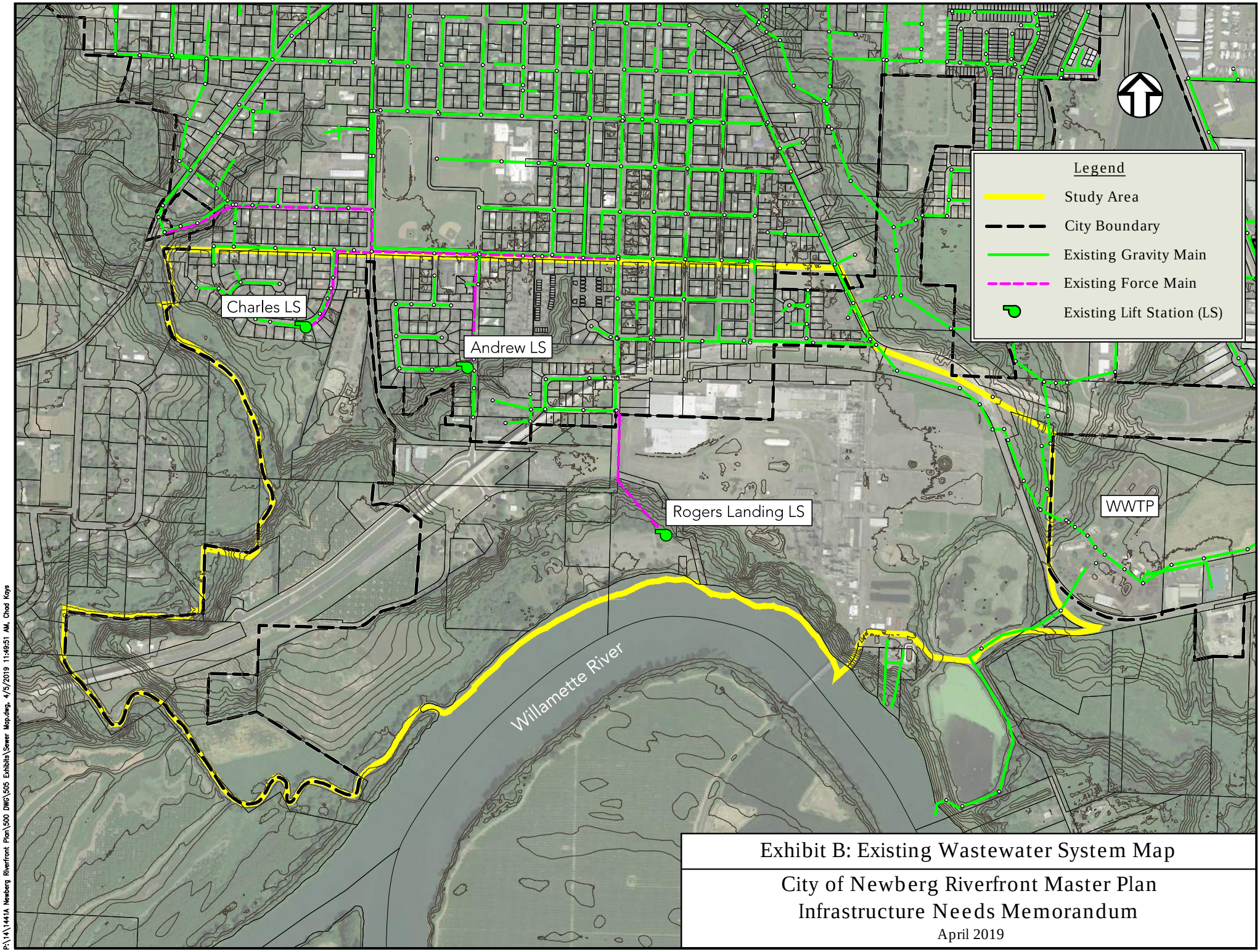


Exhibit B: Existing Wastewater System Map

City of Newberg Riverfront Master Plan
Infrastructure Needs Memorandum
April 2019

P:\14\1441A Newberg Riverfront Plan\500 DWG\505 Exhibits\Sewer Map.dwg, 4/5/2019 11:49:51 AM, Chad Koys

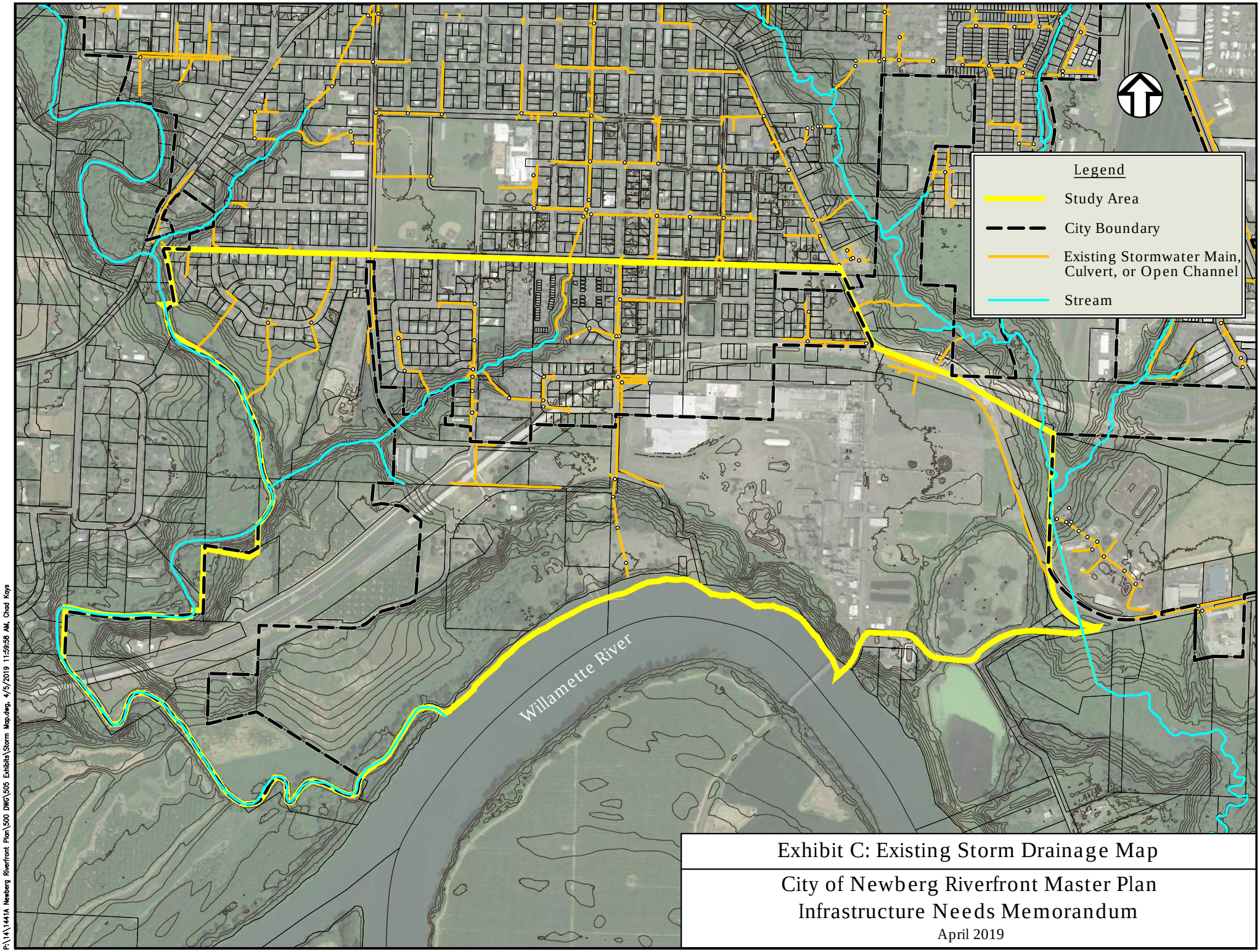


Exhibit C: Existing Storm Drainage Map

City of Newberg Riverfront Master Plan
Infrastructure Needs Memorandum
April 2019

P:\14\1441A Newberg Riverfront Plan\500 DWG\505 Exhibits\Storm Map.dwg, 4/5/2019 11:59:58 AM, Chad Koys

No improvements to the stormwater system within the planning area are currently included in the 2014 City of Newberg Stormwater Master Plan Update. The 2002 Riverfront Master Plan proposed stormwater lines along some of the roads proposed and recommended for improvement by that planning effort. It also proposed disposal of stormwater runoff into to the existing stormwater main outfalling to the Willamette River. The capacity of that existing stormwater main to accept additional flow was not discussed in the 2002 Plan.

Franchise Utilities

As part of this planning effort, the City of Newberg contacted privately-owned franchise utilities in order to generally ascertain the extent of their facilities within the planning area. These franchise utility companies currently provide electricity, gas, cable, and telephone services to customers within the planning area.

PGE provides electricity to Newberg, and has a substation on the riverfront industrial site. In contacting PGE, they were unaware of any known issues serving the area.

NW Natural provides natural gas within the planning area, though their mapped facilities appear to be largely located north of the Bypass. They do have a 12-inch high pressure gas line serving the riverfront industrial site. This line is also the primary feed for the City of Newberg.

