WASTEWATER GENERAL SEWER PLAN AND FACILITY PLAN

DECEMBER 2016 (draft)

VARELA & ASSOCIATES, INC.
ENGINEERING AND MANAGEMENT
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WASTEWATER GENERAL SEWER PLAN AND FACILITY PLAN

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CITY OF LEAVENWORTH

WASTEWATER GENERAL SEWER PLAN

AND

FACILITY PLAN

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1.0 INTRODUCTION

1.1 Purpose and Need

The City is under a compliance order per their National Pollution Discharge Elimination System (NPDES) permit to comply with a total phosphorous waste load allocation (WLA) as contained in The Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load Water Quality Improvement Report (the TMDL).

Consistent with the TMDL, the phosphorus limits proposed for Leavenworth are based on restricting the mass of phosphorus discharged to the Wenatchee River. The mass limit under the TMDL will be 0.286 kg/d (0.6305 lb/day), averaged over the critical seasons (March 1 to May 31, and also July 1 to October 30). The 0.6305 lb/day limit requires an average concentration in the effluent of 0.148 mg/l at the projected 2040 year average annual flows. The City's discharge permit indicates compliance must be achieved by 2020.

In order to comply with the TMDL, the City must prepare a General Sewer Plan / Facility Plan (GSP/FP) in accordance with chapter 173-240-050 & 060 WAC. The overall goal of the GSP/FP is to evaluate and determine the most cost effective treatment improvements for the City's wastewater treatment plant. This GSP/FP is prepared to comply with the referenced WAC.

1.2 Project Background

The City of Leavenworth operates a wastewater collection and treatment system serving the residential and commercial users within the City limits, UGA and sewer service area. The City's wastewater treatment plant (WWTP) is a Class II activated sludge oxidation ditch, secondary clarification and UV disinfection.

Portions of the collection system are 70-80 years old. It is likely the portions of the collection system are nearing the end of their service life and replacement/rehabilitation will be needed to extend the useful life of the collection system pipes and a program for flow monitoring, inspection and maintenance is needed.

Over the next 20-year planning period significant growth in the residential sector of the service area is not expected while continued growth in the commercial sector is expected.

1.3 NPDES Permit

The City of Leavenworth operates their publicly owned treatment works (POTW) under NPDES Permit No.WA0020974 with an effective date of April 16, 2010 and expiration date of August 31, 2015. See **Appendix B**.

The City submitted an "Application for Renewal of National Pollutant Discharge Elimination System" Permit No.WA0020974 for the City of Leavenworth POTW in August 2014. See **Appendix B**. The application was reviewed and accepted in September 2014 which allows the City to continue operating under their existing permit which remains in effect until notified otherwise by the Washington State Department of Ecology (ECY).

1.4 Own/Operate/Maintain

The City of Leavenworth currently owns, operates and maintains the wastewater collection system and POTW.

Owner
City of Leavenworth
700 Highway 2
PO Box 287
Leavenworth, WA 98826
Ph. 509-548-5275

Operator
Antonio Muro
Certified Class II Operator
Leavenworth POTW
1402 Commercial Street
Leavenworth, WA 98826
Ph. 509-548-5994

1.5 Approvals Required

The GSP/FP and plans/specifications must be submitted to the Washington State Department of Ecology (ECY) for review and approval prior to implementation.

1.6 Compliance with Adopted Water Quality Management Plan

There are currently two applicable Total Maximum Daily Load (TMDL) studies for the Wenatchee River. The two applicable documents include:

- Wenatchee River Watershed – Temperature Total Maximum Daily Load Water Quality Improvement Report, July 2007, Pub. No. 07-10-045.
- Wenatchee River Basin Dissolved Oxygen and pH Water Quality Improvement Report, revised August 2019, Pub. No. 08-10-062.

The temperature TMDL findings do not result in any impact or implications for the Leavenworth wastewater treatment plant (WWTP). The TMDL management plan for temperature is primarily directed at riparian vegetation and river channel controls and management. The Leavenworth WWTP effluent discharge impacts are within the water quality parameters allowed in WAC 173-201A.

The dissolved oxygen (DO) and pH TMDL findings result in impacts and improvement implications to the Leavenworth WWTP if the form of effluent phosphorus (P) limitations. The implications and resulting plant improvements necessary to comply with the limitations is the topic of this report.

1.7 Compliance with SEPA / NEPA

General sewer plans and engineering reports, per WAC 173-240-050 & 060, must comply with the State Environmental Policy Act (SEPA). In addition, for Federally funded projects, improvements must comply with the National Environmental Policy Act (NEPA).

For projects funded using Ecology funding, the State Environmental Review Process (SERP) must be complied with. Due to the fact Ecology (a State agency) and administers funding received from the Federal level, SERP is designed to meet both SEPA and NEPA; and, follows a "NEPA like" process. It is anticipated, at a minimum, compliance with SEPA and SERP will be necessary. In addition, if funding is received from a Federal agency (e.g. USDA-Rural Development), additional funding agency specific NEPA requirements will be required depending on funding agency and will be addressed at that time.

At the time of this draft report the environmental review and clearance process has been initialized. At the time the final report is complete, additional discussion will be added regarding the compliance status with SEPA, NEPA and SERP.

2.0 BASIC PLANNING DATA

2.1 Location and Physical Characteristics

2.1.1 Location

The City of Leavenworth is located in the Wenatchee National Forest on the lower east slopes of the Cascades at the outlet of Tumwater Canyon in the upper reaches of the Wenatchee River Valley along Highway 2 approximately 22 miles west of Wenatchee. See **Figure 2-1**.

2.1.2 Topography

The City lies on the north-northwest bank of the Wenatchee River at the base of the Tumwater Mountain. The topography generally slopes to the south-southwest from the base of the mountain (approximate elevation 1,400) to the Wenatchee River (approximate elevation 1,100) with the majority of the developed area between elevation 1,100 and elevation 1,200. See **Figure 2-2**.

2.1.3 Climate

Leavenworth has a true four–season climate. It lays on the eastern edge of the Cascade Mountains, creating a much drier, more continental climate than in Seattle and the Puget Sound area. Leavenworth averages twenty-four inches of precipitation per year, which supports a variety of tree species including Ponderosa Pines.

In the winter, temperatures are typically in the 30s and 40s with lows near 20. Leavenworth receives the vast majority of its annual precipitation between the months of October and March, much of which falls as snow. The city averages an impressive ninety-five inches of snowfall per year and is one of Washington State's snowiest cities. Some years during particularly harsh winters, snow can remain on the ground for months at a time, but this is not normal.

In spring, temperatures typically rise into the 60s and 70s with low temperatures in the 30s and 40s. Leavenworth's low temperatures do not average above freezing until April.

Summers are warm and sunny in Leavenworth. Temperatures are typically in the 80s to near 90 degrees, but it does occasionally reach the one hundred degree mark. Temperatures cool off at night to near 50 degrees. In the fall, temperatures plunge rapidly falling from an average high of 78 degrees in September to 34 degrees in December.

2.1.4 Flood Plain

The flood plain is shown on **Figure 2-3a and Figure 2-3b**.

2.1.5 Surface Waters

The local surface waters include the Wenatchee River, Icicle Creek and Chumstick Creek. See **Figure 2-2**.

2.2 City Boundaries and Land Use

2.2.1 City Boundaries

The City boundaries are shown on **Figure 2-2**. The boundaries include the City Limits, UGA and Sewer Service Area.

2.2.2 Land Use

See **Figure 2-4** for current City zoning.

2.3 Population

Population estimates are based on Chelan County Resolution 2015-112 provides population allocations for Chelan County and each of the designated Urban Growth Areas including the incorporated City of Leavenworth. This document allocates 2,419 persons in the City of Leavenworth UGA. This includes the estimated 1,990 persons residing within the City Limits. The Sewer Service Area extends to areas outside the UGA. The estimated population in the areas outside the UGA but within the Sewer Service Area is 140 persons.

Total current population is as follows (see also Section 3.1).

Table 2-1: Current Estimated Population

Designated Area	Population
City of Leavenworth (City Limits):	1,990
City of Leavenworth UGA:	429
City of Leavenworth Sewer Service Area:	140
Total	2,559

2.3.1 Tourism

Tourism is a substantial component of the local economy in Leavenworth. Sources estimate that up to 2,000,000 people visit Leavenworth annually and that some festival weekends attract as many as 60,000 tourists. Wastewater flow contributions by businesses can vary significantly due to tourism peaks. Project wastewater flow projections included in other sections of this report take into account the potential impacts due to tourism and commercial wastewater contributions.

2.4 Wenatchee River

The Wenatchee River, Icicle Creek and some tributaries in the Wenatchee River watershed are on the state of Washington's 303(d) list of impaired waters for dissolved oxygen and pH.

In 2002, the Washington State Department of Ecology (Ecology) began a study of several water quality problems noted in the Wenatchee River watershed. Ecology completed TMDLs for DDT in

Mission Creek and for fecal coliform bacteria and temperature throughout the Wenatchee River watershed. The U.S. Environmental Protection Agency approved these TMDLs.

The TMDL affecting Leavenworth and its WWTP is the TMDL for dissolved oxygen and pH in the Wenatchee River watershed. During 2002 and 2003, Ecology collected water quality data from the mainstem Wenatchee River, Icicle Creek, and other tributaries, as well as from permitted facilities discharging to these waters.

In 2005 and 2006, Ecology used these data to:

- Assess the cause of dissolved oxygen and pH violations of Washington State water quality standards in these rivers and streams.

- Show that phosphorus is the limiting nutrient in Icicle Creek and the lower Wenatchee River.

- Calibrate a QUAL2K water quality model for the Wenatchee River and Icicle Creek.

The QUAL2K model simulated natural water quality conditions in the Wenatchee River and Icicle Creek. Ecology then used the model to calculate how much point source and nonpoint source pollution should be reduced to meet water quality standards for dissolved oxygen and pH.

A total maximum daily load (TMDL) was completed for the Wenatchee River in August 2009 and approved by EPA ("Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load Water Quality Improvement Report", revised August 2009, Publication No. 08-10-062). The water quality impairments addressed by the TMDL occur in the lower Wenatchee River watershed below the City of Leavenworth and above the confluence with the Columbia River. Most violations occur in the lower portion of the Wenatchee River and tributaries; however the upstream pollution sources contribute to the downstream violations. The impairments typically occur during periods of seasonally low streamflow. Most water quality violations for DO and pH occur in August and September, although impairments also occur during the pre-runoff period in the spring.

The Wenatchee River TMDL has identified phosphorus as the nutrient driving the DO and pH water quality impairments; and wasteload allocations have been set for Leavenworth; and subsequent enforcement through the City's NPDES permit. The TMDL document indicates, "Achieving the water quality standards targeted by this TMDL will promote fish health and survival of these species, non-listed salmonids, other fish species, and non-fish species."

