

# EXECUTIVE SUMMARY

## ES-1 Introduction

Planning the 20-year wastewater infrastructure needs of a fast-growing region presents enormous challenges. Expanding populations must be served and increasing flows must be handled. Infrastructure must be used wisely to maximize limited resources; regulations must be followed. Planning on this level involves weighing a complicated array of interconnected—and often conflicting—factors and variables.

But challenges also reveal opportunities. Exciting technologies are now available that promote water reclamation, energy efficiency, biosolids and biogas utilization, and overall environmental sustainability as never before. A window is open to extraordinary possibilities. This *Central Kitsap County Wastewater Facility Plan* (Facility Plan) provides a road map for the Central Kitsap area’s long-term wastewater infrastructure needs. It also explores system improvements that will start moving Kitsap County toward a greener future.

The overall goal of providing sewerage service is to protect public health and the quality of water resources. This Facility Plan identifies the facilities required to meet these goals and provides guidance for the development of wastewater facilities for a growing service area. Beyond that, it highlights opportunities for Kitsap County to chart a more sustainable, energy-efficient course. It also must comply with Washington Department of Ecology (Ecology) regulations for facility plans (Washington Administrative Code [WAC] 173-240-060). This Facility Plan will allow the County to manage growth within the context of a countywide wastewater service network.

Another key driver was Kitsap County’s “Water as a Resource” Policy. The County has enacted a far-reaching resolution (Resolution 109-2009, dated June 22, 2009) to conserve and protect the county environment by enlightened stewardship of local county water resources. These aquatic resources and assets include wetlands, stormwater, groundwater, streams, lakes, and Puget Sound. The County has declared its policy to reuse wastewater effluent and minimize flow and nutrient loading to Puget Sound while preserving and conserving precious groundwater resources. This resolution articulates the County’s environmental leadership to preserve and protect its resources. A copy of this resolution is included in Appendix 5B.

To develop a 20-year wastewater facility plan, a comprehensive, defensible decision-making methodology first must be established. The recommendations provided in this Facility Plan were arrived at by determining a set of key criteria. These criteria are based on the following factors:

- planning area characteristics and population projections
- estimated wastewater flows and loadings
- condition of existing infrastructure
- current regulations
- water conservation and reuse.

After determining the key criteria based on the factors listed above, they were applied to all potential wastewater infrastructure project alternatives to identify, evaluate, and rank them. Only capital projects that can be easily supplemented or modified for future wastewater reclamation and reuse were identified for consideration. (Note: The term “reuse” is used broadly in this Facility Plan to express any efforts to increase the wastewater system’s beneficial use of biosolids and biogas, energy efficiency, water reclamation, and overall environmental sustainability.) Figure ES-1 provides a general graphical depiction of the methodology that was employed to reach the final recommendations.

