Final Facility Plan

for the

LIGHTHOUSE POINT
WATER RECLAMATION FACILITY

PREPARED FOR

City of Blaine, Washington

CH2MHILL

March 2006

Final

Facility Plan

for the

LIGHTHOUSE POINT WATER RECLAMATION FACILITY

Prepared for

City of Blaine, Washington

March 2006

CH2MHILL
1100 112th Ave. NE
Bellevue, WA 98004

Final Facility Plan
for the
LIGHTHOUSE POINT
WATER RECLAMATION FACILITY

City of Blaine, Washington

March 2006

Prepared By:

CH2MHILL
1100 112th Ave. NE
Bellevue, WA 98004

Prepared in compliance with the Washington Department of Ecology
Requirements for Facility Plan, WAC 173-240-060.

Owner's Authorized Representative:

Mr. Steve Banham, P.E.
Public Works Director
City of Blaine, Washington
1200 Yew Avenue
Blaine, Washington 98230

(360) 332-8820

Executive Summary

The City of Blaine, Washington (City) is in the planning process of implementing their new water reclamation facilities to address the growing need for wastewater treatment and enhancing water quality in their marine environment. The proposed Lighthouse Point Water Reclamation Facility (WRF) will be constructed on a site along the Marine Drive corridor. This corridor is a key focal point for the City as it is the first visible landmark viewed by visitors traveling south into the U.S. The proposed Lighthouse Point WRF will not only be required to meet the growth and treatment needs of the City but it must also enhance the redevelopment of the area as envisioned in the community development master plan.

This Facility Plan is intended to provide the City with a planning document for the new treatment facilities that will summarize the preliminary service requirements, process evaluation, cost analysis, and design criteria for the proposed Lighthouse Point WRF. This Facility Plan has been prepared in accordance with the requirements of Washington Administration Code 173-240-060, which is administered by the Washington State Department of Ecology (Ecology).

Background and Goals

The City owns and operates all components and facilities of the wastewater collection and treatment system. The City's system consists of a secondary WWTP, WWTP gravity sewer lines, force mains, and 10 pump stations.

History of the Planning Process

The City's existing WWTP began operation in 1980. Following adoption of the 1994 General Sewer Plan, the *City of Blaine Wastewater Facilities Engineering Report* (Brown & Caldwell, 1994) recommended construction of a new WWTP on the City's existing WWTP site to address significant anticipated growth in population and wastewater flows. The report identified several archeological issues on the existing site but concluded that no other site was feasible. Ecology reviewed the report and requested clarification of some issues. The clarifications were provided by the *Wastewater Treatment Plant Upgrade and Expansion Predesign Report* (KCM, 1997). Together, these two documents were approved by Ecology in February 1998 as an engineering report for the WWTP upgrade.

Design documents for the WWTP upgrade and expansion were completed in 1999, and construction began in spring 1999. Problems began when site excavation encountered human remains in July 1999. This led to protests from the Lummi Indian Nation, shutdown of the project in August 1999, and contract termination in March 2000. As a result of its archaeological characteristics, the existing WWTP site on Semiahmoo Spit is no longer considered a feasible long-term treatment site. The City entered into an agreement with the Lummi Nation to abandon the site and remove all unnecessary treatment facilities.

In the aftermath of the expansion project's termination, the City aggressively evaluated alternatives for addressing capacity limitations of their collection system, the treatment needs

for future growth, and facilities to meet regulatory compliance requirements. Public scrutiny of wastewater issues in Blaine has been high. Water quality is a key concern of the community, especially since the closure of Drayton Harbor to shellfish harvest due to fecal coliform contamination. There are many contributors to water quality issues in the harbor, however, as a point source, municipal wastewater discharges are often singled out in the public perception of coliform contamination.

The City implemented temporary improvements to prevent wet-weather overflows at Lift Station #1 (LS1), but they are insufficient to guarantee that there will be no future overflows. These temporary facilities were also labor intensive and visually unsightly. The City also implemented some interim improvements to enhance performance of the existing WWTP until the proposed Lighthouse Point WRF utilities are completed.

Because of the financial impact of constructing the proposed Lighthouse Point WRF and permanent wet weather overflow protection facilities, the City is seeking multiple sources of funding. A General Sewer Plan was prepared and submitted to Ecology in 2004, which laid the foundation for development of new treatment and conveyance facilities. Ecology approved the planning document in late 2004 and the City moved forward with an implemented multi-phased approach to addressing their treatment and sewage overflow issues.

A Facility Plan and design documents for the wet weather overflow protection facilities are currently being prepared for the Phase 1 improvements. This Facility Plan is being prepared to address the treatment facilities required at the new Marine Drive site. These proposed facilities have been designated as the proposed Lighthouse Point WRF.

Facility Plan Goals

The primary purpose of this Facility Pan is to serve as a detailed planning document that City staff can use to implement required improvements to address identified capacity, treatment, and operation and maintenance needs over the next 20 years at the proposed Lighthouse Point WRF. Specific goals of this Facility Plan include:

- Comply with the requirements of WAC Chapter 173-240-060.
- Prepare the plan to be consistent with all other applicable Federal, State, and local regulations, policies, and planning requirements.
- Identify the sizing and design criteria for the proposed facilities.
- Identify budgetary-level construction costs for the proposed treatment facilities.
- Develop a financing plan for the recommended improvements and assess potential impacts on proposed utility rates.

Regulatory Requirements

Implementation of wastewater treatment and conveyance facilities must address the regulations and requirements of many Federal, State, and local regulatory agencies.

Key Federal regulations pertinent to this Facility Plan include; the Endangered Species Act (ESA), Magnuson-Stevens Fishery Conservation and Management Act, Coastal Zone

Management Act, Clean Air Act, National Environmental Policy Act, National Historic Preservation Act, and Public Participation requirements.

Key State regulations pertinent to this Facility Plan include; the National Pollutant Discharge Elimination System (NPDES) Program, Ecology's Criteria for Sewage Works Design and Reliability Requirements, State Environmental Policy Act, State Environmental Review, State Waste Discharge Permit, and the Washington State Energy Code.

Key local regulations and policies pertinent to this Facility Plan include; City of Blaine codes and standards, Whatcom County Solid Waste Policies, and the Northwest Air Pollution Authority.

Based on the impacts identified in the Environmental Report, no significant environmental impacts are anticipated for the Lighthouse Point WRF.

Service Area Characteristics

The City is located in the northwestern part of Washington State directly adjacent to the U.S.-Canadian border along U.S.v Interstate 5. Drayton Harbor divides the City into two parts, with Semiahmoo Spit and much of Birch Point lying west of Drayton Harbor. The remaining portion of the City is east of Drayton Harbor and includes approximately 2 square miles of business and residential area. Blaine's population is approximately 3,956 within the City limits, as of December 31, 2002 (Sehome, 2003).

The rapid growth of Vancouver, the Municipality of Surrey (a Vancouver suburb), and the surrounding area into a metropolitan, industrial, and urban center has affected the entire area, including the City. The resort community of Birch Bay is south of the City. This area has experienced considerable growth over the last 20 years, and growth pressures are expected to continue.

The City's incorporated area includes 3,500 acres (5.5 square miles) currently within the City limits. The Urban Growth Area (UGA) includes approximately 2,400 acres (5.7 square miles) for a total area of the City and associated UGA of 5,900 acres or 9.2 square miles. Wastewater from within the City is primarily from single-family residential sources, with some minor commercial and light industrial sources.

Wastewater Collection System

Much of the City's collection system has been upgraded or constructed within the last 25 years, although a large portion of the system in the central business area and northeast portion of the City is considerably older (originally constructed in the 1920s). A detailed description of the City's collection system, its hydraulic capacity and limitation, and proposed capital improvements plan is presented in the City of Blaine General Sewer Plan (CH2M HILL, 2004)

Wastewater Treatment Facility and Outfall

The City's WWTP is rapidly nearing its capacity. Native American remains discovered at the west WWTP site during construction of a capacity expansion project in 1999 preclude expansion of the plant at this location, and storage capacity within the conveyance system is limited. Faced with a new NPDES permit that includes stringent toxicity testing and plant capacity assessment, the City must identify a solution for future wastewater treatment while maintaining compliance with regulations and permit requirements at the existing facility. An alternatives evaluation process, conducted between May 2003 and April 2004, identified a number of options for future treatment and selected a preferred alternative with the assistance of an active Citizens' Wastewater Advisory Committee (CWAC) made up of community members, Native American tribal leaders, and key regulatory players.

Existing WWTP Description

The existing treatment processes include preliminary treatment, secondary treatment, dis-infection, and solids stabilization. Influent pumping (Lift Stations #1 and #4) is located offsite from the WWTP site. Preliminary treatment includes fine screening and odor control. Rotating biological contactors (RBCs) and secondary clarifiers provide secondary treatment. The treated effluent is disinfected with chlorine and discharged through an outfall and diffuser into the Semiahmoo Bay, which is open to the Strait of Georgia. Solids are stabilized through aerobic digestion, and the digested solids are transported by truck to Tjoelker Farms for disposal.

The current NPDES waste discharge permit for the City (Permit No. WA-002264-1) became effective April 1, 2003, and will expire on June 1, 2007. The permit requires secondary treatment capable of producing 30 mg/L Biochemical Oxygen Demand (BOD) and 30 mg/L Total Suspended Solids (TSS) effluent.

Existing Outfall Description

The Blaine WWTP outfall consists of a 24-inch-diameter ductile iron pipe that extends into Semiahmoo Bay approximately 2,200 feet from the shoreline and terminates at a depth of about 30 feet below mean lower low water (MLLW). The outfall includes a diffuser, which consists of six 8-inch-diameter ports.

An outfall inspection was conducted in early 2004 to assess the general condition of the exposed portions of the pipe and to check for any evidence of damage, leakage, scouring, or undermining around the outfall pipe and diffuser. During the investigation of the outfall, a hole was identified approximately 100 feet from the diffuser. The capacity of the outfall is sufficient to handle future effluent flows for at least 20 years. The City repaired the hole in the damaged effluent outfall in July 2004, as a condition of its May 5, 2004, settlement to appeals brought before the Pollution Control Hearing Board.

Summary of Existing Treatment Capacity

The overall capacity of the Blaine WWTP is established by the capacity of the single most limiting unit process. Capacity may be limited by either treatment of conventional pollutants (BOD and TSS) or treatment under various hydraulic loading conditions. The existing WWTP currently has a maximum month process capacity of 0.8 mgd and a peak

instantaneous hydraulic capacity of 2.4 mgd. However, several process units have treatment limitations. These limitations will be addressed through interim improvements to allow treatment to continue until the new facilities are online.

Wastewater Characteristics

This section presents an overview of the wastewater characteristics for the City's existing wastewater treatment system. The historical wastewater flow and loadings are presented, along with the projected wastewater flow and loadings for the proposed Lighthouse Point WRF.

Historical Flows and Loadings

Table ES-1 shows the historical flows and loadings to the existing WWTP.

TABLE ES-1
Blaine Sewage Treatment Plant – Historical Influent Wastewater Flow and Loading Trend

Year	Annual Average Flow (mgd)	Average Annual TSS (lbs/day)	Average Annual BOD_5 (lbs/day)	Maximum Month Flow (mgd)	Maximum Month TSS (lbs/day)	Maximum Month BOD_5 (lbs/day)
2003	0.61	1,011	1,165	0.88	1,153	1,193
2002	0.61	1,193	1,255	0.85	1,026	1,076
2001	0.49	955	972	0.71	799	895
2000	0.50	847	1035	0.68	1,358	1,353
1999	0.44	672	735	0.80	884	940
1998	0.38	631	573	0.72	733	747
1997	0.45	636	600	0.81	655	592

Design Flows and Loadings

Table ES-2 shows the proposed design flows to the proposed Lighthouse Point WRF.

TABLE ES-2
City of Blaine 2023 Hydraulic Design Criteria

	Minimum Flow (mgd)	Annual Average (mgd)	Maximum Month (mgd)	Dry Weather Peak Hour (mgd)	Wet Weather Peak Hour (mgd)
Central and East Blaine, and East Blaine UGA	0.31	0.77	1.11	1.39	5.50(1)
West Blaine	0.09	0.23	0.39	0.41	1.64(1)
City of Blaine Total	0.4	1.00	1.5	1.80	7.14

[1]Central Blaine, East Blaine, and East Blaine UGA wet weather peak hour based on the 2023 baseflow and 25-year storm, 24-hr duration.

[2]West Blaine wet weather peak hour flow is an estimated value based on the peaking factor from the Central Blaine, East Blaine, and East Blaine UGA annual average to wet weather peak hour flow (7.14).

Treatment Process Design Criteria

Historical influent water quality data and the required effluent water quality form the basis for planning and subsequent design.

Table ES-3 shows the proposed design loading to the proposed Lighthouse Point WRF.

TABLE ES-3
Water Reclamation Facility Design Criteria – Influent Flow and Loadings

Influent Parameter	Average Annual Load (1.0-mgd), lbs/d	Maximum Month Load (1.55-mgd), lbs/d
BOD_5 [1.]	1,918 (230 mg/L)	2,715 (210 mg/L)
TSS[1.]	1,768 (212 mg/L)	2,715 (210 mg/L)
VSS[2.]	1,326 (159 mg/L)	2,055 (159 mg/L)
TKN[2.]	359 (43 mg/L)	556 (43 mg/L)
NH_3 [3.]	209 (25 mg/L)	323 (25 mg/L)
Alkalinity (as $CaCO_3$)[2]	1,668 (200 mg/L)	2,585 (200 mg/L)
Temperature (°C)[4]	13	13

1. Based on Annual Average values, 1998 – 2002; Maximum Month, 1998 – 2002, See Table 5.
2. VSS assumed to be 75 percent of TSS, TKN assumed to be 170 percent of NH_3, Alkalinity concentrations for strong and medium wastewater (Metcalf & Eddy, 1991).
3. Annual Average, 1992-1993 Blaine STP Periodic Influent Sampling = 25 mg/L; Max Month Jan 2003 = 12 mg/L.
4. Temperature is assumed.

The treatment process design criteria are based on the maximum month influent load to the WWTP. The maximum month value corresponds to the monthly effluent compliance standard listed in the NPDES permit. Using the maximum month value for the design criteria will statistically result in process reliability 92 percent of the time (WEF, 1998). The treatment process design capacity for the Lighthouse Point WRF will be 1.55 mgd, which is the maximum month influent flow associated with the peak hydraulic capacity of 3.1 mgd

assuming a peaking factor of 2. The peak hydraulic flow of 3.1 mgd was established from the wet weather storage facility that will be constructed under the Phase I contract.

Treatment Site Evaluation

This section presents an overview of the evaluation process to determine the site of the proposed Lighthouse Point WRF and a brief summary of the various process components evaluated for implementation at the proposed Lighthouse Point WRF site.

Evaluation of New WWTP Site / Treatment Alternatives

The evaluation of alternatives for the City's future wastewater treatment was accomplished through a structured decision process. The process used a set of decision criteria grouped under five overall objectives for wastewater treatment. In order to ensure that the final decision would represent the priorities of the City's stakeholder groups, the CWAC was formed to help guide criteria development, alternative screening, and decision-making on the preferred alternative.

Treatment and Site Alternatives

Thirteen alternatives for the treatment of the City's wastewater were initially developed for evaluation. A fourteenth alternative was later added during the evaluation process. For each alternative, a fact sheet was completed to provide sufficient detailed information to allow the CWAC to rank alternatives against the evaluation criteria.

CWAC Recommendations of Preferred Alternative

Based on the results of the analysis, the CWAC recommended the City Council implement the proposed conveyance and treatment facilities using a multi-phased approach. The first phase is to construct new wastewater equalization storage and upgrade the existing LS1 to address sanitary sewer overflows along Marine Drive. In addition, repairs will be made to the existing WWTP to improve capacity, including repairs to the headworks treatment and control structures. The second phase of the project will be the construction of the proposed Lighthouse Point WRF on Marine Drive to treat flows from Central and East Blaine. The third phase of the project will involve treating the flows from West Blaine, either via a regional solution with Birch Bay or at a new satellite plant located in West Blaine.

Treatment Facilities Development and Analysis

The objective of this section was to document and present the preliminary design criteria and sizing requirements for each treatment configuration alternative evaluated for the proposed Lighthouse Point WRF. The planning and design parameters summarized in this section were used to size each alternative.

Process Components Evaluation

The treatment components for the unit processes are listed on Table ES-4.

Development of Alternatives

A number of treatment configuration alternatives were evaluated for use at the proposed Lighthouse Point WRF. It was assumed that for the majority of the treatment configuration alternatives, the City would continue the current practice of contracting their solids treatment to others. However, the option of including solids treatment at the proposed Lighthouse Point WRF was included in one of the treatment configuration alternatives. Table ES-4 lists the treatment configuration alternatives evaluated.

TABLE ES-4
Treatment Configuration Alternatives

Alt.	Preliminary/ Primary Treatment	Secondary Treatment	Disinfection Treatment	Solids Handling	Solids Treatment
1	Coarse Screening/Grit Removal	Conventional Activated Sludge (CAS)	UV System	Thickener	No
2	Coarse Screening/Grit Removal	Conventional Activated Sludge (CAS)	Liquid Chlor./ Dechlor. System	Thickener	No
3	Coarse Screening/Grit Removal	Batch Reactor (SBR)	UV System	Thickener	No
4	Coarse Screening/Grit Removal	Batch Reactor (SBR)	Liquid Chlor./ Dechlor. System	Thickener	No
5	Coarse Screening/Grit Removal	Extended Aeration (EA)	UV System	Thickener	No
6	Coarse Screening/Grit Removal	Extended Aeration (EA)	Liquid Chlor./ Dechlor. System	Thickener	No
7	Fine Screening/Grit Removal	Membrane Bioreactor (MBR)	UV System	Thickener/ Dewatering	Yes
7A	Fine Screening/Grit Removal	Membrane Bioreactor (MBR)	UV System	Thickener/ Dewatering	No
8	Fine Screening/Grit Removal	Membrane Bioreactor (MBR)	Liquid Chlor./ Dechlor. System	Thickener	No
9	Fine Screening/Grit Removal	Fixed Film (RBC)	UV System	Thickener	No
10	Fine Screening/Grit Removal	Fixed Film (RBC)	Liquid Chlor./ Dechlor. System	Thickener	No

Evaluation of Monetary and Nonmonetary Criteria

As part of the treatment process and conveyance facilities evaluation activities, cost estimates and analyses for each alternative were developed. Estimates include the construction cost and annual operations and maintenance costs for each alternative. The alternatives were ranked and recommendations made for the most cost-effective and appropriate treatment and conveyance approach, including the costs for the associated mitigation features. It should be noted that the MBR process provides a higher quality effluent than the other alternatives and exceeds the NPDES requirements for the City.

In addition to the monetary analysis, each of the alternatives were scored and ranked based on their performance against nonmonetary criteria. The nonmonetary criteria are composed of various features or benefits for the proposed treatment facilities that were identified as of value to the City. These nonmonetary criteria are an extension of the criteria developed as part of the public outreach process during the General Sewer Plan development (CH2M HILL, 2004).

The capital costs and annual costs for the treatment process alternatives were developed using a combination of the computer programs Pro2D (CH2M HILL Process Design Model) and CPES (CH2M HILL Parametric Cost Estimating System), along with vendor data, to determine the conceptual cost opinions. Pro2D assists in determining the size and number of unit process required at a wastewater treatment facility.

Nonmonetary evaluation included performance criteria such as flexibility, reliability, ease of maintenance, and ease of operation. Nonmonetary evaluation also included environmental criteria such as effluent water quality, safety, noise and odor impacts, use of byproducts, and disposal requirements. Lastly, nonmonetary evaluation included implementation criteria such as land use compatibility and public acceptance.

A workshop was conducted on October 18, 2004, to review the preliminary cost results and solicit feedback from members of the Blaine City Council and the CWAC regarding the weighting of the nonmonetary criteria. The results of the monetary and nonmonetary analysis are presented on Table ES-5.

TABLE ES-5
Monetary and Nonmonetary Results and Ranking

Alt.	Treatment Processes	Capital Costs ($M)	Capital Cost Ranking	Present Worth ($M)	Present Worth Ranking	Non Monetary Score	Ranking
1	CAS, UV	$17.62	5	$36.71	6	31.6	6
2	CAS, Chlorine	$17.84	6	$36.25	5	30.0	9
3	SBR, UV	$16.37	1	$35.17	2	32.6	4
4	SBR, Chlorine	$16.59	3	$34.71	1	31.0	7
5	Extended AB, UV	$19.00	9	$38.48	8	32.2	5
6	Extended AB, Chlorine	$19.23	10	$38.06	7	30.6	8
7	MBR, UV, Solids Treatment	$23.21	11	$52.84	11	39.6	1
7A	**MBR, UV**	**$18.36**	**7**	**$42.98**	**10**	**37.1**	**2**
8	MBR, Chlorine	$18.51	8	$42.01	9	35.4	3
9	RBC, UV	$16.39	2	$35.73	4	29.6	10
10	RBC, Chlorine	$16.61	4	$35.27	3	28.0	11

Based on these results, the City Council directed that further evaluation of Alternatives 3 and 7A be conducted to allow a final selection between the two alternatives. These alternatives represent the two preferred options for the proposed Lighthouse Point WRF. Blaine City Council unanimously selected Alternative 7A as the preferred solution for the proposed Lighthouse Point WRF.

Recommended Plan

Wet weather overflow mitigation is addressed as part of the Phase 1 improvements. The proposed Lighthouse Point WRF includes the infrastructure to be implemented under the Phase 2 improvements to provide treatment of the East and Central Blaine flows. The Phase 3 improvements include the facilities to convey or treat the West Blaine flows.

The following is a brief summary of the recommended improvements for the Phase 1 and Phase 3 facilities. A more detailed summary of the improvements proposed in the Phase 2 facilities is also included in this section.

Phase 1 Capital Improvements

The City currently is experiencing wet weather flow overflows in their sewer collection system during significant rainfall events when the capacity of the main trunk line along Marine Drive is exceeded with a combination of domestic wastewater and stormwater inflow and infiltration (I/I).

Wet weather storage will be provided under the Phase 1 improvements to accommodate the storage needs of these peak flows until such time as the peak flows subside and can be conveyed through LS1 to the existing WWTP within the capacity of the existing system. An estimated storage volume of 400,000 gallons is determined to meet the preliminary system capacity needs.

Phase 1 improvements are described in greater detail in a separate Facility Plan for the wet weather storage facilities (Lift Station 1 Improvements and Equalization Storage Facility Plan [TetraTech/KCM, 2005]).

Phase 2 Capital Improvements

This section briefly summarizes the proposed Lighthouse Point WRF site and the proposed process improvements for the proposed Lighthouse Point WRF.

Treatment Plant Site and Visual Mitigation

The proposed Lighthouse Point WRF site is adjacent to the existing location of LS1 on the north side of Marine Drive. The Marine Drive corridor is a mix of commercial and industrial land uses.

The site will require visual mitigation to disguise the treatment facilities from the surrounding community. The visual mitigation must be consistent with the City's Master Plan of the area and promote public use of the adjacent site. The visual mitigation strategy developed during several design charettes strives to integrate the treatment facility into the

surrounding marine environment. Public use of the site will be promoted through a scenic overlook of the beach and Semiahmoo Bay.

Treatment Plant and Conveyance Facilities

The treatment components that have been selected for the proposed Lighthouse Point WRF include the following unit processes. All treatment processes and support functions for the proposed facility will be enclosed in a single building, which is referred to as the Facility Building. The Facility Building will consist of 23,000 square feet of floor space.

- Preliminary/primary treatment using fine screening and grit removal
- Secondary treatment using membrane bioreactor (MBR) technology
- Disinfection using ultraviolet (UV) irradiation
- Solids handling consisting of thickening and storage
- Laboratory, operations/administration space, HVAC/electrical space
- Maintenance Space

The plant conveyance systems that are needed for the proposed Lighthouse Point WRF include influent and effluent pump stations, with plant yard piping, the existing force main along Semiahmoo Spit, and an intertie to existing outfall in Semiahmoo Bay.

In addition to treatment and conveyance facilities, the Lighthouse Point WRF will have provisions for significant odor and noise mitigation to ensure that the facilities do not negatively impact the surrounding community.

Solids Management Plan

The solids management plan for the proposed Lighthouse Point WRF is to contract the transportation, management, and ultimate disposal of the biosolids to an outside contractor. The City currently contracts biosolids management at their existing WWTP.

Only solids thickening and storage will be provided at the Lighthouse Point WRF. If the City decides at some point to provide treatment of biosolids at the Lighthouse Point WRF, additional facilities would be required to stabilize, dewater, and dispose of the biosolids.

Effluent Disposal and Reuse Potential

The City will continue to use the existing outfall for the Lighthouse Point WRF. The Department of Health has closed a zone around the City's outfall into Semiahmoo Bay to shellfish harvest as a precautionary measure. With the proposed Lighthouse Point WRF discharging high water quality, there may be opportunities in the future to reduce the shellfish closure zone associated with the outfall, as well as potential alternative outfall locations with the reuse quality water produced by the membrane technology used in the Lighthouse Point WRF.

There are several potential uses for reclaimed water within the City of Blaine, including but not limited to golf courses on Semiahmoo and light industrial uses.

Phase 3 Capital Improvements

The Phase 3 improvements will address the wastewater treatment and conveyance needs for the West Blaine community. Initially, the flows from West Blaine will continue to be treated by the existing WWTP, which will have sufficient hydraulic and treatment capacity once the East and Central Blaine flows are being treated through the proposed Lighthouse Point WRF. There are four potential long-term solutions to treat flows from West Blaine that were originally considered.

- Convey to Lighthouse Point WRF on Marine Drive (Alternative #1)
- Build new WWTP/WRF located in Semiahmoo (Alternative #2)
- Convey West Blaine flows to existing Birch Bay WWTP (Alternative #3)
- Build new regional WWTP/WRF for West Blaine and North Birch Bay (Alternative #4)

The first three of these alternatives have been considered for further analysis. Alternative #4 would potentially be a variation of Alternative #2 and would require significant coordination and cooperation from the Birch Bay Water and Sewer District (BBWSD) to determine flows and loading, which could add several years to the implementation schedule.

A Blaine City Council work session was conducted on November 15, 2004, to review the preliminary results of the evaluation of alternatives to address the West Blaine wastewater treatment and conveyance needs. The Council tentatively adopted the recommendation to convey West Blaine flow to the proposed Lighthouse Point WRF under Alternative #1.

Phase 2 Costs and Financing Plan

The preliminary level construction and annual cost estimate was determined for the proposed treatment facilities presented previously. Table ES-6 includes the construction cost, annual cost and the life cycle cost summary for the Lighthouse Point WRF.

TABLE ES-6
Preliminary Cost Estimate

Base Project Costs		
Treatment, Conveyance, and Odor Control		
	Subtotal	$7,577,000
Additional Project Costs		
Demolition, Sitework, Yard Piping, and Site Electrical		
	Subtotal	$1,041,930
Contractor Markups		
Overhead and Profit, Mob/Bonds/Insurance, and Contingency		
	Subtotal	$3,924,199
Additional Construction Costs		
Pile Foundations, Shoring and Dewatering Conditions		$650,000
Building and Architectural Aesthetics		$2,530,000
	Subtotal	$3,180,000
Total Construction Cost		
Location Adjustment Factor		$188,147

TABLE ES-6
Preliminary Cost Estimate

Escalation (Mid-Point Constr.) and Location Adjustment Factor	$1,077,455
WA Sales Tax	$1,376,087
Total Construction Costs	**$18,364,818**
Estimated Life Cycle Costs	
Total Project Cost	**$18,364,818**
Est. Annual O&M	$965,600
Est. Life Cycle Total	**$40,235,661**

1. The costs are based on the January 2004 index
2. Interest Rate = 3.5%, Inflation Rate = 2.5%, Life Cycle = 25 years
3. MBR – Membrane Bioreactor, UV – Ultraviolet Disinfection

Rate Impacts

The rate impact analysis was developed to project annual revenue needs and determine the levels of rate increases needed to support those needs. The increases that are initially projected are then smoothed to provide orderly and predictable annual rate increases.

Prior to January 2005, the sewer rates had not been increased since January 2000. Between July 1996 and January 2000, the sewer rates were increased five separate times, for a total increase of 22 percent over that period. The rates were increased in January 2005 to $49.90 for the flat residential rate, which is a 25 percent increase. The commercial rates were also increased by 25 percent. This is the first of a series of rate increases designed to help the City keep up with operational expenses and fund the additional debt service they will incur for the CIP. There is a substantial rate increase projected over the next 5 years. In addition, the significant rate increase was warranted for 2005 was warranted because the current rates were not sufficient to meet current expenses plus debt service.

Contents

Executive Summary **ES-1**
Background and Goals ES-1
History of the Planning Process ES-1
Facility Plan Goals ES-2
Regulatory Requirements ES-2
Service Area Characteristics ES-3
Wastewater Collection System ES-3
Wastewater Treatment Facility and Outfall ES-4
Existing WWTP Description ES-4
Existing Outfall Description ES-4
Summary of Existing Treatment Capacity ES-4
Wastewater Characteristics ES-5
Historical Flows and Loadings ES-5
Design Flows and Loadings ES-5
Treatment Process Design Criteria ES-6
Treatment Site Evaluation ES-7
Evaluation of New WWTP Site / Treatment Alternatives ES-7
Treatment Facilities Development and Analysis ES-7
Process Components Evaluation ES-7
Development of Alternatives ES-8
Evaluation of Monetary and Nonmonetary Criteria ES-8
Recommended Plan ES-10
Phase 1 Capital Improvements ES-10
Phase 2 Capital Improvements ES-10
Phase 3 Capital Improvements ES-12
Phase 2 Costs and Financing Plan ES-12
Rate Impacts ES-13

1 Introduction **1-1**
1.1 Background and Goals 1-1
1.1.1 History of the Planning Process 1-1
1.1.2 Facility Plan Goals 1-3
1.2 Regulatory Requirements 1-3
1.2.1 Federal Regulations 1-3
1.2.2 State Regulations 1-5
1.2.3 Local Regulations and Policies 1-7
1.3 Organization and Contents 1-7
1.4 References 1-8

2 Service Area and Vicinity Characteristics **2-1**
2.1 Land Use, Zoning, and Development Patterns 2-1
2.1.1 Land Use 2-1
2.1.2 Zoning 2-1
2.1.3 Development Patterns 2-8

2.2 Sewer Service Area and Relationship with Adjacent Sewer Providers 2-8
2.2.1 Sewer Service Area 2-8
2.2.2 Interagency Agreements 2-9
2.3 Surrounding Vicinity Characteristics 2-9
2.3.1 Topography 2-9
2.3.2 Critical Areas 2-9
2.3.3 Geology and Soils 2-9
2.3.4 Climate 2-10
2.3.5 Water Resources 2-10
2.3.6 Water Supply 2-11

3 Existing Wastewater Facilities 3-1
3.1 Existing Collection System Description 3-1
3.1.1 Sewer Lines 3-1
3.1.2 Lift Stations 3-1
3.1.3 Onsite Wastewater Disposal Systems 3-2
3.2 Existing Wastewater Treatment Description 3-2
3.2.1 Treatment Facilities 3-2
3.2.2 Outfall 3-3
3.3 Wastewater Treatment Facility Evaluation 3-6
3.3.1 Hydraulic Capacity 3-6
3.3.2 Process Unit Capacity Assessment 3-7
3.3.3 Summary of Existing Capacity 3-9
3.4 Short-Term Treatment Facility Improvements 3-10
3.5 Outfall Improvements and Recommendations 3-11

4 Wastewater Characteristics 4-1
4.1 Historical Wastewater Flows and Loadings 4-1
4.1.1 Wastewater Flow 4-1
4.1.2 Wastewater Load 4-2
4.2 Historical Infiltration and Inflow Analysis 4-2
4.2.1 Noted Areas of Infiltration/Inflow 4-5
4.2.2 Efforts to Reduce Infiltration/Inflow (I/I) 4-6
4.3 Projected Wastewater Flows and Loadings 4-6
4.3.1 Hydraulic Design Criteria 4-8
4.3.2 Treatment Process Design Criteria 4-9
4.3.3 Effluent Criteria 4-11

5 Process Components Evaluation 5-1
5.1 Treatment Process Components Definition and Evaluation 5-1
5.2 Treatment Facilities Development and Analysis 5-1
5.2.1 Treatment Requirements 5-2
5.2.2 Evaluation of Alternatives 5-2
5.2.3 Treatment Requirements Summary 5-20
5.3 Conveyance Requirements 5-33
5.3.1 Hydraulic Capacity of Lighthouse Point WRF 5-34
5.4 Mitigation Requirements 5-35
5.4.1 Visual Mitigation Measures 5-35
5.4.2 Odor Control 5-36

5.4.3 Noise Abatement ... 5-43
6 Evaluation of Monetary and Nonmonetary Criteria ... 6-1
6.1 Introduction ... 6-1
6.2 Monetary Analysis ... 6-1
6.2.1 Basis of Cost Estimate ... 6-1
6.2.2 Construction Costs ... 6-2
6.2.3 Annual Costs ... 6-2
6.2.4 Present Worth ... 6-3
6.3 Nonmonetary Analysis ... 6-3
6.3.1 Performance Criteria ... 6-4
6.3.2 Environmental Criteria ... 6-4
6.3.3 Implementation Criteria ... 6-5
6.4 Alternative Evaluation Results ... 6-6
6.5 Evaluation Conclusions ... 6-11

7 Recommended Plan ... 7-1
7.1 Interim and Phase 1 Capital Improvements ... 7-1
7.1.1 Existing WWTP Interim Improvements ... 7-1
7.1.2 Conveyance and Wet Weather Storage ... 7-2
7.1.3 Lift Station 1 Improvements ... 7-2
7.2 Phase 2 Capital Improvements ... 7-2
7.2.1 Treatment Plant Site ... 7-2
7.2.2 Treatment Plant Facilities ... 7-5
7.2.3 Design Criteria ... 7-19
7.2.4 Reliability and Redundancy Requirements ... 7-33
7.3 Phase 3 Capital Improvements ... 7-35
7.3.1 Convey to Proposed Lighthouse Point WRF on Marine Drive ... 7-35
7.3.2 Build New WWTP/WRF Located in Semiahmoo ... 7-36
7.3.3 Convey West Blaine Flows to Existing Birch Bay WWTP ... 7-36
7.4 Phase 3 Recommendations ... 7-37
7.4.1 Summary of Alternatives Evaluation ... 7-37
7.4.2 Recommendations ... 7-38

8 Program Financing ... 8-1
8.1 Capital Costs ... 8-1
8.2 Annual Operation and Maintenance Costs ... 8-4
8.3 Rate Impact Analysis ... 8-4
8.3.1 Existing Rate Structure ... 8-4
8.3.2 Funding Options and Assumptions ... 8-6
8.3.3 Total Revenue Requirements ... 8-7
8.3.4 Rate Impacts ... 8-7
8.4 Available Capital Funding Sources ... 8-9
8.4.1 State Capital Funding Sources ... 8-9
8.4.2 Federal Capital Funding Sources ... 8-10

9 Environmental Documents and Agency Review ... 9-1
9.1 Environmental Review ... 9-1
9.1.1 Review Process ... 9-1

9.1.2 Requirements for Lighthouse Point Water Reclamation Facility . 9-2
9.1.3 Environmental Document Approval Timeline..... 9-2
9.2 Permits and Approvals..... 9-3
9.3 Summary..... 9-4

Figures

2-1 City of Blaine Vicinity Map
2-2 Current and Future Service Area Boundary
2-3 Zoning Map
3-1 Blaine Wastewater Treatment Plant Plan
3-2 Blaine Wastewater Treatment Plant Existing Process Flow Diagram
3-3 Blaine Wastewater Treatment Plant Preliminary Hydraulic Profile
4-1 BOD5 trend, 1997 – 2003
4-2 TSS trend, 1997 – 2003
4-3 Wet Weather & Dry Weather Wastewater Treatment Plant Flow 1997-2002
4-4 Wet Weather Flow as a Percentage of Dry Weather Flow
4-5 City of Blaine December 1999 Wastewater Treatment Plant Flow vs. Flow Monitoring Data
4-6 Central Blaine, East Blaine, and East Blaine UGA Wet-Weather Flow Hydrograph
6-1 Graph of Life Cycle Cost vs. Relative Benefit
6-2 Graph of Construction Cost vs. Relative Benefit
7-1 Lighthouse Point WRF Site
7-2 FEMA Flood Map
7-3 Lighthouse Point WRF - Liquids Process Stream
7-4 Lighthouse Point WRF - Solids Process Stream
7-5 Lighthouse Point WRF - Hydraulic Profiles
7-6 Lighthouse Point WRF - Preliminary Facility Layout
8-1 Summary of Funding for Wastewater Treatment Projects

Tables

ES-1 Sewage Treatment Plant – Historical Influent Wastewater Flow and Loading Trend
ES-2 City of Blaine 2023 Hydraulic Design Criteria
ES-3 Water Reclamation Facility Design Criteria – Influent Flow and Loadings
ES-4 Treatment Configuration Alternatives
ES-5 Monetary and Nonmonetary Results and Ranking
ES-6 Preliminary Cost Estimate
2-1 Land Use
2-2 Acreage and Allowable Uses by Zoning Category
2-3 Climatological Data
3-1 City of Blaine WWTP: Existing Wastewater Processes and Major Equipment
4-1 City of Blaine: Existing Blaine WWTP Influent Flow Information
4-2 Wastewater Treatment Plant – Historical Influent Wastewater Loading Trend Information
4-3 Blaine Wastewater Treatment Plant – Historical Influent Wastewater Loading
4-4 City of Blaine Annual Projected Population Growth Rates
4-5 Existing and Projected Population for the City of Blaine Sewered Areas
4-6 Influent Flow Dry Weather Peaking Factors – 24-hour Diurnal Conditions
4-7 City of Blaine 2023 Hydraulic Design Criteria

4-8 Water Reclamation Facility Design Criteria – Influent Flow and Loadings
4-9 Current NPDES Permit Effluent Limitations
5-1 Wastewater Treatment Process Components
5-2 Treatment Configuration Alternatives
5-3 Water Reclamation Facility Design Criteria - Influent Flows and Loadings
5-4 Current NPDES Permit Effluent Limitations
5-5 Lighthouse Point WRF - Treatment Configuration Alternative Design Criteria
5-6 Lighthouse Point WRF - Treatment Configuration Alternative Evaluation Results
5-7 Hydraulic Design Criteria for Lighthouse Point WRF
5-8 Alternative 1 - Odor Sources and Design Criteria for Ventilation of Process Rooms
5-9 Alternative 2 - Odor Sources and Design Criteria with Covers and Enclosures
5-10 Comparative Evaluation of Odor Control Technologies
5-11 Maximum Permissible Noise Levels (dBA)
6-1 Associated Construction Costs
6-2 Life-Cycle Cost Parameters
6-3 6-3Lighthouse Point WRF - Capital Cost Opinion
6-4 Lighthouse Point WRF - Nonmonetary Criteria Revised Evaluation
6-1 Lighthouse Point WRF - Flow and Mass Balance
6-2 Typical Flow Rate and Mass Loading Used for the Design and Operation of WWTP
6-3 Preliminary Design Criteria
6-4 Design Criteria for Pump Stations
6-5 Odor Sources and Design Criteria with Covers and Enclosures
6-6 Ecology's Maximum Permissible Noise Levels (dBA)
6-7 Lighthouse Point WRF - Future Expansion
6-8 Guidelines for Classifying Sewerage Works
6-9 General Requirements for Each Reliability Classification
6-10 Cost Analysis Evaluation
7-1 Proposed Lighthouse Point WRF: Flow and Mass Balance
7-2 Typical Flow Rate and Mass Loading Factors Used for the Design and Operation of Wastewater Treatment Plant Facilities
7-3 Preliminary Design Criteria
7-4 Hydraulic Design Criteria for Proposed Lighthouse Point WRF
7-5 Design Criteria for Pump Stations
7-6 Odor Sources and Design Criteria with Covers and Enclosures
7-7 Ecology’s Maximum Permissible Noise Levels (dBA)
7-8 Proposed Lighthouse Point WRF: Future Expansion
7-9 Guidelines for Classifying Wastewater Works
7-10 General Requirements for Each Reliability Classification
7-11 Cost Analysis Evaluation
8-1 Capital Improvement Program
8-2 Capital Cost Estimate for the Lighthouse Point WRF
8-3 Annual Operation and Maintenance Costs WRF
8-4 Current Sewer Rate Structure for the City of Blaine
8-5 Summary of Funding Sources by Year
8-6 Summary of Rate Impacts
9-1 Lighthouse Point WRF Permit Requirements

Appendixes

A Facility Plan Requirements and Organization
B Plant Flow Data
C Pretreatment Ordinance
D NPDES Permit
E CWAC Presentations
F Tjoelker Sludge Farm Contract with City of Blaine
G Tjoelker Solids Permit
H Implementation Schedule
I Rate Analysis Summary
J Ordinance No. 04-2596
K Department of Ecology Checklist
L Environmental Report
M Permit Applications Forms
N SEPA Environmental Checklist
O Department of Health Shellfish Letter

CHAPTER 1

Introduction

The City of Blaine, Washington (City) is in the planning process of implementing their new water reclamation facilities to address the growing need for wastewater treatment and enhancing water quality in their marine environment. The new Lighthouse Point Water Reclamation Facility (WRF) will be constructed on a site along the Marine Drive corridor. This corridor is a key focal point for the City, as it is the first visible landmark viewed by visitors traveling south into the U.S. The proposed Lighthouse Point WRF will not only be required to meet the growth and treatment needs of the City, but it must also enhance the redevelopment of the area as envisioned in the community development master plan.

