CHAPTER EP-1
LONG-TERM OPERATING IMPACTS AND MITIGATION MEASURES FOR THE EXECUTIVES PREFERRED PLAN

INTRODUCTION AND DESCRIPTION OF THE EXECUTIVE'S PREFERRED PLAN

It has been almost one year since King County issued its *Draft Regional Wastewater Services Plan* (RWSP). Much has happened between then and now to move us closer to a final plan for managing the wastewater flows that our region's growing population will generate in the next 40 years. The major activity during this year was to go into the community and hear from citizens about services they are willing to support. This was no small effort. The choices are complex, involving a number of issues. The King County Executive carefully weighed the public's views and is now ready to recommend a plan to the King County Council—a plan that reflects a strong commitment to protecting our water resources so that future generations can enjoy them as much as we do.

WHAT ARE THE ISSUES? WHAT ARE THE CHOICES?

The King County wastewater system serves 1.3 million residents within a 420 square-mile service area. A total of 255 miles of pipes, 38 pump stations, and 22 regulator stations move wastewater from our homes and businesses to two treatment plants. Liquid effluent leaves the plants through outfalls to Puget Sound. Biosolids, the organic by-product of the treatment process, are recycled for agricultural and forestry uses.

Choices made in the past have consistently favored building and maintaining a regional system that protects public health and maintains the quality of our region's water bodies. The County provides a high level of treatment—secondary treatment—at both treatment plants and has implemented an aggressive program to reduce the amount of untreated wastewater that overflows into nearby water bodies. This level of service costs money. And it will cost even more money to build new facilities and expand existing facilities to serve our customers in the years to come.

During the planning process, we gave citizens an opportunity to tell us what level of service they would like us to provide in the future. The choices were presented in the draft RWSP as options that could be adopted under four possible strategies. Two of the strategies proposed expanding the capacity[1] of the two existing treatment plants—the

[1] The word "capacity" used throughout this document refers to the volume of average wet weather flows that the treatment plant or conveyance system is designed to handle. Average wet weather flows are wastewater flows that occur during wet months but not during storms.

West Treatment Plant in Seattle and the East Treatment Plant in Renton; the other two strategies propose building a new treatment plant (North Treatment Plant) in north King County or south Snohomish County. Each strategy and option presents difficult and complex issues to consider:

- **How much can we expand our existing treatment plants?** And when do we want to expand them? The West Treatment Plant has very limited room for expansion. Under both two-plant strategies, this plant would be expanded to its maximum capacity. The East Treatment Plant would have more room for expansion. In considering expansion, should we allow flexibility for meeting demands beyond our 40-year planning window?
- **How do we serve the fastest growing parts of the service area?** It looks as if the fastest rate of growth will occur in the north and northeastern parts of the service area. Should we build more pipes to convey flows from these parts to existing treatment plants? Or should we build a new plant to serve these areas?
- **What levels of flow should we plan for?** In addition to the wastewater that comes from our homes and businesses, rain water (stormwater) enters wastewater pipes through sources such as roof drains and leaking pipes (inflow and infiltration).
- **What is the appropriate level and timing to control combined sewer overflows?** In parts of Seattle, sanitary sewers collect both stormwater and wastewater. During storms, flows in these pipes may exceed the capacity of the conveyance pipes and treatment plants and then discharge untreated combined sewer overflows (CSOs) to local water bodies. Should measures be taken to reduce the amount of stormwater entering the sewer system to reduce the need to expand treatment plant and conveyance pipes in the future?
- **How much of a role should reclaimed water play in the region's future water supply picture?** We may choose to use reclaimed water from our treatment plants not only for irrigating lawns and golf courses, but also to add indirectly to existing water supply. Scientific studies are needed to understand how reclaimed water can be used to supplement water supply without impacting human and environmental health. What should we do now to prepare for a future in which reclaimed water may be an important part of our region's water supply?
- **How much do we value water quality?** The four strategies in the draft RWSP would meet or exceed state and federal standards for water quality. Do we need to go further?

WHAT ARE THE RECOMMENDATIONS?

The majority of the community expressed significant concern for protecting water quality and public health. They are willing to pay more to prevent water quality problems as long as costs and other impacts are distributed equitably. With few exceptions, they ranked CSO control as a top priority so that water bodies can be clean year round for

everyone to enjoy. Reducing inflow and infiltration and continuing to recycle biosolids was also rated highly.

After reviewing citizen preferences and available technical and financial data, the Executive decided on a strategy and accompanying options that he could recommend with confidence to the King County Council. The *Executive's Preferred Pla*n reflects our region's strong commitment to preserving water quality and recycling our resources in a cost-effective manner. The main features of the plan are building a new North Treatment Plant, expanding the East Treatment Plant, and building a new outfall into Puget Sound.

The plan includes other important features:

- Making improvements to parts of the conveyance system, including pipes and pump stations, to serve treatment plants and to handle additional flows in the system
- Pursuing an aggressive CSO program, including building CSO storage tanks and treatment plants, to reduce discharges from each CSO outfall to one overflow event per year on average
- Providing financial incentives that encourage local agencies to reduce inflow and infiltration into the King County wastewater system
- Continuing to recycle biosolids and finding ways to make biosolids recycling even more efficient
- Providing opportunities to reuse highly-treated water from the plants and continuing to study ways to economically provide reclaimed water by conducting pilot and demonstration projects, investigating stream-flow augmentation and groundwater recharge, and exploring the idea of building satellite plants to provide reclaimed water to local communities
- In addition to monthly rates, we charge new customers directly for connection to the system—a charge termed a "capacity" or growth charge. The state imposes a limit on these charges. We propose to continue to work with the state to allow us more flexibility in applying these charges so that growth pays its share of improvements to the system

After the King County Council adopts a final plan by the end of 1998, we expect to begin implementing the plan in 1999 and continue through at least the year 2030. Much can happen in such a long stretch of time—regulations can change and more information can surface. We will monitor conditions and adapt the plan as needed throughout the course of the implementation period.

HOW MUCH WILL THE PLAN COST AND WHO WILL PAY FOR IT?

The costs for each major component of the *Executive's Preferred Plan* are shown in table 1.

Table EP1-1
Estimated Costs to Implement
the Executive's Preferred Plan

Treatment	$262,000,000
Conveyance	$489,000,000
CSO	$230,000,000
Biosolids	$85,000,000
Water Reuse	$20,000,000
TOTAL	$1,086,000,000

Note: All numbers are calculated in 1998 net present value. The total includes the net present value of new capital facilities and additional operating expenses stemming from these new facilities

Customers in King and Snohomish Counties connected to the regional system have paid for wastewater services in the past. This plan assumes that they will do so in the future. But the good news is that, even though the costs for the recommended improvements are high, monthly rates are predicted to remain relatively stable. The County will sell revenue bonds each year to obtain the capital to pay "up front" for the projects and then will spread the repayment of the bonds over a 35-year period. Currently, we charge local agencies a monthly wholesale rate of $19.10 per customer. These agencies, in turn, bill their customers. Monthly rates in 1998 dollars without considering inflation are predicted to rise slightly in the early years of the implementation period but will become even lower than today's rate toward the end of the period. This lower rate is predicted to occur because the costs will be spread out over a larger population and because repayment costs for current debts will decrease.