2.5 Existing Water System

The existing water system serving the City of Leavenworth, including public and private wells within the sewer service area, is shown in **Figure 2-5**.

2.6 Other Wastewater Treatment Facilities

Other wastewater facilities in the Leavenworth area and Wenatchee River watershed within 25 miles of Leavenworth include:

- Lake Wenatchee POTW (20 miles)

- Peshastin POTW (4 miles)
- Dryden POTW (7 miles)
- Cashmere POTW (11 miles)
- Wenatchee POTW (22 miles)
- East Wenatchee POTW (25 miles)

3.0 WASTEWATER PLANNING DATA

Planning area, population, design flows, loadings and effluent criteria were evaluated and projected as part of this GSP/FP. The pertinent projections and values applicable to the evaluations are summarized in the following paragraphs of this section. Additional information and documentation, not included in this section, can be found in the following technical memoranda (TMs) included in **Appendix A**.

TM-01: Planning Area and Population
TM-02: Population and Commercial Flow Projections
TM-03: Wastewater Flow and Loading Projections, Design Criteria

3.1 Planning Area and Population

The Sewer Service Planning Area is shown in **Figure 3-1**.

Total current estimated sewer service area population and the projected sewer service area population to be used to estimate residential wastewater flows are shown in the following table.

Table 3-1: Sewer Service Area Projected Population

Description	2015 Estimated Population (1)	2040 Projection (2)	Change	Calculated Annual Growth Rate
City of Leavenworth UGA (3)		2,659		
City of Leavenworth	1,990			
Sewer Service Areas outside UGA		265		
Total	1,990	2,924	934	1.55%

(1) *Current Sewer Service Area = City of Leavenworth*
(2) *Future Sewer Service Area = City of Leavenworth UGA + identified areas outside the UGA (anticipated to be within City of Leavenworth UGA prior to 2040)*
(3) *Includes City of Leavenworth population*

3.2 Wastewater Flows

The population flows and commercial flow projections are summarized in the following table.

Table 3-2: Summary of Population and Commercial Flow Projections

Description	Projected WW Daily Demand (MGD)	% Increase	% of Existing Design Capacity
Existing Wastewater Treatment Plant (WWTP)			
- Current Design Capacity	0.650		100%
- Current Average Daily Flow	0.296		

Description	Projected WW Daily Demand (MGD)	% Increase	% of Existing Design Capacity
Projected Wastewater Flow Growth Projections			
- Population Growth Allowance	0.075		
- Commercial Growth Allowance	0.135		
Total Projected Wastewater Flow Growth	0.210	70.9%	
Total Projected 2040 Wastewater Flow for Planning	0.506		78%

3.3 Design Flows and Loading

Design maximum month and maximum day flows were projected for three distinct seasons consistent with anticipated future seasonal effluent limitations.

The projected maximum month, maximum day, and peak wastewater design flows for the design year are presented in the following table.

Table 3-3: Projected Wastewater design Flows – 2040 Design Year

Parameter	Projections
Design Year	2040
Design Year Projected Population (Sewer Service Area)	2924
Average daily flow (gallons per day)	0.51
Maximum Month (critical season Mar.-May)	0.57
Maximum Month (critical season Jul.-Oct)	0.56
Maximum Month (non-critical - Jun. and Nov.-Feb.)	0.73
Maximum Day (critical season Mar.-May)	0.89
Maximum Day (critical season Jul.-Oct)	0.76
Maximum Day (non-critical - Jun. and Nov.-Feb.)	1.41
Peak Flow (critical season Mar.-May)	1.78
Peak Flow (critical season Jul.-Oct)	1.52
Peak Flow (non-critical - Jun. and Nov.-Feb.)	2.82

Recommended wastewater loading for the design year are presented in the following table.

Table 3-4: Projected Pollutant Loading – 2040 Design Year

Parameter	Projection
BOD_5 – Average Daily, lb/day	836
BOD_5 – Maximum Monthly Average, lb/day	1,221

Parameter	Projection
BOD_5 – Maximum Day, lb/day	1,825
TSS – Average Daily, lb/day	576
TSS – Maximum Monthly Average, lb/day	778
TSS – Maximum Daily Average, lb/day	1,614

Projected loading of phosphorus and TKN are presented in the following table.

Table 3-5: Projected Nutrient Loading – 2040 Design Year

Parameter	Projection
Total Kjeldahl Nitrogen as N, Average Daily, lb/day	204
Total Kjeldahl Nitrogen as N, Maximum Monthly Average, lb/day	270
Total Phosphorus, Average Daily, lb/day	43
Total Phosphorus, Maximum Monthly Average, lb/day	55

Notwithstanding the projections for loading presented for determining facility needs to comply with waste load allocations in the TMDL, the facility design criteria presented in the City's NPDES permit shall remain as indicated in the following table.

Table 3-6: Leavenworth Existing Design Criteria (NPDES Permit)

Parameter	Value
Average flow for the maximum month	0.84 MGD
Influent BOD_5 loading for maximum month	1,390 lbs/day
Influent TSS loading for maximum month	2,120 lbs/day
Population Equivalent	3,849 persons

3.3.1 Effluent Criteria

The Leavenworth wastewater treatment facility discharges treated effluent to the Wenatchee River, subject to the restrictions and limitations under Washington State Department of Ecology National Pollutant Discharge Elimination System (NPDES) permit number WA-002097-4, effective September 1, 2010, expiring August 31, 2015. The effluent limitations listed in the discharge permit are excerpted and presented in the following table.

Table 3-7: Leavenworth WWTP Effluent Limitations, NPDES Permit WA-002097-4

EFFLUENT LIMITATIONS: OUTFALL # 001		
Parameter	**Average Monthly [a]**	**Average Weekly [b]**
Biochemical Oxygen Demand (5 day)	30 mg/L; 210 lbs/day and 85% minimum removal	45 mg/L; 315 lbs/day
Total Suspended Solids	30 mg/L; 210 lbs/day and 85% minimum removal	45 mg/L; 315 lbs/day
Fecal Coliform Bacteria [c]	200/100 mL	400/100 mL
Temperature	28.8º C maximum daily	
pH	shall not be outside the range of 6.0 to 9.0	
[a] Average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured. See footnote c for fecal coliform calculations.		
[b] Average weekly discharge limitation means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week. See footnote c for fecal coliform calculations.		
[c] To calculate the average monthly and average weekly values for fecal coliforms you must use the geometric mean. Ecology gives directions to calculate this value in publication No. 04-10-020, Information Manual for Treatment Plant Operators available at: http://www.ecy.wa.gov/pubs/0410020.pdf		

The above effluent limitations are consistent with technology-based treatment standards in effect where these limitations are protective of receiving water quality standards.

In addition to the current permit limitations, the City of Leavenworth is required by its permit to implement improvements necessary to comply with waste load allocations in the Wenatchee River Dissolved Oxygen and pH (TMDL). The general outline of the phosphorus limitation strategy for protecting water quality standards was outlined in Ecology's TMDL Report.

The proposed effluent limitations to comply with the TMDL waste load allocations are presented in the following table.

Table 3-8: Leavenworth Total Phosphorus Proposed Effluent Limitations to meet Waste Load Allocations

EFFLUENT LIMITATIONS: OUTFALL #001	
Total Phosphorus (as P) (1)	Seasonal Average Limit
For "season" of March 1 to May 31	0.286 kg/day
For "season" of June 1 to June 30	No limit
For "season" of July 1 to October 31	0.286 kg/day
For "season" of November 1 to April 30	No limit

(1) *Compliance with the effluent limitations for TP will be based on a seasonal average with the running seasonal average for the season reported on monthly for tracking compliance with the allowable mass limitation.*

The proposed seasonal average limit is based on numerical consistency with the waste load allocation presented in the TMDL report, and water quality standards protection strategy consistent with other Washington water bodies where phosphorus limitations are imposed to protect dissolved oxygen and pH standards. Justification for seasonal average limitations to meet waste load allocations was presented in the *City of Leavenworth Wastewater Facility Planning NPDES Required Progress Report,* submitted to Ecology in December, 2014.

4.0 WASTEWATER COLLECTION SYSTEM

Review of the existing wastewater collection system was conducted as part of this GSP/FP. Pertinent findings and recommendations are summarized in the following paragraphs of this section. Additional detailed information and documentation, not included in this section, can be found in the following technical memoranda (TMs) included in **Appendix A**.

TM-04:Preliminary Infiltration / Inflow Determination
TM-05:Collection System Evaluation and Mapping Update

4.1 Introduction

The collection system has been studied extensively starting with the 1996 Wastewater Facilities Plan (WWFP) followed by the 2001 cleaning and internal inspection project, documented in the 2001 "Sanitary Sewer Collection System Cleaning, Inspection and Testing; Summary Report and Rehabilitation Prioritization Plan" (Summary Report), and 2008 Sewer Collection System Master Plan (Master Plan).

This section presents the results of the comprehensive review of the previous collection system evaluations and updated with current information, records and data provided by City maintenance and public works staff.

4.2 Existing System

The existing collection system is shown in **Figure 4-1**. An inventory of the existing collection system is summarized in the following table.

Table 4-1: Collection System Inventory

By Size				By Material		
Pipe Size	Approx. Lineal Feet	%		Material	Approx. Lineal Feet	%
18"	800	1.2%		Concrete	34,900	52.9%
15"	6,300	9.5%		Clay	1,200	1.8%
14"	1,400	2.1%		Transite (AC)	11,000	16.7%
12"	3,600	5.5%		PVC	18,900	28.6%
10"	7,700	11.7%		Total	66,000	
8"	46,200	70.0%				
Total	66,000					

4.3 Collection System Priority Replacement

Figure 4-2 consolidates the recommendations from the 2001 Summary Report and 2008 Master Plan. Pipes noted for replacement (Priority 1 and 2) should be sized per the Master Plan. Pipes not scheduled for replacement but noted in the Master Plan as needing additional capacity (Priority 3) should be replaced as growth occurs and additional capacity is needed. The estimated cost to replace priority one and two mains is shown in the following table.

Table 4-2: Priority 1 and Priority 2 Replacement Plan – Revised Cost Estimate

Description	Priority 1	Priority 2	Both
Lineal Feet	7,607	5,245	12,852
Estimated Cost for Spot Repairs @ $7,500 ea.	$ 180,000	$ (75,000) (1)	$ 105,000
Estimated Cost for Reach Replacement @ $150/lf (2)	$ 1,140,000	$ 790,000	$ 1,930,000
Estimated Construction Subtotal	$ 1,320,000	$ 715,000	$ 2,035,000
Contingency (20%)	$ 264,000	$ 143,000	407,000
Sales Tax (8.4%)	$ 111,000	$ 60,000	$ 171,000
Estimated Construction Total	$ 1,695,000	$ 918,000	$ 2,613,000
Engineering including Design, Construction Management and Inspection (25%)	$ 424,000	$ 230,000	$ 653,000
Estimated Project Total	$ 2,119,000	$ 1,148,000	$ 3,266,000

(1) *Credit for mains noted as "spot repair" under Priority 1 recommendations which change to "reach replacement" under Priority 2 recommendations.*

(2) *Assumes surface restoration limited to restoration necessary for surfacing disturbed for pipe replacement. Estimated cost would increase if full width roadway restoration was desired.*

The estimated budget costing for the Priority 3 improvements is shown in the following table.