This Facility Plan is intended to provide the City with a planning document for the new treatment facilities that will summarize the preliminary service requirements, process evaluation, cost analysis, and design criteria.

This Facility Plan has been prepared in accordance with the requirements of Washington Administration Code (wac) 173-240-060, which is administered by the Washington State Department of Ecology (Ecology). Further information on the requirements of WAC 173-240-060 and other applicable regulations is provided in Section 1.2 below.

1.1 Background and Goals

The City owns and operates all components and facilities of the wastewater collection and treatment system. The City's system consists of a secondary wastewater treatment plant (WWTP), gravity sewer lines, force mains, and 10 pump stations.

1.1.1 History of the Planning Process

The City's existing WWTP began operation in 1980. Following adoption of the 1994 General Sewer Plan, the *City of Blaine Wastewater Facilities Engineering Report* (Brown & Caldwell, 1994) recommended construction of a new WWTP on the City's existing WWTP site to address significant anticipated growth in population and wastewater flows. The report identified several archeological issues on the existing site but concluded that no other site was feasible. Ecology reviewed the report and requested clarification of some issues. The clarifications were provided by the *Wastewater Treatment Plant Upgrade and Expansion Predesign Report* (KCM, 1997). Together, these two documents were approved by Ecology in February 1998 as an engineering report for the WWTP upgrade.

Design documents for the WWTP upgrade and expansion were completed in 1999, Ecology approved them, and construction began in spring 1999. Problems began when site excavation encountered human remains in July 1999. This led to protests from the Lummi Indian Nation, shutdown of the project in August 1999, and contract termination in March 2000. As a result of its archaeological characteristics, the existing WWTP site on Semiahmoo Spit is no longer considered a feasible long-term WWTP site. The City entered into an

agreement with the Lummi Nation to abandon the site and remove all unnecessary WWTP facilities.

In the aftermath of the expansion project's termination, the City evaluated alternatives for addressing capacity limitations and regulatory requirements. In 2000, the City conducted an analysis of the existing capacity at the WWTP and made recommendations to improve the capacity in the interim planning period. In May 2000, the City submitted the *Amendment to Wastewater Facilities Engineering Report & Wastewater Treatment Plant Upgrade and Expansion Predesign Report* (Tetra Tech/KCM, 2000), conditionally approved by Ecology on May 31, 2000. In 2000 and 2001, the City identified several options for future wastewater treatment and concluded that the best solution was to convey the City's wastewater flows to the Birch Bay Water and Sewer District's WWTP near Point Whitehorn. Despite a number of regional benefits, however, the project was not successful in attracting funding.

In the meantime, wastewater flows have continued to grow. To address capacity and treatment limitations at the existing WWTP, a solution for future treatment needed to be found and implemented as soon as possible and compliance with regulations and permit requirements maintained until the new solution was in place. Public scrutiny of wastewater issues in the City has been high. Water quality is a key concern of the community, especially since the closure of Drayton Harbor to shellfish harvest due to fecal coliform contamination. There are many contributors to water quality issues in the harbor, however, as a point source, municipal wastewater discharges are often singled out in the public perception of coliform contamination.

Potential sewage overflows from Lift Station No. 1 (LS1), which handles all flows from East and Central Blaine has also been a contributing factor to water quality degradation. In 2000, the City provided temporary storage for wastewater peak flows with rubber bladders installed near this lift station, and performed cleaning, inspection, and modest rehabilitation of the facility. These temporary improvements have prevented several wet-weather overflows, but they are insufficient to guarantee that there will be no future overflows. The City determined that the preferred long-term solution to eliminate the overflows at LS1 would require providing storage to hold peak flows during heavy rainfall, then releasing them to be pumped to the WWTP after peak flows decrease. This solution was described in the *City of Blaine Lift Station No. 1 and Marine Drive Headworks Facility Plan (*TetraTech/KCM, 2002).

Because of the financial impact of constructing new WWTP and wet weather overflow protection facilities, plus the difficulty of financing these improvements solely through rate increases, the City is seeking multiple sources of funding. In order to qualify for funding, the proposed improvements must be included in a comprehensive wastewater facility plan that provides reliable estimates of population growth, wastewater flows, and loads over a defined planning horizon. A General Sewer Plan was prepared and submitted to Ecology in 2004, which laid the foundation for development of new treatment and conveyance facilities. Ecology approved the planning document in late 2004 and the City moved forward with implementing a multi-phased approach to addressing their treatment and sewage overflow issues.

A Facility Plan, followed by design documents for the wet weather overflow protection facilities, is currently being prepared for the Phase 1 improvements. This Facility Plan is

being prepared to address the WWTP facilities required at the new Marine Drive site. These proposed facilities have been designated as the proposed Lighthouse Point WRF.

1.1.2 Facility Plan Goals

The primary purpose of this Facility Plan is to serve as a detailed planning document that City staff can use to implement required improvements to address identified capacity, treatment, and operation and maintenance needs over the next 20 years at the proposed Lighthouse Point WRF. Specific goals of this Facility Plan include:

- Comply with the requirements of WAC Chapter 173-240-060
- Prepare the plan to be consistent with all other applicable Federal, State, and local regulations, policies, and planning requirements
- Identify the sizing and design criteria for the proposed facilities
- Identify budgetary-level construction costs for proposed WWTP facilities
- Develop a financing plan for the recommended improvements and assess potential impacts on proposed utility rates

Studies leading to the preparation of this Facility Plan included:

- *City of Blaine General Sewer Plan* (CH2M HILL, 2004)
- *City of Blaine Lift Station No. 1 and Marine Drive Headworks Facility Plan (*TetraTech/KCM, 2002)
- *Amendment to Wastewater Facilities Engineering Report & Wastewater Treatment Plant Upgrade and Expansion Predesign Report* (Tetra Tech/KCM, 2000)
- *Wastewater Treatment Plant Upgrade and Expansion Predesign Report* (KCM, 1997)
- *City of Blaine Wastewater Facilities Engineering Report* (Brown & Caldwell, 1994)

1.2 Regulatory Requirements

Implementation of treatment and conveyance facilities must address the regulations and requirements of many Federal, State, and local regulatory agencies. This section briefly summarizes applicable rules and regulations for this Facility Plan.

1.2.1 Federal Regulations

Environmental Regulations

Key Federal environmental regulations pertinent to this Facility Plan are as follows:

- ***Endangered Species Act (ESA)***—Projects that use Federal funding or need to obtain Federal permits must comply with the requirements of the ESA. The ESA provides protection against "take" (defined as killing, harming, harassing, or altering habitat) of federally listed endangered species. Projects that involve potential taking of listed species must consult with the National Marine Fisheries Service and/or the U.S. Fish and Wildlife Service to determine appropriate measures to avoid, minimize, and/or mitigate

impacts to these species. The City sewer service area includes habitat for a number of listed aquatic and terrestrial species.

- ***Magnuson-Stevens Fishery Conservation and Management Act***—The National Marine Fisheries Service (NMFS) issued interim final regulations in December 1998 to implement the essential fish habitat (EFH) requirements of the 1996 Sustainable Fisheries Act, which had significantly amended the 1976 Magnuson-Stevens Fishery Conservation and Management Act. EFH is defined as "waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH must always include the critical habitat of endangered and threatened species. The Magnuson-Stevens Act required Federal agencies to provide NMFS with a written assessment of the effects on EFH of any Federal action that may adversely affect EFH, except activities covered by a general concurrence.
- ***Coastal Zone Management Act***—The Coastal Zone Management (CZM) Act requires that all Federal activities be consistent with approved State coastal zone management programs to the maximum extent possible.
- ***Clean Air Act***—The Federal Clean Air Act of 1992 requires that all Federally funded projects be in compliance with State and regional air quality plans. Local air pollution control agencies must be notified if a building is being renovated or demolished, and an asbestos survey is required. WWTP facilities are considered sources of air emissions under the Clean Air Act.
- ***National Environmental Policy Act***—The National Environmental Policy Act (NEPA) applies primarily to projects receiving Federal funding. Its primary goal is to help public officials make decisions based on an understanding of the environmental consequences and to take actions that protect, restore, and enhance the environment. To accomplish this, NEPA requires Federal agencies to either prepare or have prepared written assessments or statements that describe the affected environmental consequences of a proposed project, reasonable or practicable alternatives to the proposed project, and any mitigation measures necessary to avoid or minimize adverse environmental effects.

  In accordance with NEPA, the Council on Environmental Quality has issued regulations (40 Code of Federal Regulations (CFR) 1500-1508) establishing a standard Federal environmental review process. This process includes three levels of environmental review including a categorical exclusion, an environmental assessment, or an environmental impact statement (EIS).

  Washington State has adopted laws similar to those of NEPA, which are known as the State Environmental Policy Act (SEPA). SEPA is discussed under the "State Regulations" heading below.
- ***National Historic Preservation Act***—This Act applies to all projects that receive funding from the U.S. Environmental Protection Agency (EPA), including pass-through funding to State water quality agencies. Designed to protect historic, cultural, and archaeological resources from damage or destruction, it requires that agencies undertaking projects consult with the State Historic Preservation Officer (SHPO) and local Native American Tribes. In areas with a high likelihood of subsurface artifacts or other cultural resources, major capital projects involving earth disturbance typically must undertake a program of

archaeological exploration to determine whether such resources are present. If resources are encountered during these investigations or during project construction, they must be evaluated, and a plan must be developed in conjunction with the SHPO and the affected Tribe(s) for preservation, removal, or recording of the site and artifacts.

Public Participation

Federal requirements for sewer or facility plans call for public meetings prior to adoption of the plan. These meetings provide citizens with information about the contents of the facility plan and an opportunity to ask questions and provide comments and statements regarding the plan.

1.2.2 State Regulations

National Pollutant Discharge Elimination System Program

The State of Washington administers Federal wastewater effluent limitations through the National Pollutant Discharge Elimination System (NPDES) program. All wastewater discharges into the waters of the State must be permitted through Ecology with an NPDES permit. This permit establishes the allowable quantity of discharge from a given WWTP as well as the allowable levels of pollutants in that discharge.

Criteria for Sewage Works Design and Reliability Requirements

The Ecology-developed *Criteria for Sewage Works Design* (Ecology, 1998), also known as the Orange Book, is a guide for design of wastewater collection and treatment systems. The primary goals of the manual are as follows:

- Ensure that the design of wastewater collection and treatment systems is consistent with State public health and water quality objectives
- Establish a basis for the design and review of plans and specifications for wastewater treatment works and sewerage systems
- Establish the minimum requirements and limiting factors for review of wastewater treatment works and sewerage system plans and specifications
- Assist the owner or the owner's authorized engineer in the preparation of plans, specifications, reports, and other data
- Guide departments in their determination of whether to issue approvals, permits, or certificates for wastewater treatment works or sewer system

Ecology uses the Orange Book design guidelines to review and approve reports, plans, and specifications. Design criteria presented in Chapter 6 of this plan are generally based upon those in the Orange Book. Areas where the City's design guidelines differ from Ecology's are noted in the text.

State Environmental Policy Act

The SEPA, like NEPA, requires agencies proposing actions that may affect the environment to weigh the environmental impacts of those actions, along with other decision making

factors. SEPA applies to most actions undertaken by the Blaine Public Works Department, including the implementation of the WRF.

SEPA includes three possible levels of review:

- Categorical exemption (reserved for agency actions that are considered to have negligible environmental impact)
- Environmental checklist (generally used for projects that do not qualify for a categorical exclusion but are not expected to have significant impacts; also used to determine whether impacts are significant enough to warrant additional review)
- EIS (required when a project is determined likely to have significant impacts on the natural or built environment)

This Facility Plan is considered a "non-project" agency action and, as such, is subject to SEPA review. A SEPA environmental checklist for the plant is included in Appendix A.

State Environmental Review Process (SERP)

A Memorandum of Understanding has been established between Federal and State agencies to implement a single environmental review process for utility projects receiving Federal or Federal pass-through funding. This review process, designed to meet the requirements of both NEPA and SEPA, is called the State Environmental Review Process (SERP, WAC 173-98-100).

The review process is initiated by preparing an Environmental Report (ER) that follows the guidelines of Rural Utility Service (RUS) Bulletin 1794A-602. The report accomplishes the following:

- Establishes the purpose and need for the project
- Presents alternatives to the proposed project
- Evaluates the environmental effects of the proposed project and the alternatives considered
- Assesses the significance of those environmental effects
- Specifies mitigation measures where necessary

As part of the evaluation of environmental effects, project applicants must consult with appropriate regulatory agencies to identify environmental resources in affected areas and to review any conclusions drawn from an analysis of the proposed project's potential effect to these resources.

State Waste Discharge Permit

State law requires a State waste discharge permit for commercial, municipal, and industrial discharges to a WWTP or onsite disposal system or to groundwater or surface waters of the State.

Washington State Energy Code

The Washington State Energy Code establishes energy-efficiency requirements for new structures.

1.2.3 Local Regulations and Policies

City of Blaine

Regulations related to sewer service and capital project development within the City include:

- Blaine Municipal Code (BMC) Chapter 13.08, Sewer System
- BMC Chapter 13.12, Street Drainage, Water, Sewer, and Electric Improvements—Assessment Reimbursement Contracts
- BMC Chapter 13.14, Utility Service Assessments, Rates, and Charges
- BMC Chapter 16.04, SEPA Guidelines
- BMC Chapter 16.08, Shoreline Management Master Program
- BMC Chapter 16.12, Natural Resource Lands and Critical Areas Management
- BMC Chapter 16.16, Wetland Management
- BMC Chapter 16.18, Clearing, Grading, and Fill

Whatcom County Solid Waste Policies

Ecology establishes regulations to enforce State laws addressing permit applications, monitoring, and siting criteria for management of solid waste and sludge. In Whatcom County, the Whatcom County Health Department administers these permitting processes as part of its solid waste planning effort.

Northwest Air Pollution Authority

The Northwest Air Pollution Authority regulates construction and modification of potential air contaminant sources, such as odor scrubbing facilities. The Authority must be notified of construction projects to evaluate whether a permit is required. The formal notification is called a "notice of construction and application for approval to construct, install, establish, or modify an air contaminant source," but is commonly referred to as a Notice of Construction (NOC) permit.

1.3 Organization and Contents

This section provides a brief summary of the contents of each chapter of this Facility Plan.

Chapter 2, Service Area and Vicinity Characteristics. Defines the existing sewer service boundary and topographic features. Notes land use, as well as basins from interagency agreements or redevelopment.

Chapter 3, Existing Wastewater Facilities. Presents an overview of the City's existing wastewater collection system and treatment facilities.

Chapter 4, Wastewater Characteristics. This chapter presents an overview of the wastewater characteristics for the City's existing wastewater treatment system. The historical wastewater flow and loadings are presented, along with the projected wastewater flow and loadings for the proposed Lighthouse Point WRF.

Chapter 5, Treatment Facilities Development and Analysis. This chapter presents the evaluation of the process components utilized within wastewater treatment facilities, including the advantages and disadvantages, and expected performance and reliability.

Also included in this chapter is the development and analysis of treatment facility alternatives for the proposed Lighthouse Point WRF, including treatment requirements and alternatives evaluation, and the associated conveyance and mitigation requirements.

Chapter 6, Evaluation of Monetary and Nonmonetary Criteria. Document the results of the cost estimating and life-cycle cost analysis performed for each of the treatment configuration alternatives evaluated for the proposed Lighthouse Point WRF. In addition, this chapter presents the evaluation of nonmonetary criteria and ranks the treatment configuration alternatives.

Chapter 7, Recommended Plan. Briefly describes the recommended improvements proposed that address the wet weather overflow needs as part of the Phase 1 improvements. Also describes the proposed Lighthouse Point WRF infrastructure to be implemented under the Phase 2 improvements to provide treatment of the East and Central Blaine flows. The Phase 3 improvements briefly describing the facilities to convey or treat the West Blaine flows are included.

Chapter 8, Program Financing. This chapter presents the estimated capital and annual operation and maintenance (O&M) costs of the recommended alternative for the City's proposed Lighthouse Point WRF. This chapter also discusses the rate impacts, including outside financial assistance programs, required to support the financing plan and ongoing operational costs. Available outside financial assistance programs are also discussed.

Chapter 9, Environmental Documents and Agency Review. This chapter presents the necessary permits, agency approvals, environmental documents, and timelines to ensure construction of the proposed Lighthouse Point WRF will be implemented as anticipated. The information presented in this chapter is based on the assumption that both State and Federal funding sources will be used to finance the design and construction of the proposed Lighthouse Point WRF.

In addition, Appendix A provides a quick reference of EPA requirements to their relevant sections of this Plan.

1.4 References

Following is a list of literature cited in this Facility Plan:

Birch Bay Water and Sewer District Records. 1999

Brown & Caldwell. 1994. *City of Blaine Wastewater Facilities Engineering Report*. 1994.

CH2M HILL. 1992. *Semiahmoo Peninsula - Feasibility Study to Use Reclaimed Water for Golf Course Irrigation*, June 1992.

CH2M HILL. 2004. *General Sewer Plan for the City of Blaine, Washington*. September 2004.

CH2M HILL. 2004. Review and Refine Planning and Design Criteria, Lighthouse Point WRF. "TM 1.02 – Review and Refine Planning / Design Criteria." August 17, 2004.

CH2M HILL. Parametric Cost Estimating System (CPES).

City of Blaine. 1995. Groundwater Management Plan.

City of Blaine. 1996. Wellhead Protection Plan.

City of Blaine. 1999. Comprehensive Plan.

City of Blaine. 2002-2003. Population Growth Allocations.

Grady, C.P.L., G.T. Daigger, and H. C. Lim. 1999. *Biological Wastewater Treatment*, 2nd Ed. Marcel Dekker, Inc., New York. 1999.

KCM. 1997. *Wastewater Treatment Plant Upgrade and Expansion Predesign Report*. 1997.

Metcalf & Eddy, Inc. 1991. *Wastewater Engineering - Treatment, Disposal, and Reuse.* 3rd Ed. McGraw-Hill, Inc. New York, New York.

Sehome Planning & Development Services. 2003. *City of Blaine Population Growth Allocations 2002-2022*. February 2003.

TetraTech/KCM. 2005. *City of Blaine, Lift Station No. 1 and Marine Drive Headworks Facility Plan*. February 2005.

Tetra Tech/KCM. 2002. *Lift Station No. 1 and Marine Drive Headworks Facility Plan DRAFT*. January 2002.

Tetra Tech/KCM. 2000. *City of Blaine, Amendment to Wastewater Facilities Engineering Report & Wastewater Treatment Plant Upgrade and Expansion Predesign Report*. May 2000.

Washington State Department of Ecology. 1998. *Criteria for Sewage Works Design – Water Quality Program.* Publication No. 98-37 WQ. Olympia, Washington.

Washington State. *Washington Administrative Code, Section 173-60-040 - Maximum Permissible Environmental Noise*. September 1975.

Water Environment Federation. American Society of Civil Engineers. 1998. *Manual of Practice No. 8 - Design of Municipal Wastewater Treatment Plants*. 4th Ed. WEF/ASCE. Alexandria, Virginia.

CHAPTER 2

Service Area and Vicinity Characteristics

The City of Blaine, Washington, is located in the northwestern part of Washington State, approximately 19 miles north of Bellingham, and less than 2 hours from Seattle. The City is on the border between the U.S. and Canada on the north/south Interstate 5 (I-5) corridor in Washington. Drayton Harbor divides the City into two parts, with Semiahmoo Spit and much of Birch Point lying west of Drayton Harbor. The remaining portion of the City is east of Drayton Harbor and includes about 2 square miles of business and residential area. Blaine's population is approximately 3,956 within the City limits (Sehome, 2003).

Vancouver, British Columbia, is approximately 34 miles north of the City. The rapid growth of Vancouver, the Municipality of Surrey (a Vancouver suburb), and the surrounding area into a metropolitan, industrial, and urban center has affected the entire area, including the City. South of the City is the resort community of Birch Bay. This area has experienced considerable growth over the last 20 years, and growth pressures are expected to continue. Figure 2-1 provides a graphic description of Blaine's general location. This figure also shows other wastewater treatment facilities in the area.

The City is responsible for the collection and treatment of wastewater within its service area. The boundaries of the service area for the City are shown in Figure 2-2. Wastewater from within the City is primarily from single-family residential sources, with some minor commercial and light industrial sources. The collection system consists of gravity sewers, force mains, and 10 lift stations. The existing sewer system is described briefly in Chapter 3 and in more detail in the General Sewer Plan (CH2M HILL, 2004).

2.1 Land Use, Zoning, and Development Patterns

2.1.1 Land Use

The City's Urban Growth Area (UGA) and zoning is shown in Figure 2-3. It includes approximately 5,900 acres or 9.2 square miles, of which approximately 3,500 acres (5.5 square miles) are currently within the City limits. For analysis of existing and future land use, the City has divided the UGA into smaller planning units, which are briefly described on Table 2-1. Detailed descriptions of the land use areas can be found in the General Sewer Plan (CH2M HILL, 2004).

2.1.2 Zoning

Within the City, there are 2,773 acres zoned for residential use, including 2,333 zoned for low-density residential use (up to six units per acre); 420 acres for medium-density residential use (up to 12 units per acre), and 20 acres for high-density residential use (more than 12 units per acre). This comprises 79 percent of the total land within the City limits. Whatcom County currently zones the UGA outside the City limits for low-density residential use, with densities ranging from four units per acre to one residence per 5 to 10 acres. Table 2-2 provides a summary of acreage and allowable density for zoning categories within the City.

N

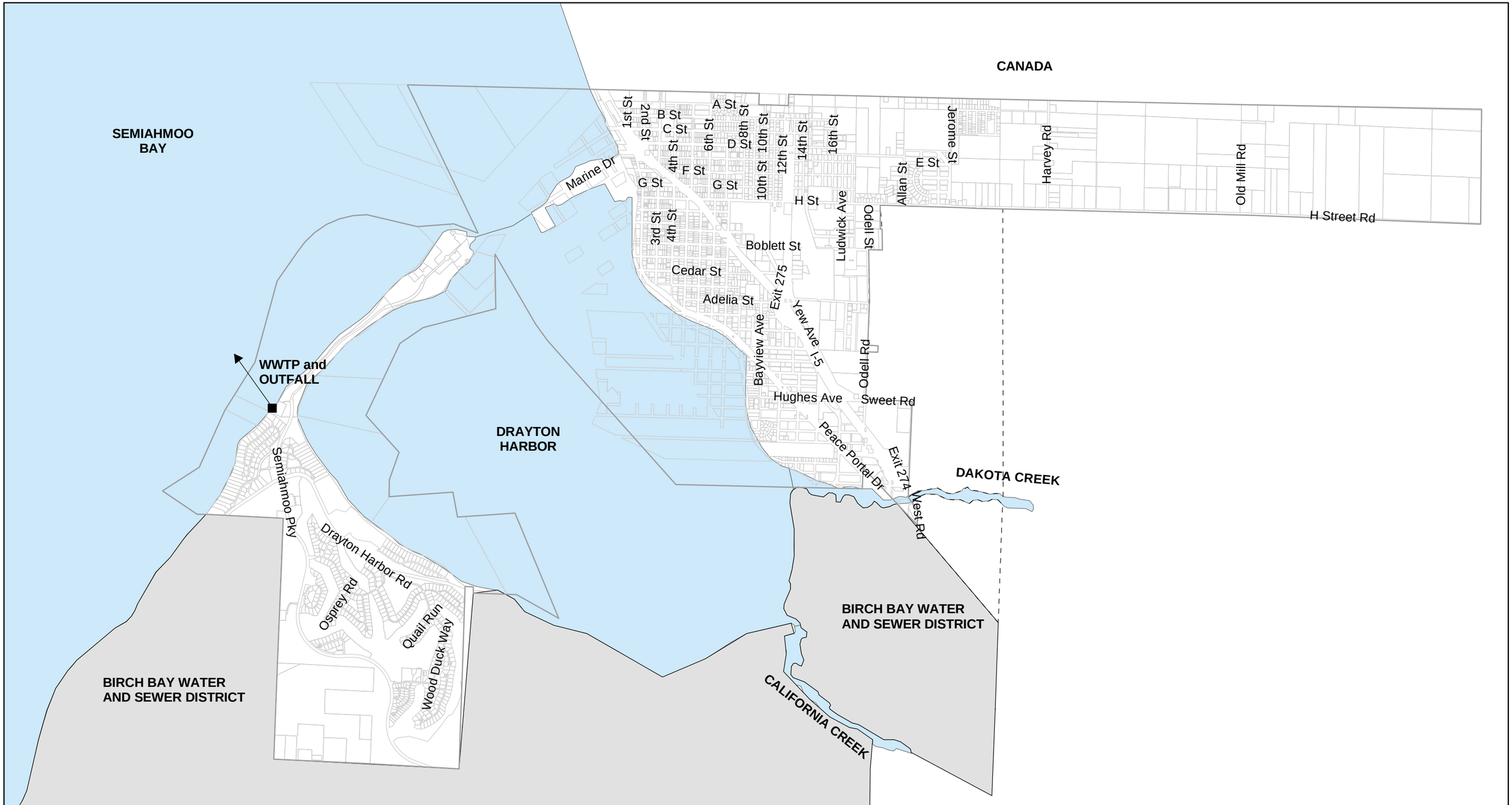
0 1 2 3 4

Scale in Miles

Figure 2-1
City of Blaine
Vicinity Map

CH2MHILL

179597.SP.03.04_W05204006SEA_Blaine Vicinity Map.ai_5/26/04_roy-dk



N

SCALE

1 inch equals 2,500 feet

0 2,500 5,000 7,500 10,000 Feet

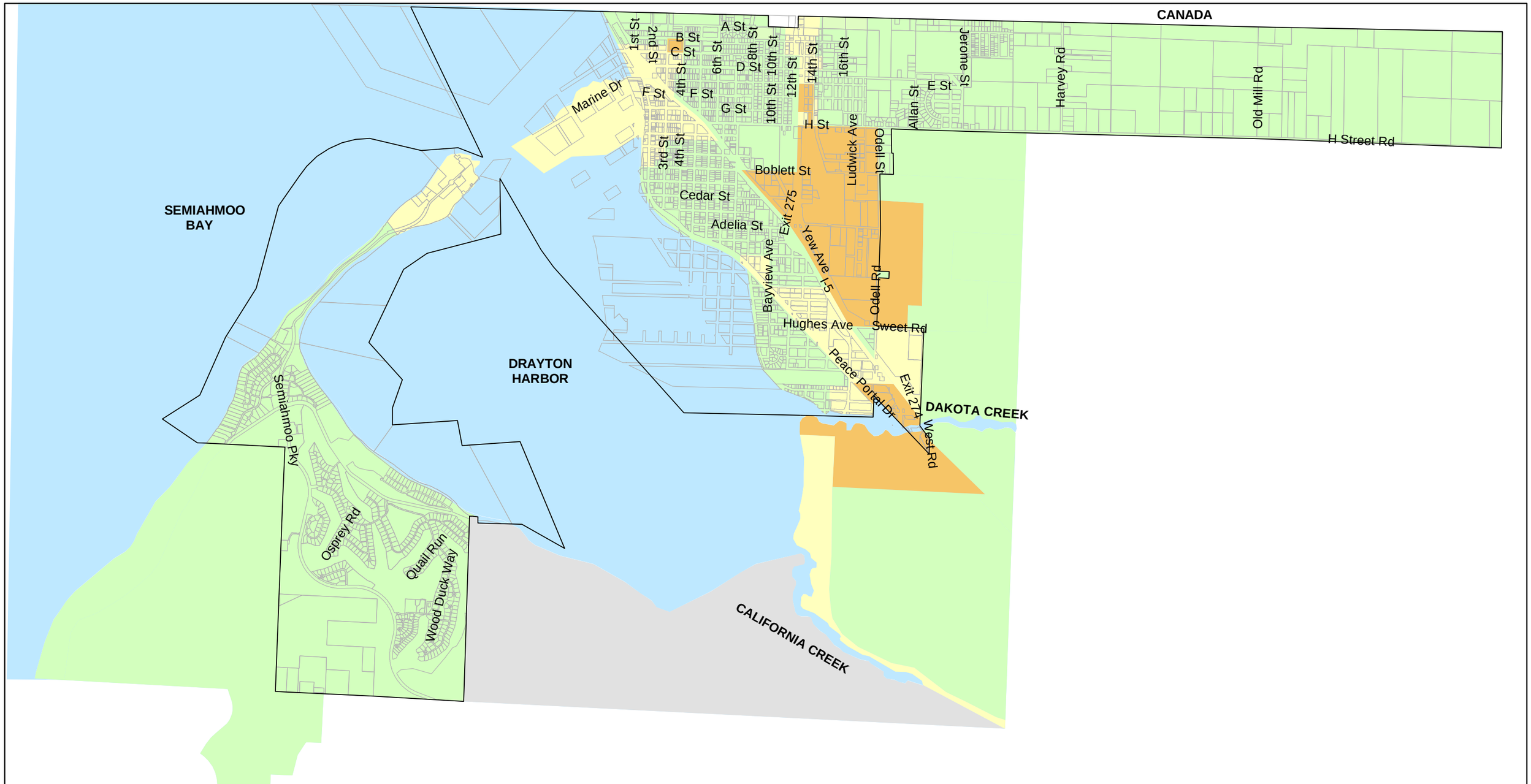
LEGEND

- Current Service Area Boundary
- Future Service Area Boundary
- Birch Bay Service Area
- Wastewater Treatment Plant (WWTP)

CITY OF BLAINE, WASHINGTON

FIGURE 2-2
Current and Future Service Area Boundary

CH2MHILL



N

SCALE

1 inch equals 2,500 feet

0 2,500 5,000 7,500 10,000 Feet

LEGEND

- City Limit
- Commercial
- Undesignated UGA
- Industrial
- Residential

CITY OF BLAINE, WASHINGTON

FIGURE 2-3
Zoning Map

CH2MHILL

TABLE 2-1
Land Use

Area	Land Use	Acreage
Central Blaine	Residential/Commercial/Manufacturing	
Semiahmoo	Residential/Resort	
East Blaine	Residential	1,180
East Blaine UGA	Residential/Manufacturing	1,000
Loomis UGA	Residential/Resort/Manufacturing	750
South Drayton Harbor UGA	Residential	1,150
West Semiahmoo UGA	Residential/Resort	825

Source: City of Blaine General Sewer Plan, 2004

TABLE 2-2
Acreage and Allowable Uses by Zoning Category

Zone	Name	Allowable Uses/Max Density	Total Acres	Percent of City
R	Rural	Single-family residential; 12,000 sq. ft. lots up to 3 per acre	14	0.4
PR	Planned Residential	4 units per acre residential by planned unit development (PUD), neighborhood commercial	1,182	33.7
RPR	Residential Planned Recreation	Planned residential development, recreation (density per Semiahmoo Master Plan)	918	26.3
RL	Residential Low Density	Single-family residential; 7,200 sq. ft. lots up to 6 per acre	219	6.3
SDR	Single/Duplex Residential	Single-family residence, duplex; 6,000 sq. ft. lots up to 12 per acre	120	3.4
RM	Residential Medium Density	Single-family and multi-family residential; 6,000 sq. ft. lots up to 12 per acre	300	8.6
RH	Residential High Density	Single-family and multi-family residential; up to 18 units per acre (24 by conditional use permit)	20	0.6
R/O	Residential Office	Multi-family residential up to 18 units per acre (24 by conditional use permit); non-retail office	42	1.2
PC	Planned Commercial	Commercial; residential PUDs (up to 18 units per acre)	66	1.9
CB	Central Business	Retail sales and services; residential above first floor	69	2.1
HC	Highway Commercial	Retail sales and services; residential by conditional use permit	115	3.3
M	Manufacturing	Manufacturing, retail sales; residential by conditional use permit	338	9.6
MPR	Marine Planned Recreation	Mixed commercial, residential emphasizing tourism, recreation	57	6.6
MC	Marine Commercial	Marine-related commercial and industrial uses	50	1.4
		Total acres in City	3,510	100%

Source: City of Blaine Comprehensive Plan, 1999

Land zoned for manufacturing encompasses 388 acres, or 11 percent of land within the City; included in this category is the Marine Commercial zone, which includes approximately 50 acres along Marine Drive. Commercial land includes 349 acres, or 10 percent, of the City's land. Included in the commercial zoning category is the Central Business zone, the Highway Commercial zone, the Planned Commercial zone, the R/O zone in Central Blaine, and the Marine Planned Recreation Zone located at the tip of Semiahmoo Spit.

2.1.3 Development Patterns

In recent years, the Central Blaine planning area has accounted for approximately 25 percent of overall growth within the City and UGA; growth rates have averaged just over 1 percent per year. The Semiahmoo area has been the fastest-growing area of the City, with growth approximating 10 percent annually. The East Blaine area within the City limits has been growing very slowly, especially in areas not served by public utilities. In general, growth within the unincorporated UGA has been slow, due in large part to the lack of urban services.

In the future, development patterns in Blaine are expected to change to some degree as infill reduces the available land in Central Blaine and the City extends urban services to areas where they are currently lacking.

2.2 Sewer Service Area and Relationship with Adjacent Sewer Providers

2.2.1 Sewer Service Area

The City is responsible for the collection and treatment of wastewater within its service area. Wastewater from within the service area is currently conveyed to the existing Blaine wastewater treatment facility for secondary treatment and discharge into Semiahmoo Bay. The area currently served by the City's sewer system is shown in Figure 2-2. The system serves the entire area within the City limits, including the Semiahmoo development on the west, and Central Blaine on the east. Areas of the City not connected to the system include land uses such as the airport runway, which do not require sewer service, and some homes using septic tanks.

The City's future wastewater service area includes several areas outside the current City limits but in the UGA. The City's goal is for all future development within these areas to be connected to the sewer system, including existing development that is currently using septic systems. These areas include East Blaine, the East Blaine UGA, and the West Semiahmoo UGA. However, the City has not yet determined exactly how the sewer system will be implemented for the East Blaine UGA and West Semiahmoo UGA. Land use designations in this area are primarily for single-family residential development with supporting commercial uses.

A portion of the Blaine UGA (the South Drayton Harbor UGA) is served by the Birch Bay Water and Sewer District. The District plans to provide wastewater service to southern portions of the UGA outside the City's current service area, including the South Drayton Harbor area (see Figure 2-2).

2.2.2 Interagency Agreements

Interagency agreements serve as legal documentation for the conveyance of wastewater generated within one agency to the facilities in another agency. The City currently has no interagency agreements with either Birch Bay Water and Sewer District (the adjacent sewer provider on the south) or the City of Surrey, British Columbia (the adjacent sewer provider on the north). No other sewer service providers have service areas contiguous with the City.

2.3 Surrounding Vicinity Characteristics

2.3.1 Topography

The area within and surrounding the City can be characterized as gently rolling terrain. Although some areas of the eastern portion of the City exceed 200 feet in elevation, most of the eastern portion of the City lies below 100 feet in elevation and slopes gradually to Drayton Harbor. On the west, the terrain varies from the sea level elevation of Semiahmoo Spit up the steep bluffs of Birch Point to a maximum elevation of 268 feet. Most of the land on Birch Point is between 100 and 200 feet in elevation.

2.3.2 Critical Areas

The identification and protection of critical areas is a key goal of the Growth Management Act (GMA). Critical areas are defined by the GMA as wetlands, frequently flooded areas, aquifer recharge areas, geologically hazardous areas, and fish and wildlife habitat conservation areas. Under the GMA, special consideration must be given to these designated areas. The City's Shoreline Management Master Program and development regulations have been updated to provide additional protection to these areas.