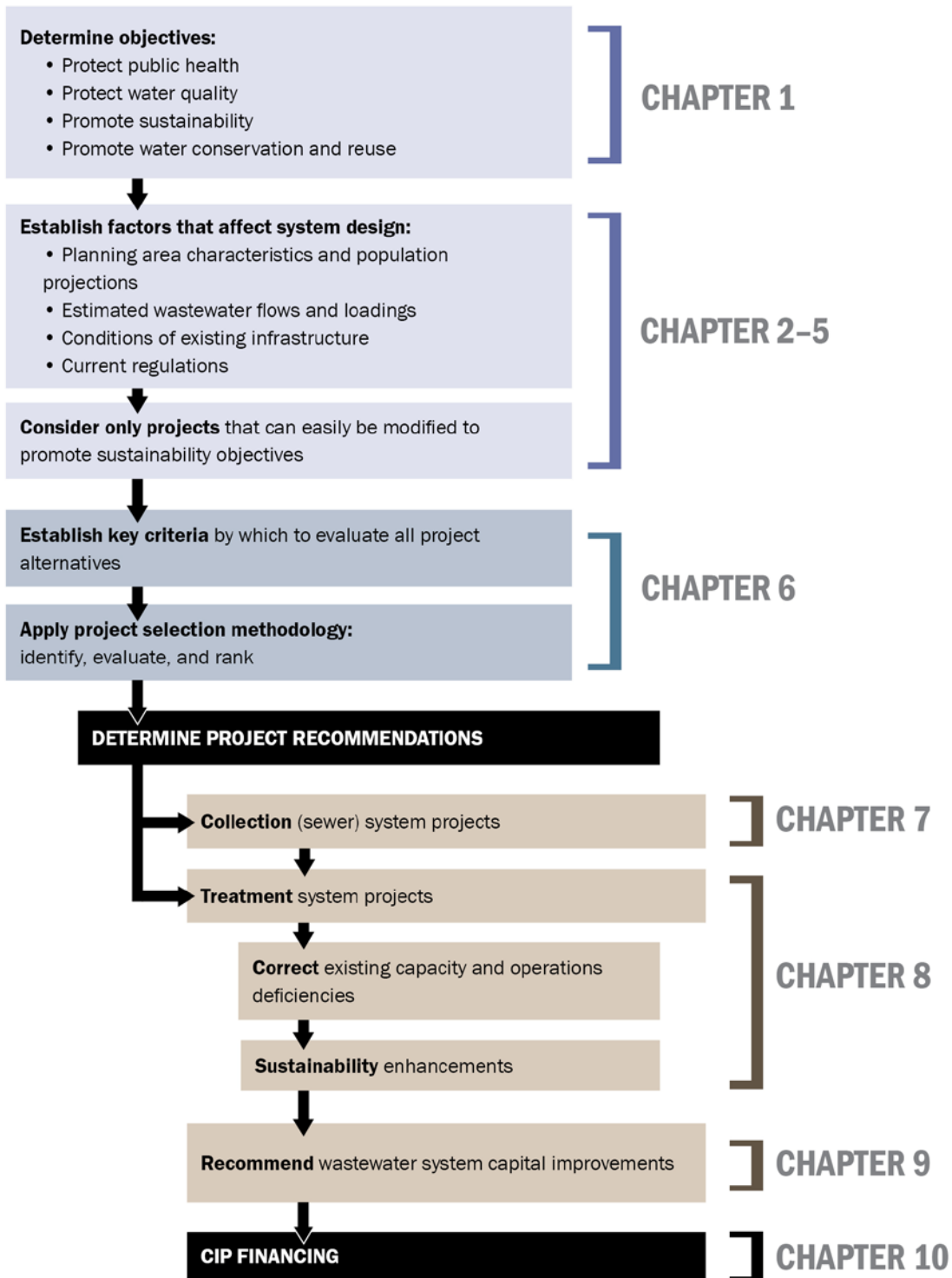


Figure ES-1. Facility planning methodology

The criteria that most heavily influence the selection of potential projects for further consideration are shown in Table ES-1. This table also indicates which of the two main wastewater infrastructure categories these criteria apply to.

Table ES-1. Key Criteria Used to Select Projects					
Key criterion number	Key criterion	Key criterion attributes	Applicable to collection system projects	Applicable to treatment system projects	Facility Plan chapters where discussed
1	Correct known wastewater system deficiencies	Facilities are intended to rectify known existing significant wastewater infrastructure deficiencies.	✓	✓	4, 7
2	Repair and replace aged assets	Facilities are intended to repair and replace wastewater system components that are near or beyond asset service life.	✓	✓	4
3	Provide wastewater service capacity for planning period growth (serving wastewater flow and load projections)	Facilities provide capacity expansion to meet wastewater service requirements for anticipated growth in the planning period (to year 2030), consistent with Growth Management Act (GMA) requirements.	✓	✓	3
4	Regulatory compliance	Facilities must comply with all applicable regulations and permits.	✓	✓	4, 5
5	Land use	Facilities are intended to provide service for applicable designated land use categories, and to avoid sensitive areas unsuitable for service or for wastewater facilities. Use and upgrade of existing infrastructure is encouraged.	✓	✓	2, 7, 8
6	Accepted engineering design criteria	Facilities must comply with Ecology and other accepted industry standards for design and operations.	✓	✓	6, 7, 8
7	Best available technologies	Facilities utilize the currently available best technology to meet existing and anticipated wastewater system needs economically, efficiently, and reliably.		✓	8
8	System operational considerations	Capital improvements facilitate maintenance and operations of facilities.		✓	8
9	Flexibility for future expansion	Facilities can be modified or expanded to provide new roles or services without creating stranded investments or precluding future opportunities.	✓	✓	7, 8
10	Reclaimed water utilization	Facilities enable the beneficial use of highly treated wastewater effluent for irrigation, groundwater recharge, and stream flow augmentation. All wastewater effluent is currently discharged to Puget Sound.		✓	8
11	Energy usage	Treatment processes or facilities are capable of reducing energy consumption or of producing "green power."		✓	8