Table 4-3: Priority 3 Replacement Plan – Cost Estimate

Description	Pipe Size	LF	$/LF	Amount
Collection Upgrade	21"	110	$200	$22,000
Collection Upgrade	18"	630	$175	$110,000
Collection Upgrade	12"	446	$150	$67,000
Collection Upgrade	10"	1940	$140	$272,000
			Estimated Construction Subtotal	$471,000
			Contingency (20%)	94,000
			Sales Tax (8.4%)	$40,000
			Estimated Construction Total	$605,000
			Engineering inc. Design, Construction Management and Inspection (25%)	$151,000
			Estimated Project Total	$756,000

4.3.1 South Interceptor Sewer

The "South Interceptor Sewer" is approximately 4,000 lf of 15"/14" trunk main paralleling the Wenatchee River from the WWTP to MH E3. The South Interceptor has been a priority main for upgrade / replacement for several years. The 1996 GSP/FP evaluated this section and recommended cleaning/CCTV inspection and root removal on a biennial basis.

Subsequently the cleaning/CCTV inspection documented in the 2001 Summary Report noted the 14" section of the South Interceptor Sewer from C12 to E3 as in satisfactory condition and the 15" section between MH C1 to MH C8 (approximately 2,900 lf) noted as a Priority 1 replacement.

Following the 2001 Summary Report the 2008 Master Plan noted the South Interceptor between MH H2 and C12 as requiring increased capacity and recommended replacement with 21" pipe (MH H2 to MH A1) and 18" pipe (MH A1 to MH C12).

Based on these recommendations the City replaced the 15" pipe from MH C2 to MH C4 with 18" pipe via pipe bursting. Also, the City has listed replacement of the South Interceptor Sewer in the City's 2016 Capital Facilities Plan (CFP) (for 2017 – 2022) showing a $1.5 million budget.

The portions of the South Interceptor Sewer recommended for replacement based on the 2001 Summary Report are included in Table 2 as Priority 1 replacement. The portions of the South Interceptor Sewer recommended for replacement based on the 2008 Master Plan are included in Table 3 as Priority 3 replacement.

4.3.2 Combined Priorities 1, 2 and 3 Improvements

All three of the priority improvement projects are needed for implementation. However, the Priority 3 improvements are not as imminent as the Priority 1 and Priority 2 improvements, due to their relation to collection system capacity. However, this is dependent on how quickly conditions and development within the collection system occur.

It is advisable and cost efficient if all three elements of the priority work can be implemented under one project and resolve the collection system needs at one time. If funding availability or user rate impacts do not allow this, the City may opt to delay the Priority 3 improvements in an effort to postpone costs and implement each improvement on a section-by-section basis in an effort to more closely time each section when the additional capacity is needed. In this event, it is recommended the City monitor flows in the critical reaches to stay apprised of remaining existing capacity in each section.

4.4 Combined Sanitary/Sewer Manholes

Overflow events in the City's remaining combined sanitary/storm sewer manholes are reported to be rare since the 1988 improvements to 5 "at-risk" manholes at that time. It is recommended the City continue to monitor the system for overflows of wastewater into the stormwater and revisit the issue if occurrences increase.

4.5 Infiltration and Inflow

An evaluation to estimate infiltration and inflow (I/I) entering Leavenworth's collection system was conducted (see TM-04, **Appendix A**). Based on EPA criteria, infiltration was found to be non-excessive; and, excessive for inflow. Significant inflow events have occurred and coincide with the plant operator observations. Historically the treatment plant has handled the significant inflow events without adverse operational effects but these events will pose greater challenges in the future as base flows increase due to growth and less capacity is available to handle inflows.

Additional evaluations to develop more reliable data and flows, and identify inflow sources were identified. The following sections summarize recommendations.

4.5.1 Utilize Existing WWTP Flow Monitoring Capabilities

The treatment plant was designed to monitor and record continuous / instantaneous flow data but was not being utilized due to lack of software for data accumulation and recording. It is recommended the City implement continuous flow monitoring and recording of instantaneous flow data. At the time of this report, the City was in the process of implementing improvements to begin continuous influent flow monitoring.

Following the accumulation of a minimum of one-year of recorded instantaneous flow data analysis of the data should be conducted to assess the following:

- Confirm WWTP design peaks for upcoming upgrade
- Review additional data and confirm or revise/update infiltration estimates
- Quantify magnitude of peak instantaneous inflow events and impact to WWTP hydraulic capacity

4.5.2 Inflow Prevention Plan

It is recommended the City continue to implement and step up efforts to identify and eliminate sources of inflow. This plan should include the following:

- Review 2001 smoke testing data
- Eliminate identified inflow sources which have not already been corrected
- Conduct a new round of smoke testing to identify and eliminate new inflow sources
- Actively seek inflow sources in the collection system during significant rain/snow melt events to identify and eliminate additional inflow sources such as;
    - manhole lids
    - manholes located in depressions
    - roof drains
    - combined storm drain manholes, storm overflows into the sewer system

4.5.3 Infiltration Source Isolation

Following the accumulation of 1 to 2 years continuous flow data it is recommended a late-night flow monitoring at key manholes in the system during peak infiltration periods is conducted to identify areas in the collection system which contributes the highest volumes of infiltration.

4.6 Smoke Testing

It is recommended the City smoke test the system (per recommendation in Section 4.5.2) to identify and eliminate inflow sources. The City could conduct the smoke testing using City forces, or could utilize Evergreen Rural Water of Washington (ERWoW) to assist. Alternatively, the City could contract the work. Additional implementation information and contact information is included in TM-04 in **Appendix A**.

4.7 Cleaning and CCTV Inspection Program

It is recommended the City implement a program for systematic and consistent cleaning and internal CCTV inspection of the remaining collection system (per recommendation in Section 4.5.4). The purpose of the program is:

- Remove solids from the mains to maintain capacity
- Assess condition and identify sections requiring additional maintenance or replacement
- Prioritize and budget for repairs or replacement/rehabilitation
- Identify infiltration/inflow sources
- Determine future inspection intervals

Estimated budget required for cleaning/CCTV inspection of the remaining 35,000 lineal feet of concrete, clay and transite pipe, including evaluation and prioritization of findings, is $100,000.

4.8 Collection System Future Capacity Upgrades and Future Extensions

The Leavenworth 2008 Sewer Collection Master Plan (Master Plan) included a comprehensive evaluation and analysis of existing and future capacity needs for the Leavenworth collection system. The findings and recommendations of the Master Plan regarding capacity and future expansions have not changed and are applicable. Figure 6 of the 2008 Master Plan depicts: (1) recommended capacity upgrades within the existing collection to accommodate future growth, and (2) future extension routes for future mains to accommodate planning for future growth and development. Figure 6 is included as part of TM-05 in **Appendix A** of this current GSP/FP document.

4.8.1 Future Capacity Upgrades

As indicated above, recommended capacity upgrades are included in the above referenced Figure 6 (TM-05 in **Appendix A**). The capacity upgrades have also been included on **Figure 4-2** of this GSP/FP. The capacity upgrades are included as the Priority 3 improvements.

The collection system size upgrades that will be necessary at the point future development begins to reach capacity of portions of the collection system. **Figure 4-2** is included in TM-05, **Appendix A**. If the Priority 3 improvements are included as part of the overall collection system upgrade project, the capacity issues in the collection system will be resolved as part of the over collection system improvements; and, will provide adequate collection system capacity for the duration of the planning period (through 2040) and beyond.

If the Priority 3 project elements are delayed and not completed as part of the larger overall project, individual collection system upgrades will be necessary on a case by case basis, as development occurs and collection system capacities are reached at critical points in the system. Under this scenario, it is recommended the City conduct period flow monitoring at critical locations to monitor remaining reserve capacity and estimated timing for capacity upgrades and/or rerouting of flows.

4.8.2 Future Collection System Extensions

As future expansion and development occurs within the UGA, extensions to the collection system will be needed to accommodate growth. The 2008 Master plan provided planning for anticipated routing and connection points for future growth and extensions. As indicated above, Figure 6, included as part of TM-05 in **Appendix A**, includes anticipated future connection points and recommended collection main size.

4.9 Collection System Capital Improvements Plan

Recommended collection system capital improvements are summarized in the following table.

Table 4-5: Collection System Capital Improvements Plan

Description (& purpose)	6 year	6-10 year
Priority 1 and Priority 2 Collection System Improvements (1) (upgrade / replacement)	$3,270,000	
Priority 3 Collection System Improvements (1) (capacity)		$760,000
Collection System Smoke Testing (inflow)	$10,000 - $20,000	
Clean and Video Inspection (inflow, infiltration, maintenance)		$100,000 (2)

(1) *Includes the South Interceptor Sewer reach of sewer main. City's 2016 Capital Facilities Plan (CFP) includes $1.5 million budget for replacement of this sewer.*
(2) *Assume City does all at one time. Alternative: City budget $10,000 per year and address entire system over 10 year period.*
(3) *Estimates are in 2016 dollars.*

The anticipated schedule for improvements is contingent upon the City's ability to acquire funding or accumulate reserves. If the City is unable to acquire grant and/or low interest loan funding for the projects identified herein, the City will reschedule those improvements following an analysis of the project(s). The City may also be able to combine all or portions of the work listed in conjunction with the treatment plant upgrade project anticipated as part of this overall facility planning process.

5.0 WASTEWATER TREATMENT FACILITIES

5.1 Introduction

A comprehensive evaluation and assessment of the existing wastewater treatment plant (WWTP) was conducted to assess current operation, performance, individual component analysis, reliability and redundancy, deficiencies and recommended upgrades. The evaluation specifically considered existing facilities in the context of future design conditions for phosphorus discharge and compliance with the Wenatchee River Dissolved Oxygen and pH Total Maximum Daily Load (TMDL).

The full content of the plant evaluation is included as TM-06: Existing Treatment Facilities Evaluation in **Appendix A** of this GSP/FP. The following summarizes the conclusions and recommendations of the evaluation.

5.2 Summary and Conclusions

The Leavenworth wastewater treatment plant is performing well at the current flows and loadings. The facility overall is very well maintained, and the operators are diligent with equipment maintenance in order to maximize use and extend the life of all components. However, due to normal use and life expectancy limitations, some existing equipment is showing wear due to a harsh service environment and continuous operation. Specific pieces of equipment have been identified where it appears replacement of equipment is likely within the timeframe being considered for upgrade to meet future effluent phosphorus requirements.