The average monthly rate necessary to support the plan over the period 1999-2015 is $19.92 in today's dollars. Because of the debt retirement and growth of customers noted above, the average monthly rate needed over the period 1999-2030 would be $18.97 in today's dollars although actual rates will be higher due to inflation.

Finally, these costs and rates are based on planned improvements to the wastewater system only. Should additional costs be incurred, for example as part of a salmon recovery plan in response to the proposed listing under the federal Endangered Species Act (ESA), costs and rates will be correspondingly higher.

IMPACTS AND MITIGATION MEASURES

The Executive's Preferred Plan (EPP) is described in the preceding section. The major features of the EPP are as follows:

- Create a three-treatment-plant system (comprised of the West Plant, East Plant and new North Plant)
- Reserve capacity at the West Plant (leave at 133 mgd) to provide future CSO treatment, if needed, after 2018, or to provide for unanticipated growth in the City of Seattle
- Expand East Plant in increments to 135 mgd (2020)
- Construct new North Plant in increments:

  18 mgd by 2010

  36 mgd by 2030

  54 mgd by 2040

- Construct a conveyance system to carry influent to the North Treatment Plant and an outfall from the North Treatment Plant to Puget Sound (2010)
- Implement CSO program to achieve one event per outfall per year by 2030.
- Implement aggressive I/I reduction program based on incentives/surcharges.
- Produce Class B biosolids at all three plants while continuing to explore alternative technologies to improve biosolids quality and marketability.
- Provide flexibility to produce and distribute reclaimed water at all treatment plants. Research new applications for reclaimed water and build smaller "satellite" plants if circumstances warrant.

The major features of the EPP are shown in Figure EP1-1. Table EP1-2 shows the chronological sequence of projects under this service strategy.

LONG-TERM OPERATIONAL IMPACTS

Following is a discussion of the probable long-term impacts of the EPP. These were first presented in the RWSP Draft EIS for Service Strategy 3. The EPP is based on Strategy 3, revised to reflect changed population and flow projections. A detailed description of the affected environment is provided in Chapter 4 of Part II of this FEIS.

Table EP1-2. Executive's Preferred Plan
List of Capital Facilities (by year required on-line)

1996	2000	2005	2010	2015	2020	2025	2030	2040

Treatment Plant Projects

- ✷Construct 18 MGD North End Plant (2010)
- ✷North End Plant Outfall (2010)
- ✷Increase East Plant capacity to 135 MGD (2020)
- ✷Increase NEP capacity to 36 MGD (2030)
- ✷Increase NEP to 54 MGD (2040)

Conveyance Projects

- ♦ESI-11 – Wilburton Siphon (1998)
- ♦Reuse Projects (1999)
- ♦Trunk Improvements (2000)
- ♦ESI-1 (2000)
- ♦Increase York PS capacity ot 68 MGD (2000)
- ♦I&I Reduction Program Project (2003)
- ♦Auburn Interceptor Sections 1,2,3 (2004)
- ♦Trunk Improvements (2001-2010)
- ♦Off-line storage at North Creek (2005)
- ♦Forcemain from new Kenmore PS to NEP (2010)
- ♦PS at Kenmore to pump to NEP (2010)
- ♦Tunnel from NEP to Puget Sound (2010)
- ♦Trunk Improvements (2010-2020)
- ♦Auburn Interceptor Storage (2020)
- ♦Trunk Improvements (2021-2030)
- ♦Convey N. Creek PS flows to Kenmore (2030)
- ♦Increase N. Creek PS to 50 MGD (2030)
- ♦Modify York PS to pump 35 MGD north (2030)
- ♦Transfer McAleer-Lyon PS flows to NEP (2038)
- ♦McAleer-Lyon PS flows to NEP (2038)
- Trunk Improvements (2031-2040)

CSO Projects

- ★Harbor (1998)
- ★Denny Way (2006)
- ★MLK Way (2008)
- ★Henderson (2009)
- ★Norfolk (2009)
- ★ S. Magnolia (2010)
- ★SW Alaska St. (2010)
- ★Murray (2010)
- ★Barton (2011)
- ★North Beach (2011)
- ★University Montlake (2015)
- ★Hanford (2017)
- ★West Point (2018)
- ★Lander (2019)
- ★Michigan (2022)
- ★Brandon (2022)
- ★Chelan (2024)
- ★Connecticut (2026)
- ★King Street (2026)
- ★Hanford (2026)
- ★8th Avenue S. (2027)
- ★W. Michigan (2027)
- ★Terminal 115 (2027)
- ★3rd West (2029)
- ★Ballard (2029)
- ★11th Ave (2030)

1996	2000	2005	2010	2015	2020	2025	2030	2040

WATER RESOURCES

Impacts

Long-term operational impacts to the water quality of receiving water bodies include discharge from the treatment plants and CSO outfalls, conveyance system impacts, and infiltration and inflow impacts.

Treatment Plants

Systemwide, treatment plant discharges would increase for the EPP as a direct result of expected population growth in the region. Based on the region's anticipated growth, for example, Average Wet Weather Flow (AWWF) for the system is expected to grow from an estimated 190 mgd in 1990 to 283 mgd by 2030. Increased discharges would cause long-term impacts on water quality in Puget Sound off West Point, Duwamish Head, and the new North Plant outfall. Pollutant loadings from treatment plant discharges are expected to increase as the population grows in the King County wastewater service area although they would continue to meet permit requirements. The chemical constituents in these discharges include nutrients (nitrogen and phosphorous), metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), organic compounds, fecal coliform bacteria, and total suspended solids. King County's Industrial Waste Program monitors and controls the discharge of industrial substances that may contaminate biosolids and treated effluent. In projecting pollutant loadings, it has been assumed that the Industrial Waste Program will continue to operate much as it does now.

Water quality impacts near the wastewater outfalls have been evaluated for both CSO and treatment plant discharges (Hays et al., 1995). The effluent plumes from these discharges contain both dissolved ions and particulates. They are dispersed at varying distances. The heavier suspended particulates tend to settle out of the effluent plume immediately. Metals and organic compounds have a high affinity for adsorbing to sediment particles (Hays, et al., 1995). Therefore, the sediment layer near these outfall pipes may contain elevated concentrations of these metals and organic compounds. These sediments are of concern due to the environmental persistence, toxicity to aquatic life, and potential for bioaccumulation of those pollutants present (Hays et al., 1995). Dissolved ions and compounds which are adsorbed to lighter particulates tend to mix within the water column, are transported away, and do not contribute to localized impacts at the outfall (Hays, et al., 1995).

The location and depth of treatment plant outfalls in Puget Sound influence the dispersion of the effluent plume and its water quality impacts. In Puget Sound, the upper layer of relatively less dense (less saline) water tends to circulate northward and out of Puget Sound, while the lower layer of denser (more saline) water slowly moves southward (Ebbesmeyer 1994). Flushing rates between the West Point and Duwamish Head outfalls also differ, based on their relative locations in Puget Sound. The West Point outfall discharges wastewater into the upper water layer; thus, it is flushed northward out of Puget Sound. The Duwamish Head outfall discharges into the lower

water layer; thus, it takes longer to disperse as the layer moves southward (Ebbesmeyer 1994). Overall water quality impacts from treatment plant discharges to Puget Sound will depend on outfall locations and flushing rates. To the extent that the EPP would redirect effluent away from the Duwamish Head outfall and to a new, more northerly outfall that discharges into the upper water layer, it would be preferable from a water quality perspective.