In 1992, the City adopted its Wetland Protection Ordinance (codified as BMC Chapter 16.16, Wetland Management). Wetland areas are classified according to their wetland functions and values, with Category 1 being the most valuable and Category 3 the least valuable. Approximately 10 percent of the land within City, and approximately 20 percent of land within the Blaine UGA, is classified as wetlands or buffer areas.

Other critical areas and natural resource lands within the service area are regulated by the City's Natural Resource Lands and Critical Areas Management regulations (Chapter 16.12 BMC).

The City's critical areas regulations govern activities within the critical areas located within the City. However, the most important natural resource and critical areas within the UGA are located outside the City limits in unincorporated Whatcom County. The County's critical area regulations are contained in Chapter 16.16 of the Whatcom County Code.

2.3.3 Geology and Soils

The City's geology, like much of the Puget Sound region, was affected by the last advance and retreat of Ice Age glaciers. The City was once the delta and outlet for the Nooksack River, but a deep ice barrier forced the Nooksack to the south. Weather and tides have changed the shape of once open and exposed Drayton Harbor by eroding the steep bluffs of Birch Point and depositing the material to the north to form Semiahmoo Spit.

Soils in the area are generally stratified sand and gravel of varying thickness. Gravel and sandy loam soils in the uplands provide good drainage; silt and silty clay in lower areas have poor drainage characteristics. Where drainage is poor, groundwater does not drain away from sewers and is more likely to enter the collection system as infiltration. Groundwater in such areas rises to within a few feet of the ground surface, making it susceptible to contamination from septic tank systems. The City uses groundwater for its water supply, so protecting it by providing a wastewater collection system is an important community benefit.

2.3.4 Climate

The City area enjoys a mild maritime climate. Occasionally, the area experiences brief periods of extremely cold weather, which results from northeasterly winds blowing off the Canadian Plains.

Historical climatological data for the City area is shown on Table 2-3. The monthly temperature ranges from an average low of 43 degrees Fahrenheit to an average high of 60 degrees Fahrenheit. Monthly precipitation ranges from an average minimum of 1.35 inches in July to an average maximum of 5.97 inches in November. Almost three-quarters of the yearly total of approximately 36 inches falls as rain from October through April.

TABLE 2-3
Climatological Data

Month	Mean Temperature (degrees F)		Mean Precipitation (inches)
	High	Low	
January	45	33	4.34
February	50	35	3.33
March	55	38	2.98
April	60	41	2.80
May	67	46	2.46
June	72	51	1.92
July	76	54	1.35
August	75	54	1.54
September	69	49	1.92
October	60	42	3.43
November	50	37	6.03
December	44	32	4.45
Annual Average	60	43	36.52

Source: Birch Bay Water and Sewer District records, 1999

2.3.5 Water Resources

Significant water bodies in the City and the Blaine UGA include Drayton Harbor, Semiahmoo Bay, Dakota Creek, and California Creek.

2.3.6 Water Supply

The City owns and operates a municipal water system that provides domestic, commercial, industrial, and irrigation water to retail customers within the City and the greater City area. The system also provides surplus water on a wholesale contract basis to the Birch Bay Water and Sewer District and the Bell Bay Jackson Water Association.

The source of supply for the water system is a 30-square-mile groundwater aquifer system located in the Dakota Creek watershed, east of the City. The City currently obtains water from eight wells, with a total installed pumping capacity of 2,229 gallons per minute (3.2 million gallons per day, or mgd). Two additional wells on Boblett Street could supply an additional 650 gallons per minute, or 1 mgd, if Ecology approves of pending water rights applications. These wells are not currently in use.

Historically, the aquifer in which the City has developed its wells has produced water that meets drinking water quality standards, with the exception of one emergency backup well that has an iron/manganese and odor problem. However, the development of additional septic tanks within the aquifer recharge area, additional private wells in the aquifer, or the development of incompatible land uses could cause water quality to deteriorate. The City has drafted both a Groundwater Management Plan (1995) and a Wellhead Protection Plan (1996) that identify aquifer recharge areas and address water quality issues. The UGA was drawn to include the majority of the water resource area, although portions of the recharge area extend beyond the UGA.

CHAPTER 3

Existing Wastewater Facilities

This chapter presents an overview of the City's existing wastewater collection system and treatment facilities. A detailed analysis of the collection system hydraulic performance and condition assessment is presented in the General Sewer Plan (CH2M HILL, 2004).

3.1 Existing Collection System Description

The City's collection system currently covers a service area defined by the City limits. Wastewater from within the City is primarily from single-family residential sources, with some minor commercial and light industrial sources. The collection system consists of gravity sewers, force mains, and 10 lift stations.

Much of the City's collection system has been upgraded or constructed within the last 25 years, although a large portion of the system in the central business area and northeast portion of the City is considerably older. The oldest sewer lines in Central Blaine were originally constructed in the 1920s. A majority of these older lines have subsequently been replaced as the system was expanded from the 1950s through the 1990s. The sewers in West Blaine were constructed after 1985 and the newest sewers in Central Blaine, serving the area south of Georgia Street, were constructed after 1990.

The City completed a major sewer rehabilitation project in 1992, replacing and rehabilitating sewers and service connections and installing new storm sewers. To reduce infiltration/inflow (I/I) in the sanitary collection system, roof drains, foundation drains, and storm sewer catch basins were disconnected from the sanitary collection system and reconnected to the new storm collection system.

Since the major sewer rehabilitation in 1992, the City has completed numerous collection system improvements to identify and reduce the occurrence of I/I in the system. Also included were wet weather mitigation facilities and ongoing replacement of aged pipelines.

3.1.1 Sewer Lines

Sewer pipes in the collection system range from 4 to 21 inches in diameter and totals close to 40 miles in length. The gravity sewer lines in Central Blaine generally convey flow north and west, following topography. All the wastewater from Central Blaine is collected at LS1 and pumped across the mouth of the harbor to the WWTP on Semiahmoo Spit. Gravity sewers in West Blaine convey flow generally to the north, terminating in a 15-inch gravity discharge at the WWTP. Detailed information of the sewer collection system, including its hydraulic performance and physical condition, can be found in the General Sewer Plan.

3.1.2 Lift Stations

The City has 10 lift stations (LS) in the collection system. Each station has a duplex pump system that range in capacity from 80 gpm to 1,750 gpm. All of the stations have high-level

alarms; two of the stations (LS1 and LS9) have radio telemetry that relays the alarms to a central location. City staff monitor wet well levels in the other lift stations by directly accessing the wet well and taking manual readings. Emergency power generators are installed for Lift Stations 1, 3, and 4. A portable City generator is available to provide standby power for the other stations. Detailed information of the sewer lift stations, including its hydraulic performance and physical condition, can be found in the General Sewer Plan.

3.1.3 Onsite Wastewater Disposal Systems

Onsite wastewater disposal systems (commonly known as septic systems) are used in portions of the City service area that are outside the existing sewer collection system. The existing collection system covers Central Blaine from the Canadian border south to Dakota Creek and from the Puget Sound shoreline east to approximately Odell Road. In West Blaine, sewers serve most of the Semiahmoo residential development area. Residences in East Blaine to the east of 16th Street and in the East Blaine UGA east of Odell Road use onsite disposal systems, as do residences within the service area south of Dakota Creek.

Consistent with the requirements of the GMA, the City plans to extend sewer service to these areas over time in order to improve water quality and facilitate development to urban densities. For the East Blaine UGA, new sewers are not currently included in the City's capital improvement project (CIP), as they would be performed as development projects occur and most likely funded by the specific developer.

3.2 Existing Wastewater Treatment Description

The City's existing WWTP is rapidly nearing its capacity. Native American remains discovered at the WWTP site during construction of a capacity expansion project in 1999 preclude expansion of the WWTP at this location, and storage capacity within the conveyance system is limited. Faced with treatment limitations on their existing WWTP, the City needed to identify a solution for future wastewater treatment while maintaining compliance with regulations and permit requirements at the existing WWTP. An alternatives evaluation process, conducted between May 2003 and April 2004, identified a number of options for future treatment and selected a preferred alternative with the assistance of an active Citizens Wastewater Advisory Committee (CWAC) made up of community members, Native American Tribal leaders, and key regulatory players.

This section describes the City's existing WWTP, its performance limitations to meet its current NPDES discharge permit, and physical condition.

3.2.1 Treatment Facilities

The Blaine WWTP is located on Semiahmoo Spit, west of Drayton Harbor. The WWTP was constructed in 1980 to provide wastewater treatment for the City and the surrounding area.

The treatment process includes preliminary treatment, secondary treatment, disinfection, and solids stabilization. An influent pump station is located offsite from the WWTP site. Wastewater is conveyed to the WWTP through the collection system, which includes pressurized force mains and gravity sewers. Preliminary treatment includes fine screening and odor control. Rotating biological contactors (RBCs) and secondary clarifiers provide

secondary treatment. The treated effluent is disinfected with chlorine and discharged through an outfall and diffuser into the Semiahmoo Bay, which is open to the Strait of Georgia. Solids are stabilized through aerobic digestion, and the digested solids are transported by truck to Tjolker Farms for disposal.

Figure 3-1 shows the site plan for the existing WWTP. The process flow diagram for the WWTP is shown in Figure 3-2. Table 3-1 summarizes the unit processes and major equipment included within the Blaine WWTP.

3.2.2 Outfall

The Blaine WWTP outfall consists of a 24-inch-diameter ductile iron pipe that extends into Semiahmoo Bay approximately 2,200 feet from the shoreline and terminates at a depth of about 30 feet below mean lower low water (MLLW). The outfall includes a diffuser, which consists of six 8-inch-diameter ports. Five of the ports are arranged along the spring line of the diffuser (on alternating sides of the pipe) with a spacing of 12 feet on center; the sixth is a terminal port that discharges horizontally from the center of the outfall end structure.

An external inspection of the City's WWTP outfall was required in the City's NPDES discharge permit. In conjunction with the General Sewer Plan, an outfall inspection was conducted to assess the general condition of the exposed portions of the pipe and to check for any evidence of damage, leakage, scouring, or undermining around the outfall pipe and diffuser.

In July 2003, two divers inspected the submerged length of exposed outfall pipe and diffuser. The outfall inspection was conducted during a high slack tide, with a water surface elevation of approximately 5.5 feet above MLLW. The water depth of the outfall terminus at the time of the inspection was 30 feet.

The condition of the outfall and diffuser was observed to be structurally sound. The outfall diffuser is significantly oversized for the current plant flows, but may prove to be an important asset for the future uses. All of the visible joints are intact and appear functional. Although sediments have accumulated up to the bottom of the diffuser ports, no interference or blockage from sediment was observed. Considering the age of the structure (25 or more years), the amount of marine growth appears normal; there are no restrictions of the ports due to marine growth or bio-fouling. However, there were two issues noted with the existing outfall:

1. Lack of observable discharge from the diffuser suggested that effluent might be discharging from another point in the outfall pipeline (e.g., through a break). However, discharge flow and velocity were so low and the water clarity was so poor at the time of the first dive that it may be possible that the discharge could not be seen (although this is very unlikely).

Figure 3-1

Figure 3-2

TABLE 3-1
City of Blaine WWTP: Existing Wastewater Processes and Major Equipment

Process	Description
Fine Screening	(1) 0.10-inch Rotating Drum Screen (1) 0.03-inch Rotating Drum Screen
Odor Control	(1) Wet Scrubber
Rotating Biological Contactors	(6) 100,000-ft^2 RBC Units (2) RBC Trains with (3) Units Each Total RBC Basin Volume of 102,000 Gallons
RBC Aeration System	(4) 500-scfm Blowers
Secondary Clarifiers	(2) 660-ft^2 Rectangular Clarifiers
Chlorine Contact Chambers	(2) Concrete Chambers 40:1 Length to Width Ratio
Aerobic Digesters	(4) Concrete Tanks Total Volume of 104,570 Gallons
Aerobic Digester Aeration System	(3) 500-scfm Blowers
Dewatering Building	This building originally housed dewatering equipment, but is now used for maintenance. The dewatering equipment has been removed.
Administration Building	This building houses the administration and laboratory equipment for the WWTP. The chlorine room is also attached.

2. Evidence of pipe settlement at the third anchor block could indicate that other points of settlement and joint discontinuity are present inshore.

An additional investigation of the outfall, conducted in October 2003, identified a hole in the outfall 100 feet from the diffuser as the cause of the lack of observable discharge noted during the May 2003 investigation.

3.3 Wastewater Treatment Facility Evaluation

This section includes an evaluation of the capacity of the existing WWTP and an analysis of potential near-term improvements to enable the WWTP to meet permit requirements until the new treatment solution is implemented.

3.3.1 Hydraulic Capacity

A hydraulic analysis of the WWTP was conducted to determine the plant's hydraulic capacity and to locate any hydraulic bottlenecks or obstructions that may be reducing the capacity. The criterion for establishing the hydraulic capacity of the WWTP is to retain the wastewater within basin structures at peak instantaneous flows. At maximum month influent flows, all of the unit processes should have adequate freeboard with all effluent weir

assemblies being non-submerged. The WWTP currently is considered to have a maximum month capacity of 0.8 mgd and a 2.4-mgd peak instantaneous capacity.

The hydraulic computer model WinHYDRO, developed by CH2M HILL, was used for the hydraulic analysis of the Blaine WWTP. The WinHYDRO computer model calculates energy grade line (EGL) and hydraulic grade line (HGL) elevations upstream and downstream of the hydraulic elements in the WWTP. The hydraulic analysis begins at a water surface datum elevation at the downstream end of the WWTP. The hydraulic calculations proceed upstream from this datum elevation, one element at a time.

Modeling Results

A summary of the results of the hydraulic analysis is presented in the hydraulic profile of the Blaine WWTP, shown in Figure 3-3. All WWTP unit processes were assumed to be in service for the hydraulic analysis. The starting datum for the hydraulic profile is the mean higher high water (MHHW) elevation of 4.2 feet.

Maximum Month

The Blaine WWTP is able to convey 1.3 mgd of wastewater, with all units in service, before unit process effluent weirs become submerged. The effluent weirs for the secondary clarifiers are the first to be submerged. At 1.3 mgd, the velocity through the 8-inch flowmeter assembly is 5.8 feet per second (fps). The detention time in the chlorine contact chamber is 37 minutes.

Peak Instantaneous Capacity

The total wastewater flow that can be conveyed through the existing WWTP infrastructure is 3.0 mgd. At this flow, there is negligible freeboard with the existing unit processes, with the water surface level at the top of most structure walls. All effluent weir assemblies are submerged, and high velocities are noted within piping. The 8-inch flowmeter assembly has a velocity of 13.3 fps. The detention time within the chlorine contact chamber is 16 minutes, which is below current design criteria. The treatment capacity of the WWTP would be compromised at this influent flow.

The existing WWTP infrastructure can adequately convey the design peak instantaneous influent flow of 2.4 mgd. For this condition, there is adequate freeboard within the basin structures. The secondary clarifier effluent weir is the only submerged weir in the WWTP at this level of flow.

3.3.2 Process Unit Capacity Assessment

A treatment plant process simulation of the Blaine WWTP was conducted, which also consisted of a mass balance for each WWTP unit process. The objective of this process analysis was to verify the treatment capacity of the WWTP, which is based on established design criteria for the respective unit processes, and the resulting effluent quality. The overall capacity of the WWTP takes into account both the hydraulic and treatment capacity of the unit processes. The basis on which capacity was calculated is the maximum month influent flow and loads.

The analysis was performed using Pro2D (Professional Process Design), a steady-state whole plant simulator that was developed by CH2M HILL to perform complete wastewater

Figure 3-3

treatment plant simulations and to calculate full-plant mass balances. Pro2D uses Microsoft Excel as its computational engine, implemented as a series of worksheets in a Microsoft Excel workbook.

The design criteria used for each unit process were established by various sources. The criteria established by Ecology in its publication *Criteria for Sewage Works Design* (the "Orange Book") were the primary source. Other sources are cited as applicable and included as references.

3.3.3 Summary of Existing Capacity

The overall capacity of the Blaine WWTP is established by the capacity of the single most limiting unit process. Capacity may be limited by either treatment of conventional pollutants (biological oxygen demand [BOD] and total suspended solids [TSS]) or treatment under various hydraulic loading conditions. The WWTP has adequate hydraulic capacity for the conveyance of wastewater through its infrastructure.

The aerobic digesters appear to be a limiting unit process for the solids load to the WWTP, with a capacity of 1.05 mgd, 1,500 lbs BOD_5/day, and 1,300 lbs TSS/day. This is consistent with previous evaluations completed for the Blaine WWTP (Terra Tech/KCM, Inc., 2000). This design loading provides a 38 percent reduction in volatile solids, meeting the Class B biosolids requirement. The WWTP currently does not meet the Class B Biosolids criteria with the aerobic digester at times, as the influent loads can exceed the design criteria. However, additional stabilization is provided at the sludge disposal site, but an additional cost to the City is associated with this practice. It is anticipated that this practice can continue in the near term, so the aerobic digester does not limit the capacity of the WWTP.

The RBC unit process, as originally installed, and the secondary clarifiers limit the total capacity of the WWTP. Recently, however, the RBC has been modified by the City to increase its capacity. Two RBC trains, with three shafts each, are utilized at the WWTP. Two internal baffles within each train separated the shafts. The first baffle was removed, allowing for two shafts to treat the influent flow and loads. This results in an increase in capacity at the RBC unit process to 1.3 mgd, 2,250-lbs BOD/day (208 mg/L), and 2,642-lbs TSS/day (244 mg/L). The first stage surface loading under this condition is 5.2-lbs BOD/1,000-ft^2/day, with the total surface loading at 3.5-lbs BOD/1000-ft^2/day. The surface loadings fall within published design criteria for RBCs (Grady et al., 1999; WEF/ASCE, 1998; Metcalf & Eddy, 1991). The secondary clarifiers limit the maximum month flow to 0.92 mgd and peak flow to 1.5 mgd given the surface overflow rate criteria established in the 1985 Ecology design guide for secondary clarifiers receiving RBC effluent (less than 700 gpd/ft^2 for maximum month flow; less than 1,100 gpd/ft^2 for peak hour flow). The clarifiers typically operate within the design parameters, but the effluent TSS has exceeded the limits on occasion. The shallow depth of the clarifiers (3.5-ft to 9-ft side water depth) appears to limit sludge settling performance.

The overall process capacity is established by the overflow rate for the secondary clarifiers. The maximum month capacity of the Blaine WWTP is 0.92 mgd, 1,782-lbs BOD/day (232 mg/L), and 1,656-lbs TSS/day (216 mg/L). The hydraulic capacity of the secondary clarifiers proves to limit the capacity of the WWTP. The load associated with the hydraulic capacity is based on 2002 maximum month concentrations (shown in Chapter 4, Table 4-3).

The capacity of the aerobic digester to provide Class B biosolids is exceeded with this influent loading. This will result in an increase in solids disposal costs to the City, so it is not recommended to exceed the capacity of the aerobic digester on a regular basis. The load associated with the secondary clarifiers is well within the capacity of the RBCs (2,250-lbs BOD/day and 2,642-lbs TSS/day), so additional modifications to the RBCs are not recommended.

3.4 Short-Term Treatment Facility Improvements

The onsite treatment improvements considered for the WWTP include alternatives for upgrading existing unit processes and alternatives for split stream treatment. An alternative for upgrading an existing unit process would entail completing the majority of the improvements within an existing structure or facility. These improvements would be minimal, and would not involve changing to a different unit treatment process. The constructibility of such modifications is a major issue, since the existing WWTP cannot convey and treat the majority of the influent flow and loads if a unit process is removed from service for a significant amount of time. A split stream treatment alternative would include a new unit process being installed at the WWTP site for treatment of a portion of the influent wastewater.

Multiple onsite treatment alternatives to provide increased capacity or other improvements were investigated in 2000 (TetraTech/KCM, 2000) and as part of this preliminary planning process of the General Sewer Plan, including:

- Improvements to the Headworks
- Structural and process operation improvements to the RBCs
- Equalization basin utilization
- Secondary clarifier improvements
- Addition of effluent filtration
- Chlorine disinfection
- Aerobic digester improvements
- Solids handling operational changes
- Additional odor control

Cost-effectiveness was an important factor in evaluating improvements for the WWTP, due to the future abandonment of the existing site. Any capital investment in the existing site may divert available funding for future construction. The City of Blaine Public Works Department and WWTP operational staff have been very proactive in trying to improve the performance of the WWTP. Multiple testing and performance evaluations were completed. There were additional performance evaluations, however, that may be completed onsite with minimal cost. It was recommended that the near-term capacity improvements involve initial optimization of the WWTP and further investigation of potential modifications to the WWTP as part of this WWTP planning effort for the new WWTP. The following testing and modifications were previously recommended for this initial step:

- **Internal Baffle Modifications in RBC.** As discussed previously, removing the baffle between the first and second shaft in each RBC train increased the capacity of the existing WWTP. This provides more surface area within the first stage of the RBC, reducing the surface organic load to the shafts.

- **Additional Effluent Filtration.** Including an effluent filtration system prior to disinfection will improve the TSS limitations currently existing in the secondary clarifiers, allowing for an increase in influent load at the WWTP. Package type systems can be evaluated and installed at the WWTP as required.
- **Aerobic Digesters.** The operational strategies, such as prethickening, in the aerobic digesters can be implemented or modified to optimize their performance. The City should continue with the staged operation and aerobic-anoxic operation currently practiced. Performance monitoring of any operational practices or modifications will determine the optimal strategy for aerobic digestion.

With some interim operational strategies, unit process modifications, and performance monitoring, there appear to be opportunities to improve the WWTP with minimal capital cost. With information gathered from follow-up planning activities, the process evaluations could be refined to determine the optimal capacity of the WWTP for the near term.

3.5 Outfall Improvements and Recommendations

The capacity of the outfall is sufficient to handle future effluent flows for at least 20 years if wastewater continues to be treated at a City-owned facility. With the exception of the large hole identified in the October 2003 investigation, the existing outfall and diffuser are structurally sound and in good condition, given the age of the structures.

The City repaired the damaged effluent outfall in July 2004, as a condition of its May 5, 2004, settlement to appeals brought before the PCHB. This repair work included replacement of approximately 10 feet of pipe approximately 100 feet from the diffuser. It was recommended that once the repair was complete, the City should collect detailed measurements of dye concentration at the regulatory mixing zone boundaries for the outfall. The City should also conduct dilution modeling to evaluate the dilution performance of the outfall diffuser in its present condition and, if necessary, recommend conceptual diffuser modifications to improve outfall dilution performance.

CHAPTER 4

Wastewater Characteristics

This chapter presents an overview of the wastewater characteristics for the City's existing wastewater treatment system. The historical wastewater flow and loadings are presented, along with the projected wastewater flow and loadings for the proposed Lighthouse Point WRF.

4.1 Historical Wastewater Flows and Loadings

4.1.1 Wastewater Flow

The annual average daily influent wastewater flow and maximum month average daily influent wastewater flow at the Blaine WWTP are determined from the Blaine WWTP Permit Data database from year 1997 to 2003. The influent flow has been steadily increasing over the past few years. Table 4-1 includes the average annual influent wastewater flow conditions from the influent database for year 1997 to 2003. The plant flow data is included as Appendix B.

TABLE 4-1
City of Blaine: Existing Blaine WWTP Influent Flow Information

Year	Annual Average Flow	Maximum Month Flow
2003	0.61 mgd	0.88 mgd
2002	0.61 mgd	0.85 mgd
2001	0.49 mgd	0.71 mgd
2000	0.50 mgd	0.68 mgd
1999	0.44 mgd	0.80 mgd
1998	0.38 mgd	0.72 mgd
1997	0.45 mgd	0.81 mgd

Historical data from the existing WWTP were analyzed to develop the baseline datum for the design criteria. The general ~~trend of the data indicate~~trends of the data indicate a steady increase in influent wastewater flow. The data from year 2003 coincide with the general trend from the past few years. The year 2003 annual average wastewater flow of 0.61 mgd and maximum month flow of 0.88 are used as the baseline for the design criteria. The data on Table 4-1 represent the total wastewater flow from the two main service areas for the City – Central Blaine/East Blaine/East Blaine UGA and West Blaine. Based on sewer flowrate information, of the 0.61- mgd total flow, 0.54 mgd is from Central/East Blaine and 0.10 mgd is from West Blaine.

4.1.2 Wastewater Load

Data collected at the Blaine WWTP indicate an increase in influent wastewater loads over the past 5 years. The BOD_5 and TSS loading design criteria for the proposed Lighthouse Point WRF are based on the general trend of the annual average data and maximum month data from 1997 to 2003. The data are shown on Table 4-2.

TABLE 4-2
Blaine Wastewater Treatment Plant – Historical Influent Wastewater Loading Trend

Year	Average Annual TSS (lbs/day)	Maximum Month TSS (lbs/day)	Average Annual BOD_5 (lbs/day)	Maximum Month BOD_5 (lbs/day)
2003	1,011	1,153	1,165	1,193
2002	1,193	1,026	1,255	1,076
2001	955	799	972	895
2000	847	1,358	1,035	1,353
1999	672	884	735	940
1998	631	733	573	747
1997	636	655	600	592

Figures 4-1 and 4-2 show the general trend for the wastewater load parameters

As shown in the respective figures, there is an increase in both TSS and BOD_5 at the Blaine WWTP. Table 4-3 includes the historical wastewater parameters that will be used with the service area growth projections to develop the design wastewater parameters for the proposed Lighthouse Point WRF. The City has a pretreatment program that requires permits for all establishments producing industrial wastes, including commercial establishments processing food. The City's pretreatment ordinance is included in Appendix C.

4.2 Historical Infiltration and Inflow Analysis

The I/I analysis was originally presented in the General Sewer Plan (CH2M HILL, 2004). This analysis is summarized and presented in this section.

Infiltration is defined as groundwater that enters a collection system through defective pipes, pipe joints, connections, manhole walls, or other means. Inflow is storm water that enters a collection system from foundation drains, roof drains, basement sumps, and surface water runoff. I/I generally correlates with rainfall, although the correlation tends to vary with the volume and intensity of the storm, the amount and duration of antecedent rainfall (i.e., rainfall in the days preceding the particular rain event), and seasonal groundwater fluctuations. Municipalities target I/I removal because the extraneous flow occupies pipe capacity that would otherwise be free for the sanitary flow in the system.

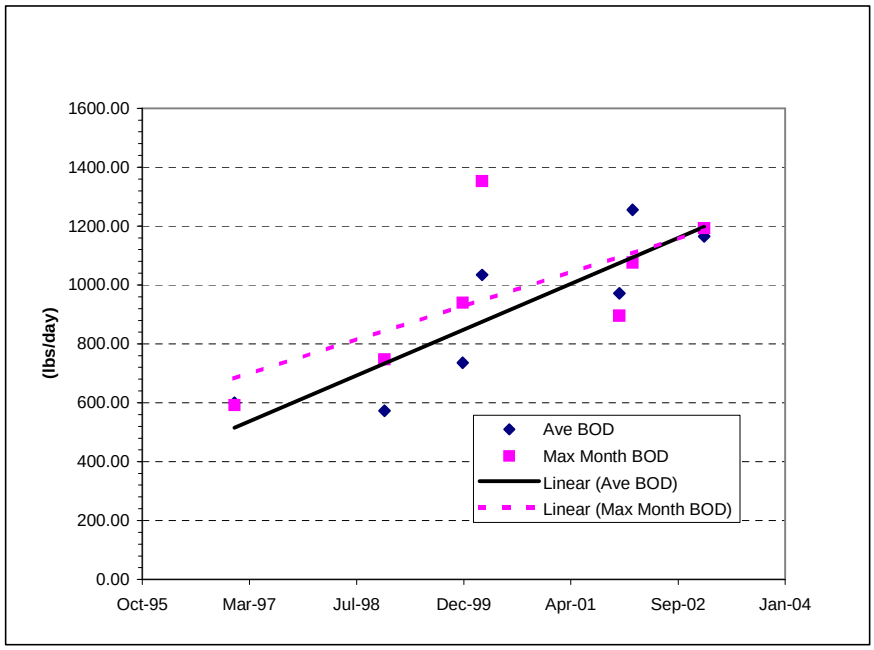


FIGURE 4-1
BOD5 trend, 1997 – 2003

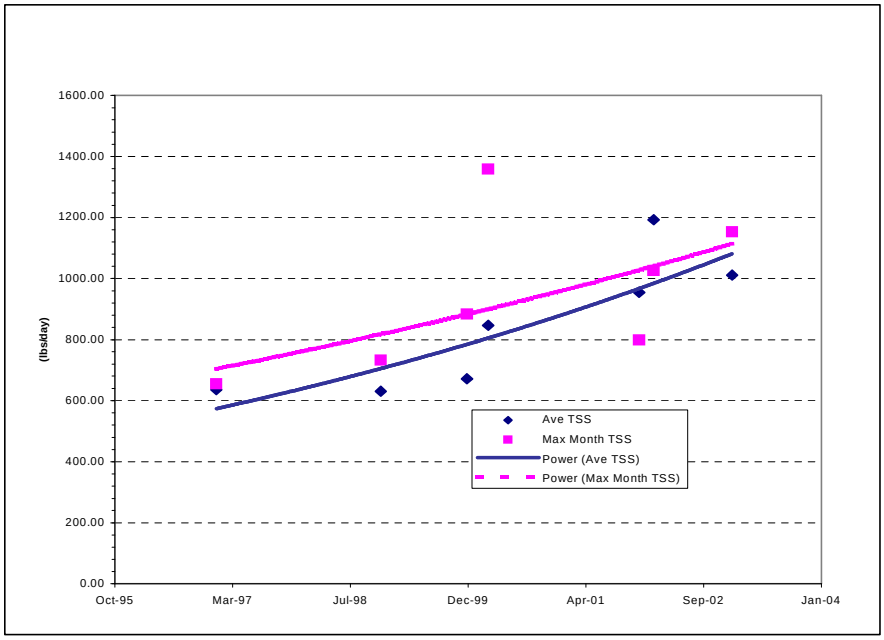


FIGURE 4-2
TSS trend, 1997 – 2003

TABLE 4-3
Blaine Wastewater Treatment Plant – Historical Influent Wastewater Loading

Influent Parameter	Average Annual Load (lbs/day)[2] 1998-2002	Maximum Month Load (lbs/day)[3.]
BOD_5[(1)]	1,170	1,200
TSS[(1)]	1,080	1,150

[1]Annual Average values, 1998 – 2002; Maximum Month, 1998 – 2002.
[2]Associated Average Annual Parameter Concentration with 0.61 mgd: BOD_5 = 230 mg/L, TSS = 212 mg/L
[3]Associated Maximum Month Parameter Concentration with 0.88 mgd: BOD_5 = 164 mg/L, TSS = 157 mg/L

Figure 4-3 is a plot of wet weather versus dry weather flow recorded at the WWTP. The 6 months with the lowest wastewater flows each year, May through October, were compared to the 6 months with the highest wastewater flows, November through April. For the years shown, wet weather flow exceeded dry weather flow by approximately 1.5 mgd in 1997. The proportion of wet weather flow to dry weather flow shows a significant decrease since 1999, but has slightly increased since 2000, as shown in Figure 4-4.

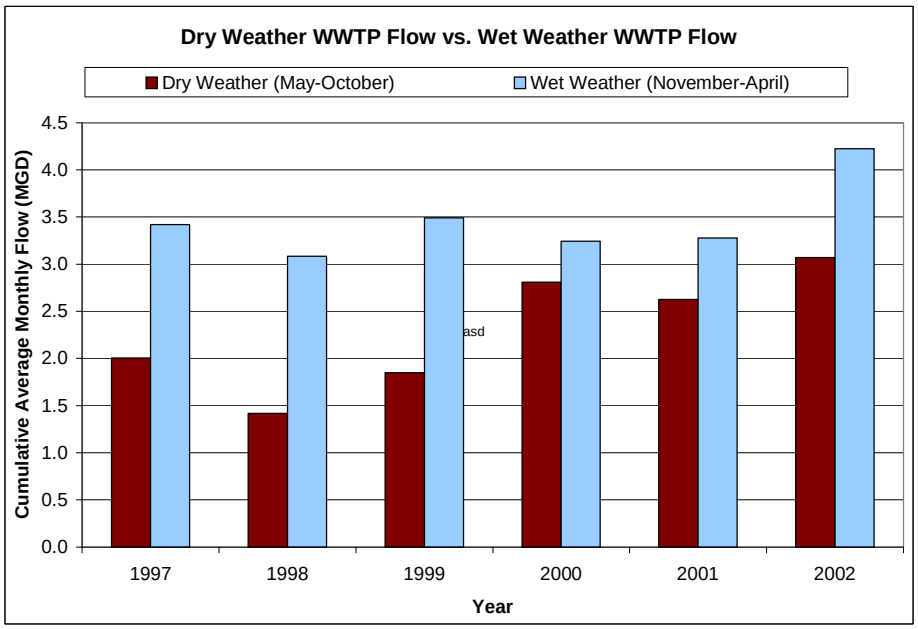


FIGURE 4-3
Wet Weather and Dry Weather WWTP Flow 1997 to 2002

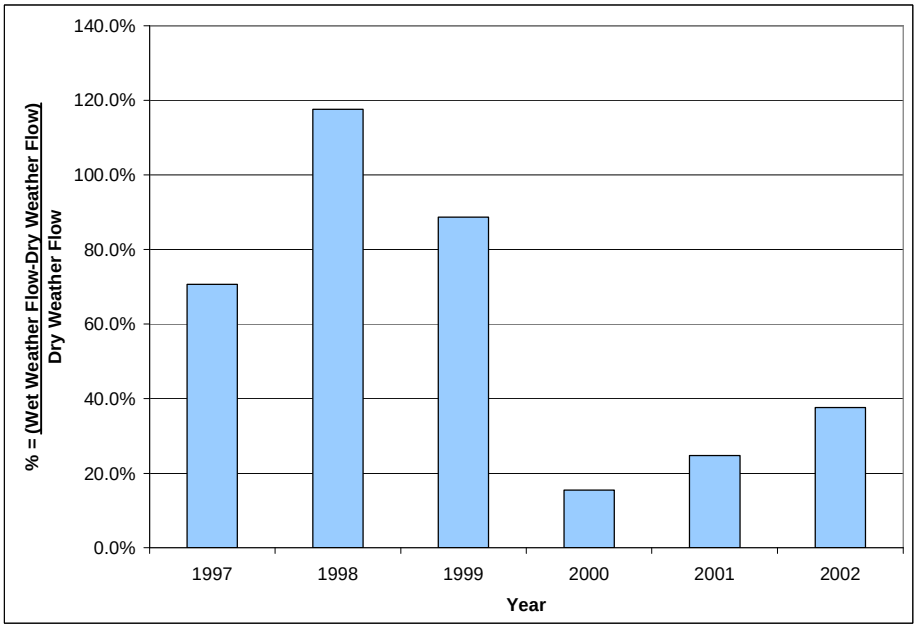


FIGURE 4-4
Wet Weather Flow as a Percentage of Dry Weather Flow

4.2.1 Noted Areas of Infiltration/Inflow

A collection system's flow response after a large rainfall event is an indicator of I/I. On December 15 and 16, 1999, the City received approximately 2.7 inches of rain in 36 hours. As shown in Figure 4-5, the sanitary sewer collection system flow was approximately 1 mgd higher than in the preceding 5 days, suggesting significant I/I. The preceding days were mostly dry, with the exception of December 12, 1999, when approximately 0.3 inch of rain fell.

Certain areas of the City experience a higher I/I influence than other areas. The flow monitoring data showed high flows in residential areas of the City on days with rainfall. Wastewater flows are expected to increase with rain, and in the City the central residential area (south of G Street, north of Georgia Street, and west of I-5) and northern residential area (north of D Street and west of 8th Street) show the largest I/I response. The pipes in the central residential area were replaced in 1991, so the age and condition of the pipe may not be the leading cause of the I/I. Since it is an older residential area of the City (constructed in the 1920s), roof drains and foundation drains may be a more likely source of I/I. The industrial area also exhibited high I/I in the flow monitoring data. The pipes in this area were installed during the 1960s and are primarily vitrified clay pipe (VCP) and reinforced-concrete pipe (RCP). The age and type of pipe, largely VCP and RCP, suggest that I/I may enter the sewers through defective pipe joints or cracks in the pipes or manholes.

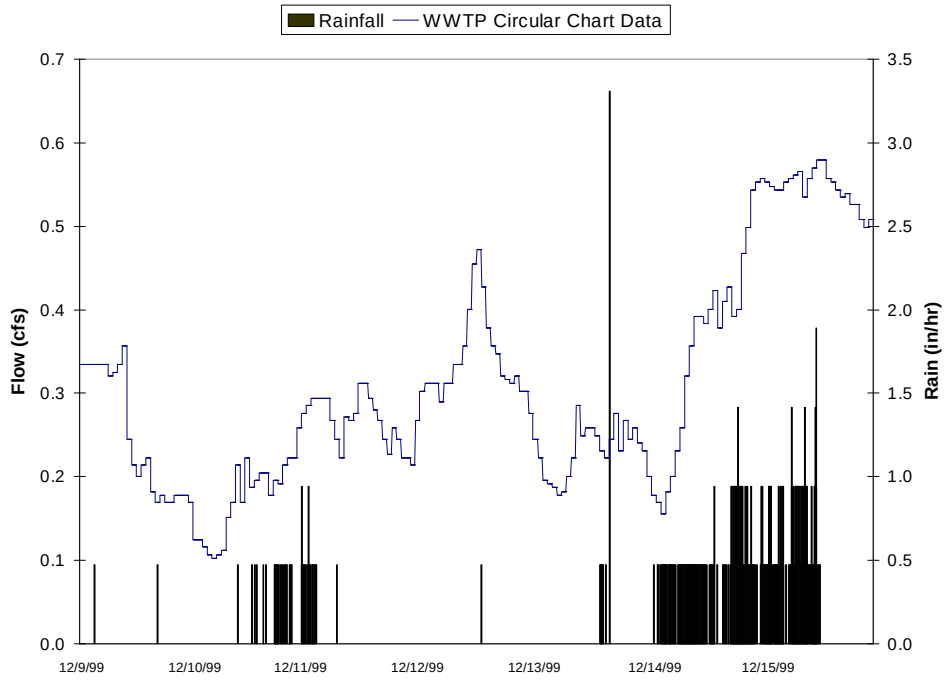


FIGURE 4-5
City of Blaine December 1999 Wastewater Treatment Plant Flow vs. Flow Monitoring Data

4.2.2 Efforts to Reduce Infiltration/Inflow (I/I)

Beginning in 2000, the City began pipeline construction projects to rehabilitate gravity sewers with known high I/I. Older areas of the City with VCP were found to have the most I/I, and therefore the pipes were targeted for replacement. Approximately 26,000 feet of VCP have been replaced to address this issue.