In-plant conveyances such as flow channels and pipelines were found to be adequate to handle the flow projection through the planning period (year 2040).

The existing biological treatment facilities were not designed to remove or reduce phosphorus in the effluent and have little potential for being readily adapted to remove phosphorus biologically, in part because the location of the plant makes odor concerns a high priority, which can limit the flexibility of operation of the biological unit process. Biological phosphorus removal is one of the future upgrade options for consideration, however substantial additional infrastructure and resulting cost is necessary, including odor mitigation and control.

The existing solids separation facilities (clarifiers and sludge-handling system including storage and dewatering) have capacity to handle the additional solids that would be generated if chemical phosphorus removal is added to the existing plant. Chemical phosphorus removal is one of the future upgrade elements for consideration in the overall phosphorus removal strategy. Chemical phosphorus in general does not include an increased risk of generating objectionable odors, however there are operational costs associated with chemical consumption and increased waste solids that must be disposed of.

As noted above, several components within the plant are approaching their expected useful life, and are expected to need replacement early in the planning horizon covered by this facility plan. Critical equipment and components that are expected to need replacement at around the same time as new phosphorus limits come into effect can be considered for inclusion in the next plant upgrade project. The start-up, commissioning, and operational learning curve for new tertiary phosphorus removal facilities will put a burden on the plant staff, so including equipment upgrades and replacement in the

upgrade project, in cases where it is needed anyway, will be advantageous for realizing the most from the investment in new facilities.

The following elements are recommended for inclusion in the next plant upgrade, which primarily will implement phosphorus removal strategies to comply with future permit limitations imposed by the TMDL.

1) Replace the existing Fine Screen with new equipment, of the same type and configuration to fit in the existing fine screen channel

2) Addition of a mechanically-cleaned bar rack is recommended to reduce maintenance demands, protect equipment, and provide for redundancy to meeting biosolids requirements

3) Replacement of the in-channel grinder in the headworks building

4) Installation of drains at RAS/WAS pump station pump station 2 (the above ground lift station at clarifier #3)

5) Installation of new mixer at anoxic basin cell #3

6) It is recommended that the UV system be replaced with new equipment. New equipment would utilize existing disinfection channels, so no modifications to the concrete channel structure would be needed for this upgrade

7) It is recommended the existing belt filter press be replaced with a new sludge screw press. The existing belt filter press will reach the end of its useful life within the planning period. A screw press can be installed within the existing footprint with minimal revision to the existing dewatering building. Additionally a screw press will reduce pressate flows that will offset increases in recycle resulting from phosphorus

8) Update controls, variable frequency drives, and operator interfaces with current technology so it will have a service life appropriate for the planning period

6.0 EVALUATION OF PHOSPHORUS TREATMENT ALTERNATIVES

6.1 Introduction

An evaluation of alternative phosphorus reduction strategies was conducted for Leavenworth for meeting future effluent phosphorus limits consistent with the approved Wenatchee River Dissolved Oxygen and pH Total Maximum Daily Load (TMDL).

As stated in earlier sections, per the TMDL, the phosphorus limits proposed for Leavenworth are based on restricting the mass of phosphorus discharged to the Wenatchee River. The mass limit under the TMDL is 0.286 kg/d (0.6305 lb/day), averaged over the critical seasons (March 1 to May 31, and July 1 to October 30). The 0.6305 lb/day limit requires an average concentration in the effluent of 0.148 mg/l at the projected 2040 year average annual flows.

The evaluation emphasized the analysis of treatment alternatives (and treatment combinations) for identifying the most cost effective means to reduce effluent phosphorus concentrations suitable for discharging to the Wenatchee River under the new permit limits consistent with the TMDL. The analysis of alternatives included evaluation of potential in-plant modifications considered during the existing plant evaluation (i.e. preceding Section 5 and TM-06 in **Appendix A**), as well as add-on technologies and processes for achieving effluent phosphorus concentrations consistent with new phosphorus permit limits per the TMDL (as presented in preceding Section 3 and TM-03 in **Appendix A**).

The full content of the phosphorus treatment alternatives evaluation is included as TM-07: Phosphorus Approach and Strategy Alternatives in **Appendix A** of this GSP/FP. The following summarizes the conclusions and recommendations of the evaluation.

6.2 Summary and Conclusions

The Leavenworth Wastewater Treatment Plant (WWTP) will require significant investment in new process units to meet future phosphorus limits. Tertiary filtration – chemical precipitation and filtration – is the recommended process to achieve desired levels for Wenatchee River discharge.

Chemical precipitation for phosphorus removal is most cost effective when applied in multiple stages. Thus, it is recommended existing facilities also be upgraded to remove phosphorus by chemical precipitation, in addition to current pollutant removal functions. These upgrades would include adding chemical addition to the secondary clarifier distribution box and precipitated phosphorus removed with the biological sludge from the secondary clarifiers.

Biological phosphorus removal was evaluated as a potential upgrade, but was not cost-competitive with chemical precipitation as pre-treatment to the tertiary filtration step.

7.0 EVALUATION OF RECLAIMED WATER

7.1 Introduction

An evaluation of reclaimed water was conducted under this Facility Planning process in accordance with RCW 90.48.112. The scope of reclaimed water evaluation conducted included the following:

- Feasibility evaluation of producing treated effluent meeting reclaimed water standards
- Quantifying the potential reclaimed water volume available
- Identification and screening of potential reclaimed water use demands and sites
- Identification of required reclaimed water infrastructure and conveyance facilities
- Develop estimated capital cost for reclaimed water infrastructure and upgrades
- Cost effective comparison of estimated costs for producing and utilizing reclaimed water vs. required treatment for phosphorus treatment and continued discharge to the Wenatchee river

A summary of the evaluation findings is included in this section. The full evaluation content is included in **Appendix A** of this GSP/FP as TM-08: Potential Reclaimed Water Demands and Locations and TM-09: Reclaimed Water Treatment Technical and Economic Feasibility. The following summarizes the conclusions and recommendations of the evaluation.

7.2 Summary and Conclusions

Producing reclaimed water for irrigation at recreational and agricultural sites in the Leavenworth area is technically feasible. At this time, it is not economically feasible.

The analysis concluded that producing reclaimed water would reduce treatment costs compared to treatment needed for phosphorus removal to discharge effluent to the Wenatchee River. The cost savings would be from reduced chemical use and less sludge production, offset somewhat by higher energy costs and higher labor costs due to increased monitoring and reporting requirements.

However, the comparatively lower operation and maintenance costs of reclaimed water are not enough to offset the increases in capital project costs associated with implementing reclaimed water treatment. The lower treatment costs also do not take into account the costs of operating and maintaining the conveyance, distribution, and irrigation systems.

The economic feasibility of utilizing reclaimed water can change with time, however, due to outside factors including:

- Changes to potable water supply availability and costs
- Changes to treated effluent discharge requirements (additional changes to phosphorus limitations would not be expected for at least 2 permit cycles, which would be 10 years)
- Special funding opportunities that may arise to encourage reclaimed water use

In order to be able to respond if the economic feasibility of reclaimed water changes, it is recommended that only tertiary filtration technologies that are capable of producing Class A reclaimed water be considered for tertiary phosphorus removal.

8.0 FINAL TREATMENT ALTERNATIVES EVALUATION

8.1 Introduction

The findings presented in Section 6 (and the associated technical memorandum) indicated chemical precipitation and filtration for phosphorus removal is the recommended treatment to meet the future phosphorus limits consistent with waste load allocations established in the Wenatchee River TMDL. In addition, further improvements to the existing treatment plant were recommended in Section 5 based on an evaluation of the existing plant elements.

This section presents the results of the evaluation of alternatives for implementing these improvements. The overall scope of proposed improvements include:

- New chemical feed system to add metal salt coagulant upstream of the feed to the secondary clarifiers during the critical phosphorus removal season.
- New tertiary phosphorus removal filters, with chemical feed for phosphorus precipitation and coagulation and flocculation basins to maximize chemical efficiency.
- The equipment updates and replacements identified in Section 5 for inclusion with this project.

A summary of the final treatment evaluation findings is included in this section. The full evaluation content is included in **Appendix A** of this GSP/FP as TM-10: Final Treatment Alternatives Evaluation.

8.2 Summary and Conclusions

Filtration equipment alternatives were evaluated for meeting phosphorus limits consistent with waste load allocations in the TMDL for the Wenatchee River. Alternatives evaluated included various configurations of granular media, cloth media, and membrane media filters. Select alternatives, considered to be representative of a range of configurations, were developed in sufficient detail to allow preliminary, planning-level cost estimating for comparison and completion of the planning phase. Additional investigations and observation of existing granular media and disk filter installations will be conducted to inform Leavenworth's final technology and equipment selection during the project design phase.

Preliminarily, continuous backwash, up-flow filters (CBUF) installed in concrete tanks is the current preferred alternative for Leavenworth to meet future phosphorus effluent limitations. The preliminary selection is subject to re-visiting during preliminary design, since additional phosphorus removal performance data may be available within the upcoming months for the different filtration alternatives, and costs are subject to change as technology continues to evolve. The cost comparison showed cloth media filtration is essentially equivalent in costs to the CBUF in concrete tank alternative. CBUF filters in concrete tanks is the preferred alternative at this time for the following reasons:

- Lowest preliminary cost of the alternatives considered.
- Higher solids loading rates can be accommodated with granular media filters compared to cloth-media or membrane filters, providing more flexibility in chemical application in response to changing feed water characteristics.
- There are multiple existing installations of CBUF filters and other granular media filters for phosphorus removal applications in the area, demonstrating the performance capabilities of this technology.

The following table presents a summary of the estimated costs for the recommended alternative. The cost summary includes costs for the filter units required to meet phosphorus limits consistent with the waste load allocations as well as upgrades and improvements identified for the treatment plant.