Table ES-1. Key Criteria Used to Select Projects

Key criterion number	Key criterion	Key criterion attributes	Applicable to collection system projects	Applicable to treatment system projects	Facility Plan chapters where discussed
12	Biosolids utilization	Facilities continue or enhance the use of biosolids and nutrient recycling. Currently, biosolids from the CKWWTP are conveyed to a private enterprise for a beneficial reuse of this product.		✓	8
13	Environmental and sensitive area concerns	Facilities minimize environmental impacts for water quality, biosolids quality, noise, odor, and wildlife habitat in the surrounding community and in sensitive areas in particular.	✓	✓	2, 7, 8
14	Community considerations	Facilities are consistent with Kitsap County policies and are least disruptive to community values, aesthetics, and safety.	✓	✓	7, 8
15	Planning-level costs	Facilities provide the maximum value for the least cost. In the case of collection system improvements, total project cost (capital cost) is used as the key cost criterion. For treatment system improvements, net present value (NPV) is used as the key cost criterion for alternatives evaluation. Planning-level cost accuracy typically ranges from +50 to -30 percent.	✓	✓	6, 7, 8, 9

This Facility Plan constitutes a portion of the Kitsap County Comprehensive Plan capital facilities element. At the time of adoption this Facility Plan is consistent with the other elements of the Comprehensive Plan. However, if subsequent changes to other elements of the Comprehensive Plan render it inconsistent with this Facility Plan, revisions may be required. Further, in accordance with Revised Code of Washington (RCW) 36.70A.070(3)(e), if probable funding for the proposals set forth in this Facility Plan fall short of meeting needs, the land use element of the Kitsap County Comprehensive Plan will be reassessed.

According to RCW 90.48, all engineering reports, facility plans, construction plans, and specifications for new construction, improvements, or extensions of existing sewerage systems, sewage treatment, or disposal plants or systems shall be submitted to and approved by Ecology before construction may begin. In general, this review is intended to ensure that facilities proposed to be designed, constructed, operated, and maintained will meet the applicable state requirements to prevent and/or control pollution of state waters.

This Facility Plan will first be approved by Kitsap County as part of the capital facilities element of its Comprehensive Plan. The final Facility Plan must comply with Ecology regulations for facility plans (WAC 173-240-060). Ecology is expected to review the final Facility Plan in 2011. The requirements for an engineering report are specifically structured for projects that are funded only through local funds or by state funding programs. If a project is to be considered eligible for funding by the U.S. Environmental Protection Agency (EPA), then additional requirements are imposed in this document to conform to a Facility Plan. A facility plan must also follow the guidelines contained in the EPA publication, "Guidance for Preparing a Facility Plan" (MCD-46), and shall indicate how the special requirements contained in Code of Federal Regulations (CFR) Title 40 Part 35.719-1 will be met. One fundamental additional requirement of a facility plan is that a discussion of treatment alternatives must be included to document that the most cost-effective

solution has been recommended. This document meets the requirements for both a facility plan and an engineering report.

Approval of the Facility Plan by Ecology and the standard design criteria submitted to support development of the Facility Plan will enable Kitsap County to proceed with sewer line extensions, including pump station projects. The submittal to Ecology for approval of engineering reports and plans and specifications for these conveyance systems projects is not required (WAC 173-240-030[5]).

Adoption of this Facility Plan also requires State Environmental Policy Act (SEPA) review by Kitsap County. A non-project SEPA checklist was prepared and included in Appendix 9. Project-specific SEPA review will be prepared for each of the recommended capital improvement projects at the time they are designed and permitted.