Conveyance System

Sewer systems are designed with redundancies to prevent failures. On the rare occasions when leaks or breaks occurred, potential impacts would depend on the type of pipe and the environment at the point of leakage. If the pipe was in water, sewage could escape and cause short-term, local water quality impacts. If the pipe was underground and was a gravity flow (i.e., not pressurized) pipe, little or no sewage would be likely to escape due to surrounding groundwater pressure. Groundwater would instead enter the pipe and be conveyed with the sewage. If the pipe was a force main (i.e., pressurized flow pipe) sewage could be forced out of the pipe and enter groundwater and potentially surface water. The resulting loss of pressure would be detected at a pump station and repairs effected. Mechanical or electrical failures could also cause wastewater overflows to surface water. In all cases sewage spills would be detected and repaired quickly so any water quality impacts would be temporary and localized.

West Service Area Treatment and Conveyance

Under the EPP, no change would occur in the treatment capacity for the West Plant (Average Wet Weather capacity would remain at 133 mgd). King County will continue to meet the terms of the 1991 West Point Settlement Agreement.

East Service Area Treatment and Conveyance

Expanding the East Plant from 115 mgd to 135 mgd average wet weather flow would increase the treated wastewater effluent discharged to Puget Sound off Duwamish Head by 15 percent. Pollutant loading rates are expected to increase for nutrients, metals, organic compounds, fecal coliform bacteria, and total suspended solids. As noted previously, because the East Treatment Plant outfall discharges into the deeper waters of Puget Sound, this effluent would tend to move southward farther into the Sound. Thus, removal from the Sound would take somewhat longer than for effluent discharged into shallower, northward-moving waters of the Sound (e.g., from the West Point outfall or a new North Treatment plant outfall).

In addition, during extremely heavy storms of a magnitude expected to occur once every two years on average, the treated effluent that exceeds the capacity of the effluent transfer system would be discharged to the Green/Duwamish River through an existing outfall. No significant adverse impacts would result, as discussed in the report “Peak Flow Discharges to the Green River at the Renton Treatment Plant” (March 1998).

North Service Area Treatment and Conveyance

Operation of a North Plant with the capacity to treat 54 mgd would result in the discharge of wastewater effluent into Puget Sound from a new outfall off the north King County or south Snohomish County shore. Pollutant loadings to Puget Sound would be expected to increase overall. However, as described in Part II, Chapter 5 of this FEIS, differences in flushing rates occur between the West Point, Duwamish Head, and potential North Plant outfall locations based on whether they discharge to the upper or lower water layers in Puget Sound.

With discharge to the upper water layer, the North Plant outfall would be in a desirable location for flushing effluent out of Puget Sound because it would discharge to the main channel, where this layer is moving rapidly northward, out of the Sound. The strong currents in this channel would also maximize mixing and dispersion of the effluent. As noted in Part II, Chapter 3, the complexity of the flow layering in this area of the Sound will require additional study to determine the best location for the North Plant outfall.

The County will also investigate the possibility of discharging highly treated wastewater effluent from the new plant to freshwater. If the studies prove favorable in terms of environmental impacts and costs, the County would conduct a project-level environmental review to evaluate a freshwater discharge as an alternative to the currently-planned marine discharge.

CSOs

CSO impacts for the EPP would result in improved water quality over existing conditions.

Pollutant loading to receiving waters would be reduced for all pollutants of concern and benefit water quality for Puget Sound beaches, the Ship Canal and the Duwamish River. The CSO program for the EPP would achieve the state one-overflow-per-year goal by 2030 (13 years sooner than proposed in the *Draft RWSP)*.

The program would be phased to complete projects on Puget Sound beaches and the East Ship Canal first, followed in later years by projects along the Duwamish River and the West Ship Canal.

CSO outfall sites that would be improved include discharges to the Duwamish River (i.e., Michigan St., Brandon St., and Chelan Avenue), Elliott Bay (i.e. Denny Way, King St./Connecticut St., and Lander St./Hanford #2), the Ship Canal (University/Montlake), and Salmon Bay (i.e., 11th Avenue W. and Ballard).

The individual projects north of the Ship Canal would generally store CSO volumes for later conveyance to the West Treatment Plant for secondary treatment after peak flows subside. For CSOs south of the Ship Canal, the EPP would generally provide for storage of CSOs and onsite treatment at CSO locations. The program would benefit water quality for Puget Sound beaches, the Ship Canal, and the Duwamish River.

To further our understanding of the impacts of CSOs and the benefits of the CSO control program, King County is conducting a CSO Water Quality Assessment (WQA) and sediment analysis in the Duwamish River and Elliott Bay. The CSO WQA will evaluate CSO impacts on human health and aquatic life relative to other pollutant sources. King County is developing a Sediment Management Plan that will evaluate seven sites in the Duwamish River identified by Ecology as a top priority for clean-up. The ultimate goal of these studies is to maximize improvements and protection of water quality. The CSO WQA will be completed in 1998, and the sediment analysis will be completed in 1999. King County may propose additional refinements to the CSO program as a result of these studies.

Infiltration/Inflow

The EPP includes an aggressive program for I/I reduction based on incentives and surcharges to local sewer agencies. This program would lead to more efficient treatment of sanitary wastewater flows at the treatment facilities (i.e., less-diluted wastewater would enter the WWTP facilities). Some of the groundwater that presently enters conveyance lines would be excluded with I/I control and, thus, might increase the local groundwater elevation in some areas.

Mitigation Measures

Potential adverse impacts to water resources from operation of all the wastewater facilities proposed under the EPP could be avoided or minimized through careful design and maintenance. Based on identification of environmentally sensitive areas in the King County service area, impacts would be avoided wherever feasible. Where this was not possible, impacts would be minimized to the greatest extent practicable. The following mitigation measures could be used to avoid or minimize impacts to water resources. More specific measures could be identified in the environmental reviews of specific projects.

- Select outfall sites with strong currents and favorable circulation patterns that most rapidly move pollutants northward out of Puget Sound. Research indicates that the upper water layer best provides these conditions. Outfall locations that meet these criteria would reduce long-term operational impacts.
- Include studies of local groundwater and surface water drainage patterns for I/I control projects to avoid exacerbating local flooding and wet basements.
- Reduce the levels of contaminants entering the sewer system and enhance both biosolids and reclaimed water products by continuing King County's Industrial Waste/Source Control Pretreatment Program.
- Use appropriate procedures for handling chemicals and petroleum products during facility operation. This includes proper storage, use, and cleanup of these materials.

- Design and implement the CSO reduction program to maximize benefits to receiving waters.
- Maintain and operate treatment plants to meet permitted discharge requirements, including proper functioning of the outfall.