Comcast and Frontier provide cable and telephone services within the planning area. Frontier has very little facilities within the planning area, and no facilities south of the Newberg-Dundee Bypass.

RECOMMENDED UTILITY INFRASTRUCTURE IMPROVEMENTS

Improvements to the existing water, wastewater, and stormwater infrastructure will be necessary in order to support the preferred land use alternative. Recommended improvements are described in the following paragraphs, organized according to the type of infrastructure. These recommendations are based on the City's standards, the City's GIS system, existing utility infrastructure plans, and engineering judgement. No water or wastewater modeling was completed as part of this planning effort.

It is important to note that recommendations are limited by the general nature of land use planning, and that further utility master planning will be necessary to confirm and elaborate on the recommendations made in this memorandum.

Water System

The area south of the Newberg-Dundee Bypass and a small area on the west side of the study area just north of the Bypass currently have no water distribution system. As this area develops, it will require an entirely new water distribution network. New water mains should be constructed within the footprint of proposed roadways. To serve new development south of the Bypass, a water distribution main can be extended west from the transmission main near the water treatment plant. This new water distribution main should extend to the western portion of the study area, and should connect to the existing water system to the north where possible to provide a fully looped system. To serve the north side of the Bypass, a water main could be extended from S College Street southwest along E Weatherly Way. This water main should also be connected to the water main serving the area south of the Bypass to provide a fully looped system.

The majority of the study area north of the Bypass is currently served by an existing water distribution network. The size of existing distribution mains are relatively small within this area, and will likely not provide sufficient fire flow for future connections as the area south of the Bypass develops. Some improvements will be necessary to the distribution system north of the Bypass in order to make distribution network connections to serve the planning area.

The minimum size of water distribution mains will be 8-inches, per City standards. Final sizing will require a more in depth analysis to ensure that minimum fire flow is maintained throughout the water system in accordance with City standards.

Recommended improvements to the existing potable water system are illustrated in *Exhibit D* on the following page and summarized in **Table 1** below.

Table 1 – Recommended Water Infrastructure Improvements

Description	Sub-basin	Minimum Size	Length
Water Main	B	8-Inch	8,200 ft

It should be noted that the developer of the riverfront industrial site has the capability of using the existing non-potable water system infrastructure, and water rights.

Wastewater System

The planning area currently lacks a complete wastewater system, and will require extensive sewer infrastructure improvements to serve new development. In order to determine these system improvements, the study area was broken into six sub-basins according to the existing collection system and topography. These sub-basins are shown in *Exhibit E*. The wastewater infrastructure necessary to serve these sub-basins is illustrated on *Exhibit F* and summarized in **Table 2** below.

Table 2 – Recommended Wastewater Infrastructure Improvements

Description	Sub-basin Served	Size/Capacity
Riverfront Lift Station	B	950 gpm[1]
Force Main B1	B	8-in[1], 1000 ft
Gravity Main B1	B	8-in, 2600 ft
Gravity Main B2	B	8-in, 1600 ft
Gravity Main B3	B	8-in, 3400 ft
Gravity Main B4	A, B, C, D	18-in[1], 1300 ft
Gravity Main C1	C	8-in, 500 ft
Gravity Main D1	D	10-in, 2400 ft

1. Capacity and size are from the City's 2018 Wastewater Master Plan

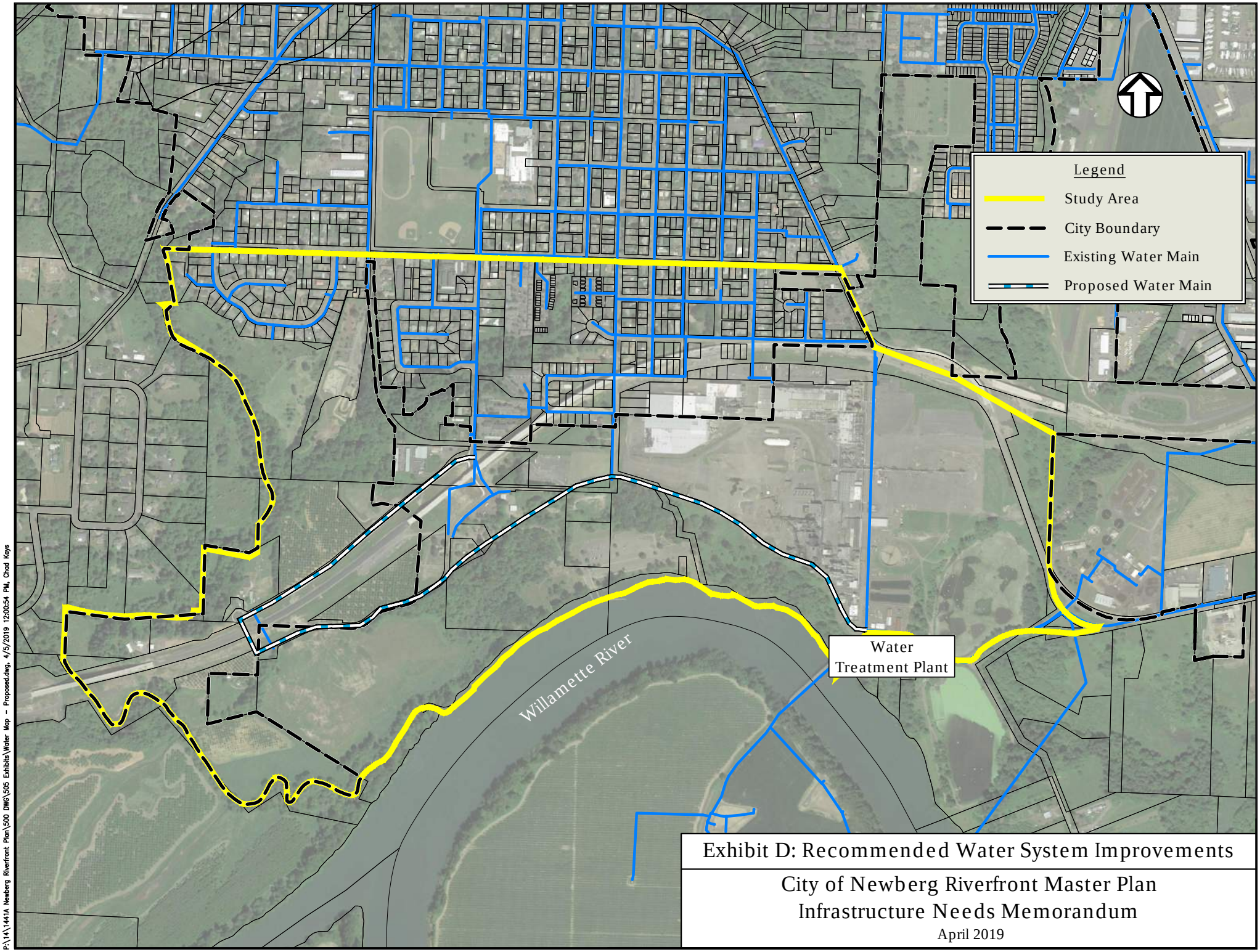


Exhibit D: Recommended Water System Improvements

City of Newberg Riverfront Master Plan
Infrastructure Needs Memorandum
April 2019

P:\14\1441A Newberg Riverfront Plan\500 DWG\505 Exhibits\Water Map - Proposed.dwg, 4/5/2019 12:00:54 PM, Chad Koys