Table 8-1: Recommended Alternative Opinion of Probable Costs, Treatment Plant

Item	Description / Quantity	Sub-item cost	Item Cost
Upgrades to Existing Facilities (Section 5)			$1,056,000
	Mechanically-cleaned bar-rack	$275,000	
	Grinder / Muffin Monster Replacement	$33,000	
	Fines Screen Replacement	$204,000	
	Drainage Improvements at RAS/WAS PS2	$10,000	
	Anoxic Cell #3 Mixer	$15,000	
	UV Equipment Replacement	$204,000	
	Screw Press	$315,000	
Upgrade Electrical and Controls to replace obsolete equipment	VFD replacement, Communications, Operator controls and Interface upgrades	$350,000	$350,000
Chemical precipitation and phosphorus removal in Existing	Coagulant feed at aeration basin effluent	$155,000	$155,000
Filter Feed Pump – lift station and yard piping	Submersible pump station, duplex 1,250 gpm submersible pumps with VFDs, 60 hp	$206,000	$206,000
Maintenance Building Re-locate		$780,000	$780,000
Pretreatment	Chemical storage and feed, coagulation and flocculation tanks	$416,000	$416,000
Filter Facilities			$982,000
	New Filter Equipment, Installed	$242,000	
	Filter structure	$180,000	
	Filter Building	$320,000	
	Reject (Backwash) Handling	$60,000	
	Ancillary process equipment (compressors, etc)	$50,000	
	Filter Building process piping	$130,000	
Site Civil		$236,000	$236,000
Electrical		$344,000	$344,000
Instrumentation		$237,000	$237,000
Contractor O&P	Mobilization, insurance, bonding, profit, etc.	$476,000	$476,000
Sub-total Construction		$5,238,000	$5,238,000
Contingency (20%)		$1,048,000	$1,048,000
Tax (8.4%)		$440,000	$440,000
Construction Total		$6,726,000	$6,726,000
Engineering & admin	Design, construction management, inspection	$1,682,000	$1,682,000
Total Project		$8,408,000	$8,408,000

9.0 RECOMMENDED FACILITY IMPROVEMENTS

This section presents the design criteria, schematic flow diagram, and hydraulic profile for the selected alternative. This section incorporates TM-11: Recommended Facility Upgrades – Design Criteria, Schematic, Hydraulic Profile included in **Appendix A** of this GSP/FP.

9.1 Design Criteria

The flow and loading design criteria for the wastewater treatment plant analysis and projections were originally presented in TM-01, TM-02, and TM-03 (Section 3). These values are summarized and re-presented in Table 9-1.

The recommended facility components with the proposed improvements outlined in TM-10 (Section 8) are summarized in Table 9-2. For Table 9-2, existing facilities and equipment have normal text and new equipment to be implemented under the phosphorus removal upgrade project can be identified by the **BOLD** text.

9.2 Schematic, Hydraulic Profile, Conceptual WWTP Site Layout

The schematic flow diagram for the proposed treatment plant, including improvements, is shown in **Figure 9-1**. The hydraulic profile for the wastewater treatment plant, incorporating the proposed improvements is shown in **Figure 9-2**.

The conceptual site layout showing new facilities for phosphorus removal is presented in **Figure 9-3**. The filter building siting is subject to revision. The location shown was selected based on the following factors:

- Building size: There are no areas on the existing treatment plant site available for this size building. The dewatering building location was considered, but would require re-location of the dewatering facilities, causing additional disruption during construction, with a low probability of cost savings.

- Proximity to treatment facilities: City staff has expressed a preference for locating the new filter facilities as close a possible to the central part of the treatment plant, to minimize conflict with City maintenance crews at the City shop and minimize operator time travelling between facilities requiring regular checks.

Table 9-1: Design Flow, Loading, Effluent Criteria

CRITERIA			DESIGN VALUE		
DESIGN POPULATION			2924		
DESIGN YEAR			2040		
Wastewater	Flow (mgd)	BOD_5 (lb/day)	TSS (lb/day)	TKN (lb/day)	TP (lb/day)
Annual Average	0.51	836	576	204	43
Maximum month average	0.73	1221	778	270	55
Maximum Daily	1.41	1825	1614	-	-
Critical Season – When phosphorus limitations are in effect			March – May, July -October		
Critical season maximum month	0.6	-	-	-	-
Critical season maximum day	0.9	-	-	-	-
Peak Flow (hourly)	2.8	-	-	-	-
Critical Season Peak (hourly)	1.8	-	-	-	-

Effluent Design Criteria [1]	BOD_5 (mg/l)	TSS (mg/l)	Fecal Coliform Bacteria (colonies /100 ml) (geometric mean)
Maximum Monthly Average	30 mg/L	30 mg/L	200
Maximum Average Weekly	45 mg/L	45 mg/L	400
Average Monthly Removal (minimum)	85%	85%	-
pH			
Temperature			

Parameter	Seasonal Average Limit
Total Phosphorus (as P) [2]	
For “season” of March 1 to May 31	0.286 kg/day
For “season” of June 1 to June 30	No limit
For “season” of July 1 to October 31	0.286 kg/day
For “season” of November 1 to April 30	No limit

(1) *Refer to NPDES permit for notes specific to application of permit limits and reporting requirements.*
(2) *Compliance with the effluent limitations for TP will be based on seasonal average with the running seasonal average for the season reported monthly for tracking compliance with allowable mass limitation.*

Table 9-2: Process Component Design Criteria

Treatment Component	Size / Description
HEADWORKS	
BAR-RACK - NEW	**RECIPROCATING RAKE, LOW PROFILE**
BAR SPACING	**3/8" SPACING BETWEEN BARS**
	WASHER / COMPACTOR FOR SCREENINGS
COMMINUTOR – REPLACE EXISTING	**(JWC) MUFFIN MONSTER CDD-3210**
NUMBER	**1**
GRINDER SHAFTS	**2**
SCREEN DRUMS	**2**
CAPACITY	**2.6 MGD**
DRIVE	**5 HP**
BYPASS BAR SCREEN (MANUAL)	MANUAL
GRIT REMOVAL CHAMBER	(SMITH AND LOVELESS) PISTA GRIT 7
DIAMETER	10'
GRIT PUMPING	TOP-MOUNTED, VACUUM PRIMED, 10 HP
GRIT WASHING	VORTEX CONCENTRATOR, SCREW CLASSIFIER/DEWATERER
IN-CHANNEL FINE SCREEN – REPLACE EXISTING	**ROTATING DRUM WITH WASHER / COMPACTOR**
NUMBER	**1**
SIZE (DRUM DIAMETER)	**40"**
OPENINGS SIZE	**0.080"**
CAPACITY	**2.8 MGD**
FLOW METER (FE 100)	9" PARSHALL FLUME, ULTRASONIC
ALKALINITY ADDITION	SODIUM HYDROXIDE FEED
PUMP	LIQUID METRONICS, INC. (LMI)
CAPACITY	.02-2.0 GAL/HR @ 55 PSI
CONTROL	MANUAL
SEWAGE SELECTOR TANK	
NUMBER	3
VOLUME, CELL 1	62,000 gal
VOLUME, CELL 2	45,000 gal
VOLUME, CELL 3	45,000 gal
VOLUME, CELL TOTAL	152,000 gal
MIXERS	**(1 NEW IN CELL #3)** FLYGT / EMU

Treatment Component		Size / Description
TYPE		SUBMERSIBLE DIRECT DRIVE
POWER EACH		4 HP
DRIVE		4 HP; VARIABLE SPEED
DETENTION TIME (50% RAS, ALL CELLS IN SERVICE)		
.65 MGD AAF		3.7 HOURS
.84 MGD MMF		2.9 HOURS
AERATION BASIN		
NUMBER		1
TYPE		OXIDATION DITCH
VOLUME		98,600 CF; 0.74 MG
AERATORS (#1 & #2)		(EIMCO)
TYPE		VERTICAL TURBINE
HORSEPOWER EACH		50 HP
DRIVE		VFD VARIABLE SPEED
DETENTION TIME (50% RAS)		
.65 MGD AAF		18.1 Hours
.84 MGD MMF		14.0 Hours
F:M IN AERATION BASIN		
1040 PPD AA BOD (2000 mg/l MLVSS)		0.08 d^{-1}
1390 PPD MM BOD (2000 mg/l MLVSS)		0.11 d^{-1}
SLUDGE AGE (SRT OR MCRT)		
1040 PPD AA BOD (Winter)		29 d
1390 PPD MM BOD (Winter)		19 d
COAGULANT ADDITION FOR PHOSPHORUS REMOVAL IN SECONDARY		
COAGULANT		**ALUMINUM SULFATE**
DOSE RANGE AHEAD OF CLARIFIERS		**50 – 100 MG/L AS ALUM**
STORAGE		**2500 GALLONS**
METERING PUMPS		**2 @ 0 – 6.5 GALLONS PER HOUR FLOW-PACED**
CLARIFIERS		
MECHANISM	(C1, C2)	(LAKESIDE SPIRAFLO)
	(C3)	(EIMCO-BAKER PROCESS)
DIAMETER	(C1, C2)	32'
	(C3)	40’

Treatment Component		Size / Description
AREA	(C1, C2) ea.	800 SF
	(C 3)	1180 SF
SIDE WATER DEPTH	(C1, C2)	10'
	(C3)	14’
VOLUME (w/o cone)	(C1, C2) ea.	8,040 CU FT, 60,160 GAL
	(C3)	17,590 CU FT, 131,600 GAL
MECHANISM TYPE	(C1, C2)	PERIPHERAL FEED, CENTER DRAW-OFF
	(C3)	CENTER FEED, CENTER DRAW-OFF
WEIRS	(C1, C2)	CENTER
	(C3)	PERIPHERAL
WEIR LENGTH	(C1, C2) ea.	94'
WEIR LENGTH	(C3)	126'
FEED WELL	(C3)	16' DIA x 8' DEEP
CLARIFIER OPERATION		PARALLEL
SURFACE OVERFLOW RATE (THREE CLARIFIERS OPERATING)		
	.65 MGD AAF	264 GPD/SF
	.84 MGD MMF	341 GPD/SF
DETENTION TIME (50% RAS) (THREE CLARIFIERS OPERATING)		
	.65 MGD AAF	6.2 HR
	.84 MGD MMF	4.8 HR
SOLIDS LOADING RATE (50% RAS@3500 MG/L MLSS, THREE CLARIFIERS IN OPER.)		
	.65 MGD AAF	10.2 PPD/SF
	.84 MGD MMF	13.2 PPD/SF
WEIR LOADING RATE (THREE CLARIFIERS IN OPERATION)		
	.65 MGD AAF	2,070 GPD/FT
	.84 MGD MMF	2,675 GPD/FT
SLUDGE & SCUM PUMPING		
RETURN/WASTE ACTIVATED SLUDGE PUMPS (PUMP STATION PS1)		(GORMAN RUPP MODEL T4A)
NUMBER		3
CAPACITY EACH		540 GPM @ 52' TDH
DRIVE		15 HP; 1800 RPM, VFD VARIABLE SPEED BELT AND PULLEY REDUCED TO 1515 RPM MAX.
TYPE		SELF-PRIMING CENTRIFUGAL