Unavoidable Adverse Impacts

Increases in wastewater volumes under the EPP (as under any of the alternative service strategies) would increase overall pollutant loadings to Puget Sound. Pollutant loadings under the EPP would be removed from the sound faster than alternatives that include larger volume discharges from the Duwamish outfall due to the more rapid flushing action associated with discharging to the upper water layer.

BIOLOGICAL RESOURCES

Impacts

Operational impacts to biological resources would generally relate to population growth in the King County Service Area. Increased wastewater flows will raise pollutant loadings to marine waters from new or expanded treatment plants, as discussed in the previous section, "Water Resources." These increased loadings, in turn, would mainly result in localized impacts near the outfalls. The extent of adverse impact on the marine environment will depend on outfall discharge volumes and location. Biological resources, including fish and shellfish, can be affected either through physical changes in their environment (sediment size, water temperature, and levels of dissolved oxygen), or through chemical toxicity associated with contaminants in the water column and sediments. Some contaminants, including metals and toxic organics, can be conveyed through wastewater discharges.

Design and operation of the system's treatment plants and outfalls would comply with federal and state water and sediment quality standards. This would minimize impacts on the biological resources of the marine environment.

New or expanded treatment plants and their associated facilities could also result in some habitat loss or conversion, particularly if the North Treatment Plant is sited at an inland undeveloped location. Other wastewater treatment and conveyance facility impacts on biological resources would be minimal.

Reduction of CSOs as part of the EPP would benefit fish and shellfish populations; improve foraging habitat for shorebirds, raptors, waterfowl, and other water-dependent birds; and improve conditions for other wildlife dependent on aquatic habitats. Cleaner water would contribute to productivity of food sources such as crustaceans, invertebrates, and aquatic plants. Chronic pollutant loadings to fish habitat, the potential exposure of fish to contaminants, ingestion of or entanglement in floatable material, and the

likelihood of exposure to dissolved oxygen "sags" following CSO events would all be reduced.

Potential adverse operational impacts include accidental spills of diluted or undiluted sewage or other waste materials into water bodies if a pipeline or CSO storage facility leaked, particularly in cases where pipelines cross streams or pass through water bodies. Such accidental spills differ from CSOs in that they are rare and temporary and can be corrected quickly. These spills typically do not result in specific adverse impacts to biological resources because they are rare and the receiving water body further dilutes the waste.

An outfall from a new North Plant would introduce effluent to a new location, affecting marine biological resources in the immediate vicinity.

Impacts of the EPP

West Service Area Treatment and Conveyance

The West Plant would remain at its existing average wet weather capacity. No additional impacts to biological resources would occur.

East Service Area Treatment and Conveyance

Expansion of the East Plant to 135 mgd would result in the increase of treated wastewater effluent discharged to Puget Sound off of Duwamish Head. The East Plant outfall discharges into the deeper waters of Puget Sound, where the increased discharge volume would have an incrementally greater localized impact to biota near the outfall. As described in the Water Resources section, this effluent would tend to move southward farther into the deeper waters of Puget Sound and take longer to be removed from the Sound than effluent discharged to the upper, northward-moving layers (e.g. from West Point and a North Plant outfall). However the discharge would meet all water quality standards and would have no significant impacts to water quality.

The peak flow discharge to the Green/Duwamish River, described in the Water Resources section and discussed in detail in the report, "Peak Flow Discharges to the Green River at the Renton Treatment Plant"(March 1998) would have no adverse impacts to biota in the river. The impact to marine biota would be beneficial because a third outfall would not have to be built through the intertidal area.

North Service Area Treatment and Conveyance

Additional baseline studies would be required for proper design and operation of a new North Plant outfall to identify aquatic biological resources potentially at risk from discharge. Potential impacts include both physical and chemical changes in the aquatic environment that could adversely affect biological resources as generally discussed above. The outfall location at the northern edge of the service area is the most favorable for long-term impacts to Puget Sound-wide biological resources if effluent is discharged

into upper water layers of the main channel, because effluent would generally flow northward and out of Puget Sound more quickly than effluent from other outfalls (particularly the Duwamish Head outfall). The outfall and any associated mixing and sediment impact zones would be designed to meet all applicable water quality and sediment standards. These standards have been developed to minimize adverse impacts on beneficial uses of marine waters including fish, shellfish, eelgrass, kelp, and other marine resources, which occur in the waters of western Washington. Consequently, the North Plant discharge is not expected to result in significant adverse impacts on the biological resources of central Puget Sound.

Studies that will be undertaken to evaluate the impacts of discharging highly-treated wastewater effluent to fresh water will also evaluate potential impacts to biological resources, including ESA-listed species.

CSOs

Impacts of CSO reduction on biological resources would be beneficial. Aquatic biota in the vicinity of CSO outfalls would likely benefit from the reduction in contaminant discharges associated with CSO reductions (see Water Resources discussion above).

Infiltration/Inflow

Impacts of I/I project operation on biological resources would be minimal.

Mitigation Measures

- Where feasible, native vegetation would be planted around new facilities to provide noise and visual buffers between the facility and any adjacent wildlife habitat.

- Outfalls would be sited to minimize adverse impacts to biological resources.

Unavoidable Adverse Impacts

Increases in treatment plant outfall discharges would unavoidably disturb or displace marine biota over a small area near discharge points.

LAND AND SHORELINE USE

The EPP would provide adequate wastewater conveyance and treatment capacity to accommodate the population growth anticipated in the King County Comprehensive Plan. It would provide capital facilities prior to or concurrent with growth occurring inside the County's designated Urban Growth Area. Changes to planned regional land use patterns would not be caused by implementation of the EPP as it is consistent with the Comprehensive Plan and the Growth Management Act.

Consistency with Policies and Regulations

Growth Management Act and Local Comprehensive Plans

The State of Washington and King and Snohomish Counties have prepared population and employment projections as part of the growth management process. These projections, which include information on geographic distribution, have provided the basis in the RWSP to determine future flows into the King County system (refer to the RWSP for a detailed discussion of flow projections). The timing, sizing, and location of proposed facilities under the EPP were developed to provide adequate capacity to handle these expected wastewater flows. This service strategy does not include the capacity to handle wastewater flows generated outside the King County wastewater service area, including flows generated within isolated urban growth areas such as those in the Snoqualmie River Valley. For these reasons, the EPP is consistent with the GMA.

Local comprehensive plans for counties and cities within the King County wastewater service area have been prepared in conformance with the GMA. The EPP, through conformance with the overall growth management process, is also consistent with the goals and policies for utility service levels in local comprehensive plans. In addition, because the timing, sizing, and location of proposed facilities are based on population and employment projections that are also used as a basis for development of local comprehensive plans, this service strategy is consistent with the growth management requirement for concurrency (i.e., the availability of necessary utilities and other infrastructure and services concurrent with development that depends on the infrastructure and services).

Shoreline Management Act

For the EPP, a number of major facilities (conveyance pipes, pumping stations and outfalls) are proposed for designated shoreline areas and would require shoreline permits. In most jurisdictions and shoreline environments, wastewater treatment plants and associated conveyances and other facilities are not prohibited. However, because wastewater facilities (except for outfalls) are not considered water-dependent uses, a demonstration of public benefit and need for the particular shoreline location is typically required before a shoreline permit is granted. In addition, conditions are usually attached to permit approvals specifying public access requirements, landscaping and visual mitigation, and other performance standards. These permit conditions would likely apply to facilities in the shoreline zone for the EPP.