The City has funding allocated for private citizens to voluntarily disconnect foundation drains and roof drains from the collection systems and reconnect them to the separate storm drain system. The program has been successful in reducing I/I as evidenced by the significant reduction in wet weather flow percentage since 1998, and approximately $2 million has been spent since the onset of this program.

4.3 Projected Wastewater Flows and Loadings

This section presents the projected wastewater flows and loadings used as the design criteria for the proposed Lighthouse Point WRF. The hydraulic and process design criteria for the WRF were developed in part within the General Sewer Plan (CH2M HILL, 2004), and are summarized in this section. The criteria are based on the annual average daily and maximum month average daily influent wastewater flow measured at the Blaine WWTP

from 1997 to 2003. The daily diurnal flow patterns from the 1999 flow monitoring data are used to determine the peaking factors for the daily minimum and peak hourly influent wastewater flow. Anticipated wastewater flow projections in year 2023 are determined from population growth factors. The wet weather peaking factors are used to determine the appropriate volume of flow equalization required prior to the wastewater reaching the proposed Lighthouse Point WRF. Wet weather peaking factors are based on the 25-year, 24-hour storm event and the Soil Conservation Service (SCS) Type 1A distribution.

Population projections are presented in the General Sewer Plan (CH2M HILL, 2004). Annual projected population growth rates are used to develop an estimate for the projected population of the City. The population growth is used in part to develop the design criteria for the proposed Lighthouse Point WRF. Tables 4-4 and 4-5 show the projected population growth rates and associated population estimate. Equivalent Residential Units (ERUs) are used to represent the wastewater sewer flow within the system. An ERU is the average daily contribution of wastewater from a single-family residence. This unit of measurement is used to equate non-residential (commercial/retail, industrial) or multi-family residential wastewater contributions to a specific number of single-family residences. With the population estimates and future non-residential contributions, the estimated 2023 sewage flow is determined. This sewage flow, along with the I/I component within the City's collection system, determines the 2023 annual average hydraulic design criteria for the proposed Lighthouse Point WRF.

TABLE 4-4
City of Blaine Annual Projected Population Growth Rates

Location	2002-2007	2007-2012	2012-2017	2017-2022
Central Blaine	0.9%	0.9%	0.8%	0.7%
East Blaine	2.9%	2.9%	3.0%	3.4%
West Blaine	9.7%	6.3%	4.1%	3.3%

Source: City of Blaine Population Growth Allocations 2002-2022

TABLE 4-5
Existing and Projected Population for the City of Blaine Sewered Areas

Location	2003	2013	2023
Central Blaine	3,029	3,310	3,560
East Blaine	336	619	632
West Blaine	688	1,410	2,014
East Blaine UGA	0	0	615
Total	4,053	5,339	6,711

UGA = Urban Growth Area

4.3.1 Hydraulic Design Criteria

The hydraulic design criteria for the proposed Lighthouse Point WRF is the anticipated influent wastewater flow for the year of 2023. Peaking factors from the dry weather annual average flow (DWAA) to maximum month (DWMM), minimum (DWMIN), and peak hourly (DWPH) influent wastewater flow are used to establish the corresponding 2023 wastewater flow rates. The peaking factors are developed from historical and current data at the Blaine WWTP. The peaking factors from annual average used for this analysis are presented in Table 4-6.

TABLE 4-6
Influent Wastewater Flow Dry Weather Peaking Factors – 24-hour Diurnal Conditions

Influent Flow Condition	Peaking Factor
Minimum Daily Flow[1]	0.4
Average Daily Flow	1.0
Max Month Flow[2]	1.45
Peak Hourly Flow[2]	1.8

[1]Based on Diurnal Flow Patterns (Figure 3-9, General Sewer Plan, CH2M HILL, 2004)
[2]From Year 2003 Blaine WWTP Influent Wastewater Data

Table 4-7 includes the hydraulic capacity based on historical average annual conditions and projected for future growth (except as noted), required at the WRF in 2023.

TABLE 4-7
City of Blaine 2023 Hydraulic Design Criteria

	Minimum Flow (mgd)	Annual Average (mgd)	Maximum Month (mgd)	Dry Weather Peak Hour (mgd)	Wet Weather Peak Hour (mgd)
Central and East Blaine, and East Blaine UGA	0.31	0.77	1.11	1.39	5.50[(1)]
West Blaine	0.09	0.23	0.39	0.41	1.64[(2)]
City of Blaine Total	0.4	1.00	1.5	1.80	7.14

[1]Central Blaine, East Blaine, and East Blaine UGA wet weather peak hour based on the 2023 baseflow and 25-year storm, 24-hr duration.

[2]West Blaine wet weather peak hour flow is an estimated value based on the peaking factor from the Central Blaine, East Blaine, and East Blaine UGA annual average to wet weather peak hour flow (7.14).

As noted on Table 4-7, the peak flow in the City's sewer system is during the wet weather conditions. An estimate of the peak wet weather condition (25-year storm) from the Central Blaine Service area to be conveyed by LS1 in 2023 is approximately 3,820 gpm (5.50 mgd). The hydrograph for the Central Blaine, East Blaine, and East Blaine UGA service area is shown in Figure 4-6. This wet weather peak hour flow results in a peaking factor of 7.14 from the dry weather annual average daily flow. As a result of the high peaking factor associated with the wet weather data at LS1, a level of flow equalization will be required. It

is anticipated that Project T1, improvements to Lift Station 1, will provide flow equalization storage to minimize the peaking factors at the proposed Lighthouse Point WRF.

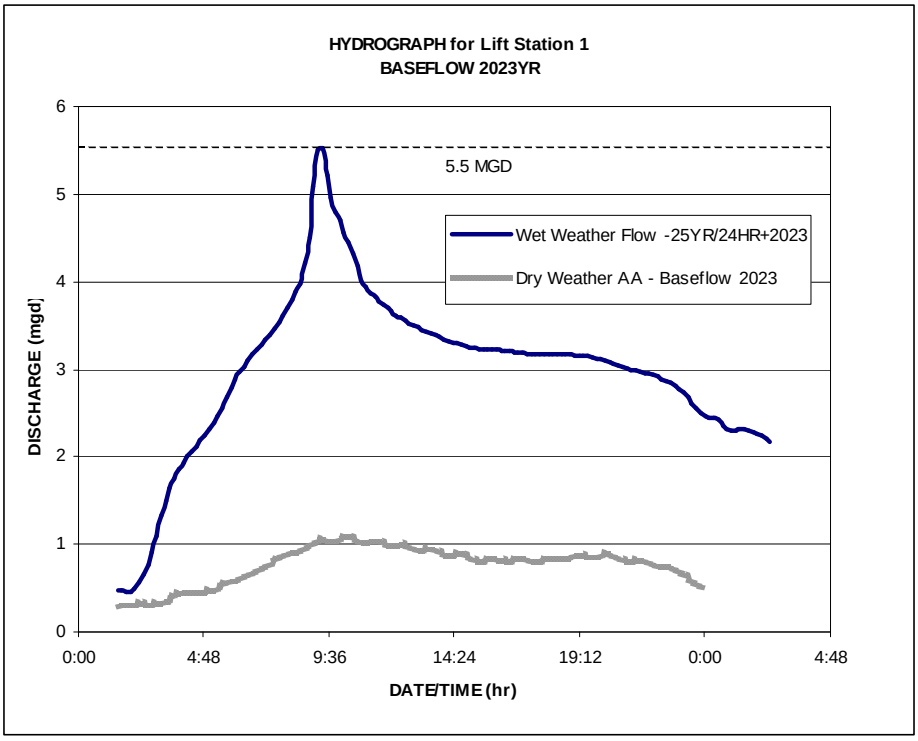


FIGURE 4-6
Central Blaine, East Blaine, and East Blaine UGA Wet-Weather Flow Hydrograph

Flow equalization volume will be included within Project T1 from the City's CIP in the General Sewer Plan (CH2M HILL, 2004) to reduce the wet weather peak hour flow from 5.5 mgd to 3.1 mgd prior to the proposed Lighthouse Point WRF. The Lighthouse Point WRF is designed to have a peak hydraulic capacity of 3.1 mgd. A preliminary economic evaluation comparing treatment costs to equalization costs determined the required flow equalization to be ~~700~~400,000 gallons. In sizing the facility to hydraulically meet the 2023 wet weather peak hour flow requirements for the entire City, a reserve capacity will be included at the WRF. This reserve can be used for the treatment of West Blaine wastewater flows if warranted, or used for additional future system connections.

4.3.2 Treatment Process Design Criteria

Historical influent water quality data and the required effluent water quality form the criteria for the level of treatment that is required to meet these conditions.

The treatment process design criteria are based on the maximum month influent load to the WWTP. The maximum month value corresponds to the monthly effluent compliance standard listed in the NPDES permit, which is included as Appendix D. Using the maximum month value for the design criteria will statistically result in process reliability 92 percent of the time (WEF, 1998). The treatment process design capacity for the proposed Lighthouse Point WRF will be 1.60 mgd and the maximum hydraulic capacity of the treatment plant will be 3.1 mgd. These values are based on flows from the revised collection system hydraulic model that incorporates the updated flow monitoring data and the proposed equalization storage basin upstream of the treatment facilities.

The treatment process design criteria are based on the historical influent flow and load data, along with assumed values for various parameters not typically measured at the Blaine WWTP. From the historical flow and load data, the resulting wastewater parameter concentration is determined (noted on Table 4-3). As noted in the table, the maximum month values from the existing data for BOD_5 and TSS are 164 mg/L and 157 mg/L, respectively. These values are low compared to values typically found for municipal water. This lower value may result from the additional I/I reaching the existing WWTP. As the collection system is improved, reducing the I/I, the maximum month concentrations should approach those typically found for a medium-strength wastewater. For planning purposes, typical medium-strength municipal wastewater concentrations for BOD_5 and TSS will be used for the maximum month condition. With the design flow rates, the associated average annual and maximum month loads were calculated. Assumed concentration values were used for parameters typically not measured at the existing WWTP. Values from industry standard design manuals are cited within the table for those parameters. Table 4-8 includes the treatment design criteria flow and loadings for the proposed Lighthouse Point WRF. These values have been updated based on the revised flows from the updated hydraulic model. However, the process design must also be updated during the predesign activities to accurately reflect the requirements to provide appropriate treatment.

TABLE 4-8
Water Reclamation Facility Design Criteria – Influent Flow and Loadings

Influent Parameter	Average Annual Load, lbs/d (based on 1.3-mgd)	Maximum Month Load, lbs/d (based on 1.6-mgd)
BOD_5 [1.]	2,494 (230 mg/L)	2,802 (164 mg/L)
TSS[1.]	2,299 (212 mg/L)	2,802 (157 mg/L)
VSS[2.]	1,724 (159 mg/L)	2,122 (118 mg/L)
TKN[3.]	466 (43 mg/L)	574 (43 mg/L)
NH_3 [3.]	271 (30 mg/L)	334 (30 mg/L)
Alkalinity (as $CaCO_3$)[2]	2,168 (200 mg/L)	2,669 (200 mg/L)
Temperature (°C)[4]	13	13

1. Based on Annual Average values, 1998 – 2002; Maximum Month, 1998 – 2002, See Table 4-3.
2. VSS assumed to be 75% of TSS, Alkalinity concentrations for strong and medium wastewater (Metcalf & Eddy, 1991).
3. Limited sampling at the Blaine STP for NH_3 and TKN. Assumed TKN and NH_3 values based on typical domestic wastewater values. (Metcalf & Eddy, 1991)
4. Temperature is assumed.

4.3.3 Effluent Criteria

Formatted: Normal

The effluent water quality requirements of the NPDES permit for the existing outfall to the Puget Sound and the plant effluent data form the effluent design criteria to be used for the Lighthouse Point WRF. The existing outfall, identified in NPDES permit No. WA-002264-1 for the City of Blaine, discharges into Semiahmoo Bay within the Strait of Georgia of the Puget Sound. The entire NPDES permit is included in Appendix D of ~~this technical memorandum.~~ the facility plan. Table ~~7~~ 4-9 summarizes the NPDES permit requirements.

TABLE ~~7~~4-9
Current NPDES Permit Effluent Limitations

Parameter	Average Monthly	Average Weekly (1)
Biochemical Oxygen Demand, 5 day (BOD_5)	30 mg/L, 200 lbs/day	45 mg/L, 300 lbs/day
Total Suspended Solids (TSS)	30 mg/L, 200 lbs/day	45 mg/L, 300 lbs/day
Fecal Coliform Bacteria	200/100 mL	400/100 mL
pH	Daily minimum is equal to or greater that 6, and the daily maximum is less than or equal to 9	
Total Residual Chlorine (if Water Quality Based), (1)	0.35 mg/L, 2.3 lbs/day	0.9 mg/L, 6.0 lbs/day

1. Total Residual Chlorine is based on an Average Monthly and Maximum Daily value

From the wastewater treatment alternatives evaluation presented in the General Sewer Plan (CH2M HILL, 2004), providing treatment to a high-quality effluent for water reclamation and reuse was recommended. The reuse of water from the proposed reclamation facility may be desirable within the City. In addition, there may be opportunities in the future to reduce the shellfish closure zone associated with the outfall. As part of the dilution modeling that will need to be conducted for effluent from the new water reclamation facility, the shellfish closure zone surrounding the outfall should be re-evaluated. The dilution modeling is not included within ~~CH2M HILL's scope of work for~~ the Facility Plan. However, some alternatives for treatment of wastewater to be evaluated within the Facility Plan will provide the high-quality effluent desired by the City.

CHAPTER 5

Process Components Evaluation

This chapter presents the evaluation of the process components utilized within wastewater treatment facilities. The treatment components for the unit processes listed below are defined and evaluated. The advantages and disadvantages are documented, including expected performance and reliability. The liquids and solids treatment process to be defined include:

- Preliminary/Primary Treatment
  - Coarse and Fine Screens
  - Vortex Horizontal and Aerated Grit Removal Systems
- Secondary Treatment
  - Conventional Activated Sludge (including oxidation ditch, extended aeration, batch treatment (SBR), and complete mix system configurations)
  - Membrane Bioreactors
  - Fixed-film Systems (RBC, Trickling Filters)
- Disinfection Treatment
  - Ultraviolet Radiation (open and closed system configurations)
  - Chlorination and Dechlorination Systems (liquid and gas systems)
- Solids Handling (Thickening and Dewatering)
  - Thickening (including gravity thickeners, gravity belt thickening [GBT], and centrifuge, and dissolved air flotation – [DAF])
  - Dewatering (including belt filter press [BFP] and centrifuge)
- Solids Treatment
  - Aerobic and Anaerobic Digestion
  - Chemical Treatment (lime stabilization)

Also included in this chapter is the development and analysis of treatment facility alternatives for the proposed Lighthouse Point WRF, including treatment requirements and alternatives evaluation, and the associated conveyance and mitigation requirements.

5.1 Treatment Process Components Definition and Evaluation

Table 5-1 includes the definition and evaluation of various wastewater treatment process components. Advantages and disadvantages are cited for each unit process.

5.2 Treatment Facilities Development and Analysis

This chapter presents the development and analysis of treatment facility alternatives for the proposed Lighthouse Point WRF. The wastewater treatment requirements and alternatives evaluated are presented along with the associated conveyance and mitigation requirements.

5.2.1 Treatment Requirements

The objective of this section is to document and present the preliminary design criteria and sizing requirements for each treatment configuration alternative to be evaluated for the proposed Lighthouse Point WRF. The planning and design parameters developed in previous chapters will be used to size each alternative.

5.2.1.1 Development of Alternatives

A number of treatment configuration alternatives were evaluated for use at the proposed Lighthouse Point WRF. It was assumed that for the majority of the treatment configuration alternatives, the City will continue the current practice of contracting their solids treatment to others. However, the option of including solids treatment at the new facility was included in one of the treatment configuration alternatives. Table 5-2 lists the treatment configuration alternatives evaluated.

TABLE 5-2
Treatment Configuration Alternatives

Alt.	Preliminary/ Primary Treatment	Secondary Treatment	Disinfection Treatment	Solids Handling	Solids Treatment
1	Coarse Screening Grit Removal	Conventional Activated Sludge (CAS)	UV System	Thickener	No
2	Coarse Screening Grit Removal	Conventional Activated Sludge (CAS)	Liquid Chlorination/ Dechlorination System	Thickener	No
3	Coarse Screening Grit Removal	Batch Reactor (SBR)	UV System	Thickener	No
4	Coarse Screening Grit Removal	Batch Reactor (SBR)	Liquid Chlorination/ Dechlorination System	Thickener	No
5	Coarse Screening Grit Removal	Extended Aeration (EA)	UV System	Thickener	No
6	Coarse Screening Grit Removal	Extended Aeration (EA)	Liquid Chlorination/ Dechlorination System	Thickener	No
7	Fine Screening Grit Removal	Membrane Bioreactor (MBR)	UV System	Thickener	No
7A	Fine Screening Grit Removal	Membrane Bioreactor (MBR)	UV System	Thickener/ Dewatering	Yes
8	Fine Screening Grit Removal	Membrane Bioreactor (MBR)	Liquid Chlorination/ Dechlorination System	Thickener	No
9	Fine Screening Grit Removal	Fixed-film (RBC)	UV System	Thickener	No
10	Fine Screening Grit Removal	Fixed-film (RBC)	Liquid Chlorination/ Dechlorination System	Thickener	No

5.2.2 Evaluation of Alternatives

As presented in Chapter 4, the treatment process design criteria are based on the maximum month influent load to the WWTP. The treatment process design capacity (at maximum month conditions) for the proposed Lighthouse Point WRF will be 1.55 mgd, and the peak

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
PRELIMINARY/PRIMARY TREATMENT				
Coarse Screen	Coarse screening of wastewater is intended to remove the large solids that may interfere with downstream unit operations and processes and equipment, accumulate in digesters, and cause other problems. It is the first unit operation encountered in WWTP. Conventional raw wastewater coarse screens consist of mechanically and/or manually cleaned bar screens. Bar screens consist of vertical or inclined parallel steel bars or rods with openings approximately 0.5 to 2.0 inches (12 to 50 mm) across a channel through which wastewater flows. The screening of raw sewage has been established and commonly used in WWTPs throughout the world.	Depending on the bar spacing, the coarse screen is able to remove large solids include sticks, rags, and other debris. Trash of this type may clog pipes, damage pumps, interfere with mechanical aerators, clog trickling filters, accumulate in digesters, and cause other problems.	• Requires simple operation and less maintenance. • Generates less headloss compared to fine screen.	• Requires larger footprint than fine screen since the spacing is larger and the slope is flatter. • Achieves lower screening capture efficiency compared to fine screen. • Storage and handling of screenings can cause odor emissions.
Fine Screen	Fine screening of wastewater is used in both the preliminary treatment and primary treatment. The fine screens with the openings of 0.1 to 0.5 inch (2.5 to 12 mm) can effectively remove small solids such as cigarette filters, fibers, hair, plastic, rubber products, paper, and other fine material upstream of the grit removal process. With even smaller spacing of 0.1 inch or less, the fine screens can be used to substitute or polish the primary sedimentation treatment to remove suspended solids and organic pollutants. Typical applications include fine screens ahead of RBC, ABF and MBR. The reduction in settleable solids prevents blocking of distributors, aerators, and membrane, and increases the operational efficiency of the system. Fine screens are usually automatically cleaned. They can be circular, rectangular, flat, or cylindrical. They can be static or rotating. The technology is not commonly used as primary treatment in WWTPs.	When used for grit removal, the fine screen can achieve 80 to 90% of grit removal efficiency. When used for primary treatment, the rotary drum fine screen can achieve BOD removal of 15 to 25% and TSS removal of 15 to 30%.	• Requires less footprint than the primary sedimentation when achieving the same removal efficiencies.	• Generates higher headloss than the coarse screens. • If substitute for the primary sedimentation, cannot achieve removal efficiencies as high as the primary sedimentation. • Storage and handling of screenings can cause odor emissions.
Vortex Grit Removal	Grit removal is a common component of the preliminary treatment train in most treatment plants and usually follows screening. Grit systems remove settleable nonputrescible material from the wastewater, such as sand, and include washing to remove organic material before depositing it in a container for ultimate disposal. The vortex grit removal system relies on a mechanically induced vortex to capture grit solids in the center hopper of a circular tank. The wastewater enters and exits the tank tangentially. The vortex action causes particulates to move to the side of the tank, settle down the walls, and collect in a hopper. The swirling action causes some of the organics to be re-suspended. An air scour system is also normally provided to re-suspend most of the remaining organics just before the grit is removed from the hopper. Settled grit can be removed with air lift or torque-flow pumps. This is a proprietary technology. Various manufacturers make vortex systems and sizing and design vary. The vortex grit removal system is becoming popular in the large-scale installations throughout the world.	Vortex grit removal efficiencies range from 65 to 95%, depending on the grit size and density. Vortex grit removal has the higher removal efficiency for the fine grit than other types of grit removal system.	• Good process control capability. • Minimal headloss, typical 6 mm (0.25 inch). • No aeration required, saves energy. • Effective over a wide flow variation. • Equipment replaceable in operating basin. • Requires minimal space. • Removes a high percentage of fine grit (up to 73 percent of 140-mesh size).	• Proprietary design. • Paddles may collect rags. • Grit sump may become compacted and clog; requires high-pressure agitation water or air; air lift pumps are often not effective in removing grit from the sump.
Horizontal Flow Grit Removal	Horizontal flow grit removal is the earliest type of grit removal system. It uses proportional weirs or rectangular control sections (such as Parshall flumes) to vary the depth of flow and keep the velocity of the flow stream at a constant 0.3 m/s (1 ft/sec). This design velocity will carry most organic particles through the chamber and will tend to re-suspend any settled organic particles but will permit the heavier grit to settle out. The horizontal flow grit removal is generally appropriate only for small facilities that are less than 1 mgd. It is not commonly used in recent WWTPs.	With effective flow control, the horizontal flow grit removal system can remove up to 95% of the 100-mesh particles at peak flow.	• Flexibility to alter performance is possible by adjusting the outlet flow control device. • Mechanically simple. • With effective flow control, removal of grit not requiring further classification is possible.	• Difficulty in maintaining a 0.3-m/s velocity over a wide range of flows. If effective flow control is not achieved, channels will remove significant quantities of organic material that require grit washing and classifying. • Requires large footprint. • Has little process control. • Submerged chains and bearings subject to excessive wear and need intensive maintenance. • Has relatively high headloss.

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
Aerated Grit Removal	In aerated grit chamber, air introduced along one side near the bottom causes a spiral roll velocity pattern perpendicular to the flow through the tank. The heavier particles with their correspondingly higher settling velocities drop to the bottom, while the roll suspends the lighter organic particles, which are eventually carried out of the tank. The non-flow-dependent rolling action induced by the air diffusers allows the aerated grit chamber to operate effectively with a wide range of flows. The heavier particles that settle on the bottom of the tank are moved by the spiral flow of the water across the tank bottom and then into a grit trough or hopper. Chain and bucket collectors, screw augers, clamshell buckets, or recessed impeller or air lift pumps remove collected grit from the trough or hopper. This is a well-established technology that has been used widely throughout the world.	The aerated grit chamber is designed to remove particles 65 mesh (0.2 mm) or larger. With proper rate of aeration, almost 100 percent removal will be obtained, and the grit will be well-washed.	• Good process control. • The same efficiency of grit removal is possible over wide flow range. • Minimal headloss. • Aerated grit tank can also be used for chemical addition, mixing, preaeration, and flocculation before of primary treatment. • Preaeration may alleviate septic conditions in incoming wastewater to improve performance of downstream treatment units.	• Difficult to maintain proper airflow (at constant air flow, performance varies with wastewater flow). • High operation and maintenance costs. • Power consumption is higher than other grit removal processes. • Relatively large area requirement. • Significant quantities of potentially harmful volatile organics and odors may be released from wastewater containing these constituents. • The proper operation of an aerated system is open to some dispute.
Conventional Primary Clarification	Conventional primary clarification is a settling process that is carried out in a relatively quiescent tank. The solids with a higher specific gravity than the liquid will tend to settle, and the solids with a lower specific gravity will tend to rise. Primary clarification is used to remove settleable solids from degritted sludge. BOD removal is achieved through removal of organic matter associated with the solids. Oil, grease, and other floatable materials are removed through scum-skimming mechanisms. The primary clarification system may be employed to reduce the load on an activated sludge system and must be used upstream of a fixed film system. The technology is established and commonly used in WWTPs throughout the world.	It is a widely used process and can typically achieve BOD removal efficiency of 20 to 30% and TSS removal efficiency of 40 to 60%.	• Modular nature of process makes it readily expandable. • Requires no chemical addition. • Insensitive to water chemistry. • Sludge produced is readily stabilized and biodegradable. • Inexpensive method for removing BOD.	• Requires larger footprint than primary processes that use chemical addition. • Achieves lower TSS and BOD removal compared to processes that use chemical addition. • Operation with deep sludge blankets can cause odor emissions.
Chemically Enhanced Primary Treatment	Chemically enhanced primary treatment utilizes the chemical coagulation of raw wastewater prior to sedimentation to promote the flocculation of finely divided solids into more readily settleable flocs. Thus, it increases the solids and organics removal efficiencies. Coagulants, such as ferric compounds and alum, are typically dosed upstream of the primary clarifiers. The dosage is determined from bench- or pilot-scale tests. The additional load removed in the enhanced primary clarification reduces the loads to the downstream biological reactor, allowing an increase in the capacity of these unit processes.	With chemical addition, the primary clarification can remove up to 85% of TSS and 60% of BOD_5.	• Greater removal efficiencies of TSS and BOD_5. • Higher treatment capacity by functioning at higher overflow rates. • Effective to remove phosphorus (phosphorus removal could be 70 to 90%). • Certain coagulants, such as ferric salt, react with the dissolved sulfide in the wastewater and is beneficial for odor control.	• Increased mass of primary sludge. • Produces solids that are often more difficult to thicken and dewater. • Increased operational cost and operator attention. • Requires chemical handling.
SECONDARY TREATMENT				
Conventional Activated Sludge, Plug Flow	The plug flow activated sludge aeration basin is a typically long, narrow, activated sludge basin that approaches "plug flow" characteristics where the influent and RAS enter at one end and flow to the other. The reactor has the length-to-width ratio of more than 10:1, and can be viewed as an infinite number of small, completely mixed basins in series. A "plug flow" system will contain concentration gradients of soluble constituents as the fluid moves through the basin. As a result, the aeration requirement is reduced in the process as the oxygen demand will decrease from the front end of the basin to the outlet. The SRT is typically 3 to 8 days. A solids separation stage is required after the activated sludge basin.	The removal efficiencies are the function of the sludge residence time. Typical BOD_5 removal efficiency is 85 to 95%.	• Resistant to filamentous growths. • Easy to achieve high effluent DO.	• Susceptible to shock loads.
Conventional Activated Sludge, Complete Mix	The complete mix activated sludge basin is one continuous stirred tank reactor (CSTR). Wastewater is distributed uniformly throughout, and a low concentration of biodegradable matter is maintained within. The operating characteristics of MLSS, respiration rate, and the soluble BOD5 are uniform throughout. The solids residence time (SRT) is typically 3 to 8 days (seldom exceeds 15 days). A solids separation of mixed liquor is required.	The removal efficiencies are the function of the sludge residence time. Typical BOD_5 removal efficiency is 85 to 95%.	• Ability to handle shock loads. • Control of DO in the reactor is simple.	• Stimulates filamentous growths.

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
Oxidation Ditch	The oxidation ditch consists of a ring- or oval-shaped channel and is equipped with mechanical aeration devices. Wastewater and mixed liquor are circulated around the channel by brushes, rotors, or other mechanical aeration devices and /or pumping equipment located at one or more points along the flow circuit. As mixed liquor passes the aerator, the DO concentration is sharply raised but then declines as the flow traverses the circuit. Oxidation ditches typically operate in an extended aeration mode with long HRT (24 hours) and SRT (20 to 30 days). Nitrification and denitrification are also possible in the system. The solids separation of mixed liquor is provided in separate or intrachannel clarifiers and mixed liquor returned to the ditch. The oxidation ditch is widely used in small communities or where large area of land is available.	Oxidation ditch can produce good quality effluent, with possible nitrogen removal. BOD5 removal is 75 to 95%, nitrogen removal can be up to 90%, and phosphorus removal can be up to 50%.	• Operation is simple • Reliable performance over a wide range of flow, load and water characteristics • Overall cost is effective • Low sludge production, and the sludge is very stabilized	• Requires large space. • Could be the large odor source due to the large surface and possible anoxic and anaerobic conditions.
Extended Aeration	An extended aeration activated sludge system is similar to the conventional plug-flow process except that it utilizes a long SRT, typically 20 to 30 days, to assist in the stabilization of resulting biosolids along with the soluble organic matter. The biomass in the extended aeration basin is maintained in the endogenous respiration phase, which will reduce quantities of solids to be disposed of and provide greater process stability. Under this condition, low organic loading, high MLSS, and more oxygen are required. This unit process is typically used at small communities, package plants, and where nitrified element is required.	Process is flexible. Nitrification and denitrification are possible. Typical BOD_5 removal efficiency is 75 to 95%.	• Effective over a wide range of flow and loads • Low sludge production, and the sludge is very stabilized	• Requires large space. • Requires more energy for aeration. • Performance is likely affected by cold temperature if the basins are open. • Has problems of continuous loss of pinpoint floc and the tendency to lose MLSS following short-term periods of low influent loading intensity.
Sequencing Batch Reactor (SBR)	A sequencing batch reactor is a fill-and-draw, complete mix activated sludge treatment system. The aeration, biological activities, and sedimentation involved in the SBR are identical to the conventional activated sludge system, except all processes are carried out sequentially in the same tank in SBR. Discrete cycles are used during prescribed, programmable time intervals, and MLSS remains in the reactor during all cycles. A cycle includes the filling of the tank, a reaction period for the biological treatment, a settling period where biomass settles, a draw period for the removal of treated effluent, and an idle period where the reactor is ready to receive influent. SBR is typically used in small communities where land is limited.	With the appropriate control, the treatment with SBR is comparable to the treatment level of conventional activated sludge. Typical BOD_5 removal efficiency is 85 to 95%.	• Process is flexible and can remove nitrogen and phosphorus. • High tolerance for peak flows and shock loadings. • Eliminates a secondary clarifier and RAS pumping. • Minimizes MLSS washout during peak flow events.	• Less process control.
Membrane Bioreactor (MBR)	Membrane Bioreactors (MBR) are a combination of suspended growth activated sludge with immersed membrane equipment, with the latter performing the critical solids/liquid separation function that is traditionally accomplished using secondary clarifiers. The membrane-type filtration units are either placed directly in an activated sludge basin, or in a separate tank where the mixed liquor from the activated sludge basin is filtered. This process requires the fine screening and adequate grit removal upstream to protect the membrane. It is able to operate with high mixed liquor suspended solids levels (1 to 1.5%), due to the efficiency of the membrane units. The mixed liquor around the membrane units is highly aerated, and high in dissolved oxygen. The primary drivers for MBRs to date have been for facilities requiring water quality for reuse, and/or facilities with significant land area restrictions.	Excellent effluent quality can be obtained using MBR Effluent TSS is below 1 mg/L, and effluent Total Phosphorus is below 0.2 mg/L with chemical addition.	• Produces superb quality effluent. • Sludge production is reduced. • Requires a compact footprint. • Processes are easily automated to reduce the operation. • A barrier against pathogens, such as the chlorine-resistant organisms, Cryptosporidium and Giardia, is provided.	• Requires more energy for pumping and aeration than conventional activated sludge process. • The overall cost is high. • Membrane design is proprietary. • Susceptible to the wide range of flow variation.
Rotating Biological Contactor (RBC)	A rotating biological contactor (RBC) is an attached growth bioreactor containing circular-shaped corrugated plastic media mounted on a horizontal shaft. The media is partially submerged (typically 40%) in the wastewater and rotates at a speed of 1 to 2 rpm by either a mechanical or compressed air drive. Microorganisms grow on the media and provide for the removal of soluble organic matter and conversion of ammonia to nitrate. The rotation of the RBC provides for the media to be alternately exposed to wastewater and the atmosphere providing the required oxygen transfer. The rotation of RBC is also the mechanism for removing excess solids from the media by shearing forces it creates and maintaining the sloughed solids in suspension so they can be carried from the unit to a clarifier. RBCs are used for the treatment of both municipal and industrial wastewater, typically at smaller installations.	RBCs effluent BOD_5 characteristics are comparable to well-operated activated sludge processes. Where nitrification is required, RBCs can be used to provide combined treatment for BOD_5 and ammonia nitrogen or to provide separate nitrification of secondary effluent. The typical BOD_5 removal is 80 to 85%, and effluent ammonia-nitrogen is less than 2 mg/L.	• Requires less land area than activated sludge system. • Reliable performance. • Ability to handle shock loads. • Low energy cost.	• Excessive organic loading or insufficient aeration may cause the odor problem. • Organic overloading, insufficient rotational speed may cause excessive biomass buildup on media, resulting in structural damage to shafts or media, or uneven shaft rotation.

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
Trickling Filter (TF)	A tricking filter is an aerobic attached growth bioreactor in the shape of a tower. The media utilized for the biofilm growth is either rock, redwood, or various forms of plastic media. The primary objective of a TF is the removal of soluble organic matter and the oxidation of ammonia to nitrate. The wastewater is introduced at the top of the tower, and uniformly applied to the media through rotating distribution mechanisms. The surface of the media quickly becomes coated with bacteria. The wastewater travels through the air-filled media with the retention time of 8 to 20 minutes, and into an underdrain system. As the wastewater travels through the system, the attached biofilm provides the required treatment. To achieve aerobic condition, oxygen is supplied from the natural or forced circulation of air through interstices in the filter media. Oxygen transfer may be direct or by diffusion through the liquid films. A TF is typically used in small to medium sized systems requiring minimal operating expense.	TFs typically have a lower performance level than the suspended growth technologies and are used in roughing treatment or applications with effluent limits of 30 to 45 mg/L BOD_5 and TSS. However, with the proper design and operation, TFs can also achieve the performance level of suspended growth system. Typical BOD5 removal efficiency is 65 to 85%.	• Requires less land area than activated sludge system. • Low energy cost. • Ability to perform nitrification and produce low effluent nitrogen.	• Often allows the existence of nuisance organisms such as flies and snails. • Excessive organic loading or insufficient ventilation may cause the odor problem
DISINFECTION TREATMENT				
Ultraviolet (UV) Radiation Open System Disinfection	The purpose of disinfection is inactivation of enteric bacteria, and viruses that pass through secondary treatment systems to protect public health. UV disinfection is a physical disinfection method, which utilizes the UV light at a wavelength of 254 nanometers (nm) to penetrate the cell wall and cause photochemical damage to the DNA and RNA of the cells. While certain chemical compounds may be altered by UV exposure, the energy levels used are generally too low to significantly alter existing water quality constituents. In the open channel UV system, lamp banks are arranged in series and oriented either horizontal and parallel-to-flow, or vertical and perpendicular-to-flow. Certain flow control devices have to be used to control the water level along the UV channel to keep the lamps submerged all the time. The majority of existing low-pressure low-intensity UV installations use open channel configuration. Many open-channel low-pressure high-intensity UV systems are popular in wastewater treatment. The enclosed chamber low-pressure high-intensity UV systems have been used for water treatment.	UV disinfection is very effective for both secondary effluent discharge disinfection and the reclaimed water disinfection.	• No chemical needed, so eliminates the heath and safety issues related to the chlorine use. • Requires small space due to the extremely short contact time. • Simplicity of operation. • No disinfection byproducts.	• High capital cost and possibly high operation and maintenance costs compared to chemical disinfection. • Susceptible to the process upset and change of water quality. • Does not provide a residual similar to chlorine.
Ultraviolet (UV) Radiation Closed System Disinfection	UV disinfection systems are in three different designs: open channel, closed chamber, and in-line tube. The theory of disinfection is the same for all configurations. Closed chamber and tube designs are not as common as the open channel UV systems in wastewater treatment. The closed low pressure low intensity systems are rarely considered in the wastewater disinfection design. The closed low pressure high-intensity systems are usually used in water treatment. The medium pressure high intensity UV systems are closed chamber or in-line designs. In the closed systems, the lamps are housed in the enclosed chamber or tube and fully submerged at all times. The whole reactor is operated under pressure.	UV disinfection is very effective for both secondary effluent discharge disinfection and the reclaimed water disinfection.	• No chemical needed, so eliminates the heath and safety issues related to the chlorine use. • Requires small space due to the extremely short contact time. • Simplicity of operation. • No disinfection byproducts.	• High capital cost and possibly high operation and maintenance costs compared to chemical disinfection. • Susceptible to the process upset and change of water quality. • Does not provide a residual similar to chlorine.
Chlorination and Dechlorination Gas System	Chlorination is the established disinfection technique for the disinfection of wastewater. Systems can be designed to utilize chlorine gas or sodium hypochlorite solution. Chlorine is a strong oxidant that is effective against a broad range of bacteria and some viruses. Chlorine is generally stored onsite in liquid form in 1-ton containers, tank railcars, or dedicated storage vessels. Gas may be withdrawn directly from the storage container or liquid can be withdrawn and evaporated to obtain high quantities of gas. When dissolved into the liquid stream, hydrolysis and ionization take place to form hypochlorous acid and hypochlorite ions, which are the effective disinfectants. Sulfur dioxide gas is often used for dechlorination because the equipment involved and process control is very similar to that of chlorine gas. Both chemicals are highly hazardous chemicals, therefore, the systems are regulated and applications avoided in current plant designs.	Chlorine gas has a well-established history of performance for wastewater disinfection. It has good disinfection efficiency. Its toxicity prompted the need of modifying and abandoning the existing systems.	• Ability to handle process upset. • Low overall cost. • Can provide chlorine residual to control bio-growth in the transmission system.	• Hazardous chemical transportation, storage and handling bring health and safety concerns. • Subject to extensive regulatory requirements. • May produce the disinfection byproducts that are harmful to the public health.
Chlorination and Dechlorination Liquid System	Sodium hypochlorite is the widely used liquid chemical in the chlorination system. As a chlorine-based product, hypochlorite functions the same as dissolved chlorine gas for disinfection. As a liquid, the chemical is stored in tanks and pumped to the application point, more like other common wastewater treatment chemicals. The hypochlorite solution is corrosive but not toxic, therefore, it does not require the emergency scrubber system or many strict regulations. Sodium bisulfite solution rather than sulfur dioxide is typically used for dechlorination when using hypochlorite for disinfection. Sodium bisulfite's storage, handling, use and equipment requirements are similar to those of hypochlorite. The liquid chlorination and dechlorination system using hypochlorite and sodium bisulfite have seen greater use recently due to the public and employee safety concerns with chlorine gas.	Hypochlorite is a strong oxidant as chlorine and has same disinfection efficiency as chlorine. The handling of the solution is easier and simpler than chlorine gas.	• Minimizes the public health and safety concerns on the hazardous chemicals. • Ability to handle process upset. • Low capital cost. • Can provide chlorine residual to control bio-growth in the transmission system.	• The sodium hypochlorite solution is more expensive and more corrosive than chlorine gas.