Treatment Component	Size / Description
RETURN/WASTE ACTIVATED SLUDGE PUMPS (PUMP STATION PS2)	(GORMAN RUPP MODEL T6A)
PUMPS	2
CAPACITY EACH	700 GPM @ 49' TDH
DRIVE	25 HP; 1750 RPM, VFD VARIABLE SPEED
	BELT AND PULLEY REDUCED TO 1150 RPM MAX.
TYPE	SELF-PRIMING CENTRIFUGAL
SLUDGE METERING	
RAS/WAS (5)	4" MAGNETIC
SKIMMINGS/SCUM PUMPING	
AERATION BASIN	SUBMERSIBLE GRINDER PUMP
	50 GPM@26', 2 HP
CLARIFIERS 1 AND 2	DOUBLE DISC PUMP, LOWER LEVEL PS1
	4", 50 GPM+
CLARIFIER 3	SUBMERSIBLE GRINDER PUMP
	50 gpm@31', 2 HP
EFFLUENT FILTER FEED PUMPING	
NUMBER	**2**
TYPE	**SOLIDS HANDLING SUBMERSIBLE**
	1250 GPM @ 100'TDH
FORCEMAIN TO FILTER BUILDING	**8" DUCTILE IRON**
FILTER PRE-TREATMENT	
COAGULANT	**ALUMINUM SULFATE**
DOSE RANGE AHEAD OF FILTERS	**35 – 80 MG/L AS ALUM**
STORAGE	**2000 GALLONS**
METERING PUMPS	**2 @ 0 – 4 GALLONS PER HOUR FLOW-PACED**
FLASH MIXING	**3100 GALLONS**
HYDRAULIC RESIDENCE TIME	**3 MINUTES MINIMUM**
MIXER	**5 HP, HYDROFOIL IMPELLER, ON VFD**
ENHANCED FLOCCULATION	**3 TANKS**
VOLUME EACH	**6400 GALLONS**
HYDRAULIC RESIDENCE TIME NOMINAL	**30 MIN**
AGITATORS	**8" DUCTILE IRON**

Treatment Component	Size / Description
FILTERS	
CONFIGURATION	**CONTINUOUS BACKWASH UPFLOW SAND (PRELIMINARY DESIGN FOR CONTINUOUS BACK-WASH, UP-FLOW) OTHER CONFIGURATIONS MAY BE RE-CONSIDERED DURING DESIGN**
NUMBER CELLS	**2**
UNITS PER CELL	**2**
FILTER SURFACE AREA PER CELL	**50 SF**
HYDRAULIC LOADING RATE, MAX MONTH DESIGN 0.60 MGD	**2.1 GPM/SF**
HYDR. LOADING RATE, MAX DAY DESIGN 0.90 MGD	**3.1 GPM/SF**
HYDR. LOADING RATE PEAK 1.80 MGD	**6.3 GPM/SF**
DISINFECTION	
ULTRA-VIOLET LAMPS – REPLACE EXISTING	**LOW-PRESSURE, HIGH INTENSITY**
TOTAL LAMP NUMBER	**120**
NUMBER BANKS	**3**
NUMBER MODULES PER BANK	**1**
NUMBER LAMPS PER MODULE	**40**
DESIGN FLOW PER BANK	**1.6 MGD**
DESIGN DOSE	**37,000 μW/cm^2**
EFFLUENT FLOW METERING	
	9” PARSHALL FLUME (NESTED IN 12” FLUME), ULTRASONIC
PLANT UTILITY WATER SYSTEM	PACKAGE DUPLEX VERTICAL TURBINE
PUMPS	PACO
CAPACITY (EACH)	100 GPM
UTILITY WATER CHLORINATION	CARRIES CHLORINE RESIDUAL IN SYSTEM
FEED	SODIUM HYPOCHLORITE OR CALCIUM HYPOCHLORITE
FEED PUMP	LIQUID METRONICS (LMI) A94, .006-.46 GAL.HR
OUTFALL	
PIPE	16"
LENGTH (Approx.)	78’
CAPACITY	3100 gpm (4.5 MGD) at FEMA 100-YR FLOOD
RECEIVING WATER	
	WENATCHEE RIVER

Treatment Component	Size / Description
BIOSOLIDS (SLUDGE) HANDLING	
WASTE ACTIVATED SLUDGE PRODUCTION	
AVG ANNUAL, PPD DS	460
MAX MONTH, PPD DS	783
WASTE ACTIVATED SLUDGE STORAGE	
VOLUME	81,000 GAL
STORAGE TANK	(CONVERTED EAST END OF OLD AB2)
STORAGE TANK AERATION	(SANITAIRE DIFFUSERS)
TYPE	COARSE BUBBLE DIFFUSERS
BLOWER	1 (GARDNER DENVER/SUTORBILT “5M”)
CAPACITY	220 - 400 SCFM X 7 PSIG
CONTROL	VFD MANUAL VARIABLE SPEED
DRIVE MOTOR	20 HP
SUPPLEMENTAL MIXING	SUMBERSIBLE MIXER, 4 HP
STORAGE CAPACITY (1.5% DS) AT DESIGN	10 DAYS
DECANT TO THICKEN	(MANUALLY ADJUSTABLE TELESCOPING VALVE)
SLUDGE DEWATERING	
SLUDGE SCREW	**DUAL DRUM**
DRUM DIAMETER	**12 INCH**
DESIGN LOADING RATE	**150 LB DS/HR PER SCREW / DRUM**
MAXIMUM HYDRAULIC LOADING	**35 GPM PER SCREW / DRUM**
FLASH MIXXING TANK (WORKING VOL.)	**605 GALLONS**
FLOCCULATION TANK (WORKING VOL.)	**100 GALLONS**
EXPECTED SLUDGE SOLIDS CONCENTRATION	**16 % DS**
WASHWATER USE	**20 GALLONS PER HOUR**
BELT FILTER PRESS FEED PUMP (P-SD-BFP)	PENN VALLEY
TYPE	"DOUBLE DISC" PUMP
SIZE & CAPACITY	4"; 100 GPM @ 23’
DRIVE	7.5 HP
POLYMER FEED SYSTEM	ROEDIGER “ROEDOS L1”
CONCENTRATED POLYMER FEED RATE	8 GAL/HR
POLYMER SOLUTION FEED RATE	1,800 GAL/HR
STORAGE/AGING TANK VOLUME	50 GAL, STAINLESS STEEL

Treatment Component	Size / Description
BIOSOLIDS DISPOSAL	
CHELAN AND DOUGLAS COUNTY LANDFILL	
PLANT DRAINAGE PUMP SYSTEM	
PUMPS	2 X HYDROMATIC S4NX
CAPACITY	150 gpm at 41.5 feet
DRIVE	5 hp
STANDBY POWER	
MANUFACTURER	ONAN
GENERATOR	500 KW (625 KVA @ 80%), 3 PH, 480 v
WATER SUPPLY	
POTABLE (PW); OPERATION/LAB BLDG ONLY	CITY OF LEAVENWORTH
	1-1/4” RPBP PROTECTED
CITY UTILITY (PW1)	CITY OF LEAVENWORTH
	4” RPBP PROTECTED
CITY WATER METER	4" WATER METER
PLANT UTILITY (WP2)	EFFLUENT UTILITY WATER SYSTEM

10.0 IMPLEMENTATION AND FINANCING

10.1 Capital Improvements Plan

Recommended wastewater system capital improvements are summarized in the following table as compiled from earlier sections.

Table 10-1: Capital Improvements Plan

Description	Estimated Component Cost	Estimated Total Cost
Collection System		$4,150,000
• Priority 1 and Priority 2 Collection System Improvements	$3,270,000	
• Priority 3 Collection System Improvements	$760,000	
• Collection System Smoke Testing	$10,000 - $20,000	
• Clean and Video Inspection	$100,000	
Wastewater Treatment Plant Upgrades (upgrades to existing plant + phosphorus treatment addition)		$8,410,000
	Total (1)	$12,560,000

(1) *Estimated in 2016 dollars*

The estimated improvements costs are based on 2016 dollars. The following table estimates the project cost at the time of the anticipated construction (i.e. 2019) and for funding budgeting and planning purposes.

Table 10-2: Estimated Project Budget

Description	Treatment Improvements Only	Treatment and Collection System Improvements
Estimated Capital Cost (1)	$ 8,410,000	$ 12,560,000
Estimated Rate of Annual Inflation	3.5%	3.5%
Years of Inflation (based on construction beginning June 2019)	2.5	2.5
Total Inflation Contingency	8.8%	8.8%
Estimated (2)	$ 9,150,000	$ 13,660,000

(1) *From Table 10-1 estimated in 2016 dollars*
(2) *Estimated as 2019 dollars*

10.2 Potential Funding Sources

There are several funding sources available to municipalities for financing public works projects (some specifically directed at wastewater improvements) through grants and low interest loans (and forgivable loans – equivalent to grant). The favorability of each program varies from community to community, and project to project depending on several factors (e.g. $ size of project; need; potential health and safety threat; impacts to water quality; anticipated sewer rate impacts to customers; and various other funding criteria).

Two potential funding agencies that will likely result in favorable funding packages for Leavenworth are:

- WA Department of Ecology
    - Centennial Clean Water Program (CCWP), and
    - Clean Water State Revolving Fund Loan Program (CWSRF)
- US Department of Agriculture – Rural Development (RD)
    - Water and Waste Disposal Loan and Grant Program

Further information on the two programs included below; and a subsequent section with potential funding scenarios likely to result from the two funding agencies. In addition, other funding sources are list that are not specifically considered at this time, but that may have future applicability depending available funding and aggressiveness of Leavenworth in pursuing funding or other factors that may emerge as planning moves forward.

10.2.1 WA Department of Ecology

- *Centennial Clean Water Program (CCWP) (grants)*
- *Clean Water State Revolving Fund Loan Program (CWSRF) (loans and forgivable loans)*

Both above programs are administered by the WA State Department of Ecology (ECY). The programs fund planning, design, and construction costs associated with wastewater treatment facilities and the implementation of non-point activities. To be eligible, projects must be water quality projects that prevent and control pollution of ground and surface waters.

Although the two programs are listed separately and have specific criteria unique to each, they are accessible through a single application process through ECY at a single time each year. Following application submission, ECY reviews and determines the most applicable funding source and amount to be applied from each program, depending on eligibility and other criteria specific to the project.

Interest rates for loans are based on a percent of tax-exempt municipal bonds. FY 2018 loan interest rates (for non-hardship) are 0.7% for a 1-5 year loan, and 1.5% for a 6-20 year loan. Forgivable loan (i.e. equivalent to grant) may also be offered to applicants depending on funds available, and depending on financial hardship criteria of the community.

Limited grant subsidy is available to applicants that can demonstrate financial hardship. Hardship interest rates and grant subsidy eligibility are shown in the following table.

Table 10-3: ECY Hardship Interest Rates and Hardship Grant Eligibility [1]

Sewer Rate [2] ÷ MHI [3]	< 2%	≥ 2% but < 3%	≥ 3% but < 5%	≥ 5%
Hardship Designation	Non-hardship	Moderate Hardship	Elevated Hardship	Severe Hardship
20-year Loan Rates	1.5%	1.0%	0.5%	0.0%
Grant Eligibility	Not eligible	50% (up to $5M)	75% (up to $5M)	100% (up to $5M)

(1) *Based on FY2018 information, FY2019 information is unavailable at this time*
(2) *"Sewer Rate" for this calculation is the potential future sewer that would result if no grant funding was provided.*
(3) *MHI – Median Household Income for the community (Leavenworth 2016 MHI = $37,348)*

ECY requires user rates include an annual 20% reserve to be collected during the first five years, equivalent to at least one annual debt service on the loan.