Zoning

The East Treatment Plant is located in a Renton public zone, so plant expansion would be permitted subject to site plan review to ensure compliance with city zoning requirements and compatibility with surrounding land uses.

The zoning at the North Plant site would depend on its location. Shoreline areas in north King County and south Snohomish County typically have residential or other non-industrial/commercial zoning. Inland lowland areas north of Lake Washington, in south

Snohomish County and north King County, have a mix of industrial, commercial, residential, and other zoning. Site plan review would be required for a treatment plant in any of these areas.

The numerous individual pump stations, conveyance lines, and storage facilities proposed under the EPP, which are usually classified as utilities, are generally permitted, either outright or by granting a special use, unclassified use, or similar land use permit. Where such a land use permit is required, landscaping or siting requirements and other performance standards are included as permit conditions to ensure compatibility with surrounding land uses.

Direct Land Use Impacts

West Service Area Treatment and Conveyance

The EPP proposes to reserve future capacity at the West Plant, and not increase its average wet weather capacity as part of this plan. Over time the County will evaluate the increased flows to the West Plant as a result of storing more CSOs. Additional improvements to the West Plant may be needed to assure treatment efficiency during wet weather. These improvements would be within the current footprint and meet terms of the permits and agreements currently in place.

East Service Area Treatment and Conveyance

The expanded East Plant would be located in a highly urbanized industrial/commercial area, and with continuation of the existing site design features and extension of perimeter buffering, the expanded plant would be compatible with surrounding land uses.

North Service Area Treatment and Conveyance

The compatibility of a new North Plant with adjacent land uses would depend on its location. A site of 30 to 60 acres would be required to accommodate the new plant facilities and a buffer. A North Plant could be located at a shoreline site or at an inland location. Regardless of the location chosen for a new North Plant, construction of a pipeline (either influent or effluent) from the area north of Lake Washington westward to the Puget Sound shoreline would be required. Additional facilities conveying influent to the plant would also be constructed. Additional project-level site selection and environmental review studies would be needed before a final plant location would be determined. Criteria to screen potential sites would be developed, and a more complete review of land use compatibility, as well as other environmental and operational issues, would be undertaken.

Some pump stations might need to be located in non-industrial areas. Because of potential concerns about odors, noise, and visual character in these areas, pump stations would need to be designed to maximize their compatibility with surrounding land uses.

CSOs

CSO conveyance and storage facilities would be compatible with surrounding land uses since they are largely underground and any associated aboveground facilities are typically unobtrusive. Relatively less developed sites (e.g., street ends, parking lots) would be sought for CSO facilities. CSO treatment facilities would be located along the Duwamish Waterway, the Elliott Bay shoreline and the Lake Washington Ship Canal in highly urbanized areas. Therefore, these facilities are likely to be compatible with surrounding land uses.

Infiltration/Inflow

No long-term land use impacts would result from the I/I program.

Mitigation Measures

For development of new aboveground wastewater facilities proposed under the EPP the site selection and design processes would include consideration of the nature of nearby land uses and natural environmental features, and place high priority on consistency with local comprehensive plans and compatibility with adjacent land uses. For example, land use consistency and compatibility would also be promoted through inclusion of appropriate design features (odor and noise control, for example) coupled with an appropriate degree of perimeter buffering.

Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are anticipated.

ENVIRONMENTAL HEALTH

Public Health

As defined by SEPA, the term "environmental health" covers several types of impacts with the potential to affect human health and well being. These impacts are those that are not covered under other areas of SEPA and/or are not specifically addressed by protective regulations. Water and air quality, for example, have the potential to affect human health; however, they are separate SEPA "elements of the environment" and are regulated by standards expressly designed to minimize possible health effects.

For the RWSP, this section covers three topics related to environmental health: public health, noise, and hazardous materials. Public health is specifically related to CSO discharges, which—though short-term and infrequent—are not subject to pollutant

discharge limitations under state and federal water quality regulations.[2] Therefore, direct human contact with these discharges, as well as ingestion of shellfish exposed to them, is a public health issue. Noise is generated by wastewater treatment facilities and pump stations, and is generally restricted to prescribed levels by local ordinances to protect receptors. Hazardous Materials (as specified by state and federal regulations) are used in various treatment processes and are transported to, and stored on, treatment plant sites.

Not all of these environmental health issues are applicable to all service areas or system components. Therefore, this section is organized to focus only on those service areas or components in which impacts may occur.

Impacts

King County will continue to plan and carry out CSO control projects to achieve Ecology's standard of one event per outfall per year by the year 2030. CSOs would be stored and subsequently would undergo either secondary treatment at the West or East Treatment Plants or onsite treatment before direct discharge.

Direct human contact with the CSO pollutants can occur during water contact activities such as swimming, wading, boating, or scuba diving. Reduction in the frequency and volume of discharges would substantially lower the potential for human exposure to harmful bacteria, viruses, metals, and petroleum products contained in CSOs. CSO reductions could reduce human health risks in areas where overflows discharge near areas of heavy human use such as parks, beaches, and other public access points. The County is currently preparing a CSO water quality assessment to evaluate the human health benefits of CSO reduction.

Mitigation Measures

The proposed reductions in CSO discharge represent a substantial improvement over existing conditions and will reduce regional public health risks. No mitigation is necessary.

Unavoidable Adverse Impacts

No significant unavoidable adverse public health impacts are anticipated.

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[2] Regulation of CSOs by Ecology and EPA limits the **frequency** of discharge rather than the pollutant levels, which may vary according to many factors. For further discussion of CSO issues see Part II, Chapter 2, Background.

Noise

Impacts

Operation of wastewater treatment plants, pump stations, and regulator stations creates varying levels of noise that can disturb adjacent properties, depending on the type and proximity of the receptor.

Mitigation Measures

All wastewater treatment plants would be designed to contain noise, particularly when there are nearby sensitive land uses (e.g., residential). Most noise-emitting equipment would be located in buildings, reducing noise levels to acceptable limits before reaching the property line. Fan openings could be directed away from sensitive receptors. Noise levels would be in compliance with the limits established by local jurisdictions.

If necessary, pump stations would be designed with noise baffles to supply enough dead air space between the noise and the outside wall of the building to minimize noise emissions to the exterior. Depending on project-specific design, pump stations could be equipped with emergency diesel generators for use in case of power outages. These generators have high noise levels and would be tested monthly for about 30 minutes. Pump stations served by dual power feeds do not usually have emergency generators. Any noise impacts would be temporary.

A new North Plant would be designed to minimize noise impacts to surrounding areas and would meet all applicable local noise requirements. Because no site has been identified for a North Plant, it is unknown whether truck noise would affect sensitive receptors.

Operational noise at the East Plant would be addressed during the design of facilities at each expansion stage. Operational noise at the new North Plant would be addressed during the siting and design processes for that facility.

With the noise reduction techniques described above, no exceedances of local noise standards would be expected to occur. No additional mitigation would be required.

Unavoidable Adverse Impacts

No significant unavoidable adverse noise impacts are anticipated.