## ES-2 Factors that Influence Wastewater Facility Design

This section summarizes the factors that determine which design alternatives are considered for a wastewater system. These factors are all discussed in greater detail in the main body of this Facility Plan.

### ES-2.1 Planning Area Characteristics and Population Projections

Central Kitsap County's physical characteristics, population projections, and subsequent land use priorities play a critical role in selecting wastewater infrastructure project alternatives. This Facility Plan discusses population estimates for the future planning period. Equivalent residential unit (ERU) population projections for the Central Kitsap planning areas are presented in Table ES-2. A vicinity map showing the general planning area for Central Kitsap is provided in Figure ES-2.

Table ES-2. Equivalent Sewered Population for CKWWTP Service Area and Poulsbo

Year	Central Kitsap UGA	Silverdale UGA	Southern Service Area total <sup>a</sup>	Poulsbo	Bangor	Keyport (base)	Northern Service Area total	Total system
2005	14,069	16,912	30,981	7,295	4,800	1,400	13,495	44,476
2025	26,275	27,765	54,040	15,263	4,800	1,400	21,463	75,503
2030	28,641	30,601	59,242	17,632	4,800	1,400	23,832	83,074

### ES-2.2 Wastewater Characteristics

Wastewater flows and loadings also heavily influence facility design. Consequently, data related to wastewater characteristics and projected flows and loadings affect the selection of key criteria used to select project alternatives for further consideration. Flows affect the hydraulic capacity of the treatment plant, and loadings, characterized by biochemical oxygen demand (BOD) and total suspended solids (TSS) relating to sewage strength, impact the sewage treatment capacity at the Central Kitsap Wastewater Treatment Plant (CKWWTP). Existing wastewater flows and loadings are characterized and projected in proportion to the estimated population expected to be served. This information is used to develop the future target capacity requirements for new wastewater systems. Projected flows and loadings for the CKWWTP are presented in Table ES-3.

Raw influent parameter	Current design <sup>a</sup>	2030
Average annual flow (AAF), mgd	4.6	6.6
Average design flow (ADF), mgd	6.0	8.2
Peak design flow (PDF), mgd	15.0	22.7
Average peak month BOD <sub>5</sub> , ppd	14,100	16,500
Average peak month TSS, ppd	11,400	15,800

*a. Corresponds to Contract I design flows and loads, except for average peak month TSS and 5-day biochemical oxygen demand (BOD<sub>5</sub>) loadings, which correspond to the design loadings shown in the current National Pollutant Discharge Elimination System (NPDES) permit. The ADF for the secondary treatment system has been re-rated from 6 to 7 mgd per letter from Department of Ecology, July 28, 2008.*

### ES-2.3 Existing Wastewater System Condition

One of the basic objectives of facility planning is to evaluate the feasibility and cost-effectiveness of incorporating existing systems into a comprehensive wastewater management program. Accordingly, information regarding the characteristics and conditions of the existing system is analyzed to define each component's potential role in the long-term program. Maximum utilization of existing facilities is considered as the baseline condition for planning improvements.

This Facility Plan provides a description of the nature and general condition of the current wastewater system. This analysis provides an understanding of how the existing system functions. Major problem areas and existing, known deficiencies are identified; these deficiencies form the basis for recommended system upgrade and expansion programs.