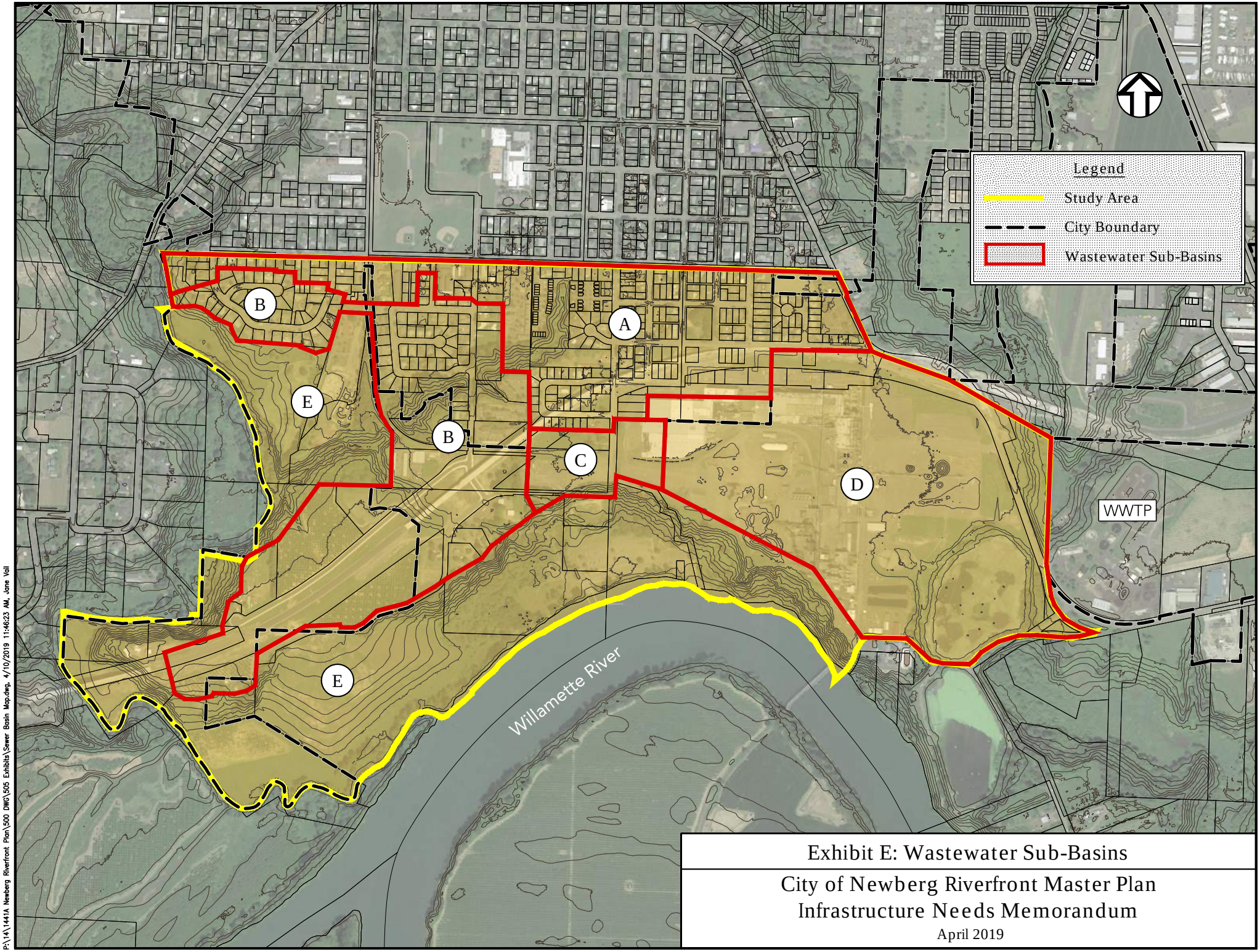


Exhibit E: Wastewater Sub-Basins

City of Newberg Riverfront Master Plan
Infrastructure Needs Memorandum
April 2019

P:\14\1441A Newberg Riverfront Plan\500 DWG\505 Exhibits\Sewer Basin Map.dwg, 4/10/2019 11:46:23 AM, Jane Vail

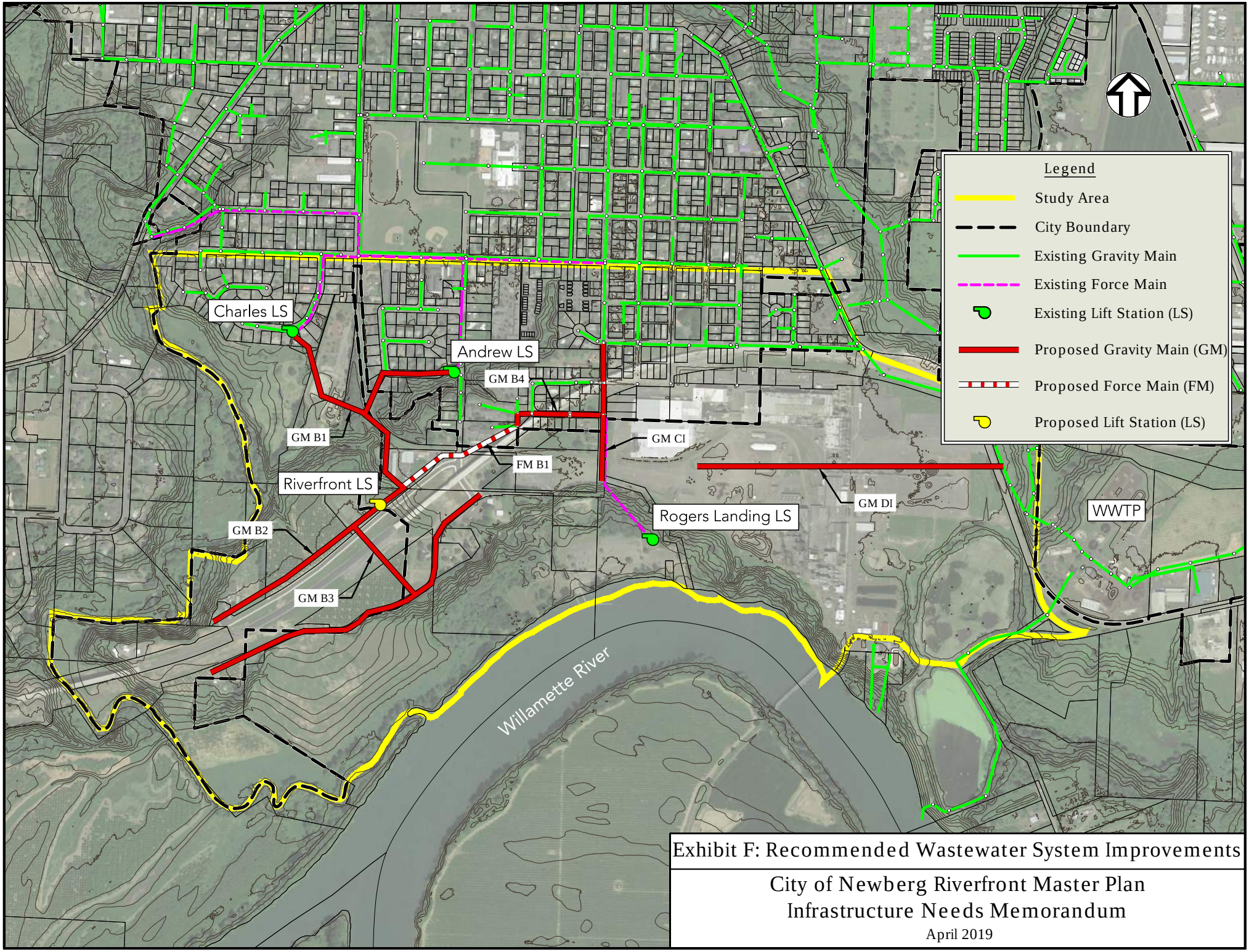


Exhibit F: Recommended Wastewater System Improvements

City of Newberg Riverfront Master Plan
Infrastructure Needs Memorandum
April 2019

P:\14\1441A Newberg Riverfront Plan\500 DWG\505 Exhibits\Sewer Map - Proposed.dwg, 4/5/2019 11:41:48 AM, Chad Koys

A detailed description of each sub-basin and the recommended improvement is described below.

Sub-Basin A. This sub-basin consists of the northern portion of the study area that is served by an existing network of gravity wastewater lines. Because this area is highly developed, and the proposed master plan does not significantly change land use, no new wastewater infrastructure is required beyond that recommended by the 2018 Wastewater Master Plan.

Sub-Basin B. This sub-basin consists of the western portion of the study area – currently served by the Charles Lift Station and Andrew Lift Station – and the additional area to be served by the proposed Riverfront Lift Station and associated collection system described in the Wastewater Master Plan. As discussed above, the Wastewater Master Plan recommended abandoning the Charles Lift Station and Andrew Lift Station. This will require upgrading the Riverfront Lift Station and force main, constructing several new gravity sewers, and upsizing one existing gravity sewer. No major changes are recommended to this proposed infrastructure, although minor adjustments to sewer alignments will be necessary to match proposed roads. This infrastructure is labeled as Gravity Main B1, B2, B3, and B4, and Force Main B1 on *Exhibit E*.

Sub-Basin C. This sub-basin consists of a mostly undeveloped land and a small portion of the riverfront industrial site in the vicinity of S River Street. Based upon the depth of the existing sewer in S. River Street (per City GIS), this area can be served by a gravity sewer extension, shown as Gravity Main C1 on *Exhibit E*.

Sub-Basin D. This area consists of the eastern portion of the riverfront industrial site. This sub-basin can be served by gravity lines flowing east into the existing trunk line on NE Wynooski Road, which currently conveys wastewater to the wastewater treatment plant. This line is labeled as Gravity Main D1 on *Exhibit E*.

Sub-Basin E. This sub-basin consists of the parks and open space within the study area, largely located within the flood plain and stream corridors. Rogers Landing is currently the only portion of this sub-basin with sewer service. Rogers Landing is served by a lift station, pumping wastewater to the collection system north of the Newberg-Dundee Bypass. Because most of this sub-basin lies within the flood plain, it is unlikely to see significant development. It has been suggested that the Rogers Landing area could be the future site of an amphitheater, as well as potential additional park improvements. Depending on the projected wastewater flows and the capacity of the existing lift station, improvements may be necessary to the lift station and potentially the force main. If new facilities are constructed outside of the Rogers Landing area, they will require new lift stations to convey flow to the collection system, because this sub-basin lies at a lower elevation than the rest of the City.

Final alignment and sizing of new sewer system infrastructure will be determined during final design of street infrastructure and development. Alignment and sizing will depend on the specific developments that are constructed, locations of roads, and exact depths of existing gravity lines.

Stormwater System

The existing stormwater system within the planning area consists of stormwater drainage collection and conveyance facilities north of the Bypass. All development will need to comply with the City's stormwater management requirements, as articulated in their Design Standards.