Hazardous Materials

Impacts

Providing secondary treatment for increased wastewater flows would require the use of more chlorine than is currently used at the East Treatment Plant. Chlorine could also be used at a new North Treatment Plant. Increased risks to environmental health are unlikely. Buildings at the two existing plants where chlorine is stored are designed to

contain spills and are equipped with automated alarm systems to minimize fire danger in accordance with the Uniform Fire Code. Chlorine storage buildings at a new North Plant would incorporate these same safety features. In addition, King County has extensive operating experience using chlorine and has developed safety measures and response plans to minimize risk to public health.

Chemicals used at pump stations to control odor and corrosion can be hazardous and require special storage and handling procedures. These chemicals are usually stored in containers, isolated from other areas within the pump station, and added to the wet well and/or force main under controlled conditions. Because of the safety features incorporated into the design of pump stations, control systems and alarms, and King County's experience with hazardous chemicals, impacts on environmental health associated with use of chemicals at pump stations are not expected to be significant.

West Service Area. Caustic soda is stored at the West Plant for use as an absorbent for chlorine, should a leak occur. Venting systems direct any chlorine gas to caustic soda tanks where the gas is absorbed and neutralized. When combined, chlorine and caustic soda produce salt water. Caustic soda use is very low; between 1978 and 1988 there were only two deliveries to the West Treatment Plant. Caustic soda is stored in large storage tanks surrounded by concrete berms to contain any leaks or spills. The potential for adverse impacts to public health is low.

East Service Area. Expansion of the East Treatment Plant would incorporate the same safety features, alarm systems, and response plans used at the existing plant. While chlorine use would increase, roughly in proportion to the size of the expansion, the risk to environmental health would remain low.

Risks associated with the use of chlorine gas and other chemicals at the East Treatment Plant would be somewhat lower under the EPP than service strategies that expand the capacity to 154 mgd.

North Service Area. Chlorine could be used for disinfection at a new North Plant although this would be thoroughly evaluated during plant design and another, less toxic, method could be selected. If chlorine gas were used, it is anticipated that it would be transported to the plant by truck or rail. Safety measures similar to those in place at the East Plant would be developed to minimize environmental health risks.

Mitigation Measures

- At each wastewater treatment plant, safety plans would continue to be implemented to minimize risks associated with hazardous materials and chemicals. Emergency response plans detail measures to be taken in the event of an emergency involving hazardous materials or chemicals. Workers receive regular training in the use of these materials, as well as in emergency response procedures.

- All facilities would be designed to minimize the potential for leaks or breaks. To prevent pipeline or facility leakage, King County conducts periodic routine pipe-

line inspections to detect possible defects. Inspections detect potential for failures before the failure is imminent. Should a leak occur, an emergency response team is mobilized so that repairs and cleanup begin immediately. Appropriate regulatory agencies, including EPA, Ecology, and the local jurisdiction in which the spill occurs, are notified.

- Chlorine would continue to be stored in concrete storage buildings designed to fully contain chlorine in the event of a leak; pressure sensors and leak detection alarms would also be provided.

- Vacuum distribution systems would be used for chlorine; these systems include fail-safe shutdown in the case of vacuum system failure.

- Sodium hydroxide would be used in emergencies to absorb chlorine in case of system malfunction.

- Chlorinated systems would be inspected regularly.

- Caustic soda storage tanks would be provided with concrete berms to contain any releases from leaks or ruptures.

- Chemicals, paints, solvents, lubricants, etc. would be stored in structures designed to contain any leakage or rupture.

Unavoidable Adverse Impacts

No significant unavoidable adverse impacts have been identified.

OTHER ELEMENTS OF THE ENVIRONMENT

Earth Resources

The EPP includes projects that would convert existing native soils to impervious surface. Such conversion increases surface water flows and runoff rates and corresponding erosion; it also impedes local aquifer recharge. In general, however, overall increases in impervious surface would be small.

Major earthquakes occur in the Puget Sound region and could result in structural damage to treatment and conveyance facilities. All structures proposed in identified seismic risk areas would be designed to withstand earthquake effects to the levels identified in applicable policies and regulations.

Impacts

New conveyances and CSO facilities under the EPP would contribute minor amounts of additional impervious surface area. Expansion of the East Plant and construction of a

new 54-mgd North Plant would result in the following estimated additional impervious surface areas:

- East Plant expansion—about 6 acres
- North Plant—about 15 acres

Impacts on earth resources from proposed facilities would not be significant. A high-magnitude earthquake could result in structural damage to the East Plant, which is located in an area subject to liquefaction during seismic activity. Large earthquakes could also result in structural instability at a new North Plant, depending on final site selection.

Increased control of CSOs will reduce deposition of contaminants in sediments near outfalls.

Mitigation Measures

Structures located in high seismic risk areas would be designed to withstand 0.3-ground acceleration, consistent with current King County policy. Where practical, soils subject to liquefaction could be overexcavated down to firmer materials.

Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are anticipated.

Aesthetics

The construction of new aboveground facilities (primarily treatment plants and pump stations) would change the visual character of the surrounding landscape to a greater or lesser degree, depending on the nature of local land uses, the size of the facility in question, and the techniques (e.g., landscaping) used to screen and buffer the facility from its neighbors.

Impacts

Expansion of the East Plant could result in approximately a 17 percent increase in the size of the existing treatment plant. Although the expanded plant would be similar in scale and visual character to the surrounding industrial and office development, its expanded size would make the facility more visible from nearby viewpoints and distant valley residences.

If a new North Treatment Plant were to be located at a shoreline location, the potential for adverse visual impacts could be significant. A new treatment plant could be a major visual element in an otherwise nonindustrial area on most shoreline sites. The visual impacts of a treatment plant at a lowland inland site north of Lake Washington would depend on site location. Some potential locations in this area are highly visible. At any

location the new treatment plant would be a new visual element. The magnitude and character of this potential impact would depend on the site chosen.

Facilities potentially required for CSO treatment at the West Plant would be located completely inside the plant footprint and of lower height than most of the plant buildings.

Pump stations and other above-ground facilities associated with conveyance lines and CSO control could have aesthetic impacts, depending on their surroundings and design. No aesthetic adverse impacts would result from the operation of underground facilities.

Mitigation Measures

To mitigate adverse visual impacts resulting from an expanded East Plant, the extensive mitigation measures employed at the existing treatment plant should be expanded to include the new structures. These mitigation measures include perimeter berming, perimeter and interior landscaping, and siting of facilities to direct views into the site toward open areas and away from structures. Mitigation measures described for the East Plant would be employed for the North Plant with the goal of a design that is compatible with the site and its surroundings.

For pump stations located at sites visible from nearby properties, landscaping could be provided to obscure the visibility of the facility. Other above-ground structures could be designed to be visually compatible with the surrounding area and structures.

Unavoidable Adverse Impacts

Construction of a new North Treatment Plant would change the visual character of the immediately surrounding area to some degree.

Recreation

Operational impacts on recreation would occur if aboveground structures were located within or close to recreational facilities, such as parks. Such impacts could be direct (i.e., lost use of park lands or amenities) or indirect (e.g., aesthetic or noise impacts).