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
SOLIDS HANDLING (THICKENING AND DEWATERING)				
Gravity Thickening	Gravity thickening is accomplished in a tank similar in design to a conventional sedimentation tank. Normally, a circular tank is used. Dilute sludge is fed to a center-feed well. The feed sludge is allowed to settle and compact, and the thickened sludge is withdrawn from the bottom of the tank. Conventional sludge-collecting mechanisms with deep trusses or vertical pickets are used to stir the sludge gently, thereby opening up channels for water to escape and promoting densification. Gravity thickening is most effective on primary sludge. The presence of biological solids, particularly WAS, typically results in lower capture rates and lower underflow solid concentrations. Provisions for dilution water and occasional chlorine addition are frequently included to improve process performance.	The performance of gravity thickener varies with the type of sludge. Solids concentration of the thickened primary sludge by the gravity thickener is 5 to 10%. Solids concentration of the thickened WAS by the gravity thickener is to3%.	• Simple operation, requiring little operator attention. • Provides some equalization and storage of solids in addition to concentration. • Conditioning chemicals are not typically required. • Minimal power consumption.	• Has potential odor problem. • Thickened solids concentration limited for WAS. • High space requirement for WAS.
Gravity Belt Thickening (GBT)	Gravity belt thickening (GBT) is a solids-liquid separation process that involves the concentration of sludge as its free water drains through a porous horizontal belt. The process relies on coagulation and flocculation of solids in a dilute slurry and drainage of free water from the slurry through a moving fabric-mesh belt. The equipment consists of a gravity belt that moves over rollers driven by a variable-speed drive unit. The sludge is conditioned with polymer and fed into a feed/distribution box at one end. The box is used to distribute the sludge evenly across the width of the moving belt as the water drains through and the sludge is carried toward the discharge end of the thickener. It is essentially a modification of the upper gravity drainage zone of the belt filter press. GBT has been used on a variety of solids having initial solids concentrations as low as 0.4 percent up to 8.0 percent. GBTs are particularly suitable for the thickening of WAS prior to digestion.	The process is polymer-dependent and can achieve 95% or greater solids capture.	• Relatively low space requirements. • Low power usage. • Moderate capital costs compared to other thickening processes. • Provides flexible control capability for process performance. • Good performance on a variety of solids.	• Generally requires moderate dosages of polymer. • May produce odors and may require enclosure and odor control. • May have fairly large variations in thickened solids concentration with fluctuations in characteristics of feed solids.
Centrifuge Thickening	In a centrifuge system, sludge is fed at a constant flowrate into the rotating bowl, where it separates into a dense sludge containing the solids and a dilute stream called centrate. Separation results from the centrifugal force-driven migration of the SS particles through the suspended liquid toward or away from the axis of rotation of the centrifuge, depending on the density difference between the liquid and solid phases. The centrate contains fine, low-density solids and is returned to the wastewater treatment system. The dense sludge is discharged from the bowl by a screw feeder into a hopper or onto a conveyor belt. Centrifuges have been used to thicken and dewater a variety of different biosolids. Their performance varies depending on the solids concentration coming into the centrifuge and the amount of polymer used. Centrifuges have historically required a substantial level of maintenance. Frequent repairs and considerable downtime have been common. However, with recent advances, modern centrifuges are much more reliable than in the past. Centrifuges also may require a significant amount of flocculant aid. Because centrifuges are totally enclosed, odors are usually minimal. Centrifuge thickening is usually used at larger facilities where space is limited and skilled operators are available, or for sludge that is difficult to thicken by more conventional means.	High solids capture (~95%) providing polymer is used.	• Contained process minimizes housekeeping and odor considerations. • Continuous operation provides flexible control capability for process performance. • Moderate or high thickened solids concentration. • Relatively small area requirements. • Low operator attention requirements. • May be used without polymer for thickening.	• High capital cost. • Requires skilled maintenance personnel and a fairly high level of maintenance. • Relatively high power requirements. • Moderate to high polymer requirements.
Dissolved Air Flotation Thickening (DAF)	Dissolved air flotation (DAF) thickening is used to concentrate biosolids that have more tendencies to float than to settle. DAF thickening is used primarily for WAS but also has been applied to aerobically digested solids. In the DAF process, air is added to incoming flow at a pressure in excess of atmospheric pressure. High pressure causes oxygen to dissolve into the flow stream. When the pressure is reduced as the flow enters the process tank, excess air is released from the solution as very small bubbles. The bubbles adhere to the suspended particles or become enmeshed in the solids matrix. The density of the solids-air aggregate is less than that of water causing it to float to the surface. Water drains from the float, increasing solids concentration. Float is continuously removed from the surface of the thickener by skimmers. Bottom collectors are also used to remove any settled solids or grit that may accumulate. To improve solids capture efficiency and reduce the size of the units, most DAF facilities use a flocculant aid. With respect to operation and maintenance, some attention is required to maintain chemical feed, recycle, and pressurization pumps, skimmers, and bottom solids removal equipment. Because of air entrainment in the float, there can also be difficulties in pumping the thickened biosolids if the correct pumps are not selected.	The concentration of solids produced by DAF thickening of waste activated solids will vary but generally can be expected to be in the range of 3 to 5% solids by weight. Removal efficiency can be 95% or greater when flocculating chemicals are used.	• Provides better solids-liquid separation (capture efficiency) than gravity thickening. • For WAS, yields higher solids concentration than gravity thickening. • Offers excellent solids equalization control. • Solids are maintained in aerobic condition, reducing potential odors. • Can remove grit from solids processing system. • Removes grease. • Relatively high solids loading rates are possible.	• Operating cost for DAF are higher than for gravity thickening, especially for coagulants and power. • Has little solids storage capacity. • Thickened solids concentration is less than in a centrifuge or gravity belt thickener. • Requires more land than a centrifuge or gravity belt thickener. • Optimal performance requires expensive polymer addition, although many systems operate very well without polymer (size must double however).

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
Belt Filter Press Dewatering (BFP)	Belt filter presses (BFPs) are commonly used for dewatering biosolids. In any BFP, there are four basic stages: chemical conditioning of the feed slurry, gravity drainage to a nonfluid consistency, preparing the solids for further shearing in the wedge section, and compaction and shearing of the biosolids. The success of the process depends on the type and amount of polymer used and adequate mixing. In the gravity drainage stage, the conditioned solids are discharged onto a moving belt. Typically, 1 to 2 minutes are required and solids are reduced in volume by about 50 percent to a solids concentration of about 6 to 10 percent. In the final stage, the solids are subjected to an increase in pressure, usually by the compression and shearing of the solids between the carrying belt and a cover belt. A considerable amount of washwater is required to keep the belts clean. Typically, secondary effluent or potable water is used for washwater.	BFP performance is sensitive to incoming feed sludge characteristics. It can dewater the anaerobically digested primary sludge to 25 to 35% solids, the anaerobically digested primary sludge and WAS to 20 to 25% solids, and the anaerobically digested WAS to 12 to 20% solids.	• Relatively low capital cost. • Relatively low power consumption. • High solids capture with minimum polymer requirements. • Continuous feed. • Moderate cake solids concentration. • Moderate throughput capabilities versus space requirement. • Open design provides good visual control capability for process performance.	• Relatively high housekeeping required – containment is difficult. • Moderate operator attention requirements; larger installations may require continuous operator attention. • Odor potential due to filtrate splashing and lack of containment. • Downtime for replacement of parts. • Sensitive to incoming feed characteristics.
Centrifuge Dewatering	Centrifuges have been used to thicken a wide range of solids. Their operation is based on the application of centrifugal force to a liquid solids stream, which accelerates the separation of the liquid and solid fractions based on specific gravity differences. The process involves both clarification of the centrate stream and compaction of the solids. Solid bowl conveyor-type centrifuges are typically used to thicken and dewater municipal solids. Recently, technical advancements have developed what is referred to in the industry as a “high solids” centrifuge. These machines use a squeezing action and can produce biosolids cakes in the range of 24 to 30% dry solids. Although greater cake solids contents can be produced from the high solids centrifuges, the penalty is 20% higher horsepower demands and up to double the polymer consumption. In addition, the higher polymer dose is believed to contribute to significant cake odors with some installations.	Depending on the type of sludge, solids concentration in the cake from the centrifuge dewatering generally varies from 10 to 35%.	• Contained process minimizes housekeeping and odor considerations. • Continuous operation provides flexible control capability for process performance. • Produces relatively dray sludge cake. • Relatively small area requirements.	• Requires skilled maintenance personnel and a fairly high level of maintenance. • Moderately high suspended-solids content in centrate. • Relatively high power requirements. • Moderate to high polymer requirements.
SOLIDS TREATMENT				
Aerobic Digestion	Aerobic digestion is the biochemical oxidative stabilization of wastewater biosolids in open or closed tanks that are aerated. With the addition of oxygen and biological activity, organic matter is converted into cellular material and then, through endogenous respiration, to digested biosolids with the release of carbon dioxide and water. Because of its simplicity of operation and because it is less susceptible to upsets than anaerobic digestion, it became quite popular in the 1950s and 1960s. However, due to improvements in anaerobic digestion and high energy costs, today aerobic digestion is mostly used in small treatment facilities. Aerobic digestion can be either performed in a semi-batch or in a continuous flow mode of operation. The continuous mode is probably the most common and operates similarly to an activated solids process. Aerobically digested solids overflow to a solids-liquid separation process where the solids are thickened. A portion of the thickened solids is recycled to the aerobic digester and the remaining solids are removed for further processing. Aeration may be provided by mechanical surface aerators or by bubble diffusers at the bottom of the tank. Generally, the power requirement of aeration equipment is dictated by the mixing required to keep the solids in suspension rather than by the energy required to provide sufficient oxygen. Aerobically digested biosolids can be difficult to dewater mechanically. In addition, the dewatering properties of aerobically digested biosolids deteriorate with increasing solids age.	The performance of aerobic digestion depends on the temperature, oxygen transfer, and tank design. It can typically achieve 35 – 50% volatile solids reduction. Aerobic digestion is classified as a Process to Significantly Reduce Pathogens (PSRP) for pathogen reduction, so it can produce Class B pathogen levels.	• Relatively simple to operate. • Requires a small capital expenditure compared with anaerobic digestion. • Does not generate significant odors. • Reduces pathogenic organisms to Class B levels. • Reduces the quantity of grease and hexane solubles. • Reduces the respiration rate of solids.	• High power requirements and operating costs. • Highly variable design parameters. • Variable performance based on temperature, location, and tank design. • Thickened biosolids have poor mechanical dewatering properties. • Large land area is required. • Useable methane is not produced.

TABLE 5-1
Wastewater Treatment Process Components

Unit Process	Process Description	Process Performance	Advantages	Disadvantages
Conventional Anaerobic Digestion	Conventional anaerobic digestion is a complex biochemical process in which several groups of anaerobic and facultative organisms simultaneously assimilate and break down organic matter in the absence of oxygen. Mesophilic anaerobic digestion involves operating temperatures ranging from 85 degrees F to 100 degrees F (29 degrees C to 38 degrees C), which provides the optimal conditions for methane forming bacteria. The process is simple to operate and has proven reliability. The organic matter is converted into methane, carbon dioxide, water, and partially degraded intermediate organics. The digested biosolids are relatively stable compared to raw solids. Methane gas generated in the process is typically burned, and the heat produced by combustion is used to maintain the optimum temperature in the digester. The process is highly sensitive to variance of pH, temperature, and toxic materials, which will impact the rate of hydrolysis and methane formation. Digesters require a fairly high level of maintenance, which primarily includes periodic cleaning to remove build-up of inert solids, maintenance of equipment for collecting and using or wasting digester gas, and maintenance of boilers or a cogeneration system for heating the digesters. It has been widely used in many large WWTPs.	Mesophilic anaerobic digestion can typically achieve 40 to 60% volatile solids reduction. It is classified by the EPA as a PSRP and has been demonstrated to consistently produce Class B pathogen levels. Vector attraction reduction is also achieved by a minimum of 38 percent volatile solids reduction in the digestion process.	• Production of a valuable end-product, methane gas, that can be used to produce heat and electricity for the digestion process and other uses. • Relatively low operating costs. • The digested biosolids meet Class B pathogen levels and are suitable for reuse on land as a soil conditioner. • The mass of solids is reduced by volatile solids destruction. • No supernatant (single-stage). • Commonly used and well understood process.	• Methane-producing bacteria are slow growing and sensitive to process upsets. • Digesters have high capital cost. • Relatively complex operation. • Potential risk from methane gas leak. • Dewaterability is less than raw solids. • Supernatant (two-stage) contains high concentrations of BOD, COD, SS, phosphorus and ammonia, therefore is difficult to treat. • Requires high level of maintenance.
Lime Stabilization	Lime stabilization of biosolids has been a practical stabilization method for many years. The basic approach is to elevate the pH of the biosolids by the addition of one of the several materials containing lime, either as calcium oxide (CaO - quicklime) or calcium hydroxide ($Ca[OH]_2$ - hydrated lime). Lime stabilization can be used either before or after dewatering or as part of the dewatering process. Lime dose requirements range from 10 to 50 percent of the dry solids weight, depending on a number of factors. Adding calcium oxide (CaO) or quicklime generates high pH values. It also generates high temperatures exceeding 131 degrees F (55 degrees C) when added to dewatered biosolids. The high temperatures help destroy pathogens in the biosolids. However, high temperatures also volatilize ammonia, amines, and other odorous compounds from the biosolids. Therefore, lime stabilization systems typically incorporate extensive odor control systems. The objective of lime stabilization is to maintain the pH at a high enough level for a sufficient period of time to inactivate the microorganism population in the solids and control regrowth. Lime stabilization also prevents odors from re-developing. The EPA regulations dictate that the initial lime addition must maintain a pH of 12 or more for at least 2 hours to meet Class B pathogen levels. To meet the vector attraction reduction requirements set by the EPA, the above requirements for maintaining a pH of 12 for 2 hours must be satisfied as well as maintaining the pH above 11.5 for the next 22 hours without the addition of more lime. To meet Class A stablilization requirements, the elevated pH is combined with elevated temperatures to 70 degrees C for 30 minutes, or other USEPA approved time-temperature processes.	With appropriate control of pH, temperature and contact time, lime stabilization can produce Class B or even Class A biosolids with vector-attraction reduction.	• Simplicity of operation. • Low capital cost. • Organic nitrogen content of biosolids is not significantly reduced. • High pH and temperature reduce pathogens and the odor potential of the biosolids product. • Addition of lime may be seen as a benefit if biosolids are land applied to acidic soils.	• High operating cost due to chemical consumption. • The dry mass and volume of the biosolids may be increased considerably. • Difficult to handle chemicals. • Volatile solids are not oxidized; therefore, there is a risk of odors redeveloping. • Ammonia is released at high pH levels requiring odor control. • The release of ammonia reduces the biosolids nitrogen levels significantly. • Biosolids products with a high pH may have restricted uses. • Unlike anaerobic digestion, useable methane is not produced.

hydraulic capacity will be 3.1 mgd. The treatment capacity will be confirmed prior to design with the forthcoming flow monitoring data.

The treatment process design criteria are based on the historical influent flow and load data, along with assumed values for various parameters not typically measured at the Blaine WWTP. From the historical flow and load data, the resulting wastewater parameter concentration is determined. From this concentration, with the design flow rates, the associated average annual and maximum month loads were calculated. Assumed concentration values were used from industry standard design manuals, cited on Table 5-3. Table 5-3 includes the treatment design criteria flow and loadings for the proposed Lighthouse Point WRF.

TABLE 5-3
Water Reclamation Facility Design Criteria – Influent Flow and Loadings

Influent Parameter	Average Annual Load (1.0-mgd) lbs/d	Maximum Month Load (1.55-mgd), lbs/d
BOD_5 (1)	1,918 (230 mg/L)	2,120 (164 mg/L)
TSS (1)	1,768 (212 mg/L)	2,030(157 mg/L)
VSS (2)	1,326 (159 mg/L)	1,525 (118 mg/L)
TKN (3)	359 (43 mg/L)	556 (43 mg/L)
NH_3 (3)	250 (30 mg/L)	388 (30 mg/L)
Alkalinity (as $CaCO_3$) (2)	1,668 (200 mg/L)	2,585 (200 mg/L)
Temperature (°C) (4)	13	13

1. Based on Annual Average values, 1998 – 2002; Maximum Month, 1998 – 2002, see Table 4-3.
2. VSS assumed to be 75 percent of TSS, Alkalinity concentrations for strong and medium wastewater (Metcalf & Eddy, 1991).
3. Limited sampling at the Blaine WTTP for NH_3 and TKN. Assumed TKN and NH_3 values based on typical domestic wastewater values (Metcalf & Eddy, 1991).
4. Temperature is assumed.

As noted, the values within Table 5-3 are based on historical data. The historical data set for NH_3 is relatively small, and may not provide a typical representation of the influent wastewater. To size the treatment processes in this facility plan evaluation, typical domestic wastewater concentrations for TKN and NH_3 will be used for the average annual and maximum month flow to determine the design loadings for these parameters.

The effluent water quality requirements of the NPDES permit for the existing outfall to the Puget Sound and the plant effluent data form the effluent design criteria to be used for the proposed Lighthouse Point WRF. Table 5-4 summarizes the NPDES permit requirements.

TABLE 5-4
Current NPDES Permit Effluent Limitations

Parameter	Average Monthly	Average Weekly [1]
Biochemical Oxygen Demand, 5 day (BOD_5)	30 mg/L, 200 lbs/day	45 mg/L, 300 lbs/day
Total Suspended Solids (TSS)	30 mg/L, 200 lbs/day	45 mg/L, 300 lbs/day
Fecal Coliform Bacteria	200/100 mL	400/100 mL
pH	Daily minimum is equal to or greater that 6, and the daily maximum is less than or equal to 9	
Total Residual Chlorine (if Water Quality Based) (1)	0.35 mg/L, 2.3 lbs/day	0.9 mg/L, 6.0 lbs/day

[1] Total Residual Chlorine is based on an Average Monthly and Maximum Daily value.

To continually meet the required NPDES permit limitations on a monthly and weekly basis, the WRF will be sized to provide effluent wastewater concentrations below those required within the permit.

Design Criteria

The design criteria for the treatment configuration alternatives is presented on Table 5-5. These criteria are used to size the unit processes included within the alternative evaluation.

Treatment Alternative Descriptions

For a definition and evaluation of the treatment alternatives, refer to the Process Components Evaluation. A description and summary of the treatment alternatives follows:

Alternative 1 – Conventional Activated Sludge with UV Disinfection

Alternative 1 consists of the following unit processes:

- Preliminary treatment using coarse screening and grit removal.
- Secondary treatment using conventional activated sludge technology with anoxic selection.
- Disinfection using UV irradiation.
- Solids handling consisting of storage and thickening.

Alternative 2 – Conventional Activated Sludge with Liquid Chlorine Disinfection and Dechlorination

Alternative 2 consists of the following unit processes:

- Preliminary treatment using coarse screening and grit removal.
- Secondary treatment using conventional activated sludge technology with anoxic selection.
- Disinfection using liquid chlorine disinfection with dechlorination system.
- Solids handling consisting of storage and thickening.

Alternative 3 – Sequencing Batch Reactor with UV Disinfection

Alternative 3 consists of the following unit processes:

- Preliminary treatment using coarse screening and grit removal.
- Secondary treatment using SBR activated sludge technology.
- Disinfection using UV irradiation.
- Solids handling consisting of storage and thickening.

Alternative 4 – Sequencing Batch Reactor with Liquid Chlorine Disinfection and Dechlorination

Alternative 4 consists of the following unit processes:

- Preliminary treatment using coarse screening and grit removal.
- Secondary treatment using SBR activated sludge technology.
- Disinfection using liquid chlorine disinfection with dechlorination system.
- Solids handling consisting of storage and thickening.

Alternative 5 – Extended Aeration Activated Sludge with UV Disinfection

Alternative 5 consists of the following unit processes:

- Preliminary treatment using coarse screening and grit removal.
- Secondary treatment using extended aeration activated sludge technology.
- Disinfection using UV irradiation.
- Solids handling consisting of storage and thickening.

Alternative 6 – Extended Aeration Activated Sludge with Liquid Chlorine Disinfection and Dechlorination

Alternative 6 consists of the following unit processes:

- Preliminary treatment using coarse screening and grit removal.
- Secondary treatment using extended aeration activated sludge technology.
- Disinfection using liquid chlorine disinfection with dechlorination system.
- Solids handling consisting of storage and thickening.

Alternative 7 – Membrane Bioreactor with UV Disinfection

Alternative 7 consists of the following unit processes:

- Preliminary treatment using fine screening and grit removal.
- Secondary treatment using membrane bioreactor technology.
- Disinfection using UV irradiation.
- Solids handling consisting of storage, thickening, and dewatering.
- Solids treatment including aerobic digestion for sludge stabilization.

Alternative 7A – Membrane Bioreactor with UV Disinfection

Alternative 7A consists of the following unit processes:

- Preliminary treatment using fine screening and grit removal.
- Secondary treatment using membrane bioreactor technology.
- Disinfection using UV irradiation.
- Solids handling consisting of storage and thickening.

Alternative 8 – Membrane Bioreactor with Liquid Chlorine Disinfection and Dechlorination

Alternative 8 consists of the following unit processes:

- Preliminary treatment using fine screening and grit removal.
- Secondary treatment using MBR technology.
- Disinfection using liquid chlorine disinfection and dechlorination.
- Solids handling consisting of storage and thickening.

Alternative 9 – Fixed-Film Secondary Treatment and UV Disinfection

Alternative 9 consists of the following unit processes:

- Preliminary treatment using fine screening and grit removal.
- Secondary treatment using fixed-film secondary treatment technology.
- Disinfection using UV irradiation.
- Solids handling consisting of storage and thickening.

Alternative 10 – Fixed-Film Secondary Treatment and Liquid Chlorine Disinfection with Dechlorination

Alternative 10 consists of the following unit processes:

- Preliminary treatment using fine screening and grit removal.
- Secondary treatment using fixed-film technology.
- Disinfection using liquid chlorine and dechlorination.
- Solids handling consisting of storage and thickening.

Alternative Evaluation Results

The preliminary design criteria and sizing requirements are used to develop and evaluate the proposed treatment alternatives. The treatment process configurations are established using the process model developed by CH2M HILL (Pro2D). Pro2D is a steady-state refined stoichiometric process tool that is integrally linked to other kinetic models. The procedures, calculations, and algorithms used within Pro2D are consistent with those recommended by the International Water Association (IWA). The process model results are supplemented with sizing information from equipment manufacturers as required.

The results of the evaluation of the treatment process configurations for the proposed Lighthouse Point WRF are presented on Table 5-6.

5.2.3 Treatment Requirements Summary

The values listed within the results of the process evaluation provide the information required for the monetary and nonmonetary evaluation presented in Chapter 6. The treatment configuration to be utilized for the proposed Lighthouse Point WRF will need to meet the effluent goals with the given capacity requirements, and accommodate the aesthetic and area requirements allowed in the selected WRF location. The limited area available will preclude some treatment configurations from being the recommended alternative. The effluent goals for the majority of alternatives are set to achieve the existing NPDES permit limitations, but as noted in the General Sewer Plan, a local CWAC meeting recommended the use of a treatment process able to provide a high-quality effluent. Each alternative presented will be evaluated on these and other criteria. The cost opinions and

TABLE 5-5
Lighthouse Point WRF – Treatment Configuration Alternative Design Criteria

Parameters	Units	Design Criteria Values										
		Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**	**Alternative 6**	**Alternative 7**	**Alternative 7A**	**Alternative 8**	**Alternative 9**	**Alternative 10**
Preliminary Treatment												
Screening	mgd											
Coarse Screen	mgd	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)					
Fine Screen	mgd							3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)
Grit Removal	mgd	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)	3.1 (1 unit off-line)
Secondary Treatment - CAS												
MLSS	mg/L	1,500 to 3,500	1,500 to 3,500									
SRT	days	8 to 10	8 to 10									
RAS Rate	--	0.5 to 0.75 Q	0.5 to 0.75 Q									
MLR Rate	--	1 to 5 Q	1 to 5 Q									
SVI	--	150	150									
Peak Clarifier SOR	gpd/sf	1,200	1,200									
Secondary Treatment - SBR												
MLSS (at low water level)				3,500 to 6,000	3,500 to 6,000							
Oxic SRT				8 to 15	8 to 15							
HRT (at low water level)				18	18							
Secondary Treatment - Extended Aeration												
MLSS	mg/L					1,500 to 3,500	1,500 to 3,500					
SRT	days					8 to 10	8 to 10					
RAS Rate	--					0.5 to 0.75 Q	0.5 to 0.75 Q					
SVI	--					150	150					
Peak Clarifier SOR	gpd/sf					1,200	1,200					
Secondary Treatment - MBR												
MLSS	mg/L							8,000 to 12,000	8,000 to 12,000	8,000 to 12,000		
SRT	days							8 to 25	8 to 25	8 to 25		
MLR Rate	--							4 Q	4 Q	4 Q		
Design Flux Rate @ 10.5 C	gfd							12 to 14	12 to 14	12 to 14		
Secondary Treatment - RBC												
First Stage SOL	lbs BOD/1,000 sf										≤ 5	≤ 5
Total Stage SOL	lbs BOD/1,000 sf										≤ 2	≤ 2

TABLE 5-5
Lighthouse Point WRF – Treatment Configuration Alternative Design Criteria

Parameters	Units	Design Criteria Values										
		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 7A	Alternative 8	Alternative 9	Alternative 10
Peak Clarifier SOR	gpd/sf										≤ 1,100 (Peak Hour) ≤ 700 (Max Month)	≤ 1,100 (Peak Hour) ≤ 700 (Max Month)
Disinfection												
Disinfection - UV Irradiation												
	mgd	3.1 (1 unit off-line)		3.1 (1 unit off-line)		3.1 (1 unit off-line)		3.1 (1 unit off-line)	3.1 (1 unit off-line)		3.1 (1 unit off-line)	
Disinfection - Chlorination/Dechlorination												
Chlorine Contact Time	min.		20 (Peak Flow)		20 (Peak Flow)		20 (Peak Flow)			20 (Peak Flow)		20 (Peak Flow)
Chlorine Contact Time	min.		60 (Avg Flow)		60 (Avg Flow)		60 (Avg Flow)			60 (Avg Flow)		60 (Avg Flow)
Design Dosage	mg/L		2 – 8		2 – 8		2 – 8			2 – 8		2 – 8
Solids Handling												
Thickening												
Solids Capture	%	95	95	95	95	95	95	95	95	95	95	95
Thickened Sludge Concentration	mg/L	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Operation - Daily	hrs/day	8	8	8	8	8	8	8	8	8	8	8
Operation - Weekly	days/week	5	5	5	5	5	5	5	5	5	5	5
Dewatering												
Solids Capture	%							95				
Thickened Sludge Concentration	%							18				
Operation - Daily	hrs/day							8				
Operation - Weekly	days/week							5				
Solids Treatment - Aerobic Digestion												
SRT	days							10 – 15				
Temperature	0 F							50 – 104 (Mesophilic)				
Solids Loading Rate	lb VS/cf-day							0.10 – 0.30				
Volatile Solids Reduction	%VSS							≥ 38				
SOUR	mg-02/g-VSS hour							< 1.5				

TABLE 5-5
Lighthouse Point WRF – Treatment Configuration Alternative Design Criteria

Parameters	Units	Design Criteria Values										
		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 7A	Alternative 8	Alternative 9	Alternative 10
Typical Performance												
BOD	mg/L	<10	<10	<10	<10	<10	<10	<5	<5	<5	<10	<10
TSS	mg/L	<15	<15	<15	<15	<15	<15	<5	<5	<5	<15	<15
NH_3	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	--	--
TN	mg/L	--	--	--	--	--	--	--	<10	--	--	--
Fecal Coliform	cfu/100mL	<100	<100	<100	<100	<100	<100	<20	<20	<20	<100	<100

MLSS = mixed liquor suspended solids
SRT = solids residence time
HRT = hydraulic residence time
RAS = return activated sludge
MLR = mixed liquor return
SOR = surface overflow rate
SVI = sludge volume index
SOL = soluble organic load
SLR = solids loading rate
SOUR = specific oxygen uptake rate

TABLE 5-6
Lighthouse Point WRF – Treatment Configuration Alternative Evaluation Results

Parameters	Units	Evaluation Results										
		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 7A	Alternative 8	Alternative 9	Alternative 10
Preliminary Treatment												
Screening												
(2) Coarse Screens	mgd	3.1 – ½" Spacing	3.1 – ½" Spacing	3.1 – ½" Spacing	3.1 – ½" Spacing	3.1 – ½" Spacing	3.1 – ½" Spacing					
(2) Fine Screens	mgd							3.1 – 2-mm Spacing	3.1 – 2-mm Spacing	3.1 – 2-mm Spacing	3.1 – 2-mm Spacing	3.1 – 2-mm Spacing
Grit Removal												
(2) Aerated Grit Chambers	mgd	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Secondary Treatment – CAS												
Aeration Basins – (2)												
MLSS	mg/L	2,200	2,200									
Aerobic SRT	days	9	9									
Anoxic SRT	days	1.5	1.5									
RAS Rate	--	0.75 Q	0.75 Q									
MLR Rate	--	2 Q	2 Q									
Total Volume	gal	1,100,000	1,100,000									
SVI	--	150	150									
Bower Capacity (1)	scfm	4,660	4,660									
SWD	ft	15	15									
Secondary Clarifiers – (2)												
Total Surface Area	ft^2	4,749	4,749									
Peak Clarifier SOR(2)	gpd/ ft^2	1,200	1,200									
SWD	ft	15	15									
Secondary Treatment – SBR												
SBR – (2) Basins												
SRT	days					10	10					
MLSS (at HWL)	mg/L					3,000	3,000					
Total Volume	gal					1,400,000	1,400,000					
SWD (at HWL)	18					18	18					
Blower Capacity (1)	scfm					4,400	4,400					

TABLE 5-6
Lighthouse Point WRF – Treatment Configuration Alternative Evaluation Results

Parameters	Units	Evaluation Results										
		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 7A	Alternative 8	Alternative 9	Alternative 10
Secondary Treatment – Extended Aeration												
Aeration Basins – (2)												
MLSS	mg/L					2,800	2,800					
Aerobic SRT	days					20	20					
RAS Rate	--					0.5 Q	0.5 Q					
Total Volume	gal					1,500,000	1,500,000					
Bower Capacity (1)	scfm					5,645	5,645					
SWD	ft					15	15					
Secondary Clarifiers – (2)												
Total Surface Area	ft^2					6,633	6,633					
Peak Clarifier SOR(3)	gpd/ft^2					484	484					
SWD	ft					17	17					
Secondary Treatment - MBR												
MBR – (2) Basins												
SRT	days					12	12	12				
MLSS	mg/L					9,017	9,017	8,700				
MLR Rate	--					4 Q	4 Q	4 Q				
Total Volume	gal					350,000	350,000	350,000				
Blower Capacity(4)	scfm					6,890	6,890	6,736				
(Anoxic, Aerobic) SWD	ft					12	12	12				
Secondary Treatment – RBC												
RBCs – (2) basins, 5 shafts per basin												
Total Media Surface Area	m^2										92,905	92,905
First Stage SOL	lbs BOD_5/1,000 ft^2										5.3	5.3
Total Stage SOL	lbs BOD_5/1,000 ft^2										2.1	2.1
Secondary Clarifiers												
SOR (5)	gpd/ ft^2										653	653
Total Surface Area	ft^2										4,749	4,749
SWD	ft										15	15

TABLE 5-6
Lighthouse Point WRF – Treatment Configuration Alternative Evaluation Results

Parameters	Units	Evaluation Results										
		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7	Alternative 7A	Alternative 8	Alternative 9	Alternative 10
Disinfection												
Disinfection - UV Irradiation												
UV Channels – (2)												
Peak Flow		3.1 (1 unit off-line)		3.1 (1 unit off-line)		3.1 (1 unit off-line)		3.1 (1 unit off-line)	3.1 (1 unit off-line)		3.1 (1 unit off-line)	
Disinfection - Chlorination/Dechlorination												
CCC – (2)												
Total CCC Volume	ft^3		5,760				5,760			5,760		5,760
Chlorine Demand	lbs/d		207		207		207			103		207
Sodium Bisulfite Demand	lbs/d		207		207		207			103		207
Design Chlorine Dosage	mg/L		8		8		8			4		8
Solids Handling - Thickening												
Sludge Flow	gpd	44,947	44,947	30,000	30,000	29,657	29,657	23,856	23,856	23,856	31,046	31,046
Sludge Load	lb/hr	78	78	2,550	2,550	66	66	75	75	75	2,588	2,588
Solids Treatment - Aerobic Digestion												
Aerobic Digestion – (2) Tanks												
Total Volume	gal											
SRT	days											
Solids Loadings	lb VS/cf-day											
SOUR	mg-0_2/g-VSS hour											
Solids Handling - Dewatering												

	100,000
	29.4
	0.09
	0.95
	3,404
	52

1. Residual DO within CAS, SBR, and Extended Aeration bioreactors is 2.0 mg/L; SF = 2.0 on peak AOR demands to determine blower capacity.
2. Accounts for reliability requirement of on unit treating 75% of peak hour flow (at 1,200 gpd/ft^2 for CAS).
3. Accounts for reliability requirement of on unit treating 75% of peak hour flow (at 500 gpd/ft^2 for Extended Aeration).
4. Residual DO within aerobic zones is 2.0 mg/L, DO within MBR zone is 4.0 mg/L; SF = 2.0 on peak AOR demands to determine blower capacity.
5. Accounts for reliability requirement of on unit treating 75% of peak hour flow (at 1,100 gpd/ft^2 for RBCs).

MLSS = mixed liquor suspended solids
SRT = solids residence time
HRT = hydraulic residence time
RAS = return activated sludge
MLR = mixed liquor return
SOR = surface overflow rate
SVI = sludge volume index
SOL = soluble organic load
SLR = solids loading rate
SOUR = specific oxygen uptake rate

evaluation criteria are presented in Chapter 6, and the alternatives are ranked accordingly. The recommendation for the treatment configuration of the proposed Lighthouse Point WRF is presented in Chapter 7.

From the evaluation of treatment alternatives, some observations are noted from the initial unit process sizing and design.

- MBRs result in the smallest required volume for a secondary treatment process configuration. As noted on Table 5-6, the total bioreactor volume is 350,000 gallons, compared with the 1.1 to 1.5 Mgal volume required for the other activated sludge type alternatives. The MBRs also result in a lower level of disinfection to meet the permit requirements based on the higher quality effluent.
- The alternatives utilizing extended aeration require the largest area for the suspended growth alternatives. The large bioreactor volume, together with the required clarifier surface area, result in a larger land area requirement, when compared to the other treatment alternatives. The actual area required for this alternative is developed in Chapter 6. Where the extended aeration system may prove cost-effective, however, is that the waste sludge will be at a higher level of stabilization than the majority of the other alternatives. This higher level of stabilization may reduce the final sludge disposal costs.
- The CAS and SBR alternatives prove to be similar in size and volume requirements. The 1.4-Mgal SBR system will be similar to the 1.0-Mgal system with the required secondary clarifiers included.
- The RBCs evaluated for the fixed-film alternative are sized to accommodate the effluent goals included in the NPDES permit. The RBCs, however, are not sized to provide for nitrification. Additional RBC shafts can be included to provide nitrification, but the initial sizing is based strictly on meeting the existing NPDES permit.

5.3 Conveyance Requirements

Preliminary design and sizing requirements for the conveyance facilities required for the site location of the proposed Lighthouse Point WRF along Marine Drive have been developed. The conveyance requirements for the proposed Lighthouse Point WRF include an influent pump station and piping to convey wastewater from a proposed flow equalization basin to the plant headworks, and an effluent pump station and piping for discharge of treated effluent to the existing outfall in Semiahmoo Bay. Interfaces with existing infrastructure and current operations are identified and evaluated in terms of hydraulic capacity.

The objective of this section is to determine the hydraulic capacity requirements for the conveyance facilities that are needed for the proposed Lighthouse Point WRF. Conveyance facilities and related infrastructure included in the evaluation are as follows:

- Influent pump station
- Effluent pump station
- Yard piping

- Existing force main along Semiahmoo Spit
- Intertie to existing outfall in Semiahmoo Bay

Sizing requirements for the conveyance facilities associated with the proposed Lighthouse Point WRF and interties with the existing infrastructure are developed using the hydraulic design capacity requirements for the proposed Lighthouse Point WRF presented previously in Chapter 4.

5.3.1 Hydraulic Capacity of Lighthouse Point WRF

The hydraulic capacity requirements for the proposed Lighthouse Point WRF that were developed earlier as part of Chapter 4 are summarized on Table 5-7. Also included in the table are the peak flow rates during wet weather conditions following flow equalization. Projected wet weather flows for the City in year 2023 were used in conjunction with optimized flow equalization volume to establish the hydraulic capacity for the proposed Lighthouse Point WRF necessary to handle flow-equalized wet weather peak flow conditions.

As shown on Table 5-7, the proposed Lighthouse Point WRF to be located at Lighthouse Point will be sized with sufficient hydraulic capacity to treat a peak flow of 3.1 mgd. This value is based on a wet weather peak hour flow rate of 7.14 mgd that is anticipated for the entire City in year 2023, and adjusted to include the proposed flow equalization facilities that will be located upstream of the plant headworks. The flow-equalized wet weather peak rate was selected based on a preliminary economic evaluation comparing treatment costs to equalization costs.