In accordance with these requirements, any development within the planning area will need to collect, treat, detain, convey, and dispose of the stormwater runoff generated by the development. This applies to public improvements that generate impervious surfaces – such as streets, sidewalks, and paths. It also applies to private developments, which construct roofs, streets, sidewalks, and parking lots.

Collection and conveyance of stormwater runoff will likely consist of a combination of underground structure and pipes, and low-impact development conveyance improvements, such as swales and flow-through planters. Treatment of stormwater runoff will likely consist of either mechanical or low-impact development treatment facilities. Detention of stormwater can take place using underground storage, ponds, and other methods. There is considerable flexibility as to the specific design of stormwater collection, conveyance, treatment, and detention facilities. A variety of factors will influence specific design solutions, such as site geography, available land surface, soil conditions, City preference, developer preference, construction cost, long-term maintenance costs, and aesthetics.

There may be some conveyance within the study area through underground stormwater pipes, which are often constructed within publicly-owned streets. Assuming the proposed and existing streets shown on the preferred alternative, we estimate a total of at least 12,000 linear feet of stormwater mains. This number does not account for the variation of street alignments that may occur as the City moves forward with planning and design, and does not include the construction of additional streets and associated storm conveyance.

Treated stormwater runoff is typically disposed of using infiltration into native soils or by conveyance into an adjacent stormwater facility or natural body of water. All methods of disposal have specific requirements and limitations. Disposal of stormwater runoff will depend on site-specific soil characteristics, the location of the site with respect to adjacent stormwater infrastructure, and the capacity of adjacent infrastructure.

Infiltration of treated stormwater runoff is often preferred over other methods because of its simplicity and relatively lower cost. However, native soils must be capable of infiltrating stormwater at or above a minimum rate for infiltration of runoff to be a viable disposal method. That capability can only be determined by onsite tests, and native soils can vary greatly in characteristics throughout an area.

According to the soils map included in the City's 2014 Stormwater Master Plan Update, native soils within the planning area are generally classified as having lower infiltration capability. This map is based on general information; the actual infiltration rates at specific locations within the planning area will vary. As each property develops, the developer will determine soil conditions and the viability of infiltration as a method of stormwater disposal. It should be noted that the Oregon Department of Environmental Quality requires registration of underground infiltration facilities such as drywells per their Underground Injection Control Program. It should also be noted that infiltration also requires consideration of existing groundwater levels and consideration of the environmental sensitivity of an area; infiltration of stormwater runoff into a floodplain or wetland is not typically acceptable.

If stormwater runoff cannot be disposed of by infiltration, it will need to be conveyed to another location, such as an adjacent stormwater pipe, pond, or infiltration facility. If an adjacent stormwater facility is available, the developer will need to demonstrate that it has capacity for disposing stormwater from the proposed development. If this adjacent stormwater facility is owned by other individuals or entities, rights to access, use, and maintenance will need to be negotiated between all parties.

Treated stormwater runoff can also be disposed of in an adjacent body of water. There are multiple stream corridors within the study area, including the Willamette River. It is important to note that disposal of stormwater runoff to these corridors may trigger additional permitting and engineering requirements according to the governing regulatory authorities. Disposal of stormwater runoff in these bodies of water should consider the hydraulic and erosion control implications of additional runoff, with the goal of protecting these existing stream corridors. They should also consider the characteristics of the treated runoff. The City's TDML Implementation Plan is the primary regulatory driver for stormwater management activities, and has specific parameters of concern for stormwater runoff, including bacteria, mercury, and water temperature. However, other regulatory authorities will have jurisdiction for disposal of treated stormwater runoff within stream corridors in the planning area. The developer will likely need to consult with an environmental permitting specialist in order to determine the specific regulatory requirements for their stormwater management improvements.

The construction of a regional stormwater facility for treatment, detention, and/or disposal may address many of the difficulties individual developers face with stormwater management. There are, however, very limited options for locating such a facility. Public ownership of land is limited within the project area to landfill property owned by Yamhill County to areas within the floodplain (such as Rogers Landing, leased by Yamhill County from the City and two private owners).

One area that might be considered for possible use as a regional stormwater facility are the existing lagoons at the southeast corner of the planning area, within the riverfront industrial site property. It could be feasible to repurpose these existing lagoons as stormwater detention ponds for treated stormwater runoff from the surrounding areas, with modifications to the existing outfall to allow controlled disposal of runoff to the Willamette River. These two lagoons currently hold water, and outfall to the Willamette River. In the past, the lagoons were used for disposal of paper mill process water; the degree of biological and/or chemical contamination, the dimensions, and the condition of the lagoons are relatively unknown.

Any use of these ponds for stormwater management will likely necessitate investigation of the condition of the lagoon basin floor for contaminants which might adversely affect the Willamette River. Depending on the degree of contamination and the requirements of regulatory authorities, cleanup might also be required. In addition, some agreement would need to be made for stormwater conveyance to the pond, pond use, access, and maintenance between the property owner, the City, and properties contributing stormwater.

Please note that we cannot recommend specific details as to proposed stormwater improvements. The sizing of stormwater facilities will depend entirely on development of each site, and how much onsite detention and/or infiltration is built.

Franchise Utilities

As part of this master planning effort, City staff spoke directly with franchise utilities within the planning area to elicit comments and concerns regarding the proposed plan.

When contacted for feedback, PGE noted that some industrial and commercial uses may have larger loads and require upgrades to their facilities. The extent of this work would be determined at the development phase. PGE was concerned that improvements protect their existing facilities in the area – particularly the substation on the riverfront industrial site.

In conversations with the City, NW Natural expressed concerns that their existing infrastructure is protected throughout future development, particularly the high pressure line serving Newberg (located on the riverfront industrial site).

Comcast had no concerns of note.

Frontier noted that they have minimal facilities within the planning area, and noted that with their current facilities they could serve around 200 new customers. Their facilities appear to be largely located north of the Bypass, so serving new customers south of the Bypass would require construction of new facilities – another 100 customers could be served with this work. Increasing service beyond that point would require more new facility construction and considerable expense on Frontier's part.

Appendix C

Cost Estimate Additional Information

Springbrook Road Improvements - Alternative 1 (E Crestview Drive directed east)

Item	Unit	Unit Price	Quantity	Cost
Parallel gravity main				
24-inch PVC gravity pipe	LF	$ 205	4,965	$ 1,017,825
Manhole 72-inch (>21-inch pipe)	EA	$ 16,500	17	$ 280,500
Highway boring	LF	$ 600	135	$ 81,000
Roadway restoration (full lane)	LF	$ 60	1,600	$ 96,000
Soil restoration	LF	$ 5	3,365	$ 16,825
Flow diversion structure	EA	$ 20,000	1	$ 20,000
Bypass pumping	LS	$ 50,000	1	$ 50,000
Upsize existing				
18-inch PVC gravity pipe	LF	$ 185	2,300	$ 425,500
Re-connect laterals	EA	$ 500	8	$ 4,000
Manhole 60-inch (18- to 21-inch pipe)	EA	$ 14,000	7	$ 98,000
Roadway restoration (full lane)	LF	$ 60	2,300	$ 138,000
Traffic Control (Highway)	LF	$ 10	2,300	$ 23,000
Control density backfill	LF	$ 165	2,300	$ 379,500
8-inch PVC gravity pipe	LF	$ 135	1,100	$ 148,500
Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	4	$ 48,000
Bypass pumping	LS	$ 50,000	1	$ 50,000
			Subtotal (rounded)	$ 2,877,000
Fernwood PS upsize				
Upsize pump station	LS	$202,000	1	$ 202,000
			Subtotal (rounded)	$ 202,000
Mobilization	%	5	-	$ 153,950
			Subtotal (rounded)	$ 3,233,000
Contingency	%	30	-	$ 969,900
			Subtotal (rounded)	$ 4,203,000
Engineering and CMS	%	25	-	$ 1,050,750
Easement	AC	$ 30,000	2.0	$ 60,000
			Project Total Cost (rounded):	**$ 5,314,000**

Springbrook Road Improvements - Alternative 2 (E Crestview Drive directed west)

Item	Unit	Unit Price	Quantity	Cost
Parallel gravity main				
24-inch PVC gravity pipe	LF	$ 205	4,965	$ 1,017,825
Manhole 72-inch (>21-inch pipe)	EA	$ 16,500	17	$ 280,500
Highway boring	LF	$ 600	135	$ 81,000
Roadway restoration (full lane)	LF	$ 60	1,600	$ 96,000
Soil restoration	LF	$ 5	3,365	$ 16,825
Flow diversion structure	EA	$ 20,000	1	$ 20,000
Upsize existing				
21-inch PVC gravity pipe	LF	$ 195	2,300	$ 448,500
Re-connect laterals	EA	$ 500	8	$ 4,000
Manhole 60-inch (18- to 21-inch pipe)	EA	$ 14,000	7	$ 98,000
Roadway restoration (full lane)	LF	$ 60	2,300	$ 138,000
Traffic Control (Highway)	LF	$ 10	2,300	$ 23,000
Control density backfill	LF	$ 165	2,300	$ 379,500
			Subtotal (rounded)	$ 2,604,000
Aquarius subdivision				
15-inch PVC gravity pipe	LF	$ 170	4,400	$ 748,000
Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	15	$ 180,000
Re-connect laterals	EA	$ 500	90	$ 45,000
Roadway restoration (full lane)	LF	$ 60	4,400	$ 264,000
			Subtotal (rounded)	$ 1,237,000
Mobilization	%	5	-	$ 192,050
			Subtotal (rounded)	$ 4,034,000
Contingency	%	30	-	$ 1,210,200
			Subtotal (rounded)	$ 5,245,000
Engineering and CMS	%	25	-	$ 1,311,250
Easement	AC	$ 30,000	2.0	$ 60,000
			Project Total Cost (rounded):	**$ 6,617,000**