### ES-2.4 NPDES Permit and Other Regulations

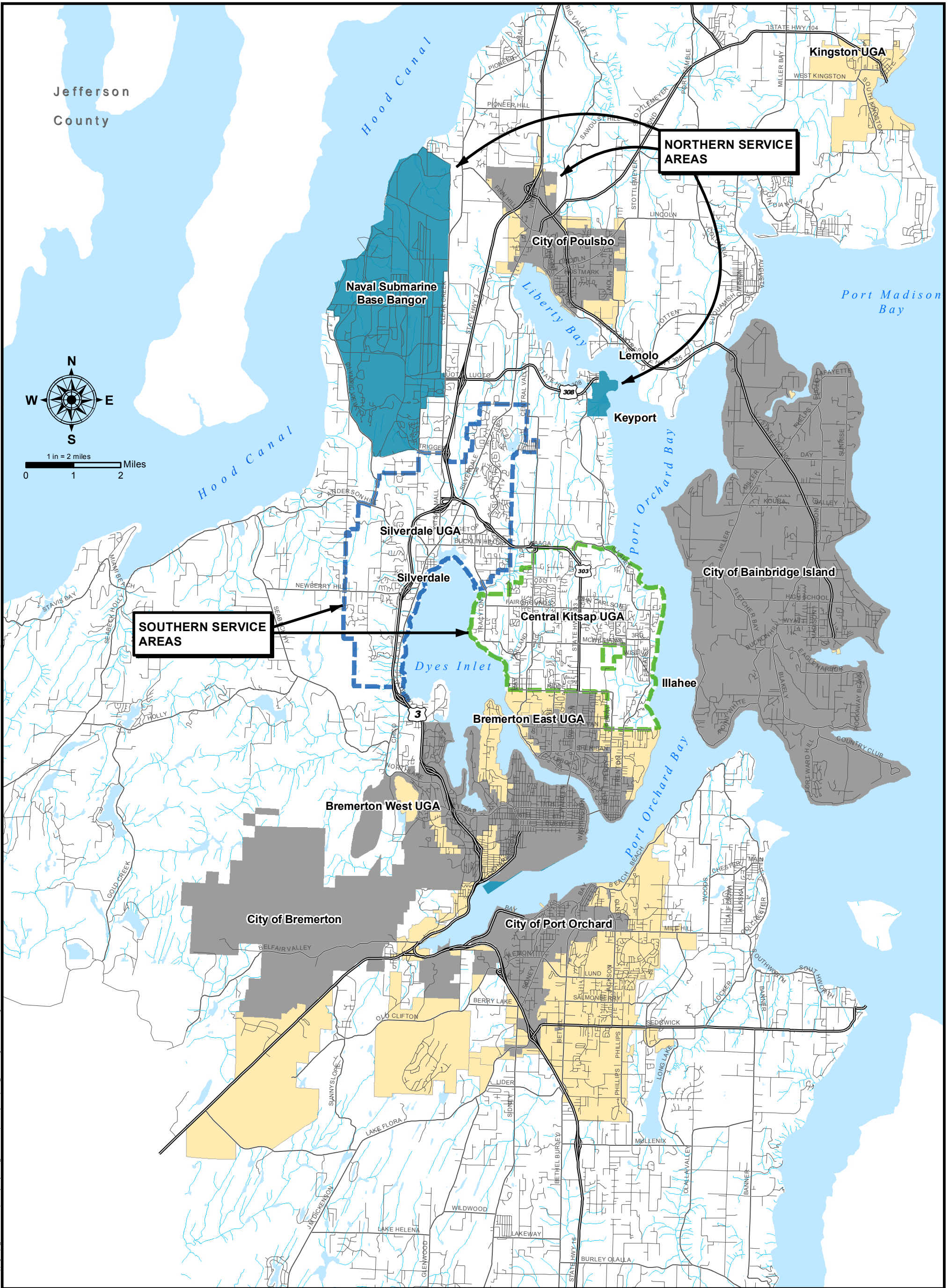
Federal, state, regional, and local regulations also play an important role in the process by which project alternatives are selected for consideration. Numerous regulations, laws, and policies affect the design, construction, and operation of wastewater facilities. This Facility Plan describes the various regulations—particularly the National Pollutant Discharge Elimination System (NPDES) permit and legislation that regulates the treatment and use of biosolids, energy conservation, effluent nitrogen concentrations, and greenhouse gas (GHG) emissions—that relate to wastewater planning for the Central Kitsap planning area.

## ES-3 Wastewater System Project Recommendations

After a thorough analysis of all the factors that influence project alternatives has been completed, a carefully crafted methodology is applied to narrow the field of viable alternatives. Through this evaluation process, the optimal combination of technologies emerges. In developing project alternatives designed to perform a given function, each project must be evaluated in sufficient detail to reveal project similarities and differences. Only then can reliable comparisons be made and alternatives ranked accordingly.

This Facility Plan presents a thorough discussion of the key criteria used to evaluate specific projects for collection and treatment systems. These criteria and subsequent applied methodologies for collection system projects necessarily vary in scope and composition for alternatives used for treatment system projects.