The application cycle for FY 2019 will be between August-October 2017, with an application deadline in October 2017 and a Final Offer List generally published by early summer of 2018 and funds available thereafter. Dates could change.

10.2.2 US Department of Agriculture – Rural Development (RD)

o Water and Waste Disposal Loan and Grant Program

The USDA Rural Development (RD) – Water and Waste Disposal Loan and Grant Program funds projects for small (less than 10,000 people) financially distressed communities to extend and improve water and waste treatment facilities. The program is primarily a loan program however, grants are also offered on projects where sewer rates become excessive as compared to sewer rates being paid in other similar communities in the region.

Applicants must demonstrate effort and subsequent inability to finance the project through their own resources or commercial credit, and demonstrate the financial feasibility of the project, including ability to repay the loan. Loan security is normally a revenue bond ordinance, with loan repayment from utility rates, although repayment from taxes can also be used for RD loans.

- Applications for funding are accepted year around with award typically within 6 – 18 months of application submittal.
- Interest rates vary – Currently 1.375% – 2.375%
- 30 to 40-year loan terms. To obtain grant funding, applicant must accept 40-year term
- Application requirements:
  - Approved environmental assessment
  - Preliminary engineering report
  - Financial feasibility and cost analysis

RD requires that the utility user rates provide for an annual 10% reserve income in addition to annual debt service. Each loan agreement is individual to the applicant. RD funds may be used for all phases of project costs (i.e. planning, design, construction, some operation) including costs incurred prior to application to RD (including costs for the current facility planning effort). The governing stipulation

is that RD funds for reimbursement of early phase costs do not become available for reimbursement until project construction is initiated via a construction contract award.

10.2.3 Other Funding Programs

There are other funding programs and mechanisms available that were not considered in depth at this time, but that may have future applicability depending available funding, aggressiveness of Leavenworth in pursuing funding or other factors that may emerge as planning moves forward. The following list is not exhaustive, but represents the more common ones pursued.

10.2.3.1 Community Development Block Grant (CDBG)

The WA Department of Commerce administers the CDBG program. These Department of Housing and Urban Development (HUD) funds are available for water and sewer projects for areas with at least 51% low to moderate income (LMI) residents, which have public health and safety or economic development issues.

The maximum grant amount is $750,000 million. Applications are due June 1 each year. Recipients are usually announced in September and, funding contracts executed within three to six months following.

As indicated above, the CDBG program is highly competitive and funds projects which primarily serve at least 51% LMI residents. Leavenworth is not shown as eligible for this funding due to not meeting the 51% LMI threshold. Cities can conduct independent income surveys in an effort to demonstrate at least 51% LMI. The likelihood of Leavenworth meeting the LMI threshold is low due to the high percentage of commercial business beneficiaries and assumed low LMI population.

10.2.3.2 Public Works Board - PWB (formerly Public Works Trust Fund)

This state program, administered by the WA Department of Commerce, has provided low interest loans for the repair, rehabilitation, and reconstruction of municipal infrastructure. The PWB (originally the Public Works Trust Fund) was established 30 years ago and historically been a sought-after source of low interest loans due to the simplicity and flexibility of the program. The program is loan only and does not offer grant funding. Loan maximum is $10 million; no matching funds required; standard Interest rate is 1.66% with 20 year loan term and no loan fee.

In recent years, since 2011, the program has not awarded funding due to the Legislature's redirection of the program's funds to help balance the State General and education funds. Applications were received last August 2016 by the program. The PWB has recommended to the Legislature funding of approximately $100 million in projects. It is not yet known whether those projects will be funded or whether the funding will be withdrawn and used by the State of Washington for government operational needs. The final status of the PWB and future funding offerings is yet to be determined.

10.2.3.3 Line Item – State Budget

A small number of communities have sought assistance from their state representative and/or state senator to obtain funding for their public works project directly from the legislature. The City of Pateros recently used this approach successfully and was able to demonstrate the severe impact of the Carlton Complex fire in the area in 2014 to the local economy and infrastructure.

This approach generally requires significant time and involvement, and connectedness with the area's State Senator and/or Representatives. Usually a person either part of city government or influential resident that can spend time and effort is needed. A strong case needs to be made by the community, and buy-in by the Senator and/or Representatives such that the project request makes it onto the State budget, and through the budget process successfully.

10.2.3.4 Revenue Bonds / General Obligation Bonds

Revenue bonds and general obligation bonds have historically been a means of funding public works projects by some communities. These funding mechanisms will likely not be needed due to the high likelihood Leavenworth will qualify favorably for the other loan/grant programs previously discussed. These funding mechanisms can be considered further if other more advantageous sources cannot be obtained.

10.2.3.5 City / Utility Reserve Funds

Accumulated local reserve funds are usually insufficient to fund large scale capital improvements without considerable supplemental funding. Communities are encouraged to budget sufficiently to be able to save and accumulate local reserves for responsible operation, future improvements and emergency reserves for the utility. In the case where large capital projects are anticipated, local reserves are generally used as seed money to match or leverage funding sources to obtain more favorable funding consideration and funding offers. Communities are encouraged to be accumulating reserves well ahead of project implementation, and to be setting utility rates accordingly.

10.3 Equivalent Residential Units (ERUs)

Leavenworth's wastewater rate charges are based on Equivalent Residential Units (ERUs). For billing purposes, one ERU is defined as a single-family residence and is invoiced at the standard residential sewer rate for residential customers. One ERU is also applied to each unit of multi-family complexes. Commercial and other not residential customers are assigned an equivalent ERU count that is intend to represent the relationship to a residential ERU. Commercial sewer rates are based on calculating and ERU count based on the average monthly water use between October 1 and September 30 with one ERU being equivalent to 7,500 gallons of water use.

The significance of the ERU count is that it represents the invoicing weight of each customer and therefore translates to revenue charged to customers and received by the City. Leavenworth's rates and fees policies are outlined in City Resolution 03-2016 for 2016 and Resolution 16-2016 for the upcoming year 2017 (effective 1/1/17). The City's rates and fees are available on Leavenworth's website at: http://cityofleavenworth.com/city-government/rate-fee-schedule/.

ERU's used for estimating rate impacts in this facility plan in the following sections are based on the City sewer billing records. The latest full year invoicing record indicated and average of 1,973 billing units or ERUs for the year. For rate impact estimating purposes, 1,950 ERU's has been used to be conservative and account for year to year fluctuations in ERU's.

10.4 Existing and Future Operation and Maintenance Costs

A summary of the City's 2016 budget and 2015 actual costs for the sewer system (collection and treatment) operation and maintenance is shown in the following table.

Table 10-4: Wastewater Treatment and Collection System O&M Costs (without P treatment)

Description	2015 (actual)	2016 (budget)	Pro Forma (est. 2019)
Sewer Operation and Maintenance	$824,669	$988,105	$1,038,000 (1)
Debt Service	$293,108	$312,466	$315,000
Capital Expenditures	$131,500	$325,000 (2)	$75,000 (3)
Total Expenditures	$1,249,277	$1,625,571	$1,428,000
Total Expenditures, less Capital Expenditures	$1,117,777	$1,300,571	$1,353,000
ERUs	1,950	1,950	1,950
Monthly Cost per ERU	$53.4	$69.5	$61.0
Monthly Cost per ERU (less Capital Expenditures)	$47.8	$55.6	$57.8
Current Single Family Residential Sewer Rate	$ 55.64	$ 55.64	

(1) *Pro Forma O&M costs assumed at 2016 budget + 5%, for estimate of 2019 O&M costs (i.e. +2%/yr. for 2.5 years).*
(2) *Annual capital expenditures not necessarily reoccurring expenditures annually. Year 2016 includes $200,000 for Preliminary Facilities Plan Engineering and $20,000 for utility rate study.*
(3) *Past years budgeted Capital Expenditures have wide range. Future expenditures may be expected to be lower if major treatment and collection improvements are addressed via this plan. Future nominal Pro Forma assumed at $75,000.*

10.4.1 Estimated Additional O&M For Phosphorus Treatment

The following table summarizes the estimated additional operation and maintenance costs for the upgraded facilities with phosphorus treatment added. The estimated additional costs include two locations for chemical addition, and tertiary filtration, including pumping, mixing, flocculating, and backwashing.

Table 10-5: Estimated Additional O&M Costs Associated With Phosphorus Treatment

Category	Basis (Assumptions)	Annual Estimated Costs
Power	$0.07 per KW-hr flat rate / no capacity charge included. Operation: estimated 243 days	
Filter feed pumping	231 gpm (2020 average), 100 ft TDH to rapid mix tanks	$3,300
Mixers and agitators	Flash mix 4 hp ave (VFD) / Floc 3x 0.6 hp ave (VFD)	$1,700
Air Compressor	Manufacturer's estimate, adjusted for flow and operational schedule	$1,200
Other process	Chemical feed pumps, control, etc.	$100
Building heat and light	9.24 kW ann ave heat (0-8 W/sf depending on month); 2.5 W/SF lighting	$6,700
Equip Maintenance (replac & repair)	Repair / Parts / Repl. Budgeting - 1.5% of new equip capital cost	$13,400
Chemicals – Alum Feed, Alkalinity, Polymer	110 mg/l alum average (60 mg/l secondary, 50 mg/l tertiary) = 305 lb/d; 0.5 mg/l polymer; 170 lb/day NaOH alkalinity	$30,700
Operating Labor	5 hr/wk sampling and testing, 4 hrs/ wk operations, 1 hrs per week records and reporting, 40 hrs per year start-up and shut-down, $35/hr	$8,000
Sludge Processing (additional chemical sludge generated):	Polymer costs, disposal, labor total assumed $600 per dry ton	$5,800
Total Ann. Estimated Increase to O&M		$70,900
Pro Forma	Assume +5% as estimate of 2019 cos ts (i.e. +2%/yr. for 2.5 years)	$74,500
	Estimated Additional O&M Cost Per ERU:	
	ERUs	1,950
	Estimated Additional Monthly O&M Per ERU	$3.2

10.5 Funding Scenarios and Estimated Sewer Rate Impacts

As indicated in preceding Section 10.2, there are several funding sources available to municipalities for financing public works projects through grants and low interest loans. The favorability of each program varies from community to community, and project to project depending on various criteria used by the funding agency and the specific details of the project. Also, indicated earlier, two potential funding agencies that will likely result in the most favorable funding packages for Leavenworth are:

- WA Department of Ecology (ECY)
  - Centennial Clean Water Program (CCWP), and
  - Clean Water State Revolving Fund Loan Program (CWSRF)
- US Department of Agriculture (USDA) – Rural Development (RD)
  - Water and Waste Disposal Loan and Grant Program

Funding scenarios for the above two funding agencies are presented for two capital improvement scenarios:

- Treatment Improvements Only ($9.15 million)
- Treatment + Collection system Improvements ($13.66 million)

The following **Table 10-6** provides an abbreviated summary of results showing the estimated rate impact ranges that may be expected for each of the two programs for loan and grant scenarios. The subsequent detailed tables – **Table 10-7** and **Table 10-8** (see the two pages following the next page) augment and provide the detailed assumptions and references for developing the scenarios.