Hess Creek Improvements (all phases)

	Item	Unit	Unit Price	Quantity	Cost
Phase 1					
	CIPP, 8 to 18-inch[1]	LF	$ 145	6,800	$ 986,000
	Flow monitoring	LS	$ 30,000	1	$ 30,000
				Subtotal (rounded)	$ 1,016,000
	Mobilization	%	5	-	$ 50,800
				Subtotal (rounded)	$ 1,067,000
	Contingency	%	10	-	$ 106,700
				Subtotal (rounded)	$ 1,174,000
	Engineering and CMS	%	15	-	$ 176,100
				Phase 1 Cost (rounded):	**$ 1,351,000**
	[1]Additional 30% added to unit price for Hess Creek accessibility constraints				
Phase 2					
	Parallel gravity main				
	27-inch PVC gravity pipe	LF	$ 220	4,700	$ 1,034,000
	24-inch PVC gravity pipe	LF	$ 205	900	$ 184,500
	15-inch PVC gravity pipe	LF	$ 170	1,200	$ 204,000
	12-inch PVC gravity pipe	LF	$ 160	1,900	$ 304,000
	Re-grading pipe	LF	$ 135	2,400	$ 324,000
	Re-connect laterals	EA	$ 500	200	$ 100,000
	Roadway restoration	LF	$ 30	9,800	$ 294,000
	Install access road	LF	$ 60	1,300	$ 78,000
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	8	$ 96,000
	Manhole 72-inch (>21-inch pipe)	EA	$ 16,500	18	$ 297,000
	Existing pipe rehab/replacement				
	36-inch PVC gravity pipe	LF	$ 245	700	$ 171,500
	18-inch PVC gravity pipe	LF	$ 185	900	$ 166,500
	Manhole 60-inch (18- to 21-inch pipe)	EA	$ 14,000	3	$ 42,000
	Manhole 72-inch (>21-inch pipe)	EA	$ 16,500	4	$ 66,000
	Install access road	LF	$ 60	1,600	$ 96,000
	Soil restoration	LF	$ 5	1,600	$ 8,000
	Hess Creek constructability	%	150	-	$ 825,000
	Bypass pumping	LS	$ 60,000	1	$ 60,000
				Subtotal (rounded)	$ 4,351,000
	Mobilization	%	5	-	$ 217,550
				Subtotal (rounded)	$ 4,569,000
	Contingency	%	30	-	$ 1,370,700
				Subtotal (rounded)	$ 5,940,000
	Engineering and CMS	%	25	-	$ 1,485,000
	Floodplain hydraulic study	LS	$ 20,000	1	$ 20,000
	Permitting	LS	$ 15,000	1	$ 15,000
				Phase 2 Cost (rounded):	**$ 7,460,000**
Phase 3					
	Pump Station, 2700-gpm	EA	$ 1,200,000	1	$ 1,200,000
	12-inch force main	LF	$ 90	700	$ 63,000
	Highway Boring	LF	$ 600	160	$ 96,000
	Local grinder pump	EA	$ 9,500	1	$ 9,500
				Subtotal (rounded)	$ 1,369,000
	Mobilization	%	5	-	$ 68,450
				Subtotal (rounded)	$ 1,438,000
	Contingency	%	30	-	$ 431,400
				Subtotal (rounded)	$ 1,870,000
	Engineering and CMS	%	25	-	$ 467,500
	Easement	AC	$ 30,000	1.20	$ 36,000
	Permitting & wetland mitigation	LS	$ 165,000	1	$ 165,000
				Phase 3 Cost (rounded):	**$ 2,539,000**
				Project Total Cost (rounded):	**$ 11,350,000**

S River St and E Eleventh St Improvements

Item	Unit	Unit Price	Quantity	Cost
42-inch PVC gravity pipe	LF	$ 275	4,700	$ 1,292,500
36-inch PVC gravity pipe	LF	$ 245	1,900	$ 465,500
30-inch PVC gravity pipe	LF	$ 230	900	$ 207,000
Re-connect laterals	EA	$ 500	75	$ 37,500
Manhole 72-inch (>21-inch pipe)	EA	$ 16,500	23	$ 379,500
Highway boring	LF	$ 600	150	$ 90,000
Roadway restoration (full lane)	LF	$ 60	7,500	$ 450,000
Bypass pumping	LS	$ 50,000	1	$ 50,000
			Subtotal (rounded)	$ 2,972,000
Mobilization	%	5	-	$ 148,600
			Subtotal (rounded)	$ 3,121,000
Contingency	%	30	-	$ 936,300
			Subtotal (rounded)	$ 4,058,000
Engineering and CMS	%	25	-	$ 1,014,500
Flow monitoring	LS	$ 30,000	1	$ 30,000
			Project Total Cost (rounded):	**$ 5,103,000**

E Pinehurst Court

Item	Unit	Unit Price	Quantity	Cost
E Pinehurst Court				
Cap and abandon line	EA	$ 1,500	1	$ 1,500
8-inch PVC gravity pipe	LF	$ 135	300	$ 40,500
Re-grading pipe	LF	$ 135	400	$ 54,000
Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	2	$ 24,000
Re-connect laterals	EA	$ 500	9	$ 4,500
Re-connect manholes	EA	$ 1,500	4	$ 6,000
Roadway restoration (full lane)	LF	$ 60	440	$ 26,400
Landscape restoration	LF	$ 20	260	$ 5,200
Bypass pumping	LS	$ 20,000	1	$ 20,000
			Subtotal (rounded)	$ 183,000
Mobilization	%	5	-	$ 9,150
			Subtotal (rounded)	$ 193,000
Contingency	%	30	-	$ 57,900
			Subtotal (rounded)	$ 251,000
Engineering and CMS	%	25	-	$ 62,750
Easement	AC	$ 30,000	0.12	$ 3,600
			Project Total Cost (rounded):	**$ 318,000**

N Main Street and S Wynooksi Street

Item	Unit	Unit Price	Quantity	Cost
N Main Street Improvements				
15-inch PVC gravity pipe	LF	$ 170	500	$ 85,000
Re-connect laterals	EA	$ 500	10	$ 5,000
Manhole 60-inch (18- to 21-inch pipe)	EA	$ 14,000	5	$ 70,000
Roadway restoration (full lane)	LF	$ 60	350	$ 21,000
Landscape restoration	LF	$ 20	150	$ 3,000
Bypass pumping	LS	$ 40,000	1	$ 40,000
			Subtotal (rounded)	$ 224,000
Item	**Unit**	**Unit Price**	**Quantity**	**Cost**
S Wynooski Street Improvements				
15-inch PVC gravity pipe	LF	$ 170	350	$ 59,500
Re-connect laterals	EA	$ 500	2	$ 1,000
Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	1	$ 12,000
Re-connect manholes	EA	$ 1,500	1	$ 1,500
Roadway restoration (full lane)	LF	$ 60	350	$ 21,000
Bypass pumping	LS	$ 40,000	1	$ 40,000
			Subtotal (rounded)	$ 135,000
Mobilization	%	5	-	$ 17,950
			Subtotal (rounded)	$ 377,000
Contingency	%	30	-	$ 113,100
			Subtotal (rounded)	$ 491,000
Engineering and CMS	%	25	-	$ 122,750
			Project Total Cost (rounded):	**$ 614,000**

E Crestview Drive, Crestview Crossing

	Item	Unit	Unit Price	Quantity	Cost
	E Crestview Drive				
	8-inch PVC gravity pipe	LF	$ 135	2,500	$ 337,500
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	9	$ 108,000
	Roadway restoration	LF	$ 30	2,500	$ 75,000
				Subtotal (rounded)	$ 521,000
	Mobilization	%	5	-	$ 26,050
				Subtotal (rounded)	$ 548,000
	Contingency	%	30	-	$ 164,400
				Subtotal (rounded)	$ 713,000
	Engineering and CMS	%	25	-	$ 178,250
	Easement	AC	$ 30,000	1.20	$ 36,000
				E Crestview Drive Cost (rounded):	**$ 928,000**
	Crestview Crossing				
	10-inch PVC gravity pipe	LF	$ 150	3,200	$ 480,000
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	11	$ 132,000
	Highway boring	LF	$ 600	160	$ 96,000
	Roadway restoration	LF	$ 30	3,100	$ 93,000
				Subtotal (rounded)	$ 801,000
	Mobilization	%	5	-	$ 40,050
				Subtotal (rounded)	$ 842,000
	Contingency	%	30	-	$ 252,600
				Subtotal (rounded)	$ 1,095,000
	Engineering and CMS	%	25	-	$ 273,750
	Easement	AC	$ 30,000	1.50	$ 45,000
				Crestview Crossing Cost (rounded):	**$ 1,414,000**