TABLE 5-7
Hydraulic Design Criteria for Proposed Lighthouse Point WRF[1]

	Minimum Flow (mgd)	Annual Average (mgd)	Maximum Month (mgd)	Dry Weather Peak Hour (mgd)	Wet Weather Peak Hour (mgd)	Equalized Wet Weather Peak Flow (mgd)
Central and East Blaine	0.31	0.77	1.11	1.39	5.50	2.40
West Blaine	0.09	0.23	0.39	0.41	1.64	0.70
City of Blaine Total	0.40	1.00	1.50	1.80	7.14	3.10

[1] Values for hydraulic design criteria were obtained from Table 4 of TM 1.02—Review and Refine Planning and Design Criteria, Lighthouse Point WRF (CH2M HILL, July 2004).

The proposed Lighthouse Point WRF will be located at the site of LS1 along Marine Drive in Central Blaine. Initially, the new WRF will only treat flows from Central and East Blaine, with the existing WWTP on Semiahmoo Spit remaining in operation to treat flows from West Blaine. The existing lift station, LS1, that is currently used to convey raw sewage flows from East and Central Blaine to the City's existing WWTP will be converted to an influent pump station for the new WRF. Other modifications that are planned for the proposed Lighthouse Point WRF site include installation of a 400,000-gallon flow equalization basin. The flow equalization basin will be upstream of the influent pump station, and will regulate

the wet weather peak flow rate to a maximum of 3.1 mgd. Thus, the pumps for the influent and effluent pump stations will be sized for a capacity of 3.1 mgd.

Details of the piping conveyance system and pump stations are presented in the recommended plan in Chapter 7.

5.4 Mitigation Requirements

Preliminary requirements for facilities required for visual mitigation, odor control, and noise abatement for the proposed Lighthouse Point WRF will be developed. Odor control and noise abatement measures will be consistent with the treatment processes selected for the proposed Lighthouse Point WRF. Requirements for visual mitigation of the proposed Lighthouse Point WRF site will involve identifying the essential design elements of the artist's renderings of the proposed Lighthouse Point WRF prepared during an architectural design charette that was conducted in June 2004 and with involvement from the CWAC and other members of the community.

The primary objective of this section is to develop the preliminary design requirements that address visual, odor, and noise mitigation for the proposed Lighthouse Point WRF. Specific objectives for individual mitigation measures are as follows:

Visual Mitigation: The objective for visual mitigation is to develop a treatment facility that is consistent with the City's Master Plan of the area, compatible with the surrounding marine setting, and promotes public use of the adjacent site. Essential visual features for the proposed Lighthouse Point WRF have been identified using artist's renderings from the recently conducted design charette.

Odor Control: The objective for odor control is to provide the necessary odor control containment and treatment equipment so that there are minimal detectable odors outside the WRF. Preliminary requirements for odor control have been identified and developed based on the selected process components for the proposed Lighthouse Point WRF. An initial screening and comparative evaluation of odor control technology candidates has also been provided.

Noise Abatement: The noise abatement objective is to satisfy the requirements for protection of human health and safety as administered by Ecology, WAC 173-60-040. Required design elements for noise abatement have been identified based on the operational noise levels generated by the process equipment within the proposed Lighthouse Point WRF. In general, noise abatement will be provided to reduce the negative impact of noise transmission from equipment and other plant-related activities to the surrounding areas of public use.

5.4.1 Visual Mitigation Measures

Visual mitigation measures for the proposed Lighthouse Point WRF were developed during several design charettes that were previously conducted by Christensen Design Management, the City staff, and the CWAC. The main objective of the design charette was to determine if placing a WWTP on Marine Drive was compatible with the City's Master Plan and to identify and develop architectural concepts for the proposed Lighthouse Point WRF that are compatible with the surrounding physical and cultural environment at

Lighthouse Point. The design charette resulted in several artist renderings of the proposed Lighthouse Point WRF.

Using the renderings as a reference, the following features were identified during the design charettes to provide visual mitigation for the proposed Lighthouse Point WRF:

- Lighthouse (historical attraction)
- Roof plaza
- Beach enhancement and picnic area
- Landscaping and building materials
- Public parking and restrooms

The visual mitigation strategy developed by the CWAC during the design charettes strives to integrate the WWTP into the surrounding marine environment by providing a lighthouse, picnic grounds, and walking paths along the beach. Public use of the site is promoted through public restrooms, parking along Marine Drive, and a roof plaza over part of the Facility Building that provides public access to the lighthouse as well as a scenic overlook of the beach and Semiahmoo Bay. Other features include a beach enhancement area, a raised plateau area for picnic tables, a covered walkway, and access to an existing marina. Extensive landscaping will also be used to provide a visual screen to the WRF from the road and other public use areas.

The design elements of the visual mitigation strategy outlined above will be incorporated into the design of the proposed Lighthouse Point WRF.

5.4.2 Odor Control

Sources of Odor Emission

The following conveyance and treatment processes at the proposed Lighthouse Point WRF have been identified as potential sources of odor emissions:

- Equalization (400,000 gallons) storage
- Influent pump station wet well
- Influent screening and grit removal processes
- Solids handling processes
- Secondary treatment unit processes

The influent pump station will consist of a belowgrade structure that contains a wet well and submersible pumps. Because influent wastewater is occasionally septic, the potential exists for emission of hydrogen sulfide and other odorous gases into the air. In order to mitigate emission of odorous gases into the environment, odor control is recommended for the influent pump station.

The solids handling processes contained within the Headworks area and Solids Handling Room are typically the source of the strongest odors; odor complaints would be expected if these facilities were not equipped with odor control equipment. Secondary treatment unit processes typically have a much lower potential to generate objectionable odors than the other processes located in the Facility Building; however, the possibility does exist for odor generation from these basins. In order to ensure that there are minimal detectable odors from the facility, the secondary process has been included as an odor source.

Design Criteria for Odor Control

There are two potential alternatives for the City to provide odor control for the proposed Lighthouse Point WRF. The first alternative would consist of ventilating each process room within the Facility Building to odor control equipment. This option would ensure odor control for each odor source and minimize the potential for fugitive odors. However, this option requires odor control for a much larger volume of air, increasing the capital and O&M costs for the odor control equipment.

To reduce the volume of air required to be treated, smaller containment can be placed over the process equipment with the foul air inside those covers venting to the odor control equipment. Odorous air is typically contained either by enclosing odor sources in containment rooms, providing hoods or equipment enclosures, or by covering the source if it is a process basin. These enclosures must be resistant to corrosion.

Ventilation rates are potentially governed by the National Fire Protection Association (NFPA) standards for fire protection in wastewater applications, ventilation rates required to effectively capture odorous air emissions from Industrial Ventilation guidance manuals and field experience, and worker comfort and safety. On one hand, ventilation rates should be high enough to capture the odors and to keep the contained environment either acceptable for workers or non-corrosive for the materials, such as concrete. From this perspective, high ventilation rates are better. On the other hand, it is desirable to minimize ventilation rates so that the fan and scrubber system costs are low. These costs include both the initial capital investment in hardware and the cost to operate the system over time. Selection of the actual ventilation rate must strike a balance between these two opposing issues. The following rules of thumb are offered as basic guidance for initial ventilation design criteria.

- For particularly odorous areas that will be occupied, such as rooms with open belt filter presses or truck loading bays for loading sludge cake, use 12 to 20 Air Changes per Hour (ACH).
- For covered basins that are not occupied, use 6 ACH.
- Sweep velocities along channels being ventilated should be at least 50 feet per minute; 100 feet are desirable.
- Capture velocities on makeup air openings (including cracks) should be at least 200 feet per minute.
- For tightly closed conveyor systems (e.g., screw conveyors), use 10 cfm per foot of conveyor.
- For capturing odorous air from a process aeration source, such as aeration basins or forced air covered trickling filters, ventilate the process at a rate 10 percent higher than the peak supply air.
- Once air flows are set, carefully review the air flow patterns to ensure sweep air patterns do not leave dead pockets without ventilation.

In all cases, the guideline that results in the highest ventilation rate will govern. For

instance, if an ACH rate of 12 does not provide effective capture velocity, then the ACH must be raised or the system configuration modified to get the capture velocity at the lower ACH.

For Alternative 1, it is assumed that the following has been included in the basic odor control design. A summary of odor sources, design criteria, and flowrates for sizing odor control equipment is found on Table 5-8.

TABLE 5-8
Alternative 1 – Odor Sources and Design Criteria for Ventilation of Process Rooms

Odor Source	Area (ft^2)	Height (ft)	Volume (ft^3)	ACH	Flowrate (cfm)
Influent pump station wet well	100	10	1,960	6	196
Headworks area	2,310	20	46,200	20	15,400
Solids handling room	1,276	20	25,520	20	8,507
Secondary Treatment Unit Process [1]	4,200	20	16,800	12	16,800
				Total	**40,903**

[1] Secondary treatment unit process is based on the MBR alternative.

- Cover over the influent pump station wet well and ventilation of the process air.
- Ventilation of entire Headworks area, which includes screenings equipment, grit removal equipment, screenings/grit storage bins, and truck loading.
- Ventilation of the solids handing room, which includes the GBT, sludge holding tanks, and truck loading.
- Covers for the secondary treatment unit processes and ventilation of the process air from those reactors.
- Odor control equipment for treatment of odorous air from these sources.

For Alternative 2, the following odor control features will be included in the basic design of the solids handling facilities. A summary of odor sources, design criteria, and flowrates for sizing odor control equipment are found on Table 5-9.

TABLE 5-9
Alternative 2 – Odor Sources and Design Criteria with Covers and Enclosures

Odor Source	Area (ft^2)	Height (ft)	Volume (ft^3)	ACH	Flowrate (cfm)
Influent pump station wet well	100	10	1,960	6	196
Influent screening equipment and basin	420	4	2,640	6	264
Grit removal basin	175	4	1,348	6	135
Dumpster area/truck loading	900	20	18,000	20	6,000
Sludge holding tank	200	4	800	6	80

TABLE 5-9
Alternative 2 – Odor Sources and Design Criteria with Covers and Enclosures

Odor Source	Area (ft^2)	Height (ft)	Volume (ft^3)	ACH	Flowrate (cfm)
Gravity belt thickener	450	10	4,500	12	900
Solids truck loading	200	20	4,000	20	1,333
Secondary Treatment Unit Process [1.]	4,200	4	16,800	6	2,800
				Total	**11,708**

[1]Secondary treatment unit process is based on the MBR alternative

- Cover over the influent pump station wet well and ventilation of the process air.
- Enclosures for screenings equipment, grit removal channel, and screenings/grit storage bins within the Headworks area. Also includes ventilation for the truck loading area.
- Enclosure for gravity belt thickener, covers on the sludge holding tank, and ventilation for truck loading area within the Solids Handling room.
- Covers for the secondary treatment unit processes and ventilation of the process air from those basins.
- Odor control equipment for treatment of odorous air from both these odor sources.

Alternative 2 is recommended in order to minimize the capital and annual costs for the odor control equipment. A majority of the process equipment has covers and/or enclosures already incorporated into the design and cost presented (see Chapter 8). The design criteria on Table 5-9 will be used in follow-on tasks as the basis for selecting, sizing, and estimating costs for odor control equipment. An initial screening and preliminary evaluation of various odor control technologies is provided in the following section.

Odor Control Technology

Several alternatives were initially considered as part of this preliminary evaluation of odor control technologies, including compost biofilters, soil biofilters, bioscrubbers, modular biofilters, packed tower chemical scrubbers, and water-regenerable activated carbon. From this initial list of possibilities, technologies that were determined to be feasible due to the space constraints at the Lighthouse Point WWTP included bioscrubbers, packed tower chemical scrubbers, and water-regenerable activated carbon. Descriptions and initial evaluations of these three alternatives are provided in this section.

Bioscrubber (Biotrickling Packed Tower)

In a biotrickling tower, odorous air is blown into the bottom of the tower and flows up through the media material. The media may be a synthetic material or a natural material such as lava rock. The media allows the cultivation of a fixed-film growth of bacteria that consumes the odorous gases that pass through it. The bacteria also utilize other odor compounds as a food source including ammonia and various organic reduced-sulfur compounds. Recirculation pumps provide a continuous stream of water that keeps the

media wet, provides nutrients, and carries away waste products. A source of water, preferably non-chlorinated secondary effluent, would need to be piped to the unit.

The recirculated water is continually blown down to a drain to control pH and remove waste products. Drain water will be low in pH and should be routed to a flow stream where it can be diluted. Treated air migrates out of the filter bed and into the atmosphere.

Packed Tower Chemical Scrubber

Chemical scrubbers are the most common type of wet scrubber used for odor control in municipal WWTPs. They represent a proven technology and have been the technology of choice for many municipalities. Chemical scrubbers easily remove odor constituents including hydrogen sulfide, ammonia, and various organic reduced-sulfur compounds. These systems are highly effective in situations involving high odor concentrations and large airflows.

Countercurrent packed-tower scrubbers can be configured in either single- or multi-stage arrangements. Odorous air enters the bottom of the tower and flows upward through a bed of packed media, while contacting a downward flowing scrubbant solution. The treated air is exhausted out the top of the tower. Packing media aid in scrubbing efficiency by providing a large, interfacial area for contact between the odorous air and scrubbant solution. A fan, placed before or after the tower, moves the odorous air through the system and out the exhaust stack.

The scrubbant solution chemicals (usually acid for ammonia and caustic plus chlorine for hydrogen sulfide control) enhance the ability of the solution to absorb and oxidize odorous compounds. This solution is collected in a sump at the bottom of the tower and recirculated to the top by a scrubber recycle pump. A portion of the scrubber solution is continuously blown down during the process and replenished by makeup water to remove waste products from the system. Blowdown should be routed to a flow stream where it can be diluted.

Water-Regenerable Activated Carbon

A water-regenerable activated carbon system consists of multiple carbon vessels filled with water-regenerable carbon connected in a manifold arrangement. The hydrogen sulfide in the odorous air is adsorbed into the carbon and converted to sulfuric acid, a water-soluble compound. Once the carbon is spent, a solenoid valve opens and allows water to wash the carbon to restore adsorption capacity. Regeneration in place reduces operating costs and increases the operational life of the carbon. When the carbon is regenerated, the unit remains online since only one chamber is regenerated at a time. Water would need to be piped to the system for regeneration. Drain water will be low in pH and should be routed to a flow stream where it can be diluted. This technology is proprietary and only manufactured by one vendor.

Comparative Evaluation of Odor Control Technologies

The three odor control technologies described above were evaluated on a comparative basis. The comparative evaluation is summarized on Table 5-10. In the evaluation process, each odor control technology was rated on a scale from good (+1) to poor (-1). The evaluation criteria used to compare the alternatives are listed below:

Technical

- Proven technology
- Reliability
- Odor removal efficiency
- Maintenance requirements
- Power consumption
- Capital cost

Environmental

- Space requirements
- Media disposal
- Chemical handling

The results of the comparative evaluation found on Table 5-10 suggest that the chemical scrubbers have the most favorable rating of the three odor control technologies included in the evaluation, followed closely by bioscrubbers and water-regenerable carbon. Chemical scrubbers are incorporated into the proposed Lighthouse Point WRF conceptual design, presented in Chapter 7.

Technical Evaluation Criteria

Proven Technology/Reliability: Each of the odor control technologies included in this evaluation has a proven track record of success when designed and operated correctly. Chemical scrubbers are the most common type of odor control technology used in municipal WWTPs. Bioscrubbers are emerging as an alternative to chemical scrubbers, having a similar footprint and comparable removal efficiency. The water-regenerable carbon technology has been in the marketplace for the shortest length of time. However, these units have performed effectively and are relatively easy to operate.

Odor Removal Efficiency: Odor removal efficiency relates to the ability of a particular odor treatment technology to remove odor constituents such as hydrogen sulfide or ammonia. Water-regenerable carbon is able to effectively remove hydrogen sulfide. However, at higher hydrogen sulfide concentrations, the carbon requires more frequent regeneration and subsequent changeout, adding to operating costs. Water-regenerable activated carbon is also able to adsorb organic reduced-sulfur compounds up to a certain level until breakthrough occurs. These compounds remain in the carbon even after water-regeneration, reducing the overall adsorption capacity of the carbon. As such, water-regenerable carbon technology would not be suitable for odorous air streams containing significant quantities of organic reduced-sulfur compounds. In contrast, bioscrubbers and chemical scrubbers are able to remove both inorganic and organic sulfur compounds very efficiently. Bioscrubbers may emit a slight “earthy, musty” odor that is not offensive to most people.

Maintenance Requirements: This criterion refers to the day-to-day maintenance that would be performed by plant staff. The bioscrubber would require the least amount of daily maintenance due to the relative simplicity of this system. The chemical scrubber would require more daily maintenance than the bioscrubber, due to the mechanical complexity of this system. The carbon technology requires the most maintenance time due to the need to monitor for breakthrough, regenerate the carbon, and replace spent carbon.

Power Consumption: This criterion refers to the total power consumed by the prime mover associated with a typical system. Carbon filters have a moderate level of power consumption due to the static pressure required to move air through the media. Bioscrubbers and chemical scrubbers have a higher level of power consumption due to the need to move both air and liquid through the media.

Capital Costs: This criterion is a relative ranking of capital cost per cfm of installed capacity. Bioscrubbers have the highest capital cost of the three alternatives, with chemical scrubbers and water-regenerable carbon having comparable, lower costs.

Environmental Evaluation Criteria

Space Requirements: Space requirements include footprint areas for scrubbers, chemical storage tanks, pumps, and blowers. The carbon scrubber is the least space-intensive of the three odor control technologies. Bioscrubbers have slightly greater space requirements due to the need for recirculation pumps. Chemical scrubbers also have greater space requirements due to the need for chemical storage and recirculation pumps.

Media Disposal: Spent carbon must be disposed of, but is typically not considered hazardous. Spent carbon media is usually recycled by the manufacturer or sent to a landfill for disposal. Bioscrubber media has a working life than can exceed 15 years; the disposal of the media is less of a consideration than spent carbon. The media from the chemical scrubber is inert, and therefore does not require replacement.

Chemical Handling Requirements: Chemical scrubbers require delivery, handling, and storage of hazardous chemicals like caustic soda, hypochlorite, and sulfuric acid. Carbon and bioscrubber technologies require no chemical handling, and therefore have no subsequent impacts associated with chemical delivery, storage, or handling.

TABLE 5-10
Comparative Evaluation of Odor Control Technologies

	Odor Control Technologies		
Evaluation Criteria	**Bioscrubber**	**Chemical Scrubber**	**Regenerable Carbon**
Technical			
Proven technology	0	+1	0
Reliability	+1	+1	+1
Odor removal efficiency	0	+1	+1
Maintenance requirements	+1	-1	-1
Power consumption	-1	0	0
Capital costs	-1	0	0
Technical Score:	**0**	**2**	**1**
Environmental			
Space requirements	0	+1	+1
Media disposal	+1	+1	-1
Chemical handling	+1	-1	+1
Environmental Score:	**2**	**1**	**1**
OVERALL SCORE:	**2**	**3**	**2**

Odor Control Summary

The results of the comparative evaluation found on Table 5-10 suggest that the chemical scrubbers have the most favorable rating of the three odor control technologies included in the evaluation, followed closely by bioscrubbers and water-regenerable carbon. Chemical scrubbers are incorporated into the proposed Lighthouse Point WRF conceptual design, presented in Chapter 8.

5.4.3 Noise Abatement

Health and Safety Considerations

Environmental noise effects on human populations include speech interference, sleep disturbance, and annoyance. Some typical noise levels encountered in an urban environment include the following:

- Normal conversation ranges between 55 and 65 decibels A-weighted (dBAs) when the speakers are 3 to 6 feet apart.
- Quiet urban nighttime noise dBAs typically fall in the low 40s.
- Noise levels during the day in a noisy urban area are frequently as high as 80 dBA.
- Noise levels above 110 dBA become intolerable and can result in hearing loss.

State and local governments have primary responsibility for controlling noise sources and regulating outdoor noise levels in the environment. WAC 173-60-040 establishes noise limits that vary according to the land use of the property where the noise source is located and the property receiving the noise; these noise limits are administered by Ecology. The maximum permissible noise levels are shown on Table 5-11. Treatment plant construction noise is exempt under WAC 173-60-050, and thus is not addressed in the noise abatement measures.

TABLE 5-11
Maximum Permissible Noise Levels (dBA)

Land Use of Noise Source	Land Use of Receiving Property			
	Residential		Commercial	Industrial
	Day	Night[1]		
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

[1]Maximums are 10 dBA lower than nighttime levels for residential property from 10 p.m. to 7 a.m.

Source: WAC 173-60-040.

Sources of Noise

The following types of operational noise sources are associated with the proposed Lighthouse Point WRF:

- Noise from the operation of mechanical equipment, including pumps, blowers, fans, and centrifuges. These planned activities would occur on a continuous basis.

- Noise from routine O&M activities, including screening and grit hauling, and biosolids treatment and handling. These planned activities would typically occur for short time duration and during normal working hours.
- Noise from standby power generation facilities (to be used as backup power for treatment facilities and pump stations during a power outage). When needed, standby power generators would operate on a continuous basis until power is restored.
- Noise from emergency operation, maintenance, and repair activities. These are unanticipated conditions that may require nighttime work, and could pose significant noise impacts.

Design Guidelines for Noise Abatement

For mitigation of noise from the influent pump station, all equipment will be housed in an enclosed structure. Ventilation air intakes and exhausts will be placed in a direction facing away from sensitive receivers. Noise-reduction-related acoustic louvers and duct silencers will be selected to reduce transmission of indoor noise to the outdoor environment. Noise levels immediately outside of the enclosure will be at or below the level stated on Table 5-11 for an industrial noise source and a commercial receiving property.

For noise abatement at the WRF, all noise-generating equipment will be contained inside the building. Noise sources such as pumps, fans, blowers, and centrifuges will be designed with the necessary noise reduction features to limit noise impacts immediately outside of the Facility Building to the level stated on Table 5-11 for an industrial noise source and a commercial receiving property. This level of noise abatement will allow the proposed Lighthouse Point WRF to be consistent with ambient noise levels. The City may decide to impose more stringent noise standards during the design of the WWTP.

CHAPTER 6

Evaluation of Monetary and Nonmonetary Criteria

6.1 Introduction

As part of the treatment process and conveyance facilities evaluation activities, cost estimates and analyses for each alternative were developed. Estimates included the construction cost and annual O&M costs for each alternative. The alternatives were ranked and recommendations made for the most cost-effective and appropriate treatment and conveyance approach, including the costs for the associated mitigation features.

In addition to the monetary analysis, each of the alternatives was scored and ranked based on its performance against nonmonetary criteria. The nonmonetary criteria are made up of various features or benefits for the proposed WWTP that were identified as of value to the City. These nonmonetary criteria are an extension of the criteria developed as part of the public outreach process during the General Sewer Plan development (CH2M HILL, 2004).

The objective of this chapter is to document the results of the cost estimating and life-cycle cost analysis performed for each of the treatment configuration alternatives evaluated for the proposed Lighthouse Point WRF. In addition, this chapter presents the evaluation of nonmonetary criteria and ranks the treatment configuration alternatives.

6.2 Monetary Analysis

The capital costs and annual costs for the treatment process alternatives were developed using a combination of the computer programs Pro2D and CPES (CH2M HILL Parametric Cost Estimating System), along with vendor data, to determine the conceptual cost opinions. Pro2D assists in determining the size and number of unit process required at a WWTP, as discussed in Chapter 5. CPES calculates conceptual-level capital and annual cost estimates based on the type, size, and number of unit processes included in a facility. Additional values are entered into CPES to account for contractor markups, escalation costs, and location adjustments. Vendor data was used to supplement the cost estimates from CPES where applicable.

6.2.1 Basis of Cost Estimate

Cost estimates of the various alternatives developed in Chapter 5 are considered to be Class 4 estimates, based on standards established by the American Association of Cost Engineers (AACE). Class 4 estimates are described as generally being prepared based on a 10- to 15-percent design level or essentially at the facility plan level. This level of cost estimate is typically used for assessing feasibility and screening various alternatives.

The typical accuracy range for this cost estimate class is from –15 percent to –30 percent on the low side and from +30 percent to +50 percent on the high side. Class 4 estimates are prepared for feasibility studies and facility plans.

The costs developed are presented in 2004 dollars and do not include future escalation. No costs are included for extraordinary circumstances such as potential discovery and remediation of contaminated materials or actions that may be required to address the existence of cultural artifacts.

The final construction cost of the projects will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. As a result, the final project costs will likely vary from those presented. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing final budgets.

6.2.2 Construction Costs

The construction cost of a WWTP has many components. The basic construction cost includes the cost of labor and materials needed to construct the facilities. Those basic costs are then marked up with the overhead, profit, and the cost of mobilization and demobilization. A contingency allowance and sales taxes are also added to the construction costs. Table 6-1 includes the values used for the associated construction costs.

TABLE 6-1
Associated Construction Costs

Cost Item	Value	Applied To
Contractor Overhead	10-percent	Base Construction Cost (BCC)
Contractor Profit	5-percent	BCC + Overhead (OH)
Contractor Mobilization / Demobilization / Insurance	5-percent	BCC + OH +Profit (P)
Contingency	20-percent	BCC + OH +P + Mob/Demob (MD)
Escalation to Mid-Point of Construction	8.59-percent	BCC + OH +P + MD + Contingency (C)
Location Adjustment Factor	1.5-percent	BCC + OH +P + MD + C
Pile Foundations	10-percent	Building Cost
Dewatering Conditions	8-percent	Building Cost
Shoring	8-percent	Building Cost
Architectural Aesthetics	20-percent	Building Cost
Sales Tax	8.2-percent	BCC + All Associated Costs

6.2.3 Annual Costs

Economic evaluation of alternatives requires consideration of both annual costs as well as construction cost. It is the relationship between construction and annual costs that often results in one alternative being more economically attractive than another over the life of the project. Annual costs include expenditures for operations, maintenance, administration, materials and chemical costs, energy costs, and other business expenditures such as interest and depreciation costs.

Operation and Maintenance—Labor

One component of the annual costs is the cost of labor to operate and maintain the facilities. These costs can be highly variable across different treatment processes depending on the nature of the process, its reliability, ease of operation, and level of maintenance required. Assumptions were made based on experience of the staffing needs of the various treatment processes and based on a burdened labor rate of $50 per hour. A 20-percent contingency was applied to account for unknown needs and the uncertainty of the actual extent of operations and maintenance required.

Operation and Maintenance—Consumables (Power, Chemical, and Natural Gas)

Another component of the annual costs is the cost of consumables such as power, chemicals, and natural gas. Again, these costs can be highly variable across different treatment processes depending on the nature of the process. Estimates of the consumables cost were developed based on the anticipated requirements to operate the facilities under average conditions on an annual basis. The components and assumptions included in the annual costs were power ($0.07/kWh), market rate for chemical costs, and major equipment replacement (i.e., membrane replacement of 10 years). A 20-percent contingency was also applied to account for unknown demands and the uncertainty of the actual extent of O&M required.

6.2.4 Present Worth

Life-cycle costs were developed from the capital and annual costs. The life-cycle cost analysis was based on the defined project life and cost of money interest rate, and all cost disbursements. Table 6-2 includes the values used for the associated life-cycle cost analysis.

TABLE 6-2
Life-Cycle Cost Parameters

Cost Item	Value
Interest Rate	3.5-percent
Inflation Rate	2.5-percent
Project Comparison Period	20 years

6.3 Nonmonetary Analysis

There are many other nonmonetary factors that may be equally or more important than just the monetary evaluation in selecting a preferred alternative. Nonmonetary evaluation may include performance criteria such as flexibility, reliability, ease of maintenance, and ease of operation. Nonmonetary evaluation may also include environmental criteria such as effluent water quality, safety, noise and odor impacts, use of byproducts, and disposal requirements. Lastly, nonmonetary evaluation may include implementation criteria such as land use compatibility, and public acceptance. These nonmonetary criteria are listed and described in the following subsections.

6.3.1 Performance Criteria

Performance criteria generally relate to the way each alternative achieves the objectives of the project and how well each alternative is expected to function. Performance factors include flexibility and reliability for both O&M.

Response Flexibility to Changing Conditions

12Adaptability of each alternative is the primary screening consideration under this evaluation criterion. The flexibility to meet changing conditions is of particular concern with possible future constraints such as revised effluent limits, modified disposal methods, resource scarcities, or technological advancement. Flexibility evaluations should also consider responsiveness to new land use plans, development patterns, and lifestyle changes, such as water and energy conservation.

Strong Process Performance Record

Assurance of meeting design performance is the overall screening consideration under this evaluation criterion. The evaluation considers the relative risk of process failures, susceptibility of the alternative to disruption from catastrophes, and consequences of functional system failures, regardless of cause.

Extent of Maintenance Required

The level of maintenance required to keep the WWTP in operation is the overall screening consideration under this evaluation criterion. The evaluation considers the relative risk of mechanical failures, the level of preventative maintenance required, and the extent of labor and consumables required in order to maintain the equipment in good working condition.

Ease of Use by Operators

This evaluation criterion reflects the ease with which the various alternatives can be operated, the level of skill required from the plant operations staff, and the degree in which automation can be implemented with that alternative.

6.3.2 Environmental Criteria

The environmental criteria have been selected from several of the topics generally covered in the SEPA checklist for WWTPs. Environmental factors include aspects of the proposed treatment facilities to meet water quality, air quality, and noise requirements, in addition to the proper use or disposal of byproducts from the facilities.

Effluent Water Quality

All treatment alternatives evaluated must meet the NPDES discharge permit for secondary treatment. However, some of the alternatives routinely exceed the minimum treatment performance necessary to achieve secondary effluent. Some alternatives can achieve water quality suitable for nonpotable reuse applications.

Public and Operator Safety Risks

Each treatment alternative was evaluated based on its inherent safety risks. Safety risks may include the requirement for hazardous chemicals to be stored at or transported to and from

the site, the potential for explosive conditions to exist resulting from the treatment operation, or other miscellaneous hazards such as drowning and falling.

Beneficial Use of Byproducts

One of the key benefits of some treatment processes is the production of a byproduct that can be used by either the treatment operations or made commercially available to others. These byproducts could potentially be the reuse of the effluent if the water quality is suitable, or the use of the biosolids, if appropriate levels of treatment have been met.

Amount of Solids to be Disposed

All treatment processes will have some degree of solids residuals that must be disposed of from the plant. However, some treatment processes generate fewer solids than other alternatives and they also may provide greater degrees of stabilization.

Noise and Odor Impacts

There is always some odor risk near WWTPs. Important factors include number, character, and location of sensitive receptors, climate, and degree of odor control provided. Different treatment processes have different degrees of odor generation potential and, hence, varied risk of producing measurable odor at the WWTP boundary.

Noise concerns are associated with both construction and facility operations. Construction will cause noise impacts at WWTP sites as well as in areas of sewer construction. Noise from WWTP operations is generally at low or background levels. Sludge and chemical truck traffic are noise generators.

6.3.3 Implementation Criteria

The ability to implement a plan or project is the single most important consideration in evaluating alternatives. It is also the factor that is most difficult to estimate. Key aspects of implementation include the overall acceptability of the preferred alternative to municipal officials, the public, and governmental agencies.

Integration into the Marine Drive Master Plan

Plans involving WWTPs in or near shorelines, residential areas, or parks are considered less compatible with most existing land use due to the industrial character of WWTPs.

Visual aesthetics must be evaluated in terms of the impact on the surrounding land uses and the community as a whole. WWTPs located in industrial areas have much less visual impact on the surrounding community than those located in residential or commercial areas. Architectural and layout mitigating measures are included in this evaluation.

Public Acceptance

Acceptability to the public will, to some degree, depend on the financial impact to the ratepayers. In addition, the impacts to the public from noise, odors, and/or visual aesthetics are all major factors in gaining public acceptance. Each alternative must meet a minimum level of standard in order to be considered further for implementation.

6.4 Alternative Evaluation Results

The results of the monetary analysis, including the detailed breakdown of the cost estimate, are presented on Table 6-3. A workshop was conducted on October 18, 2004, to review the preliminary results of the cost evaluation with members of the Blaine City Council and the CWAC. Also presented during the workshop was the preliminary assessment of the importance weight of the various nonmonetary criteria (Appendix E).

The nonmonetary criteria described previously were developed for the purpose of scoring each treatment process alternative that weighs the advantages and disadvantages of the alternatives against each other. Weighting factors established for each evaluation criteria were based on the relative importance of the criteria in selecting an alternative. A score was assigned to each nonmonetary criterion (from 5 being a positive characteristic to 1 being a negative characteristic). The scores were then applied to the importance weighting, and summarized to provide the total weighted score.

During the workshop, the nonmonetary criteria were revised to better reflect the importance and values of the community. The attendees weighted the importance of each criterion and the technical scoring was reevaluated based on the revised weightings.

The weighted average was then calculated and entered on Table 6-4. The revised nonmonetary criteria with importance weighting and scoring are shown on Table 6-4.

As shown in Table 6-4, the highest ranking alternative for monetary criteria (lowest present worth cost alternative) is Alternative 4 – Sequencing Batch Reactors and Liquid Chlorine Disinfection with a present worth value of $34.71 M. Alternative 4 was ranked eighth based on the nonmonetary criteria evaluation.

Note that the second ranked alternative for monetary criteria is Alternative 3 – Sequencing Batch Reactor with UV Disinfection with a present worth value of $35.17 M. Alternative 3 was ranked fourth based on the nonmonetary criteria evaluation.

Alternative 7 – Membrane Bioreactors, UV Disinfection, and Solids Treatment is the highest ranked alternative based on the nonmonetary criteria evaluation. Alternative 7 has the highest present worth cost of all the alternatives at $52.84 M, making this the 11th ranked alternative in the monetary criteria evaluation.

The results of the monetary estimates and the nonmonetary evaluation results were then graphically presented in Figures 6-1 and 6-2, which show the cost versus relative benefit of each alternative. Based on the results of the workshop and as shown in Figures 6-1 and 6-2, THE City Council directed that further evaluation of Alternatives 3 and 7A should be conducted. These alternatives represent the most viable options for the proposed Lighthouse Point WRF. This allows a final selection between the two alternatives.

TABLE 6-3
Cost Estimate of Treatment Alternatives

Item	Alternative 1 CAS, UV	Alternative 2 CAS, Chlorine	Alternative 3 SBR, UV	Alternative 4 SBR, Chlorine	Alternative 5 Extended AB, UV	Alternative 6 Extended AB, Chlorine	Alternative 7 MBR, UV, Solids Treatment	Alternative 7A MBR, UV	Alternative 8 MBR, Chlorine	Alternative 9 RBC, UV	Alternative 10 RBC, Chlorine
Base Project Costs											
Preliminary Treatment/Pumping	$1,162,000	$1,162,000	$1,162,000	$1,162,000	$1,162,000	$1,162,000	$1,212,000	$1,154,000	$1,212,000	$1,162,000	$1,162,000
Secondary Treatment	$4,054,000	$4,054,000	$3,493,000	$3,493,000	$4,775,000	$4,775,000	$4,949,000	$5,227,000	$4,949,000	$3,504,000	$3,504,000
Disinfection	$445,000	$556,000	$445,000	$556,000	$445,000	$556,000	$396,000	$396,000	$495,000	$445,000	$556,000
Solids Handling	$649,000	$649,000	$609,000	$609,000	$596,000	$596,000	$601,000	$597,000	$578,000	$601,000	$601,000
Solids Treatment/Dewatering	$0	$0	$0	$0	$0	$0	$2,168,000	$0	$0	$0	$0
Odor Control	$203,000	$203,000	$203,000	$203,000	$203,000	$203,000	$203,000	$203,000	$203,000	$203,000	$203,000
Subtotal	$6,513,000	$6,624,000	$5,912,000	$6,023,000	$7,181,000	$7,292,000	$9,529,000	$7,577,000	$7,437,000	$5,915,000	$6,026,000
Additional Project Costs											
Demolition	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000	$130,000
Overall Sitework	$265,000	$265,000	$240,000	$240,000	$290,000	$290,000	$250,000	$230,000	$230,000	$250,000	$250,000
Plant Computer System (2%)	$130,260	$132,480	$118,240	$120,460	$143,620	$145,840	$190,580	$151,540	$148,740	$118,300	$120,520
Yard Electrical (4%)	$260,520	$264,960	$236,480	$240,920	$287,240	$291,680	$381,160	$303,080	$297,480	$236,600	$241,040
Yard Piping (10%)	$651,300	$662,400	$591,200	$602,300	$718,100	$729,200	$952,900	$757,700	$743,700	$591,500	$602,600
Total Additional Project Costs	$1,437,080	$1,454,840	$1,315,920	$1,333,680	$1,568,960	$1,586,720	$1,904,640	$1,572,320	$1,549,920	$1,326,400	$1,344,160
Subtotal	$7,950,080	$8,078,840	$7,227,920	$7,356,680	$8,749,960	$8,878,720	$11,433,640	$9,149,320	$8,986,920	$7,241,400	$7,370,160
Contractor Markups											
Overhead (10%)	$795,008	$807,884	$722,792	$735,668	$874,996	$887,872	$1,143,364	$914,932	$898,692	$724,140	$737,016
Profit (5%)	$437,254	$444,336	$397,536	$404,617	$481,248	$488,330	$628,850	$503,213	$494,281	$398,277	$405,359
Mob/Bonds/Insurance (5%)	$459,117	$466,553	$417,412	$424,848	$505,310	$512,746	$660,293	$528,373	$518,995	$418,191	$425,627
Total Contractor Markups	$1,691,380	$1,718,773	$1,537,740	$1,565,134	$1,861,554	$1,888,948	$2,432,507	$1,946,518	$1,911,967	$1,540,608	$1,568,002
Project Contingency											
Contingency (20%)	$1,928,292	$1,959,523	$1,753,132	$1,784,363	$2,122,303	$2,153,534	$2,773,229	$2,219,168	$2,179,777	$1,756,402	$1,787,632
Total Contingency	$1,928,292	$1,959,523	$1,753,132	$1,784,363	$2,122,303	$2,153,534	$2,773,229	$2,219,168	$2,179,777	$1,756,402	$1,787,632
Subtotal	$11,569,751	$11,757,136	$10,518,792	$10,706,176	$12,733,817	$12,921,201	$16,639,376	$13,315,005	$13,078,665	$10,538,409	$10,725,794
Additional Construction Costs											
Escalation (to Mid-Point Construction), (8.59%)	$993,842	$1,009,938	$903,564	$919,661	$1,093,835	$1,109,931	$1,429,322	$1,143,759	$1,123,457	$905,249	$921,346
Location Adjustment Factor (1.5%)	$173,546	$176,357	$157,782	$160,593	$191,007	$193,818	$249,591	$199,725	$196,180	$158,076	$160,887
Pile Foundations	$237,000	$237,000	$237,000	$237,000	$237,000	$237,000	$220,000	$220,000	$220,000	$237,000	$237,000
Dewatering Conditions	$189,600	$189,600	$189,600	$189,600	$189,600	$189,600	$176,000	$176,000	$176,000	$189,600	$189,600
Building (Includes Operation, Maintenance, Administration)	$2,370,000	$2,370,000	$2,370,000	$2,370,000	$2,370,000	$2,370,000	$2,370,000	$2,200,000	$2,200,000	$2,370,000	$2,370,000
Architectural Aesthetics (20% of Building)	$474,000	$474,000	$474,000	$474,000	$474,000	$474,000	$474,000	$440,000	$440,000	$474,000	$474,000
Shoring (10% of Building)	$189,600	$189,600	$189,600	$189,600	$189,600	$189,600	$189,000	$176,000	$176,000	$189,600	$189,600
Contamination	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000
Total Additional Costs	$4,727,588	$4,746,495	$4,621,546	$4,640,453	$4,845,042	$4,863,949	$5,239,113	$4,655,484	$4,631,637	$4,623,526	$4,642,433
Subtotal	$16,297,339	$16,503,631	$15,140,338	$15,346,630	$17,578,859	$17,785,150	$21,878,489	$17,970,489	$17,710,302	$15,161,935	$15,368,226
Total Construction Cost											
WA Sales Tax (8.2%)	$1,336,382	$1,353,298	$1,241,508	$1,258,424	$1,441,466	$1,458,382	$1,794,036	$1,473,580	$1,452,245	$1,243,279	$1,260,195
TOTAL	$17,633,721	$17,856,929	$16,381,846	$16,605,053	$19,020,325	$19,243,533	$23,673,525	$19,444,070	$19,162,547	$16,405,214	$16,628,421

[1] The costs are based on the January 2004 index.