The first several chapters of this Facility Plan establish the foundation for a sound, systematic decision-making process. After key criteria have been established, the task of applying them to wastewater infrastructure project alternatives to develop recommendations begins.



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- Central Kitsap UGA
- Silverdale UGA
- Urban Growth Areas
- Incorporated City Limits
- Military Locations

- Water Bodies
- Water Courses
- State HWY/Route
- Principal Arterial

Data sources supplied by Kitsap County and may not reflect current or actual conditions. This map is a geographic representation based on information available. It does not represent survey data. No warranty is made concerning the accuracy, currency, or completeness of data depicted on this map.



**CENTRAL KITSAP PLANNING AREAS**  
Central Kitsap Wastewater Facility Plan  
Kitsap County Public Works  
February, 2011

Figure

### ES-3.1 Collection System Improvements

This Facility Plan provides the identification, evaluation, and ranking of projects required for the existing sewer system and for new sewer infrastructure. These projects are separated into two main categories: lift stations and piping. A detailed review of collection projects for the 2010–30 planning period is provided, along with cost estimates for all projects.

The total project cost to the County for all recommended existing and future piping and lift station improvement projects for existing and future flows is \$147.2 million: \$39.9 million for the 6-year CIP and \$107.3 million for the 20-year CIP. The costs of these projects are about equally split between lift stations and conveyance piping. The breakdown of this cost is shown in Table ES-4.

Project category	6-year CIP project costs: design year 2030 (2010\$)	20-year CIP project costs: design year 2030 (2010\$)
Existing piping improvements for existing flows	\$15,890,000	\$21,870,000
Existing piping improvements for future flows	-	\$13,930,000
Existing lift stations	\$23,970,000	\$34,532,000
Future lift stations	-	\$13,065,000
Future piping	-	\$23,900,000
<b>Subtotal</b>	<b>\$39,860,000</b>	<b>\$107,297,000</b>
<b>Grand total</b>		<b>\$147,157,000</b>

### ES-3.2 Treatment System Improvements

After collection system recommendations are made, this Facility Plan carries the project evaluation process forward to the wastewater treatment system. The key criteria described above are applied to all feasible treatment alternatives, resulting in a final set of recommendations.

A two-step process is used to assess possible treatment alternatives. An initial pass/fail evaluation is performed to determine which unit processes merit further consideration. A final evaluation of some of the treatment alternatives is then conducted. This final evaluation concludes with a ranking of alternatives and a description of the recommended improvements encompassing the best overall treatment strategies and technologies.

These recommendations for wastewater treatment, reuse, and solids treatment are summarized in Table ES-5. The total project cost for these recommendations, including all of the features necessary to comprise a complete project at the CKWWTP, is approximately \$181.3 million: \$50.2 million for the 6-year CIP and \$131.1 million for the 20-year CIP. This estimate does not include the cost of the headworks improvement project currently under implementation.



Process train	Recommendations
Liquid-stream treatment	<ul style="list-style-type: none"> <li>• Construct new headworks with Mahr screens, aerated grit tanks, and a septage receiving station (under implementation).</li> <li>• Replace existing primary clarifiers with new conventional primary clarifiers.</li> <li>• Modify existing aeration basins and channels (new diffuser membranes, baffles, mixers, pumps and piping).</li> <li>• Add two new aeration basins</li> <li>• Replace existing aeration blower with new high efficiency blowers and add one blower.</li> <li>• Add one new secondary clarifier.</li> </ul>
Water reuse	<ul style="list-style-type: none"> <li>• Provide reclaimed water at the CKWWTP instead of construction of satellite plants.</li> <li>• Construct effluent filtration facility</li> </ul>
Solids treatment/biosolids disposal	<ul style="list-style-type: none"> <li>• Add gravity belt thickener (GBT) for waste activated sludge (WAS) thickening and keep gravity thickeners for primary sludge thickening only.</li> <li>• Stay with conventional mesophilic anaerobic digestion until regulations and/or market for biosolids disposal drive the need for Class A biosolids. Add additional digester.</li> <li>• Provide existing digester improvements to upgrade sludge withdrawal, heating and mixing systems.</li> <li>• The existing system will be modified to provide the flexibility to produce Class A biosolids in the future.</li> <li>• Continue to send Class B biosolids to Fire Mountain Farm or similar facility for disposal.</li> </ul>
Biogas utilization/energy usage	<ul style="list-style-type: none"> <li>• Provide combined heat and power generation (cogeneration) to eliminate flaring of the biogas.</li> <li>• Upgrade the biogas management system to convert from the existing fuel-oil-based digester heating to biogas based heating (via cogeneration).</li> </ul>