Providence PS Infrastructure

	Item	Unit	Unit Price	Quantity	Cost
	Providence PS				
	8-inch PVC gravity pipe	LF	$ 135	2,000	$ 270,000
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	7	$ 84,000
	Highway boring	LF	$ 600	160	$ 96,000
	Roadway restoration	LF	$ 30	1,900	$ 57,000
	Pump station, 150 gpm	EA	$ 400,000	1	$ 400,000
	6-inch force main	LF	$ 60	1,300	$ 78,000
				Subtotal (rounded)	$ 985,000
	Mobilization	%	5	-	$ 49,250
				Subtotal (rounded)	$ 1,035,000
	Contingency	%	30	-	$ 310,500
				Subtotal (rounded)	$ 1,346,000
	Engineering and CMS	%	25	-	$ 336,500
	Easement	AC	$ 30,000	1.70	$ 51,000
				Providence PS Cost (rounded):	**$ 1,734,000**

NE Chehalem Drive

	Item	Unit	Unit Price	Quantity	Cost
Phase 1					
	NE Chehalem Drive Infrastructure	LS	-	1	$ 1,683,000
				Subtotal (rounded)	$ 1,683,000
	Contingency	%	10	-	$ 169,000
				Subtotal (rounded)	$ 1,852,000
	Engineering and CMS	LS	-	1	$ 365,000
				Phase 1 Cost (rounded):	**$ 2,217,000**
Phase 2					
	12-inch PVC gravity pipe	LF	$ 160	1,400	$ 224,000
	8-inch PVC gravity pipe	LF	$ 135	900	$ 121,500
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	8	$ 96,000
	Roadway restoration (full lane)	LF	$ 60	2,300	$ 138,000
				Subtotal (rounded)	$ 580,000
	Mobilization	%	5	-	$ 29,000
				Subtotal (rounded)	$ 609,000
	Contingency	%	30	-	$ 182,700
				Subtotal (rounded)	$ 792,000
	Engineering and CMS	%	25	-	$ 198,000
				Phase 2 Cost (rounded):	**$ 990,000**
Phase 3 (Chehalem and Creekside PS displacement)					
	15-inch PVC gravity pipe	LF	$ 170	400	$ 68,000
	12-inch PVC gravity pipe	LF	$ 160	5,700	$ 912,000
	8-inch PVC gravity pipe	LF	$ 135	1,500	$ 202,500
	Bore (creek crossing)	LF	$ 600	100	$ 60,000
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	26	$ 312,000
	Roadway restoration (full lane)	LF	$ 60	700	$ 42,000
	Soil restoration	LF	$ 5	6,900	$ 34,500
	Rock Allowance	LS	$ 300,000	1	$ 300,000
	Pump station demolition/removal (including building)	LS	$ 22,000	1	$ 22,000
	Pump station demolition/removal (no building)	LS	$ 11,000	1	$ 11,000
				Subtotal (rounded)	$ 1,964,000
	Mobilization	%	5	-	$ 98,200
				Subtotal (rounded)	$ 2,063,000
	Contingency	%	30	-	$ 618,900
				Subtotal (rounded)	$ 2,682,000
	Engineering and CMS	%	25	-	$ 670,500
	Environmental Permitting and Mitigation	LS	$ 50,000	1	$ 50,000
	Easement	AC	$ 30,000	3.17	$ 95,100
				Phase 3 Cost (rounded):	**$ 3,498,000**
				Project Total Cost (rounded):	**$ 6,705,000**

Riverfront PS and Improvements

	Item	Unit	Unit Price	Quantity	Cost
Phase 1					
	18-inch PVC gravity pipe	LF	$ 185	1,500	$ 277,500
	8-inch PVC gravity pipe	LF	$ 135	6,800	$ 918,000
	Re-connect laterals	EA	$ 500	15	$ 7,500
	Manhole 60-inch (18- to 21-inch pipe)	EA	$ 14,000	5	$ 70,000
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	23	$ 276,000
	Roadway restoration (full lane)	LF	$ 60	8,300	$ 498,000
	Pump station, 550 gpm	EA	$ 600,000	1	$ 600,000
	8-inch force main	LF	$ 70	1,300	$ 91,000
				Subtotal (rounded)	$ 2,738,000
	Mobilization	%	5	-	$ 136,900
				Subtotal (rounded)	$ 2,875,000
	Contingency	%	30	-	$ 862,500
				Subtotal (rounded)	$ 3,738,000
	Engineering and CMS	%	25	-	$ 934,500
	Easement	AC	$ 30,000	3.81	$ 114,400
				Phase 1 Cost (rounded):	**$ 4,787,000**
Riverfront Industrial Line					
	10-inch PVC gravity pipe	LF	$ 150	2,600	$ 390,000
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	9	$ 108,000
	Roadway restoration (full lane)	LF	$ 60	2,600	$ 156,000
				Subtotal (rounded)	$ 654,000
	Mobilization	%	5	-	$ 32,700
				Subtotal (rounded)	$ 687,000
	Contingency	%	30	-	$ 206,100
				Subtotal (rounded)	$ 894,000
	Engineering and CMS	%	25	-	$ 223,500
	Easement	AC	$ 30,000	1.19	$ 35,900
				Riverfront Industrial Line Cost (rounded):	**$ 1,154,000**
Phase 2 (Charles and Andrew PS displacement)					
	10-inch PVC gravity pipe	LF	$ 150	1,100	$ 165,000
	8-inch PVC gravity pipe	LF	$ 135	2,100	$ 283,500
	Manhole 48-inch (<18-inch pipe)	EA	$ 12,000	7	$ 84,000
	Bore (creek crossing)	LF	$ 600	100	$ 60,000
	Bore (railroad crossing)	LF	$ 600	100	$ 60,000
	Roadway restoration	LF	$ 30	600	$ 18,000
	Soil restoration	LF	$ 5	1,500	$ 7,500
	Pump station demolition/removal (no building)	LS	$ 11,000	2	$ 22,000
				Subtotal (rounded)	$ 535,000
	Mobilization	%	5	-	$ 26,750
				Subtotal (rounded)	$ 562,000
	Contingency	%	30	-	$ 168,600
				Subtotal (rounded)	$ 731,000
	Engineering and CMS	%	25	-	$ 182,750
	Environmental Permitting and Mitigation	LS	$ 165,000	1	$ 165,000
	Easement	AC	$ 30,000	1.00	$ 30,000
				Phase 2 Cost (rounded):	**$ 1,109,000**
				Project Total Cost (rounded):	**$ 5,896,000**

Pump Station Improvements (Short-term)

Site	Recommended Improvement	Recommended Completion Time	Cost
Charles Pump Station	Add manhole cover lock	1-5 Years	$1,700
	Install removable bollards in front for traffic protection	1-5 Years	$2,000
		Subtotal	*$3,700*
Chehalem Pump Station	Upgrade generator maintenance records	1-2 Years	$900
		Subtotal	*$900*
Creekside Pump Station	Install bollards for traffic protection	1-5 Years	$2,000
	Replace heater with heat tape in the valve enclosure for freeze protection	1-5 Years	$1,400
	Remount wash water backflow preventer at least 12-inches aboveground	1-5 Years	$3,500
	Relocate the portable generator connection point so it is 34 inches aboveground	1-5 Years	$1,500
	Add fencing around the station	1-5 years	$8,200
		Subtotal	*$16,600*
Fernwood Pump Station	Verify pump operating point and adjust operation (if needed) to improve capacity	Year 1	$1,400
	Check and correct (if needed) hazardous area seal-offs	1-2 Years	$2,000
	Install steel safety grating at the valve vault	1-5 Years	$1,600
	Install flow directing inlet at the influent pipe to the wet well	1-5 Years	$8,500
	Remove unused equipment from the building	1-5 Years	$1,500
	Repaint building doors	1-5 Years	$900
		Subtotal	*$15,900*
Highway 240 Pump Station	Install steel safety grating at the valve vault	1-5 Years	$1,600
	Repaint building doors	1-5 Years	$900
	Install flow directing inlet at the influent pipe to the wet well	1-5 Years	$8,500
	Install steel safety grating at the flow meter vault	1-5 Years	$1,600
		Subtotal	*$12,600*
Sheridian Pump Station	Add strip heater unit in electrical enclosure	1-2 Years	$400
	Replace burnt-out LED lights for depth display in control panel	1-5 Years	$2,400
	Remount wash water backflow preventer at least 12-inches aboveground	1-5 Years	$3,500
	Add fencing around the station	1-5 years	$8,200
	Replace heat tape with electrical heater	1-5 Years	$1,000
		Subtotal	*$15,500*
		Lift Station Improvements Subtotal	*$66,000*
		Contingency (30%)	$19,800
		Engineering (35%)	$30,100
		Administration (2%)	$1,800
		Lift Station Total Costs (rounded)	**$118,000**

Pump Station Improvements (Long-term)