Impacts

Expansion of the East Plant would not result in the loss of any land used for recreation. A location for the new North Plant that avoided displacing existing recreation facilities would be sought. Consequently, the plant would be unlikely to result in the loss of recreational facilities. Adverse post-construction impacts on recreation resulting from treatment plant expansion or construction would be minimal.

Underground facilities (conveyances and tunnels) would not result in any post-construction adverse impacts on recreation. The Murray Avenue CSO control project could eliminate some recreational space at Lowman Beach Park.

Implementation of the I/I program would not result in any recreation impacts.

Mitigation Measures

Impacts to recreation would be avoided wherever possible. Unavoidable losses of recreational use would be fully mitigated with specific measures dependent upon the nature of the lost resources.

Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are anticipated.

Cultural Resources

No cultural resource impacts would result from operation of the EPP. Potential construction impacts are discussed in Part II, Chapter 11.

Air Quality

Impacts

Volatile Organic Compounds. As described in Chapter 4 of the DEIS, VOC emissions from treatment plants are essentially proportional to the volume of wastewater treated. In general, the VOC emission potential of enclosed treatment processes, such as high-purity oxygen treatment, is considerably less than that of unenclosed treatment processes because of the limited potential for VOCs to volatilize into the ambient atmosphere. However, enclosed processes are generally more expensive initially and may not be practical or cost-effective for many municipal treatment needs. Activated sludge and trickling filter processes are estimated to have about an equal potential for releasing VOCs from wastewater.

Handling biosolids on the treatment plant site also poses the potential for release of VOCs that remain after completion of the liquid process. Again, enclosed solids handling facilities minimize this potential, but the space required for dewatering, storage, and other activities may make this impractical. Where anaerobic digestion of solids is accompanied by combustion of resulting digester gas, VOCs can be emitted during combustion.

Odor. The factors influencing a treatment facility's odor impacts are similar in many ways to those that determine its level of VOC emissions. Elements of a facility most likely to generate odors typically are not enclosed and, thus, expose wastewater or solids to open air. The highest potential sources of odor include the screenings building, sludge digester, sludge thickener, and the septage receiving and loading areas. Primary clarifiers have a moderate odor potential, while aeration basins and secondary clarifiers tend to produce few odors. Also, as with VOCs, treatment processes vary in their odor-causing potential. Trickling-filter processes have the highest potential for odor, followed by acti-

vated sludge and oxidation ditch processes. Processes with the lowest odor potential include rotating biological contactors and high-purity oxygen-activated sludge. Specific facility elements and treatment processes for the EPP will be determined during design and subject to environmental review.

Other facilities related to the conveyance of wastewater can generate odors similar to those experienced at treatment plants. Typically, odors are generated where wastewater becomes turbulent, such as at pump or regulator stations. Odors can also be present at high spots in conveyance pipelines, usually where force mains and gravity mains come together. Facilities can be designed to incorporate odor controls, such as carbon filters, to treat air before it is emitted to the environment.

Siting of a North Plant would play a large role in determining the probable extent of its odor impacts and the appropriate mitigation. Predominant wind conditions are a determining factor in how severely odor impacts are experienced. However, if a new treatment plant were sited with potential to adversely affect a sensitive neighborhood, the plant would be designed with odor control technology to enclose the more odorous processes and remove odorous compounds from the air exiting those enclosures.

Mitigation Measures

VOC (excluding toxic air contaminants (TAC)) and odor emissions from wastewater treatment facilities are not subject to regulation by PSAPCA or other agencies. However, King County actively pursues measures to reduce such emissions at its facilities. Ongoing source control efforts are the most effective method of reducing the range and concentrations of VOCs in wastewater influent. Odor control at the expanded treatment facilities would involve extending technologies currently in use to the newly constructed expansion areas. Part II, Chapter 4, Affected Environment, describes some of the types of technologies currently used to control odor at King County facilities.

In addition, King County will continue to seek practical technologies that will prevent odors from escaping wastewater facilities.

Unavoidable Adverse Impacts

Regional levels of VOC emissions would increase slightly under the EPP (as they would under any of the other alternatives).

Transportation

Operation of expanded treatment facilities would require several additional treatment plant operating staff members. Some staff members would be headquartered at the plant sites for functions such as facilities maintenance, administration, and site maintenance. Additional worker trips to and from the site would not occur during the morning and afternoon peak traffic periods. Most trips would occur during the day, although additional swing and graveyard shifts could be added at night.

The new and expanded pump stations proposed under the EPP strategy would not be staffed. Workers based at other facilities would visit each of them every 1 or 2 weeks. If repair or equipment replacement were needed, more traffic would be generated for the duration of those activities. Otherwise, very few additional trips would be generated by new or expanded pump stations.

Pipelines are inspected only periodically. Virtually no traffic would be generated by pipelines once construction was complete. Similarly, CSO control facilities would have no permanent staff. During some storm events, two to three treatment plant-based staff would make trips to the CSO facilities to ensure they were operating properly.

Transportation operational impacts under the EPP would be experienced in the vicinity of the East Treatment Plant when it was expanded to 135 mgd. They would also be experienced as a result of operating a North Plant. Biosolids truck trips would increase proportionally to the solids removed from increased wastewater flows. Biosolids one-way truck trips to and from the North Plant are projected to average up to approximately 6 per day. Operational trips are shown in Table EP1-3.

Depending upon the site selected for a new North Plant, roads to the site might require improvements in order to accommodate plant traffic.

Mitigation Measures

No mitigation measures are proposed. However, King County continues to evaluate solids processing technologies that would reduce biosolids volumes and thus hauling trips.

Unavoidable Adverse Impacts

None anticipated.

Table EP1-3
Operational Trips [1]
Executives Preferred Plan

VEHICLE TYPE	FACILITY					
	West Plant	East Plant		North Plant[2]		
	Existing, Average/Day (133 mgd)	Existing, Average/Day (115 mgd)	(135 mgd)	(18 mgd)	(36 mgd)	(54 mgd)
CARS	320/day	330/day	385/day	45/day	85/day	130/day
TRUCKS	35/day	65/day[4]	75/day	5/day	10/day	15/day
BIOSOLIDS TRUCKS [3] (7 days a week)	12/day (6 loads)	10-12/day (5-6 loads)	12-14/day (6-7 loads)	2-4/day (1-2 loads)	4/day (2 loads)	6/day (3 loads)
Chlorine RAILROAD CARS	----------	7/year	8/year	NA[5]	NA	NA

Notes: (1) Trips are one-way; figures are rounded. "One-way" is defined as a single direction trip to a single destination.
(2) Projected North Plant trips are based on existing West Plant trips to reflect most recent traffic volume data.
(3) Biosolids truck trips are one-way. Final conditions to the Shoreline Substantial Development Permit for upgrade to secondary treatment at West Point state that "the number of loaded sludge trucks shall not exceed 13 per day on average over a year period (January through December)." Thirteen truck loads per day equals 26 one-way truck trips as defined in Note (1).
(4) East Plant truck trip numbers include septage trucks which are not processed at the West Plant.
(5) Data not available.

Public Services, Utilities, and Energy

The principal utilities affected by operation of proposed facilities would be electrical power and natural gas suppliers. Treatment plants and pump stations are the facilities that would consume most of the energy required for operation under any of the service strategies. Methane and other gases produced at treatment plants could be captured and sold to an electrical utility or used to generate power to reduce demand placed on suppliers.