It is important to note that options to further improve reuse can still be added, if funding or other current market conditions make such upgrades more economical. The current baseline set of recommendations provides a foundation upon which potential future add-on projects can be built when timing, conditions, and policy decisions dictate.

### ES-3.3 Total Recommended Project Costs

The total costs for recommended existing and future wastewater infrastructure projects for the Central Kitsap planning area for the 2010–30 planning period are shown in Table ES-6.

Table ES-6. Summary of Total Infrastructure Improvement Project Costs (2010\$)			
Project category	6-year CIP project costs: design year 2030	20-year CIP subsequent project costs: design year 2030	Overall total
<b>Collection system:</b>			
Existing conveyance flows	\$39,860,000	\$70,332,000	\$110,192,000
Future conveyance flows	\$0	\$36,965,000	\$36,965,000
<b>Collection system subtotal</b>	<b>\$39,860,000</b>	<b>\$107,297,000</b>	<b>\$147,157,000</b>
<b>Treatment system:</b>			
Additional treatment capacity	\$18,512,000	\$65,352,000	\$83,864,000
Resource reclamation and reuse	\$31,662,000 <sup>a</sup>	\$65,728,000	\$97,390,000
<b>Treatment subtotal</b>	<b>\$50,174,000</b>	<b>\$131,080,000</b>	<b>\$181,254,000</b>
<b>Grand total</b>	<b>\$90,034,000</b>	<b>\$238,377,000</b>	<b>\$328,411,000</b>

a. Includes \$500,000 project for reclamation at the Kingston WWTP and is not part of the Central Kitsap CIP.

Information on capital expenditures is shown in Figure ES-3. The data shown in this figure are factored into the financial and rate assessments in Chapter 10.

**Total Central Kitsap WW Facilities Capital Expenditures with Nitrogen Removal and Reuse (8.2 mgd)**

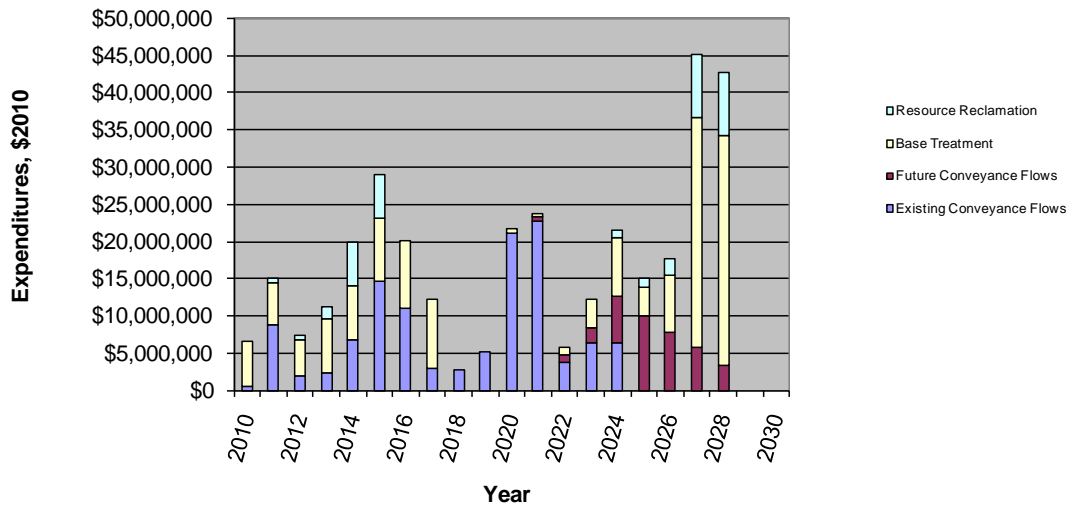


Figure ES-3. Total CKWWTP capital expenditures (including costs for Suquamish projects)

## ES-4 Financing Evaluation

The impact that the Central Kitsap County wastewater Capital Improvement Program (CIP) will have on wastewater utility customers is an important factor in determining an appropriate level of service to the

community. Consequently, an evaluation of the CIP financing plan and subsequent customer rate impacts is necessary to support the selection of the recommended project alternatives for this Facility Plan.