Site	Recommended Improvement	Recommended Completion Time	Cost
Fernwood Lift Station	Add video monitoring	11-20 Years	$41,400
	Add flow meter on the discharge pipe	1-10 years	$25,100
	Install backflow control on overflow	1-10 Years	$6,100
		Subtotal	*$72,600*
Highway 240 Lift Station	Add video monitoring	11-20 Years	$41,400
	Replace pump guide rails	5-10 Years	$5,500
		Subtotal	*$46,900*
Sheridian Lift Station	Replace conductive level sensor with pressure transducer level sensor	11-20 Years	$7,100
	Add video monitoring	11-20 Years	$41,400
	Install backflow control on overflow	1-10 Years	$6,100
	Remove mixing valve	1-10 Years	$1,200
	Install pressure gauges on discharge pipes	5-10 Years	$2,000
	Add flow meter on the discharge pipe	5-10 years	$25,100
	Install a permanent ladder in the valve vault	5-10 Years	$6,100
	Install a dedicated standby generator	5-10 Year	$49,100
		Subtotal	*$138,100*
		Subtotal	$257,600
		Contingency (30%)	$77,300
		Engineering (35%)	$117,300
		Administration (2%)	$6,700
		Lift Station Total Costs (rounded)	**$459,000**

Appendix D

Priority 1 Project Sheets

Collection System Project: Hess Creek Phase 1 - CIPP
Project Identifier: 1.a

Objective: Cured-in-place pipe lining of the upper portion of the Hess Creek trunk line to reduce I/I influence and extend the life of the pipe (dark red line on location map below). Two pipe segments along this portion do not need to be lined as they will be upsized in Phase 2. Flow monitoring in the basin will also be completed to inform the design phase of Hess Creek Phase 2 Project.

Key Issues: Access to the Hess Creek trunk line is limited and can be difficult. Truck access is very limited.

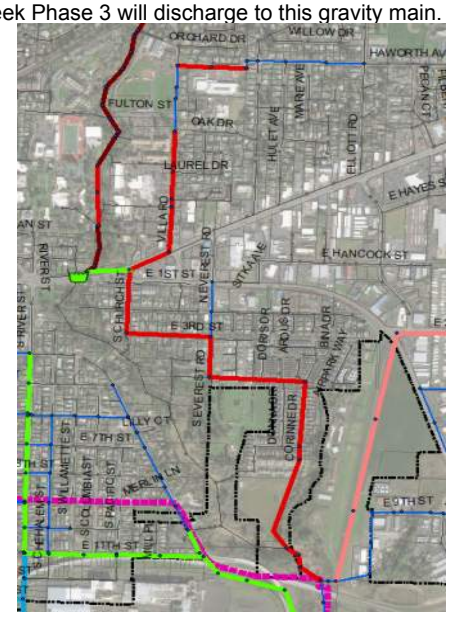
Item	Cost (2021)
CIPP, 8 to 18-inch[1]	$ 986,000
Flow monitoring	$ 30,000
Construction Subtotal (rounded)	***$ 1,016,000***
Mobilization	$ 51,000
Contingency	$ 107,000
Engineering and CMS	$ 177,000
Total Project Cost (rounded)	***$ 1,351,000***

[1]Additional 30% added to unit price for Hess Creek accessibility constraints

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: Hess Creek Phase 2 - Parallel Gravity Main
Project Identifier: 1.b

Objective: Resolve undersized downstream pipeline along N Villa Road. Construct gravity line parallel to the Hess Creek canyon and reduce flow going to the Hess Creek trunk line. The new pump station in Hess Creek Phase 3 will discharge to this gravity main.



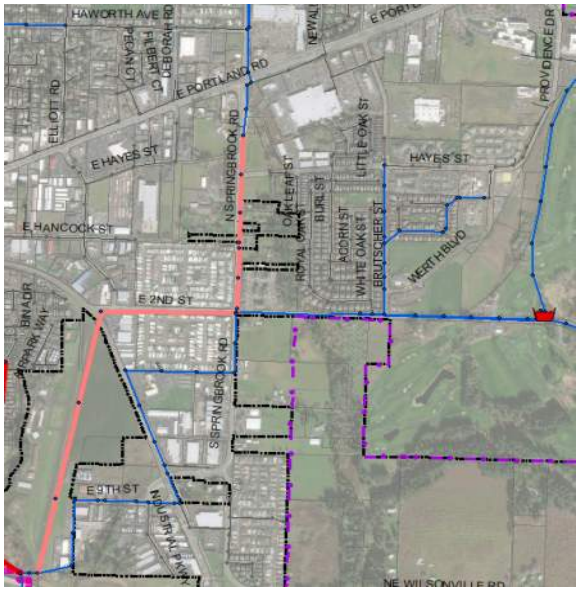
Key Issues: The most downstream segments of this project are in the Hess Creek canyon and acces is limited. Groundwater could be high in this area as well.

Item	Cost (2021)
Parallel gravity main	
27-inch PVC gravity pipe	$ 1,034,000
24-inch PVC gravity pipe	$ 184,500
15-inch PVC gravity pipe	$ 204,000
12-inch PVC gravity pipe	$ 304,000
Re-grading pipe	$ 324,000
Re-connect laterals	$ 100,000
Roadway restoration	$ 294,000
Install access road	$ 78,000
Manhole 48-inch (<18-inch pipe)	$ 96,000
Manhole 72-inch (>21-inch pipe)	$ 297,000
Existing pipe rehab/replacement	
36-inch PVC gravity pipe	$ 171,500
18-inch PVC gravity pipe	$ 166,500
Manhole 60-inch (18- to 21-inch pipe)	$ 42,000
Manhole 72-inch (>21-inch pipe)	$ 66,000
Install access road	$ 96,000
Soil restoration	$ 8,000
Hess Creek constructability	$ 825,000
Bypass pumping	$ 60,000
Construction Subtotal (rounded)	***$ 4,351,000***
Mobilization	$ 218,000
Contingency	$ 1,371,000
Engineering and CMS	$ 1,485,000
Floodplain hydraulic study	$ 20,000
Permitting	$ 15,000
Total Project Cost (rounded)	***$ 7,460,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: Springbrook Road
Project Identifier: 1.c

Objective: Increase capacity of the Springbrook Road trunk line and firm capacity of Fernwood Pump Station to accommodate development in the basin. Improvements include upsizing the firm capacity of Fernwood Pump Station, upsizing a portion of the existing Springbrook line north of E Fernwood Road, and a new parallel gravity line added west on E Second St from the E Fernwood Road intersection.



Key Issues: Pipeline will need to be bored under HWY 219. Easement negotiation with Sportsman Airpark.

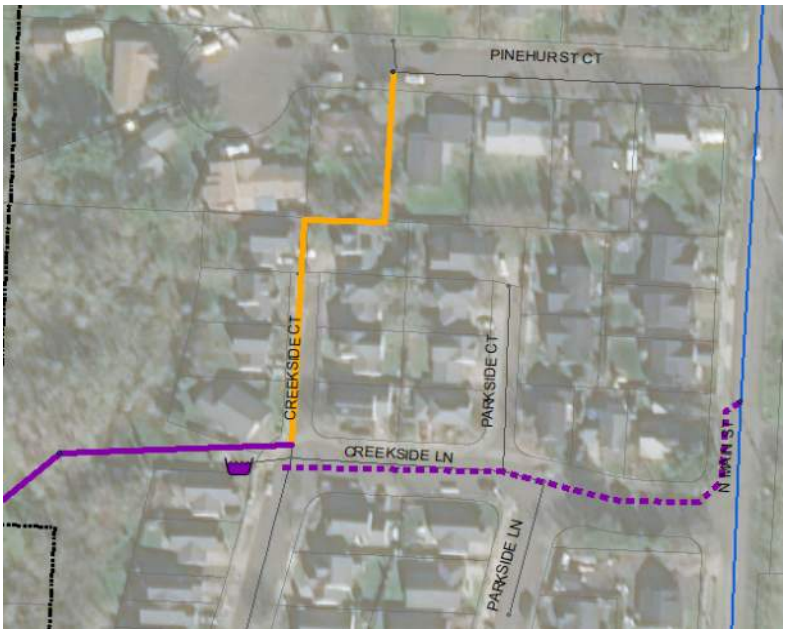
Item	Cost (2021)
Parallel gravity main	
24-inch PVC gravity pipe	$ 1,017,825
Manhole 72-inch (>21-inch pipe)	$ 280,500
Highway boring	$ 81,000
Roadway restoration (full lane)	$ 96,000
Soil restoration	$ 16,825
Flow diversion structure	$ 20,000
Bypass pumping	$ 50,000
Upsize existing	
18-inch PVC gravity pipe	$ 425,500
Re-connect laterals	$ 4,000
Manhole 60-inch (18- to 21-inch pipe)	$ 98,000
Roadway restoration (full lane)	$ 138,000
Traffic Control (Highway)	$ 23,000
Control density backfill	$ 379,500
8-inch PVC gravity pipe	$ 148,500
Manhole 48-inch (<18-inch pipe)	$ 48,000
Bypass pumping	$ 50,000
Fernwood PS upsize	
Upsize pump station	$ 202,000
Construction Subtotal (rounded)	***$ 3,079,000***
Mobilization	$ 154,000
Contingency	$ 970,000
Engineering and CMS	$ 1,051,000
Easement	$ 60,000
Total Project Cost (rounded)	***$ 5,314,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinion of accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: E Pinehurst Court
Project Identifier: 1.d

Objective: Eliminate overflows at E Pinehurst Court. The grade of E Pinehurst Court and shallow gravity main produce a potential overflow site when the trunk line on N Main Street flow close to full. This project will re-direct flow from E Pinehurst Court south to existing lines on Creekside Court and to the Creekside Pump Station basin.