[2] CAS – Conventional Activated Sludge, UV – Ultraviolet Disinfection, SBR – Sequencing Batch Reactor, AB – Aeration Basin, MBR – Membrane Bioreactor, RBC – Rotating Biological Contactor.

TABLE 6-4
Proposed Lighthouse Point WRF – Nonmonetary Criteria Revised Evaluation

		Alternative Score										
Criteria	**Importance Weighting**	**Alt 1 CAS, UV**	**Alt 2 CAS, Chlorine**	**Alt 3 SBR, UV**	**Alt 4 SBR, Chlorine**	**Alt 5 Extended AB, UV**	**Alt 6 Extended AB, Chlorine**	**Alt 7 MBR, UV, Solids Treatment**	**Alt 7A MBR, UV**	**Alt 8 MBR, Chlorine**	**Alt 9 RBC, UV**	**Alt 10 RBC, Chlorine**
Effluent Water Quality	97%	3.0	3.0	3.0	3.0	4.0	4.0	5.0	5.0	5.0	2.0	2.0
Visual Integration into the Park	94%	3.0	3.0	4.0	4.0	2.0	2.0	5.0	5.0	5.0	2.0	2.0
Noise Impacts	87%	3.0	3.0	4.0	4.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0
Odor Impacts	97%	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0
Beneficial Use of Byproducts	75%	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.0
Amount of Solids to be Disposed	56%	3.0	3.0	3.0	3.0	4.0	4.0	5.0	2.0	2.0	3.0	3.0
Flexibility to Changing Conditions	73%	3.0	3.0	4.0	4.0	3.0	3.0	5.0	5.0	5.0	2.0	2.0
Strong Process Performance Record	84%	4.0	4.0	3.0	3.0	4.0	4.0	3.0	3.0	3.0	4.0	4.0
Ease of Use by Operators	69%	3.0	3.0	2.0	2.0	3.0	3.0	4.0	4.0	4.0	4.0	4.0
Extent of Maintenance Required	75%	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	3.0	3.0
Public and Operators Safety Risks	84%	4.0	3.0	4.0	3.0	4.0	3.0	5.0	5.0	4.0	4.0	3.0
Public Acceptance	79%	4.0	3.0	4.0	3.0	4.0	3.0	5.0	5.0	4.0	4.0	3.0
Total Benefit Score		31.6	30.0	32.6	31.0	32.2	30.6	39.6	37.1	35.4	29.6	28.0
Total Construction Cost ($M)		$17.6	$17.8	$16.4	$16.6	$19.0	$19.2	$23.2	$18.4	$18.5	$16.4	$16.6
Total Life-Cycle Cost ($M)		$36.7	$36.3	$35.2	$34.7	$38.5	$38.1	$52.8	$43.0	$42.0	$35.7	$35.3

Scoring Range: 5 – Positive Characteristic, 1 – Negative Characteristic

6.5 Evaluation Conclusions

The results of the monetary estimates and the nonmonetary evaluation results were then graphically presented in Figures 6-1 and 6-2, which show the cost versus relative benefit of each alternative.

As shown in Figures 6-1 and 6-2, the preferred alternatives have a combination of high benefit for the lowest cost. Based on the presentation of the alternative evaluation results in the Council work session and after discussion of the relative benefits, Council directed that further evaluation of Alternatives 3 and 7A should be conducted. These alternatives represent the most viable options for the proposed Lighthouse Point WRF. This additional information would allow a final selection between the two alternatives.

The results of the additional evaluation of Alternatives 3 and 7A were presented in a subsequent work session with Council and members of the CWAC. Additional requirements to provide treatment for the entire unequalized flow, which would thereby eliminate the equalization storage facilities constructed in the Phase 1 Improvements were also presented.

Based on the outcome of the two work sessions, Blaine's City Council unanimously approved building the membrane bioreactor facilities described under Alternative 7A for the proposed Lighthouse Point WRF.

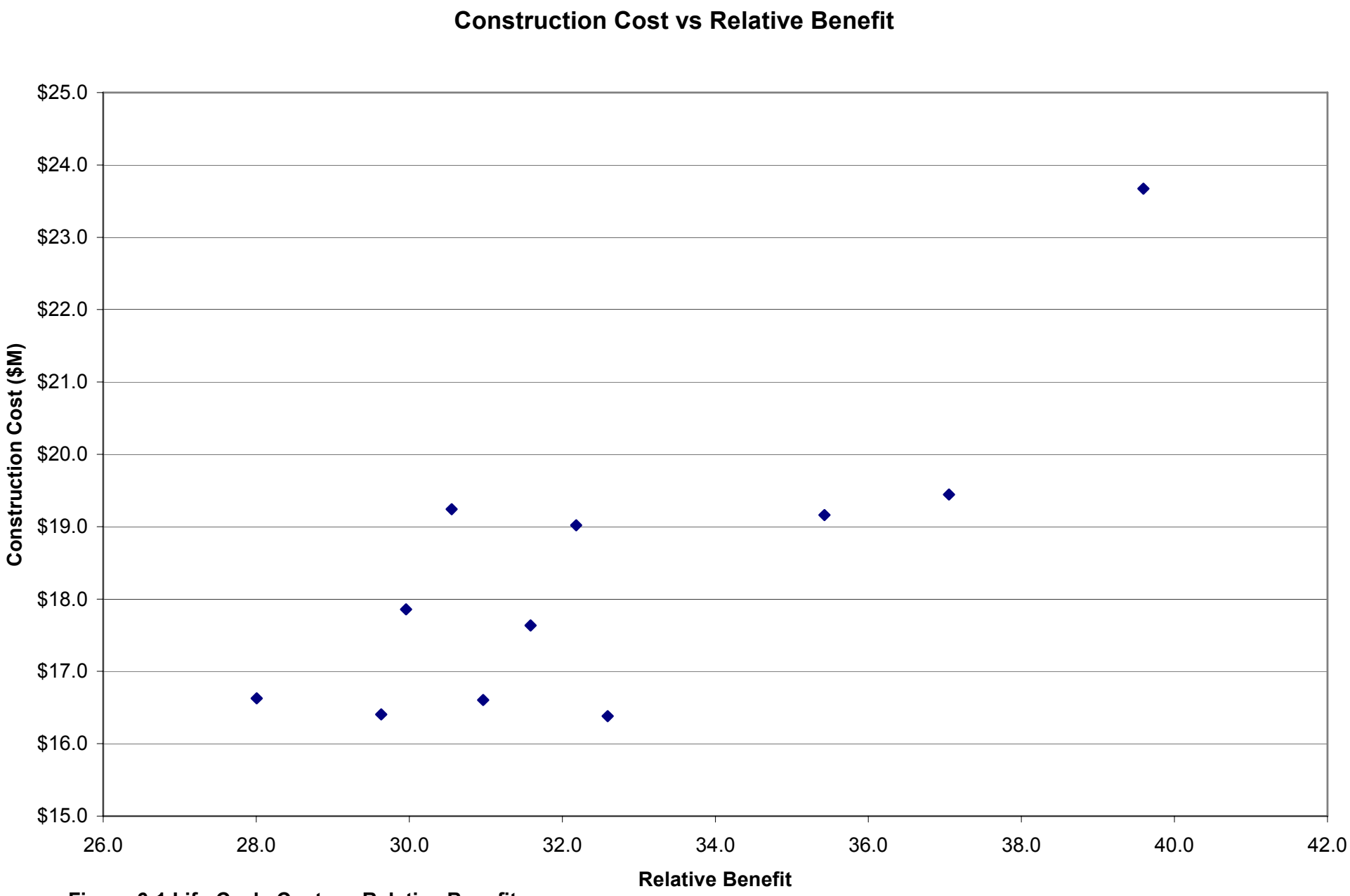


Figure 6-1 Life-Cycle Cost vs. Relative Benefit

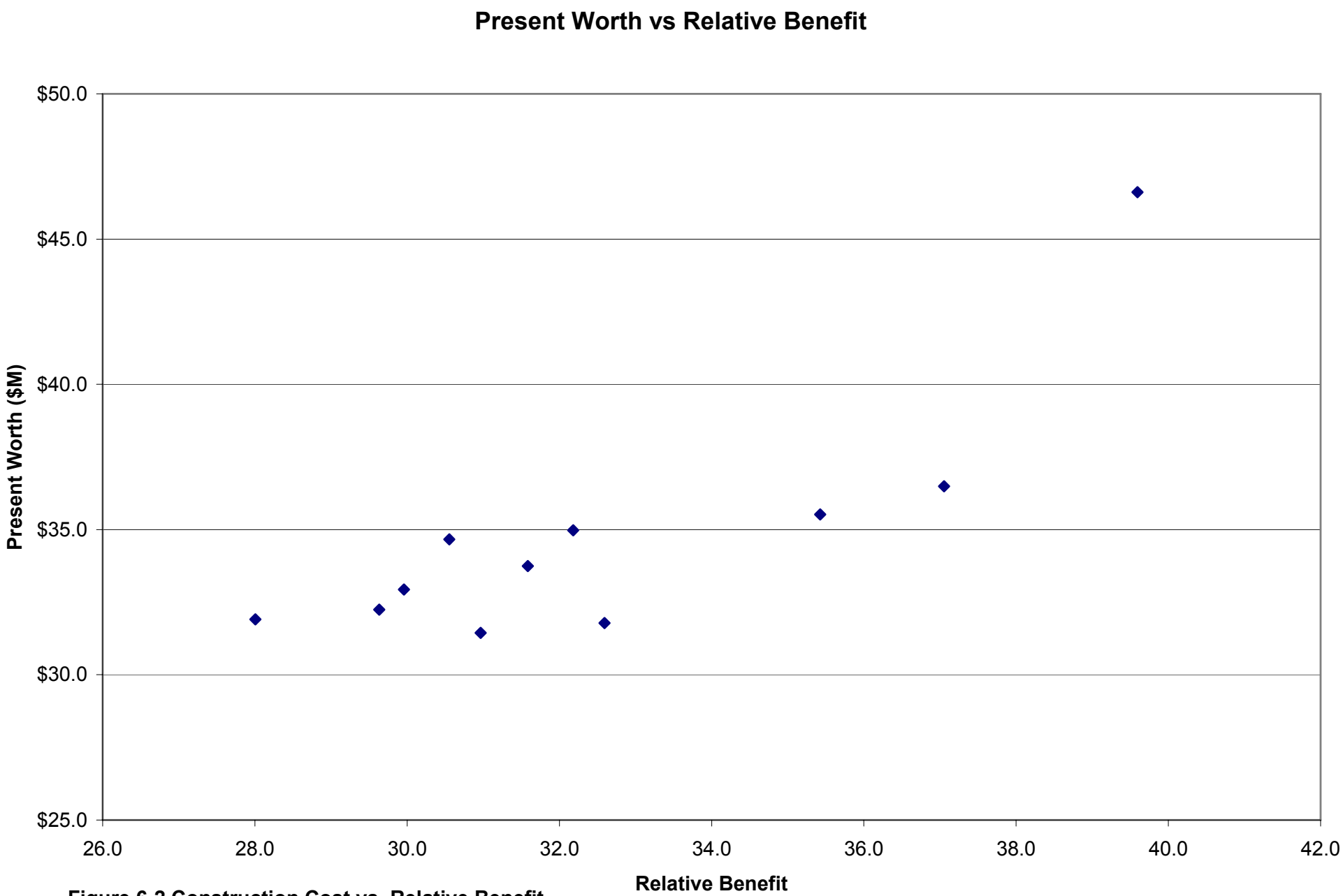


Figure 6-2 Construction Cost vs. Relative Benefit

CHAPTER 7

Recommended Plan

The infrastructure improvements to address the conveyance and treatment needs for the City over the next 20-year planning horizon are described in this chapter. This chapter briefly describes the recommended improvements proposed that address the wet weather overflow needs as part of the Phase 1 improvements, also including the interim improvements to maintain treatment capacity at the existing WWTPs.

The proposed Lighthouse Point WRF includes the infrastructure to be implemented under the Phase 2 improvements to provide treatment of the East and Central Blaine flows. The Phase 3 improvements include the facilities to convey or treat the West Blaine flows.

The following is a brief summary of the recommended improvements for the Phase 1 and Phase 3 facilities. A detailed summary of the improvements proposed in the Phase 2 facilities is also included in this chapter.

7.1 Interim and Phase 1 Capital Improvements

This section describes the proposed short-term improvements to the existing WWTP to provide reliable treatment until the proposed Lighthouse Point WRF is completed. It also describes any longer-term improvements proposed to the existing WWTP to be implemented until the long-term treatment solution for West Blaine flow is implemented.

In addition to the treatment improvements at the existing WWTP, several improvements to the conveyance system to address the wet weather overflow conditions are described in this section.

7.1.1 Existing WWTP Interim Improvements

The short-term and long-term alternatives are described in greater detail in the General Sewer Plan (CH2M HILL, 2004). Cost-effectiveness was an important factor in evaluating improvements for the WWTP, due to the future abandonment of the existing site. Any capital investment at the existing site may divert available funding for future construction. The City and its WWTP operational staff have been very proactive in trying to improve the performance of the WWTP. The type of testing and modification alternatives that were considered include the following:

- Internal baffle modifications in RBC
- Addition of effluent filtration
- Aerobic digesters process modifications

The City has contracted with another consultant to analyze the potential WWTP improvement alternatives and to implement the recommended solution.

7.1.2 Conveyance and Wet Weather Storage

As part of the Phase 1 improvements, the City is addressing the concern of sanitary sewer overflows occurring at LS1. The City currently is experiencing significant wet weather flow influences in their sewer collection system. During significant rainfall events the capacity of the main trunk line along Marine Drive is exceeded with a combination of domestic wastewater and stormwater I/I. Under these conditions, overflow occurs at LS1 because of limitations of the existing pumps to convey the flow. The existing WWTP has a hydraulic capacity limitation of 24 mgd and cannot handle the peak flows without flow equalization prior to conveyance to the WWTP site.

Wet weather storage will be provided under the Phase 1 improvements to accommodate the storage needs of these peak flows until such time as the peak flows subside and can be conveyed through LS1 to the existing WWTP within the capacity of the existing system.

The City has contracted with another consultant to plan and design these improvements. An estimated storage volume of 400,000 gallons was determined to meet the preliminary system capacity needs. Once this system is implemented, the capacity requirements of the proposed Phase 2 improvements can be reduced.

7.1.3 Lift Station 1 Improvements

The City has previously implemented improvements to LS1 to improve the operation of the pumping system and to improve the conveyance capacity of the lift station. No further improvements are anticipated until Lift Station No. 1 is converted to the influent pump station for the proposed Lighthouse Point WRF under the Phase 2 improvements.

7.2 Phase 2 Capital Improvements

This section briefly summarizes the process to select the proposed Lighthouse Point WRF and describes in more detail the proposed improvements for the proposed Lighthouse Point WRF.

The designated title of Water Reclamation Facility for the Lighthouse Point treatment plant was selected to reflect the direction from the community and the goal to use reclaimed water in the future. It was generally understood that the implementation of reclaimed water would require additional planning and regulatory review. Preliminary discussions have occurred with the Department of Health, in addition to other potential users of reclaimed water as part of the development of this Facility Plan. The positive impact on water quality due to the implementation of the MBR technology was also a factor in the selection of the facility designation.

7.2.1 Treatment Plant Site

The conceptual layout of the proposed Lighthouse Point WRF site is shown in Figure 7-1. The site is adjacent to the existing location of Lift Station 1 on the north side of Marine Drive. The Marine Drive corridor is a mix of commercial and industrial land uses.

The evaluation of site alternatives for the City's future wastewater treatment was accomplished through a structured decision process. The process used a set of decision criteria grouped under five overall objectives for wastewater treatment. In order to ensure

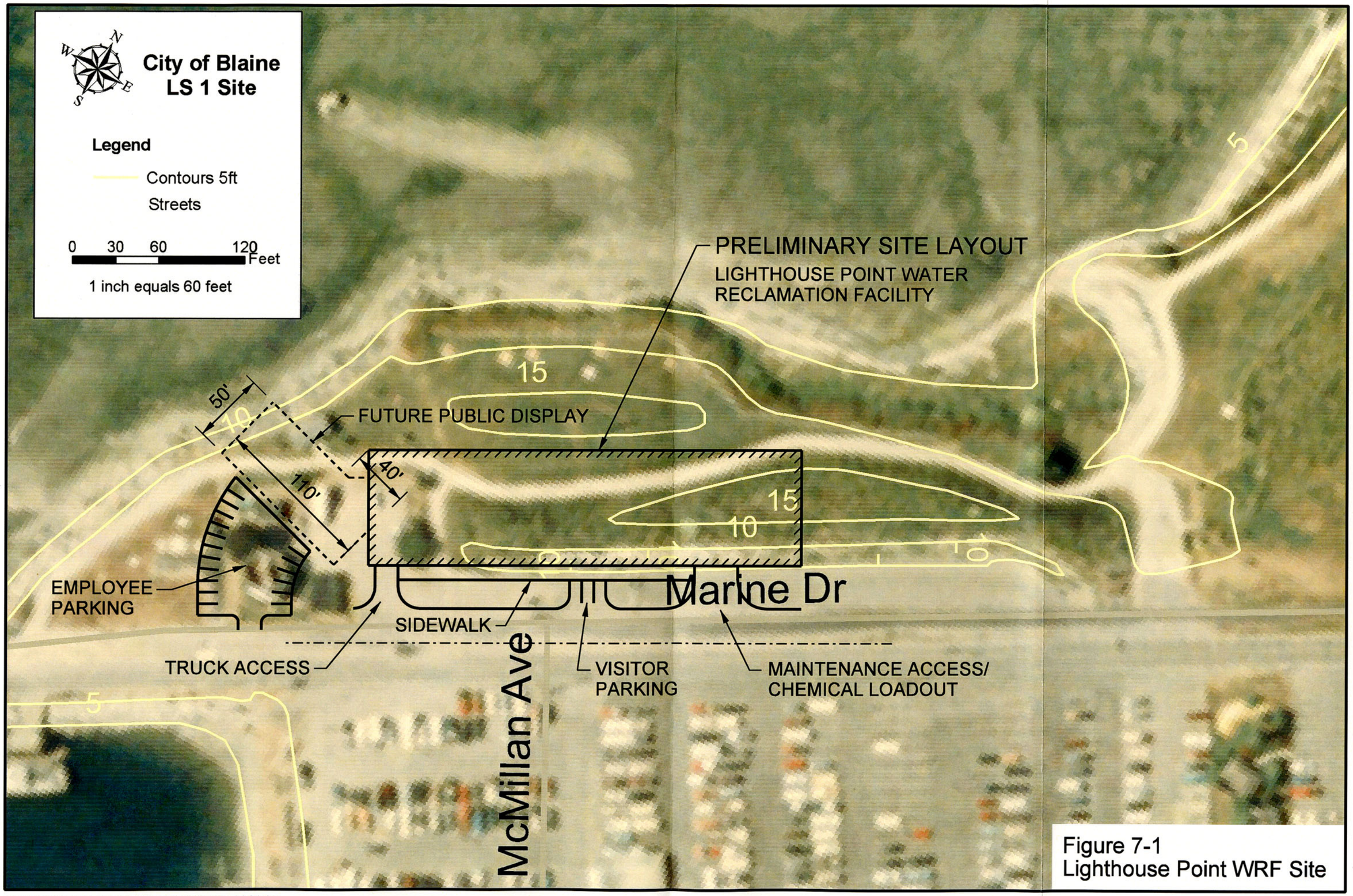


Figure 7-1
Lighthouse Point WRF Site

//Owl \ Proj \ BlaineWaCityOf \ 179587 \ Graphics \ LS1.dgn

that the final decision would represent the priorities of the City's stakeholder groups, the CWAC was formed to help guide criteria development, alternative screening, and decision-making on the preferred site alternative.

Thirteen alternatives for the treatment of the City's wastewater were initially developed for evaluation. A fourteenth alternative was later added during the evaluation process. For each alternative, a fact sheet was completed to provide sufficient detailed information to allow the CWAC to rank alternatives against the evaluation criteria. The fact sheets included information on topics presented in Chapter 5, which were designed to correspond to the CWAC's objectives/guiding principles. Based on the results of the analysis, the CWAC ultimately recommended to the City Council that the City implement the construction of the proposed Lighthouse Point WRF) on Marine Drive to treat flows from Central and East Blaine, and ultimately treating flows from West Blaine.

The plant site along Marine Drive is an area that is not subject to storm induced wave action from Puget Sound. The proposed treatment facilities is located in Zone X based on the current FEMA maps. Refer to Figure 7-2. No design requirements for wave action have been included as a result of the classification of this area. This should also be further confirmed with the Flood Division of Whatcom County during the final design phase.

7.2.2 Treatment Plant Facilities

This section presents the recommendations from the treatment process evaluation, resulting in the development of the process flow schematic, the flow and mass balances analysis, development of the hydraulic profile, and the design criteria. The treatment components that have been selected for the proposed Lighthouse Point WRF include the following unit processes:

- Preliminary/primary treatment using fine screening and grit removal
- Secondary treatment using MBR technology
- Disinfection using UV irradiation
- Solids handling consisting of thickening and storage

All treatment processes for the proposed Lighthouse Point WRF will be enclosed in a single building, which is referred to as the Facility Building. The facilities layout is described in more detail in a later section.

Process Flow Diagram

The treatment process systems and their interrelationships for the proposed Lighthouse Point WRF are shown in a process flow diagram in Figures 7-3 and 7-4. The process flow diagram shows the liquids processes, including a proposed vortex grit removal system, fine screening, anoxic and aerobic treatment processes with membrane solids/liquid separation, and effluent disinfection. The solids processes are also shown in the process flow diagram, including solids thickening and pumping facilities. The City has decided to continue with their current solids management plan, which includes thickening and storage onsite followed by removal and hauling to offsite facilities for treatment and ultimate disposal.

Flow and Mass Balance

A flow and mass balance analysis was completed as part of the preliminary process design evaluation. Table 7-1 presents a flow and mass balance for the proposed treatment system at

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD EVENT

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water surface elevation of the 1% annual chance flood.

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Area of special flood hazard formerly protected from the 1% annual chance flood event by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood event.
ZONE A99	Area to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the National Geodetic Vertical Datum of 1929

A — A	Cross Section Line
23 - - - - - 23	Transect Line

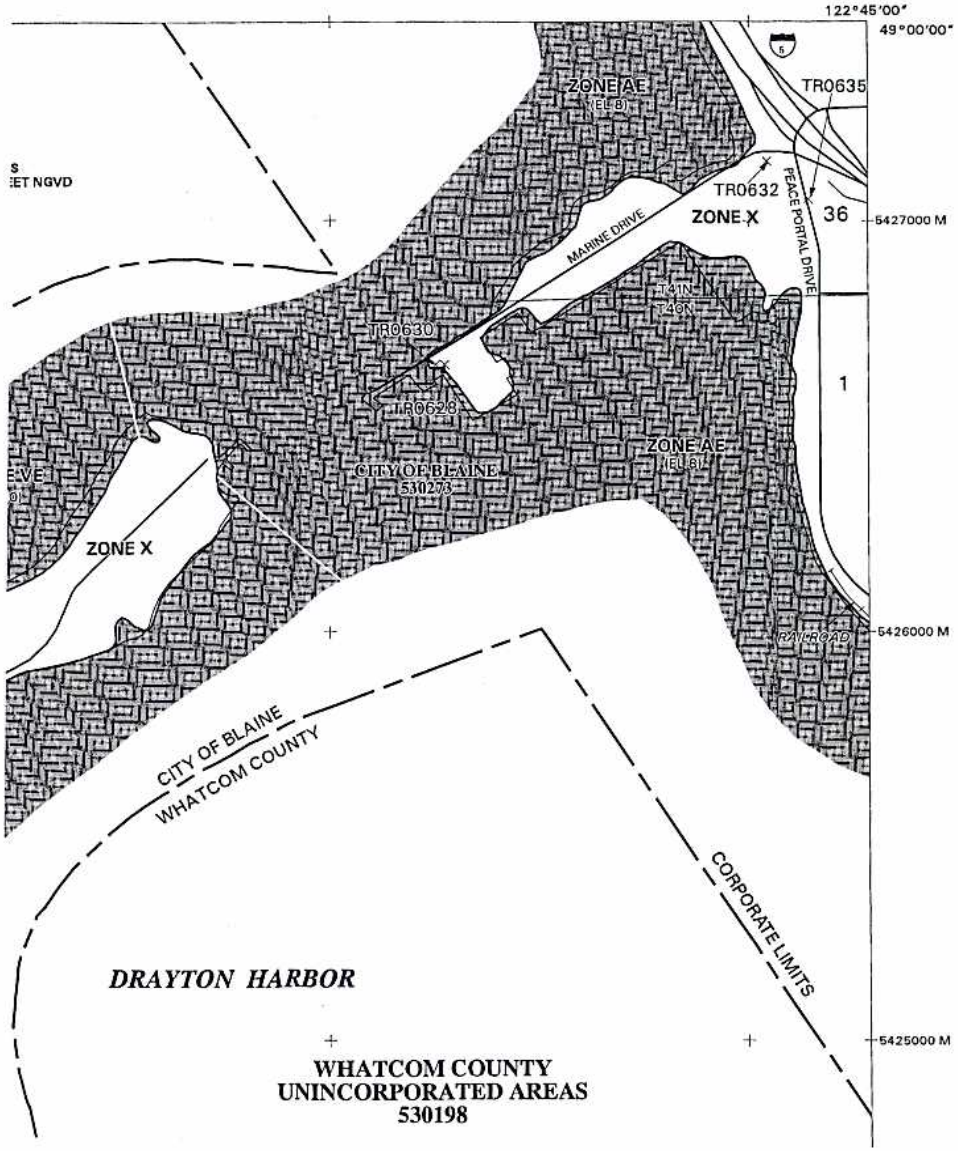


FIGURE 7-2

FEMA Map for Blaine WRF Treatment Site

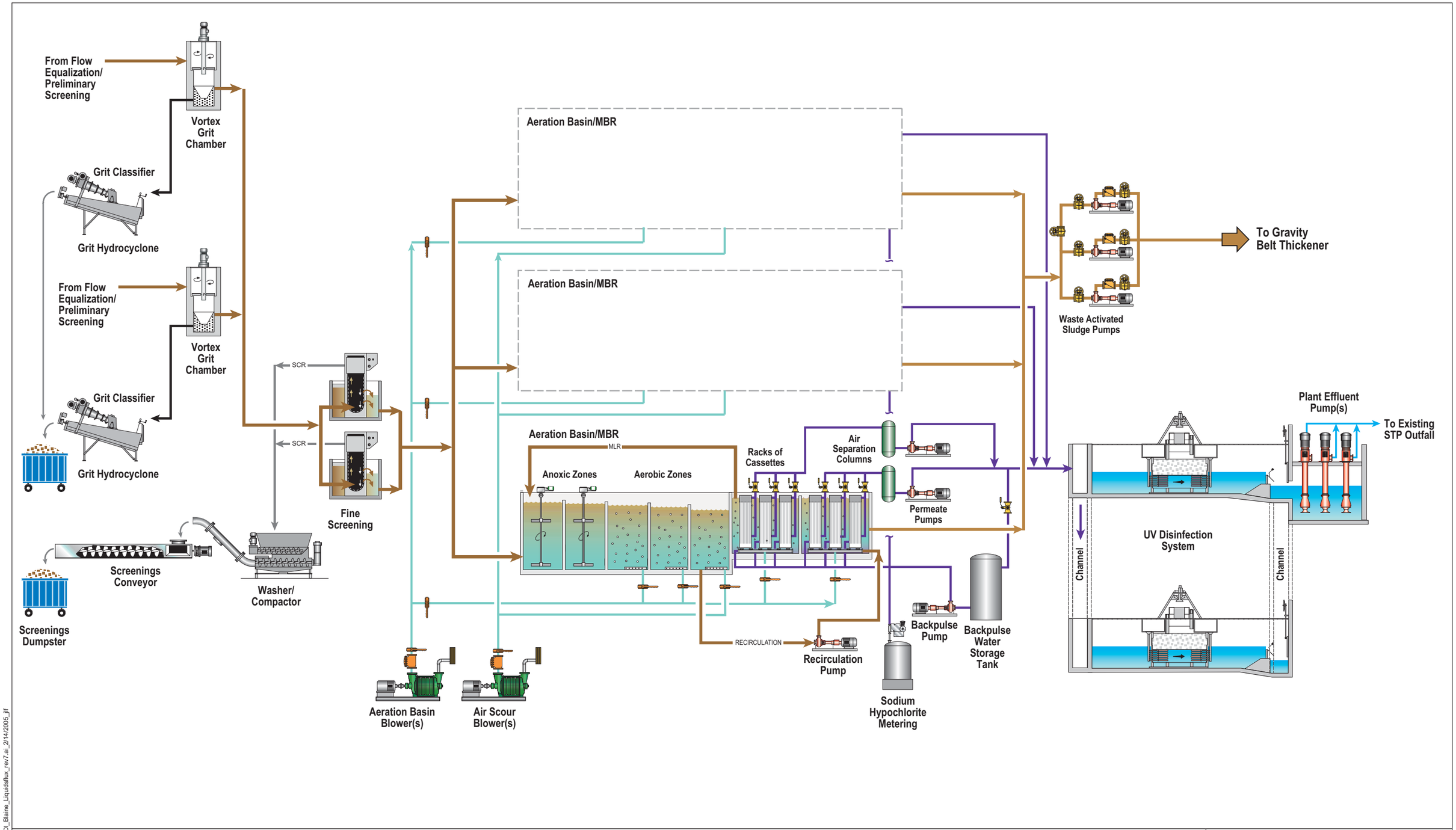


Figure 7-3
Lighthouse Point WRF
Liquids Process Flow Diagram

CH2MHILL

179597.SP.03.04_W01200500180I_Blaine_Liquidsflux_rev7.ai_2/14/2005_jlf

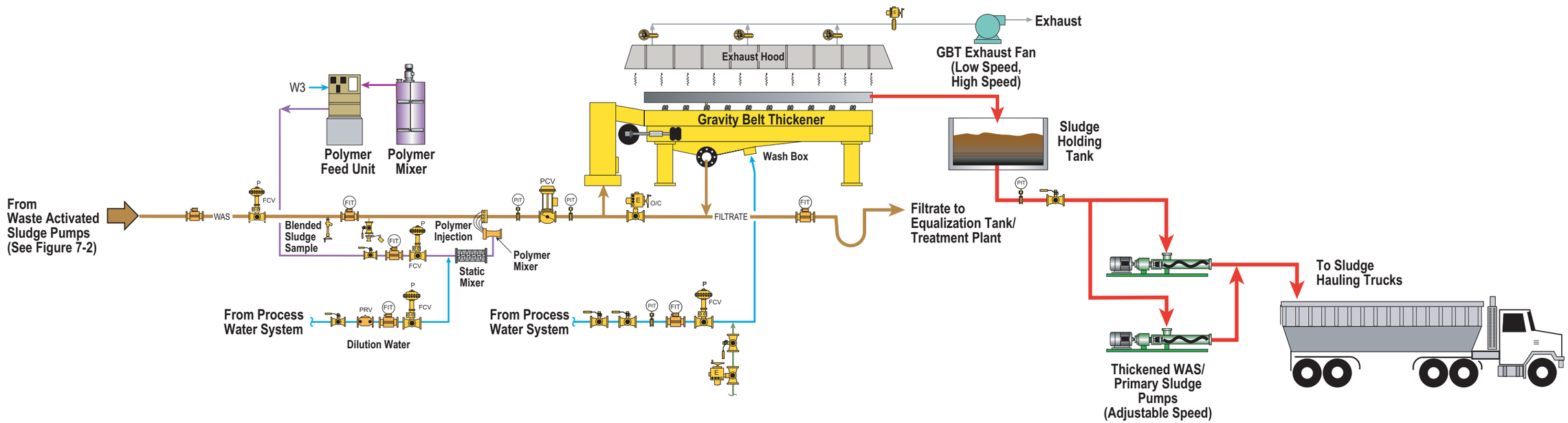


Figure 7-4
Lighthouse Point WRF
Solids Process Flow Diagram

CH2MHILL

179597.SP.03.04_W012005001BOI_Blaine_Solidsflux_rev8.ai_2/14/2005_jlf

TABLE 7-1
Proposed Lighthouse Point WRF: Flow and Mass Balance

Constituent	Raw Wastewater (RW)	Main Recycled Stream (Recycle)	Combined RW and Recycle	Fine Screen Influent	Fine Screen Effluent	Bioreactor Influent (BI)	MBR Influent (SI)	MBR Effluent (SE)	Plant Effluent (PLE)	Main WAS	WAS Thickener Influent (WAS)	Thickened WAS (TWAS)	Biosolids to Disposal	WAS Thickening Recycle (PD)
Flow (gallons/day)	1,550,000	17,694	1,567,694	1,567,694	1,566,849	1,566,849	1,566,849	1,545,995	1,545,995	20,854	20,854	3,160	3,160	17,694
Carbonaceous BOD_5 (lbs/day)	2,121	18	2,139	2,139	2,001	2,001	26,941	8	8	359	359	341	341	18
COD (lbs/day)	4,548	89	4,637	4,637	4,303	4,303	131,946	159	159	1,756	1,756	1,667	1,667	89
TSS (lbs/day)	2,031	83	2,114	2,114	1,797	1,797	125,152	14	14	1,666	1,666	1,582	1,582	83
VSS (lbs/day)	1,523	62	1,585	1,585	1,350	1,350	92,816	10	10	1,235	1,235	1,174	1,174	62
TKN (lbs/day)	556	4	560	560	552	552	5,182	10	10	69	69	65	65	4
NH_3-N (lbs-N/day)	388	0	388	388	388	388	1	1	1	0	0	0	0	0
NO_3-N (lbs-N/day)	0	3	3	3	3	3	287	283	283	4	4	1	1	3
TP (lbs-P/day)	58	1	60	60	57	57	1,673	35	35	22	22	21	21	1
Alkalinity (lbs/day as $CaCO_3$)	2,587	7	2,594	2,594	2,593	2,593	618	610	610	8	8	1	1	7
H_2S (lbs/day)	78	0	78	78	78	78	0	0	0	0	0	0	0	0
BOD_5 (mg/L)	164	122	164	164	153	153	2,060	1	1	2,060	2,060	12,914	12,914	122
COD (mg/L)	352	605	354	354	329	329	10,091	12	12	10,091	10,091	63,198	63,198	605
TSS (mg/L)	157	564	162	162	137	137	9,571	1	1	9,571	9,571	60,000	60,000	564
VSS (mg/L)	118	418	121	121	103	103	7,098	1	1	7,102	7,102	44,498	44,498	418
TKN (mg-N/L)	43.0	24	43	43	42	42	396	1	1	396	396	2,481	2,481	24
NH_3-N (mg-N/L)	30.0	0	30	30	30	30	0	0	0	0	0	0	0	0
NO_3-N (mg-N/L)	0.0	22	0	0	0	0	22	22	22	22	22	22	22	22
TP (mg-P/L)	4.5	10	5	5	4	4	128	3	3	128	128	788	788	10
Alkalinity (mg/L as $CaCO_3$)	200	47	198	198	198	198	47	47	47	47	47	47	47	47
H_2S (mg/L)	6.0	0	6	6	6	6	0	0	0	0	0	0	0	0

the proposed Lighthouse Point WRF. The flow and mass balance shows the liquids and solids process streams, as well as the recycle streams. The expected treatment efficiencies for the unit processes and overall water reclamation facility are shown in Table 7-2. Table 7-3 shows the typical flow rate and mass loading factors used for the design and operation of WWTPs.

TABLE 7-2
Water Reclamation Facility – Expected Removal Efficiencies

Unit Process	BOD_5 Removal Efficiency	TSS Removal Efficiency	TKN Removal Efficiency
Fine Screening	6%	15%	1%
Membrane Bioreactor	99%	99%	98%
Overall WRF	99%	99%	98%

TABLE 7-3
Typical Flow Rate and Mass Loading Factors Used for the Design and Operation of Wastewater Treatment Plant Facilities.

Factor	Application
	Based on Flow Rate
Peak Hour	Sizing of pumping facilities and conduits, bar rack sizing
	Sizing of physical unit operations: grit chambers, sedimentation tanks, and filters; sizing chlorine contact tanks
Maximum Day	Sizing of sludge pumping systems
Greater-than-one-day-maximum	Screening and grit storage
Maximum Week	Record keeping and reporting
Maximum Month	Record keeping and reporting; sizing of chemical storage facilities
Minimum Hour	Sizing turndown of pumping facilities and low range of plant flowmeter
Minimum Day	Sizing influent channels to control solids deposition; sizing effluent recycle requirements for tricking filters
Minimum Month	Selection of minimum number of operating units required during low flow periods
	Based on Mass Loading
Maximum Day	Sizing of selected biological processing units
Greater-than-one-day-maximum	Sizing of sludge thickening and dewatering systems
Sustained Peaks	Sizing of selected sludge processing units
Maximum Month	Sizing of sludge storage facilities; sizing of composting requirements
Minimum Month	Process turndown requirement
Minimum Day	Sizing of trickling filter recycles

Metcalf & Eddy, Inc.: Wastewater Engineering: Treatment, Disposal, and Reuse - Third Edition

Hydraulic Profile

A hydraulic analysis was performed for the proposed unit process configuration at the proposed Lighthouse Point WRF. This includes assumptions for the interconnecting pipeline and channels between the units, and identification of pumping requirements to meet hydraulic head constraints.