Annual revenues required to fund the 6-year CIP and ongoing operations are projected to increase from \$14.4 million in 2011 to \$20.1 million in 2016. The projected wastewater system revenues would need to be increased over current rates by 224 percent, or approximately 6 percent per year, by 2030.

A CIP financing plan for the wastewater collection and treatment recommendations was developed. The recommended capital improvements would require a \$55 million bond issue in 2014, in addition to the \$41 million bond issued in December 2010. In an effort to avoid dramatic rate increases, the County evaluated a level annual increase required to fund the CIP and ongoing operations, which balances the use of cash and debt financing. Wastewater system revenues would need to be increased over current rates by 6–7 percent per year between 2011 and 2016 and 6 percent per year between 2016 and 2030 to achieve this goal.

In assessing the implications of these projected rate increases, it is important to note that several of the underlying assumptions are conservative and that deviations from these assumed conditions will likely lessen future rate increases. These assumptions relate to potential reclaimed water revenue, population projections, grant funding opportunities, possible private/public or interlocal partnerships, and the proportion of future improvements to be funded by private developers.

A summary of rate impacts required to fund the capital improvements discussed in this Facility Plan is shown in Figure ES-4. Future collection systems required to serve growth have a higher impact on rates, whereas the comparative rate impact of wastewater treatment improvements is much less. Based on the evaluation provided in Chapter 10, the County’s CIP presented in this Facility Plan could be affordably implemented.

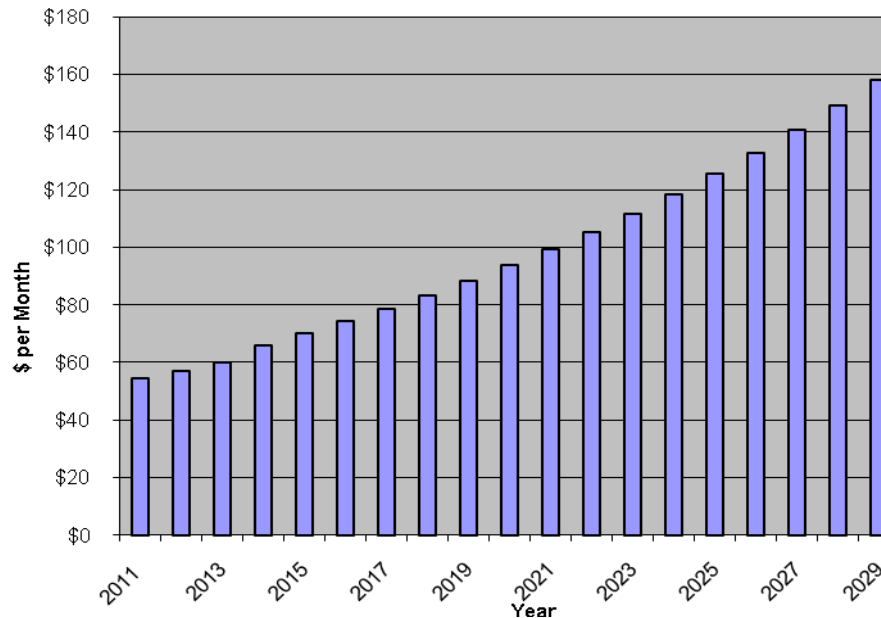


Figure ES-4. Adopted and projected monthly residential sewer rate

Complementing the 2009 “Water as a Resource” policy, this Facility Plan takes Kitsap County another step toward a greener future. Exciting new wastewater treatment technologies promote sustainability, energy efficiency, and water reclamation and reuse, further “closing the loop.” These upgrades are not only good for the environment, but they are also cost-effective and economically viable.