Key Issues: Easements will be needed to connect to Creekside court. There are local grinder pumps on E Pinehurst that could potentially be removed if the vertical alignment allows; this should be evaluated during design.



Item	Cost (2021)
Cap and abandon line	$ 1,500
8-inch PVC gravity pipe	$ 40,500
Re-grading pipe	$ 54,000
Manhole 48-inch (<18-inch pipe)	$ 24,000
Re-connect laterals	$ 4,500
Re-connect manholes	$ 6,000
Roadway restoration (full lane)	$ 26,400
Landscape restoration	$ 5,200
Bypass pumping	$ 20,000
Construction Subtotal (rounded)	***$ 183,000***
Mobilization	$ 10,000
Contingency	$ 58,000
Engineering and CMS	$ 63,000
Easement	$ 3,600
Total Project Cost (rounded)	***$ 318,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: Pump Station Improvements (Short-term)
Project Identifier: 1.e

Objective: This project includes a variety of short-term improvements to existing pump stations. The Dayton PS was replaced recently and has no short-term improvement recommendations. Andrew PS also does not have any short-term improvement recommendations.

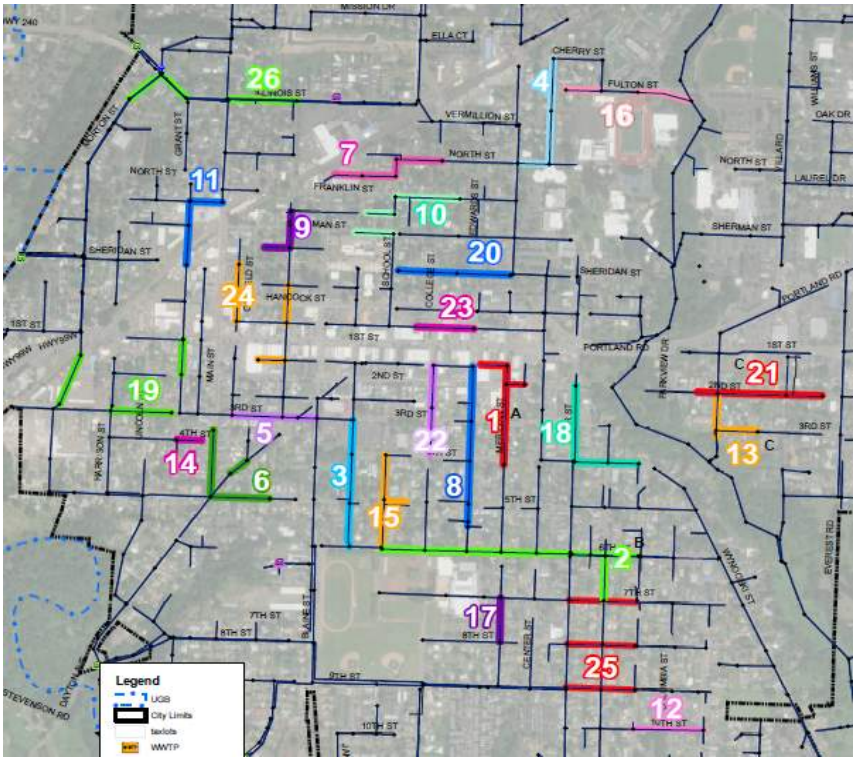
Item	Cost (2021)	
Charles Pump Station	$	3,700
Chehalem Pump Station	$	900
Creekside Pump Station	$	16,600
Fernwood Pump Station	$	15,900
HWY 240 Pump Station	$	12,600
Sheridan Pump Station	$	15,500
Construction Subtotal (rounded)	***$***	***66,000***
Contingency	$	19,800
Engineering and CMS	$	30,100
Administration	$	1,800
Total Project Cost (rounded)	***$***	***118,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: I/I Projects
Project Identifier: 1.f

Objective: Reduce I/I in the system. Focus annual pipeline replacement in areas of high I/I as identified in the 2018 WWMP. Potentially postpone larger capital improvements on trunk lines and at WWTP by reducing I/I influence and peak flows in the system.

Key Issues: I/I data should be updated periodically to provide current recommendations for reducing I/I in the system. Coordination with other utilities could provide cost-savings for the City.



Item	Cost (2021)
I/I Projects	$ 2,700,000
Total Project Cost (rounded)	***$ 2,700,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: E Crestview Drive Infrastructure
Project Identifier: 1.g

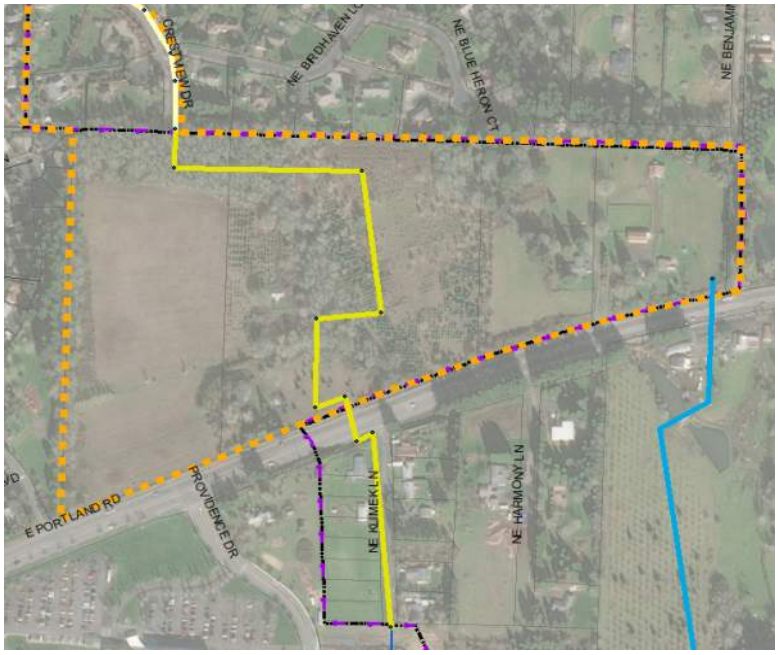
Objective: Development driven infrastructure along E crestview Drive. Proposed infrastructure based on City provided drawings.

Item	Cost (2021)
8-inch PVC gravity pipe	$ 337,500
Manhole 48-inch (<18-inch pipe)	$ 108,000
Roadway restoration	$ 75,000
Construction Subtotal (rounded)	***$ 521,000***
Mobilization	$ 27,000
Contingency	$ 165,000
Engineering and CMS	$ 179,000
Easement	$ 36,000
Total Project Cost (rounded)	***$ 928,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: Crestview Crossing Infrastructure
Project Identifier: 1.h

Objective: Development driven infrastructure for the Crestview Crossing area. Proposed infrastructure is based on the Crestview Crossing PUD (March 2019) Report from the City.



Item	Cost (2021)
10-inch PVC gravity pipe	$ 480,000
Manhole 48-inch (<18-inch pipe)	$ 132,000
Highway boring	$ 96,000
Roadway restoration	$ 93,000
Construction Subtotal (rounded)	***$ 801,000***
Mobilization	$ 41,000
Contingency	$ 253,000
Engineering and CMS	$ 274,000
Easement	$ 45,000
Total Project Cost (rounded)	***$ 1,414,000***

The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

Collection System Project: Maintenance Yard Improvements
Project Identifier: 1.i

Objective: A Master Plan was completed for the City maintenance yard. This project was in the City's draft CIP 2017-2022 at the time of the 2018 WWMP. The project will include major site work, new fleet building, and eventually new administration building. The maintenance yard is utilized by a number of City divisions.

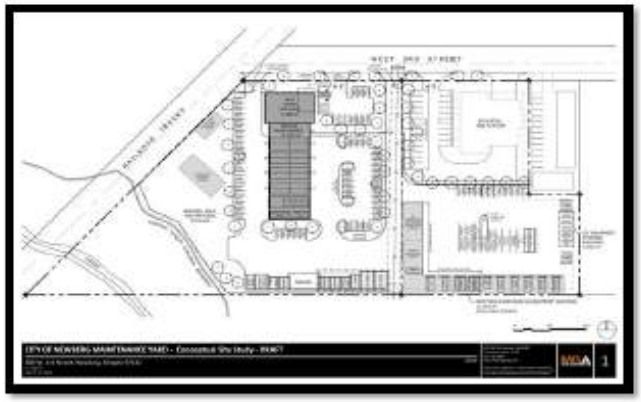


FIGURE 1 CONCEPTUAL PUBIC WORKS MAINTENANCE YARD PLAN

Item	Cost (2021)
Project Total Cost (rounded)	$ 804,000
Cost from 2018 WWMP - includes mob., eningeering, and admin. From sewer utility portion (increased by ENR)	
The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our professional opinionof accurate costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.	