The additional amount of energy consumed by new facilities under the EPP would be minor in the regional context. Energy requirements of individual facilities would be evaluated in light of available power supply during facility design.

Operation is unlikely to have a significant impact on police, fire, and emergency services. Demands on water, telephone, and other utilities are not likely to be significant.

Impacts

The additional electrical energy required to operate treatment plants in the year 2030 is estimated at 39 million kWh per year. The amount of energy produced to offset this demand has not been estimated.

Mitigation Measures

Local utilities attempt to meet the demands of their customers. More detailed environmental reviews of individual projects proposed as a result of this planning process would include assessments of possible impacts to services, utilities, and energy and any appropriate mitigation measures.

Unavoidable Adverse Impacts

Treatment of higher wastewater volumes would result in increased energy usage.

SHORT-TERM CONSTRUCTION IMPACTS

Chapter 11 of Part II of this FEIS contains a detailed discussion of construction impacts. Table EP2-9 at the end of Part I discusses and compares the construction impacts of all of the revised service strategies.

SUMMARY OF MITIGATION MEASURES

Table EP1-4 lists mitigation measures that would be employed during construction and operation of the EPP.

TABLE EP-1-4
SUMMARY OF MITIGATION MEASURES

Element of the Environment	Mitigation Measures
Earth	**Construction** • In areas of suspected contaminated soils, testing would be conducted to determine the extent of contamination before construction. • Contaminated soils from excavations would be disposed of in compliance with all applicable local, state and federal regulations. • Where contaminated soils and groundwater are found together, dewatering systems would be implemented to avoid discharging contaminated groundwater or letting soils leach to receiving surface waters. **Operations** • Adherence to state regulations and guidelines for the production and application of reclaimed water will ensure that potential adverse impacts to earth resources are minimal. • Biosolids are regulated by federal (part 503), state and local agencies. The 503 regulations limit the amount of biosolids that can be land applied in addition to limiting the level of constituents in the product.
Air	**Construction** • To minimize blowing dust, implement best management practices such as watering exposed soil areas, covering soil stockpiles and minimizing areas of earth disturbed at any one time. **Operations** • King County will continue to seek practical technologies that will prevent odors from escaping wastewater facilities. • Avoid direct exposure of humans to reclaimed water by irrigating at night or in temporarily restricted areas. Integrate signage, training and appropriate operations and maintenance procedures for equipment into health and safety program.

Element of the Environment	Mitigation Measures
Water Resources	**Construction** • Include best management practices for erosion control in construction specifications to minimize sedimentation of water bodies. **Operations** • Select wastewater discharge outfall sites with strong currents and favorable circulation patterns that most rapidly move pollutants northward out of Puget Sound. Research indicates that the upper water layer best provides these conditions. Outfall locations that meet these criteria would reduce long-term operational impacts. • Infiltration and inflow control projects in flood-prone areas would include studies of local groundwater and surface water drainage patterns to avoid exacerbating local flooding and wet basements. • King County's Industrial Waste/Source Control Pretreatment Program reduces the levels of contaminants entering the sewer system and enhances both biosolids and reclaimed water products. • At biosolids application sites, use agronomic rates to maximize crop uptake of nutrients, maintain moderate pH and monitor for soil contaminant concentrations. Maintain buffers from surface water bodies. Adhere to federal, state and local regulations and permits. • Monitor reclaimed water quality. For dual distribution systems, incorporate safeguards to prevent cross connections between potable and reclaimed water. Adhere to state standards and guidelines.
Biological Resources	**Construction** • Routes would be selected to avoid sensitive riparian and wetland areas wherever possible. • Pipeline alignments would be designed to minimize destruction of existing vegetation and wildlife habitat. These resources would be restored after construction. • Construction in streams and nearshore areas would not occur during designated fishery closure periods. • Outfall alignments would be designed to minimize impacts to sensitive intertidal communities wherever possible. • During construction, King County staff and contractors would coordinate with tribal governments to reduce the potential for disruption of tribal fishing

Element of the Environment	Mitigation Measures
	operations. • Wetland mitigation plans would be developed for wetland areas disturbed during construction. • King County would work with resource agencies to develop specific site restoration methods for affected sensitive areas. **Operations** • Mitigation measures to protect ecological health include monitoring the quality of reclaimed water to ensure that it consistently meets the Class A standard. • If high levels of mineral salts and inorganic compounds are known to be present in the reclaimed water, plant materials can be selected that are proven to be tolerant of these conditions. • Applying biosolids to the soil as an amendment improves tilth and increases plant productivity.
Energy	**Construction** • All equipment used during construction would meet applicable energy efficiency standards. **Operation** • Methane and other gases produced at treatment plants could be captured and sold to power companies or used to generate power to reduce demand on suppliers.
Environmental Health	**Construction** • Construction noise would be controlled wherever possible to avoid adversely impacting sensitive receptors such as residential neighborhoods and schools. **Operation** • Use appropriate procedures for handling chemicals and petroleum products during facility operation. • The State of Washington Water Reclamation and Reuse Interim Standards protect public health by requiring a specific level of water quality and treatment corresponding to each beneficial use of reclaimed water. King County's adherence to these standards produces the highest quality effluent designated by the state, Class A.

Element of the Environment	Mitigation Measures
	• Potential risks to public health from use of reclaimed water can be reduced even further through the following measures: Irrigation could occur at night when public exposure is likely to be low; public education (e.g., posting of signs); environmental monitoring (e.g. soil and water sampling); appropriate irrigation design and operation (e.g., providing for emergency shut-off of the irrigation system in the event of a pipe rupture) and; implementation of appropriate irrigation system maintenance procedures. • The 503 Regulations for biosolids application specify strict "ceiling concentrations" on the amounts of metals that are allowable in biosolids. King County's biosolids are well below this level. • Proper application of biosolids and adherence to permit and operations plan requirements protect public health such that no significant adverse impacts are likely to occur from biosolids applications.
Land & Shoreline Use	**Construction** • Refer to mitigation measures discussed under air, noise, aesthetics and transportation. **Operations** • To site new treatment facilities (i.e. plant, pipelines), high priority would be given to sites where such facilities would be compatible with surrounding uses.
Recreation	**Construction** • Where short periods of temporary construction impacts are expected at recreational facilities, construction could be scheduled to avoid the periods of highest recreational use. • Where trail use is disrupted, King County would provide a safe detour around the construction area wherever possible.
Aesthetics	**Operations** • To make treatment facilities more compatible, measures such as landscaped buffers and architectural treatment would be used in design.
Transportation	**Construction** • Traffic plans would be developed to ensure continued circulation and access during construction. • Open trench segments would be covered to allow residents and service vehicles

Element of the Environment	Mitigation Measures
	to access driveways and loading areas. • Temporary measures would be implemented along trails to separate pedestrians and bicyclists from vehicles.
Cultural Resources	**Construction** • Presence of known cultural resources would be taken into account when designing facilities and cultural resources will be avoided wherever possible. • If cultural resources are encountered during construction, construction would cease and a professional archaeologist will be consulted.