Table 10-6: Funding and Rate Impacts Summary

Description / Assumptions:	Ecology Funding		Rural Development Funding	
	Loan Only	Loan + Hardship Grant	Loan Only	Loan + Grant
Treatment Improvements Only	$9.15 million			
Approximate loan / grant ratio	100% / 0%	54% / 46%	100% / 0%	55% / 45%
Loan terms (interest varies)	2.6%, 20 years, 20% pmt. reserve		3%, 40 years, 10% pmt. reserve	
Approximate resulting sewer rate estimate	**$95**	**$81**	**$83**	**$74**
Impact above existing rate (i.e. $55.64)	$40	$25	$27	$19
Treatment + Collection System Improvements	$13.66 million			
Approximate loan / grant ratio	100% / 0%	70% / 30%	100% / 0%	55% / 45%
Loan terms (interest varies)	2.6%, 20 years, 20% pmt. reserve		3%, 40 years, 10% pmt. reserve	
Approximate resulting sewer rate estimate	**$110**	**$96**	**$92**	**$79**
Impact above existing rate (i.e. $55.64)	$55	$41	$36	$24

It appears funding through the USDA – Rural Development (RD) will likely be more favorable than the Department of Ecology (ECY), particularly if Leavenworth elects to implement the scenario where both treatment and collection system improvements are implemented as one project. However, this depends largely on RD's grant funding availability at the time an application is submitted.

As currently shown in the referenced tables, the RD grant option shown is for the maximum grant eligibility level (i.e. 45%) Leavenworth is eligible for from RD. If RD grant funds are not available, or are available at a significantly lower rate, ECY funding may become more desirable.

The exact details of an RD offer are determined on a case by case basis; and, are also dependent on RD's grant availability at the time of application. The process for determining further Leavenworth specific details is to meet with RD representatives and begin the application process. We recommend scheduling a meeting with RD to initiate the process. In addition, ECY funding may also be considered further depending on the RD funding process and expected outcomes. Therefore, ECY funding and funding cycle dates should be noted for consideration as backup.

The most favorable funding windows for RD are at the first of the year in January (i.e. following the previous October start of their fiscal year), and again in late summer (August during their national pooling of funding) of each year. At the time the favorable RD windows approach, the RD funding process needs to be well underway and all thresholds complete (i.e. environmental clearance, RD's preliminary engineering report, and RD forms and paperwork complete).

10.5.1 Recommended Funding Steps and Timeline

The following target funding process is recommended:

- Schedule funding meeting with RD representatives during early 1st quarter of 2017 (i.e. January 2017).
- Proceed with RD funding process (i.e. RD environmental clearance, RD's preliminary. engineering report requirements, RD application process). Complete RD requirements by June 2017.
- RD obligate funding during August 2017 national pooling of funds. If deadline not met, or favorable funding not available at that time, target back-up RD obligation of funding for January 2018.
- In September 2017, based on status and results of RD funding process, assess whether ECY funding application for October funding cycle should be submitted. If warranted, submit ECY funding application in October 2017.

Other funding scenarios and pathways may emerge as Leavenworth moves forward, and can be reviewed and considered at that time. Also, as indicated in preceding sections, there are also other more aggressive approaches through the legislative process (line item in State budget), if the City opted to pursue this approach. However, as indicated, these take more effort by the City and requires a strong case why the project should receive wider state support; and necessitates Leavenworth be in contact with a State Senator and/or Representative proponent(s) of the project.

Table 10-7: Funding Scenarios and Rate Impacts – Treatment Improvements Only

Description / Assumptions:	ECY Loan Only	ECY Loan + Hardship Grant	RD Loan Only	RD Loan + Grant
Total Estimated Project Cost	$9,150,000	$9,150,000	$9,150,000	$9,150,000
Assumed Funding Source:				
RD Loan			$9,150,000	$5,032,500
SRF/CCW Loan	$9,150,000	$4,950,000		
RD Grant				$4,117,500
CCW Hardship Grant (1) (2) or Forgivable Loan		$4,200,000		
Local Contribution	(to be deter.)	(to be deter.)	(to be deter.)	(to be deter.)
Estimated Loan/Debt Portion of Project	$9,150,000	$4,950,000	$9,150,000	$5,032,500
% Loan	100%	54%	100%	55%
% Grant (+Local)	0%	46%	0%	45%
Estimated Annual Costs ($/yr):				
New Debt Cost + Req'd Reserve (for above loan amt.)	$725,000	$392,200	$435,400	$239,500
Existing Debt Costs (Table 10-4, Pro Forma) (3)	$315,000	$315,000	$315,000	$315,000
Existing O&M Costs (Table 10-4, Pro Forma)	$1,038,000	$1,038,000	$1,038,000	$1,038,000
Annual Capital Expenditures (Table 10-4, Pro Forma)	$75,000	$75,000	$75,000	$75,000
Est Addt'l O&M Costs for Phos Trt (Table 10-5)	$74,500	$74,500	$74,500	$74,500
Total Annual Costs	$2,227,500	$1,894,700	$1,937,900	$1,742,000
Estimated Rate per ERU (based on above annual costs):				
Est. Number of ERUs (4)	1950	1950	1950	1950
Approx Req'd Rate per ERU ($/mo/ERU) (5)(6)				
New Debt Cost + Req'd Reserve	$31.0	$16.8	$18.6	$10.2
Existing Debt Costs	$13.5	$13.5	$13.5	$13.5
Existing O&M Costs	$44.4	$44.4	$44.4	$44.4
Annual Capital Expenditures	$3.2	$3.2	$3.2	$3.2
Est Addt'l O&M Costs for Phos Trt (Table 10-5)	$3.2	$3.2	$3.2	$3.2
Estimated Approx Req'd Rate ($/mo/ERU) (5)	**$95**	**$81**	**$83**	**$74**
Current (2016 & 2017) Sewer Rate ($/mo/ERU)	**$55.64**	**$55.64**	**$55.64**	**$55.64**

(1) *Estimated Leavenworth financial hardship index with project = 2.5%. Thus, potential Leavenworth eligibility for up to 50% financial hardship grant, for eligible portion of treatment costs (design phase not eligible) up to $5,000,000.*

(2) *ECY does not provide hardship grant for collection improvements, unless specifically for cost effective I/I reduction.*

(3) *Refinancing of existing debt may be allowed under RD funding, if beneficial to lower Leavenworth rates.*

(4) *See ERU discussion Section 10.3.*

(5) *Rate impact does not include additional rates associated with utility tax (if one exists).*

Table 10-8: Funding Scenarios and Rate Impacts – Treatment + Collection Improvements

Description / Assumptions:	ECY Loan Only	ECY Loan + Hardship Grant	RD Loan Only	RD Loan + Grant
Total Estimated Project Cost	$13,660,000	$13,660,000	$13,660,000	$13,660,000
Assumed Funding Source:				
RD Loan			$13,660,000	$7,513,000
SRF/CCW Loan	$13,660,000	$9,460,000		
RD Grant				$6,147,000
CCW Hardship Grant (1) (2) or Forgivable Loan		$4,200,000		
Local Contribution	(to be deter.)	(to be deter.)	(to be deter.)	(to be deter.)
Estimated Loan/Debt Portion of Project	$13,660,000	$9,460,000	$13,660,000	$7,513,000
% Loan	100%	69%	100%	55%
% Grant (+Local)	0%	31%	0%	45%
Estimated Annual Costs ($/yr):				
New Debt Cost + Req'd Reserve (for above loan amt.)	$1,082,300	$749,500	$650,100	$357,500
Existing Debt Costs (Table 10-4, Pro Forma) (3)	$315,000	$315,000	$315,000	$315,000
Existing O&M Costs (Table 10-4, Pro Forma)	$1,038,000	$1,038,000	$1,038,000	$1,038,000
Annual Capital Expenditures (Table 10-4, Pro Forma)	$75,000	$75,000	$75,000	$75,000
Est Addt'l O&M Costs for Phos Trt (Table 10-5)	$74,500	$74,500	$74,500	$74,500
Total Annual Costs	$2,584,800	$2,252,000	$2,152,600	$1,860,000
Estimated Rate per ERU (based on above annual costs):				
Est. Number of ERUs (4)	1950	1950	1950	1950
Approx Req'd Rate per ERU ($/mo/ERU) (5)(6)				
New Debt Cost + Req'd Reserve	$46.3	$32.0	$27.8	$15.3
Existing Debt Costs	$13.5	$13.5	$13.5	$13.5
Existing O&M Costs	$44.4	$44.4	$44.4	$44.4
Annual Capital Expenditures	$3.2	$3.2	$3.2	$3.2
Est Addt'l O&M Costs for Phos Trt (Table 10-5)	$3.2	$3.2	$3.2	$3.2
Estimated Approx Req'd Rate ($/mo/ERU) (5)	**$110**	**$96**	**$92**	**$79**
Current (2016 & 2017) Sewer Rate ($/mo/ERU)	**$55.64**	**$55.64**	**$55.64**	**$55.64**

(1) *Estimated Leavenworth financial hardship index with project = 2.5%. Thus, potential Leavenworth eligibility for up to 50% financial hardship grant, for eligible portion of treatment costs (design phase not eligible) up to $5,000,000.*

(2) *ECY does not provide hardship grant for collection improvements, unless specifically for cost effective I/I reduction.*

(3) *Refinancing of existing debt may be allowed under RD funding, if beneficial to lower Leavenworth rates.*

(4) *See ERU discussion Section 10.3.*

(5) *Rate impact does not include additional rates associated with utility tax (if one exists).*

10.6 Projected Schedule

(to be added)

10.7 Public Involvement / Comment

To obtain funding through USDA Rural Development and/or the Department of Ecology, a minimum of one public meeting must be held to solicit public involvement and comment on the findings of the GSP/FP. The public meeting must be publically advertised. The agenda for the meeting should list the discussion items and should include: the alternatives considered, costs, estimated rate impacts, environmental impacts and other topics as determined relevant to the project.

(additional to be added following public meeting)

10.8 Permits

(to be added)

10.9 Compliance with SEPA / NEPA

(to be added)