A hydraulic profile was developed to show the water surface elevation throughout the treatment system. Figure 7-5 shows the hydraulic profile for two types of MBR process configurations. In one MBR configuration type, the process flow is conveyed by gravity to the MBR basins. From the MBR system the effluent is conveyed using permeate pumps for discharge to the UV disinfection system. Mixed liquor recycle is pumped back to either the anoxic and/or aeration basins.

In the second MBR configuration type, the process flow is conveyed through pumping to the MBR basins. From the MBR system the effluent is again conveyed using permeate pumps for discharge to the UV disinfection system. However, in this system, the mixed liquor recycle is conveyed by gravity back to either the anoxic and/or aeration basins.

Figure 7-5 shows the water surface elevations for under an average day flow capacity of 1.6 mgd and a peak hour flow capacity of 3.1 mgd.

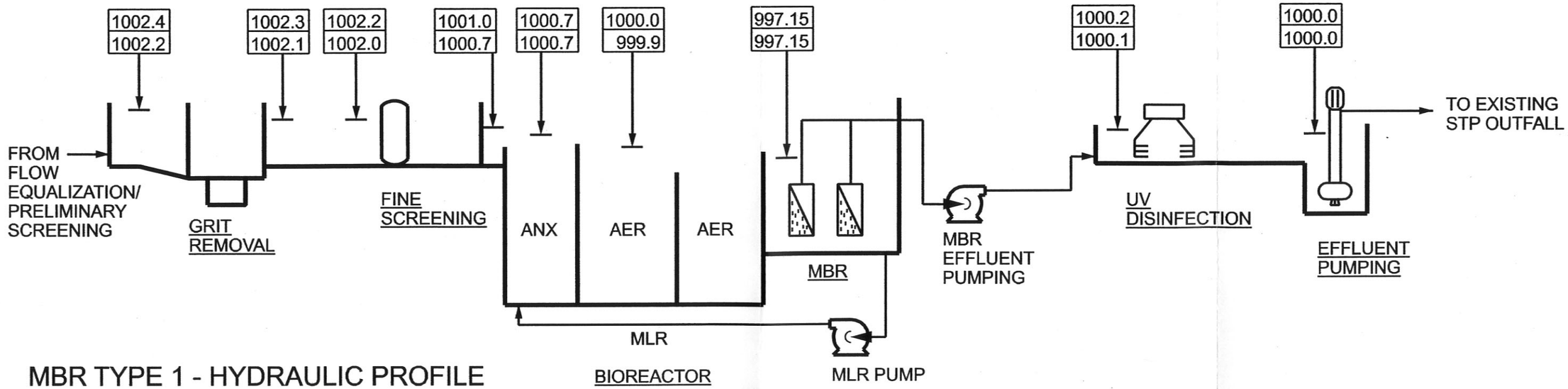
Treatment Facilities Layout and Floor Plan

The proposed floor plan for the Facility Building includes individual space for preliminary/primary treatment, secondary treatment, disinfection, and solids handling. Individual rooms have also been designated for laboratory, operations, and administration functions, HVAC, and electrical functions. The Facility Building will consist of approximately 23,000 square feet of floor space. Figure 7-6 shows the preliminary layout of the treatment facilities.

The Headworks area will house the preliminary and primary treatment facilities. The process equipment located in the Headworks area includes influent screening, grit removal, and dumpsters for collection of screenings and grit. There is also space for truck loading for screenings and grit removal. The Headworks area will consist of approximately 3,400 square feet of floor space.

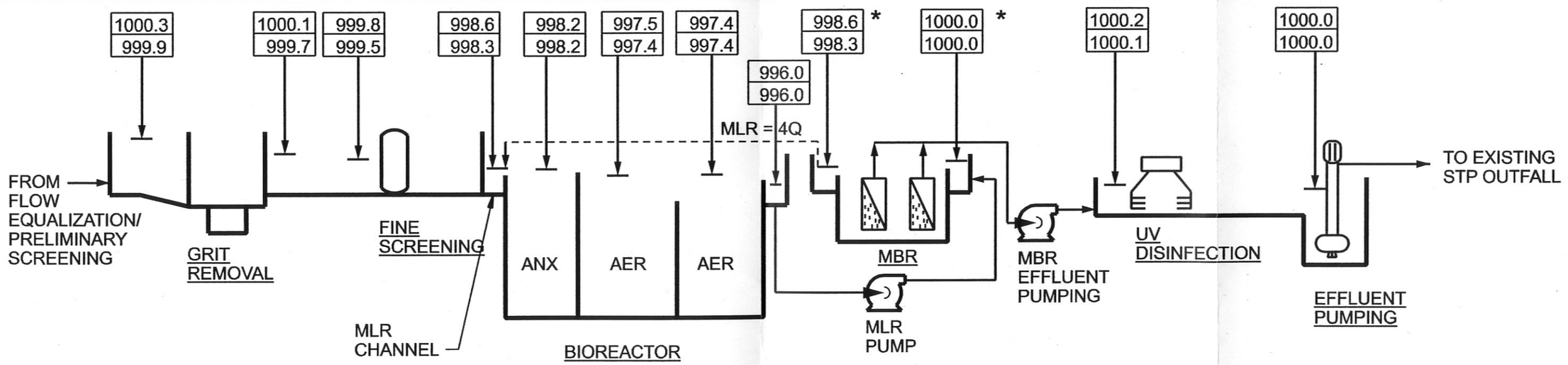
The area for the MBR process will contain the basins and process equipment for advanced treatment of wastewater. MBRs utilize immersed membrane equipment in conjunction with suspended growth activated sludge aeration. The MBR area will also house the process blowers and pumps needed for the activated sludge basins and membrane filtration basins.

The MBR Room will consist of approximately 8,000 square feet of floor space.



MBR TYPE 1 - HYDRAULIC PROFILE

► GRAVITY FEED TO MBR



MBR TYPE 2 - HYDRAULIC PROFILE

► PRESSURE FEED TO MBR

►* INDICATES WATER SURFACE LEVEL (WSL) BASED ON MIXED LIQUOR RECYCLE CHANNEL WSL

NOTES:

1000.2 - INDICATES WSL AT PEAK HOUR FLOW = 3.1 MGD

1000.1 - INDICATES WSL AT MAX MONTH FLOW = 1.55 MGD

Figure 7-4
Lighthouse Point WRF - Hydraulic Profiles

CH2MHILL

\\Owl\Proj\BlaineWACityOf\179587\Graphics\Hydraulic Profile.dgn

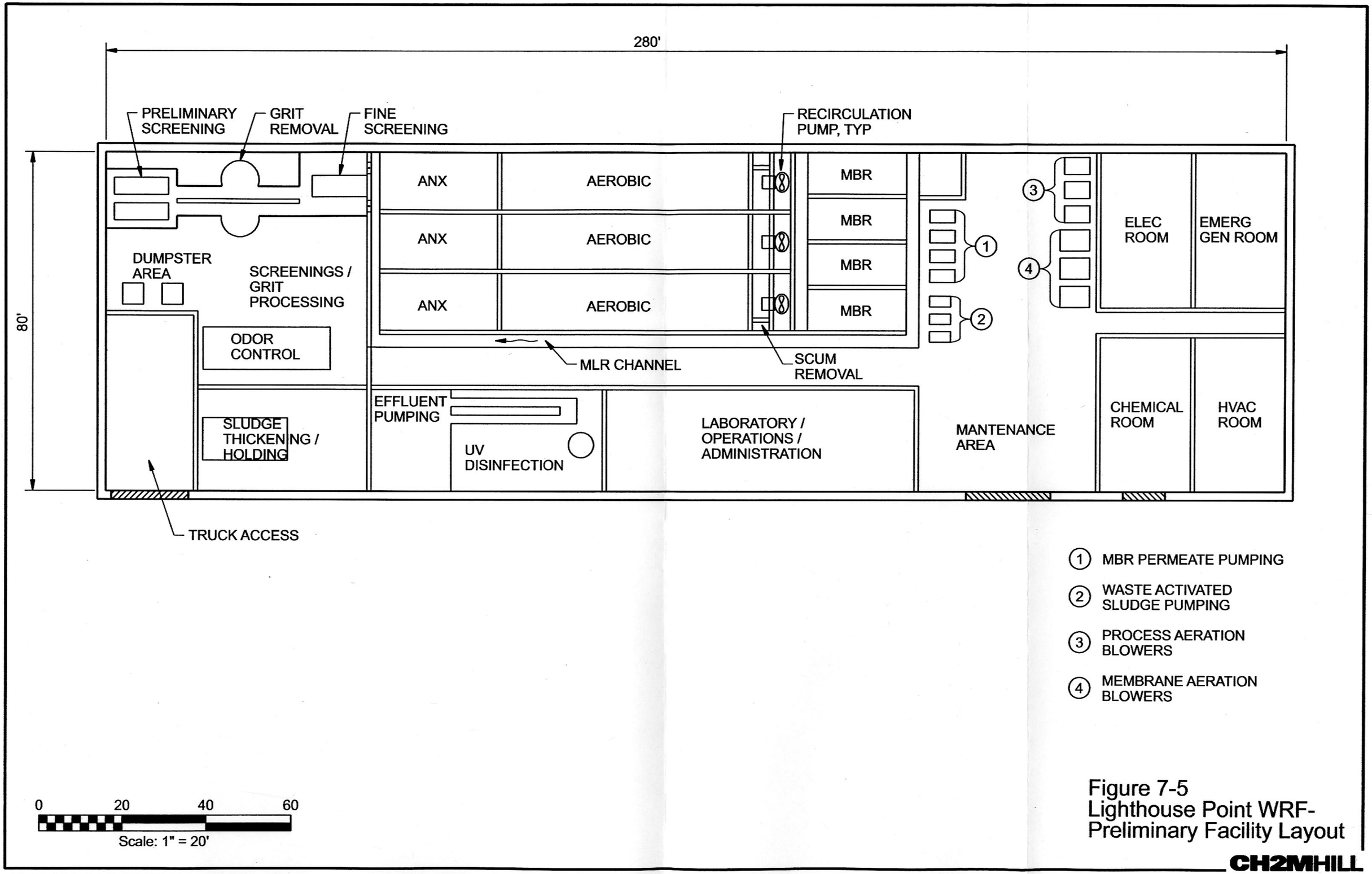


Figure 7-5
Lighthouse Point WRF-
Preliminary Facility Layout

CH2MHILL

\\Owl\Proj\BlaineWACityOf\179587\Graphics\fig-3 mbr.dgn

Solids handling facilities will be located in the Solids Handling Room. The process equipment to be contained in this room includes a GBT and sludge holding tank. There is also space for truck loading for solids removal. The Solids Handling Room will consist of approximately 14,500 square feet of floor space.

UV reactors for disinfection of the plant effluent will be located adjacent to the maintenance area, along with effluent pumping equipment and odor control equipment. The combined disinfection and pumping area will consist of approximately 1,400 square feet of floor space. The maintenance area will consist of approximately 2,700 square feet of floor space.

7.2.3 Design Criteria

Table 7-4 presents a summary of the recommended design criteria for the proposed Lighthouse Point WRF. Number and size of the treatment process units and the design criteria are presented. The number of process units and equipment recommended will be reviewed and finalized during the preliminary and final design phases of the WRF project. These process decisions include:

- Types of grit removal process and support equipment
- Type of mechanical fine screens
- Type of aeration (blower) and mixing systems
- Type of membrane equipment system
- Type of pumping systems
- Type of UV disinfection system
- Type of odor control systems

In addition to the treatment process equipment, the proposed Lighthouse Point WRF site will also contain facilities for conveyance and flow equalization. The existing LS1, located near the proposed Lighthouse Point WRF site, will be converted to an influent pump station. A 400,000-gallon storage basin will be installed upstream of the pump station for flow equalization. Effluent pumps for conveyance of plant effluent to the existing outfall in Semiahmoo Bay will be located inside the Facility Building.

Plant Conveyance Facilities

The plant conveyance systems that are needed for the proposed Lighthouse Point WRF include the following facilities:

- Influent pump station
- Effluent pump station
- Yard piping
- Existing force main along Semiahmoo Spit
- Intertie to existing outfall in Semiahmoo Bay

Sizing requirements for the conveyance facilities associated with the proposed Lighthouse Point WRF and interties with the existing infrastructure were developed using the hydraulic design capacity requirements for the proposed Lighthouse Point WRF that were described in Chapter 4. The sizing requirements are summarized on Table 7-5.

TABLE 7-4
Preliminary Design Criteria

Process Units	Design Criteria
Preliminary/Primary Treatment	
Grit Removal	
Number of Units (Duty + Standby) / Type	1 + 1 / Vortex
Capacity, ea.	3.1 mgd
Fine Screens	
Number of Units (Duty + Standby) / Type	1 + 1 / Rotary Mechanical
Capacity, ea. / Opening Size	3.1 mgd / 2-mm
Secondary Treatment	
Number of Treatment Trains (Design / Future)	(3 / 3)
Anoxic Basins	
Number / Volume per Train	1 Basin / 54,272 gal
Sidewater Depth	18-ft
Firm Capacity Detention Time @ MM Flow / PH Flow	1.66 hr / 0.84 hr
Firm Capacity Design SRT / Design MLSS	3.5 days / 8,390 mg/L
Anoxic Mixing System	
Number per Basin / Type	2 / Submersible Mixer
Horsepower, ea.	3 HP
Aeration Basins	
Number / Total Volume per Train	3 Basins / 135,094 gal.(total)
Sidewater Depth	18
Firm Capacity Detention Time @ MM Flow / PH Flow	4.2 hr / 2.1 hr
Design SRT (Aerobic/MBR) / Design MLSS	11.5 days / 8,390 mg/L
Process Aeration System	
Type	Fine Bubble Diffused Aeration
Number / Type of Blowers	3 / Centrifugal Blower
Horsepower, ea.	170 HP
Membrane Basins	
Number Membranes per Train / Volume per Train	3 Cassettes / 15,500 gal
Sidewater Depth	12 ft
Detention Time @ Avg. Flow / Max. Flow	1.5 hr / 0.5 hr
Design MLSS	10,400 mg/L
Membrane Equipment	TBD
Membrane Aeration System	
Diffuser Type	Coarse Bubble Diffused Aeration
Number / Type of Blowers	3 / Centrifugal Blower
Horsepower, ea.	20 HP
Permeate Pumps	
Number / Type of Pump	4 / Vacuum
Capacity, ea. / Horsepower, ea.	1,400 gpm / 10 HP
Recirculation Pumps	
Number / Type of Pump	2 / Axial-Flow

TABLE 7-4
Preliminary Design Criteria

Process Units	Design Criteria
Capacity, ea. / Horsepower, ea.	700 gpm / 5 HP
Waste Activated Sludge Pumps	
Number / Type of Pump	3 / Solids Handling Centrifugal
Capacity, ea. / Horsepower, ea.	60 gpm / 3 HP
Disinfection System	
UV Disinfection	
Channels / Modules per Channel	2 / 8 Modules
System Type / Capacity (per Channel)	Low pressure / 3.1 mgd
Solids Treatment	
Waste Sludge Storage	
Number / Volume per Tank	1 / 20,000 gal
Number / Type of Mixing System	1 / Submersible Mixer
Sludge Thickening System	
Number / Type	1 / Gravity Belt Thickener
Size / Hydraulic Loading	1-meter belt / 150 gpm/meter
Thickened Waste Sludge Pumping	
Number / Type of Pump	2 / Progressing Cavity
Capacity, ea. / Horsepower, ea.	50 gpm / 7.5 HP
Thickened Waste Sludge Storage	
Number of Tanks / Volume per Tank	1 / 20,000
Number / Type of Mixing System	1 / Submersible Mixer
Chemical Systems	
Sodium Hypochlorite Storage	
Number of Tank / Type	1 / Polypropylene
Capacity, ea.	400 gal
Sodium Hypochlorite Pumping	
Number / Type of Pump	2 / Chemical metering
System Demand	2,050 lb/year
Capacity, ea.	2 gpm
Citric Acid Storage	
Number of Tanks / Type	1 / Fiberglass Reinforced Plastic
Capacity, ea.	400 gal
Citric Acid Pumping	
Number / Type	2 / Chemical metering
System Demand	7,232 lbs/year
Capacity, ea.	2 gpm
Polymer Storage	
Number of Tank / Type	1 / Fiberglass Reinforced Plastic
Capacity, ea.	400 gal
Polymer Pumping	
Number / Type of Pump	2 / Chemical metering

TABLE 7-4
Preliminary Design Criteria

Process Units	Design Criteria
System Demand	3.3 lbs/hr
Capacity, ea.	1 gph
Odor Control Systems	
Influent Lift Station Odor Control	
Number / Type	
Capacity, ea. / Design Removal Percent	
Headworks and Solid Process Odor Control	
Number / Type	1 / Chemical Scrubber
Capacity, ea. / Design Removal Percent	12,000 cfm / XXX

Notes:
1. Firm Capacity = one unit off line and out of service (i.e. only 2 aeration basins in service with 3 MBR channels).
2. MM = Max Month Flow (1.55 mgd); PH = Peak Hour Flow (3.1 mgd)

TABLE 7-5
Hydraulic Design Criteria for Proposed Lighthouse Point WRF

	Minimum Flow (mgd)	Annual Average (mgd)	Maximum Month (mgd)	Dry Weather Peak Hour (mgd)	Wet Weather Peak Hour (mgd)	Equalized Peak Hour Flow (mgd)
Central & East Blaine	0.31	0.77	1.11	1.39	5.50	2.40
West Blaine	0.09	0.23	0.39	0.41	1.64	0.70
City of Blaine Total	0.40	1.00	1.50	1.80	7.14	3.10

Also included in the table are the peak flow rates during wet weather conditions following flow equalization. Projected wet weather flows for the City in the year 2023 were used in conjunction with optimized flow equalization volume to establish the hydraulic capacity for the proposed Lighthouse Point WRF and the plant conveyance facilities.

The proposed Lighthouse Point WRF will be located at the site of LS1 along Marine Drive in Central Blaine. The existing lift station, LS1, which is currently used to convey raw sewage flows from East and Central Blaine to the City's existing WWTP, will be converted to an influent pump station for the proposed Lighthouse Point WRF. Other modifications that are planned for the proposed Lighthouse Point WRF site include installation of a 400,000-gallon flow equalization basin. The flow equalization basin will be upstream of the influent pump station, and will regulate the wet weather peak flow rate to a maximum of 3.1 mgd. Thus, the pumps for the influent and effluent pump stations will be sized for a capacity of 3.1 mgd.

Hydraulic Capacity and Design Requirements for Pump Stations

The preliminary design and sizing requirements for the influent and effluent pump stations are based on the following design criteria:

- Each pump station shall be equipped with a minimum of two pumps and satisfy the Ecology requirements for firm capacity requirements under peak flow conditions.
- Each pump shall be equipped with a variable frequency drive to accommodate varying flow conditions.
- Meet the applicable requirements of the Ecology Criteria for Sewage Works Design (i.e., "Orange Book").

Influent Pump Station: The influent pump station will be sized with sufficient hydraulic capacity to convey up to 3.1 mgd of wastewater from the flow equalization basin to the headworks of the proposed Lighthouse Point WRF. The existing lift station LS1 located at the site of the proposed Lighthouse Point WRF will be reconfigured to function as the influent pump station for the proposed Lighthouse Point WRF.

Lift station LS1 is currently outfitted with two 1,750-gpm pumps that are equipped with 100-hp motors and variable frequency drives (VFDs). In order to convey influent under all flow conditions through 200 feet of 12-inch pipe to the headworks of the proposed Lighthouse Point WRF, the existing pumping facilities at LS1 will be replaced with three (3) 1,075-gpm pumps. This arrangement provides two (2) pumps in service with one (1) pump in standby to achieve the firm capacity. Each pump will be equipped with a 15-hp motor and VFD. The existing wet well will be modified to minimize the amount of solids deposition in the structure and promote self-cleaning velocity under average flow conditions.

Effluent Pump Station: The effluent pump station will be designed to convey up to 3.1 mgd of plant effluent to the City's existing outfall pipe in Semiahmoo Bay. The effluent pump station will be located at the site of the proposed Lighthouse Point WRF, adjacent to the disinfection process.

The effluent pump station will also be outfitted with three (3) pumps. Each pump will have sufficient hydraulic capacity to convey up to 3.1 mgd of effluent to the City's existing 24-inch outfall. This arrangement will also provide two (2) pumps in service with one (1) pump in standby to achieve the firm capacity. Based on these design requirements, each pump will have a capacity of 1,075-gpm, and will be equipped with a 125-hp motor and VFD. A pump station wet well will be provided for the pump suction.

The preliminary design criteria for conveyance facilities needed to support the proposed Lighthouse Point WRF are summarized on Table 7-6.

Hydraulic Capacity and Design Requirements of Conveyance Pipes

In this section, hydraulic capacity requirements are identified and evaluated for existing and proposed conveyance pipes that will serve the proposed Lighthouse Point WRF. The following hydraulic design guidelines were used to size conveyance pipes:

- Fluid velocity in force mains of between 2 and 8 feet per second (fps).
- Optimum fluid velocity of between 3 and 5.5 fps in force mains.

TABLE 7-6
Design Criteria for Pump Stations

Influent Pump Station	
No. of Pumps	3 (2 Duty, 1 Standby)
Pump Type	Submersible Non-Clog Centrifugal
Pump Capacity	1,075 gpm (1.55 mgd)
Total Dynamic Head (est.)	25 ft.
Motor Horsepower	15 hp
Drive Type	Variable
Effluent Pump Station	
No. of Pumps	3 (2 Duty, 1 Standby)
Pump Type	Vertical Non-Clog Centrifugal
Pump Capacity	1,075 gpm (1.55 mgd)
Total Dynamic Head (est.)	250 ft.
Motor Horsepower	125 hp
Drive Type	Variable

The existing force main that currently conveys sewage from LS1 to the existing WWTP on Semiahmoo Spit will be evaluated to determine its hydraulic capacity. Hydraulic capacity requirements for proposed force mains associated with the influent and effluent pump stations, and a proposed bypass pipe to divert the effluent from the proposed Lighthouse Point WRF to the existing outfall will also be determined.

Influent and Effluent Pump Station Yard Piping: Approximately 200 feet of yard piping will be required to convey wastewater from the influent pump station to the plant headworks. The conveyance pipe must be capable of handling a peak flow of 3.1 mgd, or 2,200 gpm. Based on the previously stated conveyance pipe design guidelines, the optimum pipe diameter for a flow of up to 2,200 gpm is 12 inches. Thus, approximately 200 feet of 12-inch pipe is required to convey wastewater from the influent pump station to the headworks of the proposed Lighthouse Point WRF. The effluent pump station will convey effluent from the disinfection process (UV disinfection) to the existing 14-inch force main under the mouth of the harbor. Approximately 100 feet of 14-inch pipe is needed to connect the effluent pump station with the existing 14-inch force main.

Existing Conveyance Pipe Under Harbor and Along Semiahmoo Spit: The existing pipe that is currently being used to convey flows from East and Central Blaine to the Blaine WWTP will be reconfigured to discharge reclaimed water from the proposed Lighthouse Point WRF to the City's existing outfall. The alignment of the existing conveyance pipe follows the Semiahmoo Spit, and consists of approximately 3,600 feet of 14-inch pipe under the mouth of the harbor and 6,800 feet of 10-inch pipe between the mouth of the harbor and the existing WWTP located on the westernmost edge of Semiahmoo Spit.

Using the projected peak flow rate for 2023 in conjunction with the previously stated hydraulic design guidelines, the hydraulic capacity of the existing 10-inch and 14-inch pipes was evaluated. At 2,200 gpm (3.1 mgd), the flow in the 14-inch pipe has a velocity of 5 fps,

which is in the optimal range. Under the same flow conditions, the velocity in the 10-inch pipe is 9 fps, slightly higher than the acceptable upper limit of 8 fps.

It is worth noting that the 2,200-gpm peak flow rate corresponds to a future scenario where all of the City's wastewater is treated at the proposed Lighthouse Point WRF. This scenario would only apply if the City chooses to convey West Blaine's flow to the proposed Lighthouse Point WRF when the existing WWTP at the west end of Semiahmoo Spit is abandoned. Under the current scenario in which the proposed Lighthouse Point WRF only treats flows from Central and East Blaine, the projected wet weather peak flow for 2023 is 2.4 mgd, or 1,700 gpm. At this flow rate, the velocity in the 10-inch pipe is well within the acceptable range at 7 fps. Thus, the existing 10-inch pipe along Semiahmoo Spit has sufficient carrying capacity to convey the effluent from the proposed Lighthouse Point WRF under the scenario that includes two treatment facilities. This avoids requiring the upsizing of the 10-inch pipe until the existing WWTP is abandoned and the proposed Lighthouse Point WRF is treating all of the City's wastewater.

Proposed Bypass Pipe around the Existing WWTP: In order to discharge treated effluent from the proposed Lighthouse Point WRF to the City's existing outfall in Semiahmoo Bay, a bypass pipe is needed around the existing WWTP at the west end of Semiahmoo Spit. Approximately 600 feet of pipe is required to redirect the effluent from the WRF around the existing WWTP headworks and into the existing 24-inch outfall pipe. The required pipe diameter for the bypass pipe is 12 inches, which is sufficient to handle a peak flow of 2,200 gpm without exceeding the maximum allowable fluid velocity of 8 fps.

Special consideration must be given to the alignment of the bypass pipe in order to avoid the potential encounter of cultural artifacts that have been previously discovered on Semiahmoo Point near the site of the existing WWTP. It will be necessary to construct an aboveground bypass pipe in order to prevent possible disturbance of the buried artifacts.

Solids Management Plan

The solids management plan for the proposed Lighthouse Point WRF is to contract the transportation, management, and ultimate disposal of the biosolids to an outside contractor. The City currently contracts biosolids management at their existing WWTP with Tjoelker Sludge Farm for ultimate treatment and disposal. A copy of the City's contract with Tjoelker is included in Appendix F. A copy of Tjoelker's Solids Disposal Permit is included in the Appendix G. The City also contracts with an outside contractor to haul the biosolids to the Tjoelker facilities.

The City would negotiate a new long-term contract for the proposed Lighthouse Point WRF that would provide this same service over the defined planning horizon. The contractor would be responsible for providing transportation, permitted solids management sites, additional processing or application, monitoring and administration, and management of equipment, facilities, and staff for providing ultimate solids disposal. The contractor would assume complete responsibility for compliance with local, state, and federal laws and any damages associated with transportation and use of the biosolids under current laws.

Solids thickening and storage facilities will be provided at the proposed Lighthouse Point WRF. Design criteria for these facilities are shown on Table 7-4. Waste solids will be thickened using a gravity belt thickener and then conveyed to a storage tank until they can

be pumped into a tanker truck for hauling to the Tjoelker facility for ultimate treatment and disposal.

If the City decides at some point to provide treatment of biosolids at the WRF, additional facilities would be required to stabilize, dewater, haul, and dispose of the biosolids.

Effluent Disposal and Reuse Potential

For the proposed Lighthouse Point WRF, the City will continue to use the existing outfall. There may be a potential with the reuse quality effluent water to use an alternative outfall somewhere in the vicinity of the WWTPs. However, for purposes of this Facility Plan, alternative outfall locations are not being considered at this time due to the critical schedule required to construct the proposed Lighthouse Point WRF and place it in operation. An alternative outfall would not be implemented prior to 2009.

The Washington State Department of Health previously banned the shellfish harvest in Drayton Harbor due to high fecal coliform levels. The high coliform counts also prompted Ecology to place the harbor and its tributary, Dakota Creek, on the State's list of "impaired" water bodies. In addition, the Washington State Department of Health has closed a zone around the City's effluent outfall into Semiahmoo Bay to harvest as a precautionary measure. A letter from the Washington State Department of Health on the shellfish issue is included in Appendix O. With the proposed Lighthouse Point WRF discharging high water quality, there may be opportunities in the future to reduce the shellfish closure zone associated with the outfall, as well as potential alternative outfall locations with the reuse quality water produced by the membrane technology used in the proposed Lighthouse Point WRF.

An additional benefit to the reuse quality water produced by the proposed Lighthouse Point WRF is the potential option for the outfall alternatives, including potential wetlands enhancement and discharge to a closer location with a new outfall.

Water reclamation and reuse is a concept gaining considerable recognition in Washington as both a supplemental water supply option for non-potable use and a wastewater discharge alternative. In addition, the public may find that water reuse is more economically and environmentally sound than development of traditional water supplies, such as construction of dams. For wastewater discharges, water reuse might present an opportunity for an overall decrease in pollution and/or provide the ability to meet more stringent water quality requirements when it replaces conventional wastewater discharges to sensitive surface waters.

Ecology and the Washington State Department of Health issued Water Reclamation and Reuse Standards that were finalized in 1997. The standards are based primarily on a specified level of treatment, which, in turn, is based on the end use of the reclaimed water. The treatment requirements for the use of reclaimed water are divided into four designated classes ranging from Class A, the most highly treated effluent with the greatest number of allowable uses, to Class D, which has the most restrictive level of uses.

There are several potential uses for reclaimed water within the City, including, but not limited to, golf courses on Semiahmoo and light industrial uses. The City conducted a feasibility study of reuse water for the golf course in 1992 (CH2M HILL, 1992) as one of the

major potential uses for reuse water within the City. It is not known at this time what the potential demand is, but the City will have the ability to provide reclaimed water with the construction of the proposed Lighthouse Point WRF on Marine Drive. The membrane technology recommended for the proposed Lighthouse Point WRF will allow the City to produce reuse quality effluent.

Odor Control Facilities

This section describes the preliminary design requirements that address odor mitigation for the proposed Lighthouse Point WRF. Specific objectives for odor control are to provide the necessary odor control containment and treatment equipment so that there are minimal detectable odors outside the WRF. The following conveyance and treatment processes at the proposed Lighthouse Point WRF have been identified as potential sources of odor emissions:

- Influent pump station wet well
- Influent screening and grit removal processes
- Gravity belt thickener and biosolids storage
- Aeration basins and membrane basins

The influent pump station will consist of a belowgrade structure that contains a wet well and submersible pumps. Because influent wastewater is occasionally septic, the potential exists for emission of hydrogen sulfide and other odorous gases into the air.

The solids handling processes contained within the Headworks and Solids Handling areas are typically the source of the strongest odors; odor complaints would be expected if these facilities were not equipped with odor control equipment. The aeration basins and membrane basins in the MBR area have a much lower potential to generate objectionable odors than the other processes located in the Facility Building; however, the possibility exists for odor generation from these basins.

Design Criteria for Odor Control: There are two potential alternatives for the City to provide odor control for the proposed Lighthouse Point WRF. The first alternative would consist of ventilating each process room within the Facility Building to odor control equipment. This option would ensure odor control for each odor source and minimize the potential for fugitive odors. However, this option requires odor control for a much larger volume of air, increasing the capital and O&M costs for the odor control equipment.

To reduce the required volume of air to be treated, smaller containment can be placed over the process equipment with the foul air inside those covers venting to the odor control equipment. Odorous air is typically contained either by enclosing odor sources in containment rooms, providing hoods or equipment enclosures, or by covering the source if it is a process basin. These enclosures must be resistant to corrosion.

Ventilation rates are typically governed by the NFPA standards for fire protection in wastewater applications, ventilation rates required based on the Industrial Ventilation guidance manuals, and field experience with worker comfort and safety. Ventilation rates should be high enough to capture the odors and to keep the contained environment either acceptable for workers or non-corrosive for the materials, such as concrete. From this perspective, high ventilation rates are better. It is also desirable to minimize ventilation rates

so that the fan and scrubber system costs are low. These costs include both the initial capital investment and the cost to operate the system over time. Selection of the actual ventilation rate must strike a balance between these two opposing issues. The following rules of thumb are offered as basic guidance for initial ventilation design criteria. In all cases, the guideline that results in the highest ventilation rate will govern.

- For particularly odorous areas that will be occupied, such as rooms with open belt filter presses or truck loading bays for loading sludge cake, use 12 to 20 ACH.
- For covered basins that are not occupied, use 6 ACH.
- Sweep velocities along channels being ventilated should be at least 50 feet per minute; 100 feet are desirable.
- Capture velocities on makeup air openings (including cracks) should be at least 200 feet per minute.
- For tightly closed conveyor systems (e.g., screw conveyors), use 10 cfm per foot of conveyor.
- For capturing odorous air from a process aeration source, such as aeration basins or forced-air covered trickling filters, ventilate the process at a rate 10 percent higher than the peak supply air.
- Once airflows are set, carefully review the airflow patterns to ensure sweep air patterns do not leave dead pockets without ventilation.

Design Requirements for Odor Control: The alternative that minimizes the volume of air to be treated is recommended to minimize the capital and annual costs for the odor control equipment. Many of the process equipment units have covers and/or enclosures already incorporated into the design proposed and are reflected in the cost estimate. The odor control features of this alternative include the following:

- Cover over the influent pump station wet well and ventilation of the process air.
- Enclosures for screenings equipment, grit removal channel, and screenings/grit storage bins within the Headworks area. Also includes ventilation for the truck loading area.
- Enclosure for gravity belt thickener, covers on the sludge holding tank, and ventilation for the truck loading area within the Solids Handling Room.
- Covers for the MBR basins and ventilation of the process air from those basins.
- Odor control equipment for treatment of odorous air from both these odor sources.

The design criteria on Table 7-7 were used as the basis for selecting, sizing, and estimating costs for odor control equipment.

TABLE 7-7
Odor Sources and Design Criteria with Covers and Enclosures

Odor Source	Area (ft^2)	Height (ft)	Volume (ft^3)	ACH	Flowrate (cfm)
Influent pump station wet well	100	10	**1,000**	6	**100**
Influent screening equipment and basin	420	4	**1,680**	6	**168**
Grit removal basin	175	4	**700**	6	**70**
Dumpster area/truck loading	900	20	**18,000**	20	**6,000**
Sludge holding tank	200	4	**800**	6	**80**
Gravity belt thickener	450	10	**4,500**	12	**900**
Solids truck loading	200	20	**4,000**	20	**1,333**
MBR basins	1,000	4	**4,000**	6	**400**
Anoxic/aerobic basins	3,200	4	**12,800**	6	**1,280**
				Total	**10,331**

Noise Control Facilities

This section describes the preliminary design requirements that address noise mitigation for the proposed Lighthouse Point WRF. Specific objectives for noise abatement are to satisfy the requirements for protection of human health and safety as administered by Ecology, WAC 173-60-040. In general, noise abatement will be provided to reduce the negative impact of noise transmission from equipment and other plant-related activities to the surrounding areas of public use.

Noise Considerations and Sources: Environmental noise effects on human populations include speech interference, sleep disturbance, and annoyance. Some typical noise levels encountered in an urban environment include the following:

- Normal conversation ranges between 55 and 65 dBAs when the speakers are 3 to 6 feet apart.
- Quiet urban nighttime noise dBAs typically fall in the low 40s.
- Noise levels during the day in a noisy urban area are frequently as high as 80 dBA.
- Noise levels above 110 dBA become intolerable and can result in hearing loss.

State and local governments have primary responsibility for controlling noise sources and regulating outdoor noise levels in the environment. WAC 173-60-040 establishes noise limits that vary according to the land use of the property where the noise source is located and the property receiving the noise; these noise limits are administered by Ecology. Ecology's maximum permissible noise levels are shown on Table 7-8. Treatment plant construction noise is exempt under WAC 173-60-050, and thus is not addressed in the noise abatement measures described.

TABLE 7-8
Ecology's Maximum Permissible Noise Levels (dBA)

Land Use of Noise Source	Land Use of Receiving Property			
	Residential			
	Day	Night[1]	Commercial	Industrial
Residential	55	45	57	60
Commercial	57	47	60	65
Industrial	60	50	65	70

[1]Maximums are 10 dBA lower than nighttime levels for residential property from 10 p.m. to 7 a.m.
Source: WAC 173-60-040.

The following types of operational noise sources are associated with the proposed Lighthouse Point WRF:

- Noise from the operation of mechanical equipment, including pumps, blowers, fans, and centrifuges. These planned activities would occur on a continuous basis.
- Noise from routine O&M activities, including screening and grit hauling, and biosolids treatment and handling. These planned activities would typically occur for a short duration of time and during normal working hours.
- Noise from standby power generation facilities (to be used as backup power for treatment facilities and pump stations during a power outage). When needed, standby power generators will operate on a continuous basis until power is restored.
- Noise from emergency operation, maintenance, and repair activities. These are unanticipated conditions that may require nighttime work, and could pose significant noise impacts.

Design Requirements for Noise Abatement: For mitigation of noise from the influent pump station, all equipment will be housed in an enclosed structure. Ventilation air intakes and exhausts will be placed in a direction facing away from sensitive receivers. Noise reduction-related acoustic louvers and duct silencers will be selected to reduce transmission of indoor noise to the outdoor environment. Noise levels immediately outside of the enclosure will be at or below the level stated on Table 7-8 for an industrial noise source and a commercial receiving property.

For noise abatement at the Facility Building, all noise-generating equipment will be contained inside the building. Noise sources such as pumps, fans, blowers, and centrifuges will be designed with the necessary noise-reduction features to limit noise impacts immediately outside of the Facility Building to the level stated on Table 7-7 for an industrial noise source and a commercial receiving property. This level of noise abatement will allow the proposed Lighthouse Point WRF to be consistent with ambient noise levels. The City may decide to impose more stringent noise standards during the design of the WWTP.

Visual Mitigation and Architectural Features

The objective for visual mitigation is to develop a treatment facility that is consistent with the City's Master Plan of the area, compatible with the surrounding marine setting, and promotes public use of the adjacent site. Essential visual features for the proposed Lighthouse Point WRF have been identified using artist's renderings from the recently conducted design charette.

The visual mitigation concepts for the proposed Lighthouse Point WRF were developed during several design charettes, which were previously conducted by Christensen Design Management, the City staff, and the CWAC. The main objective of the design charette was to identify and develop architectural concepts for the proposed Lighthouse Point WRF that would be compatible with the surrounding physical and cultural environment at Lighthouse Point and the City's Master Plan. The following features were identified during the design charettes to provide visual mitigation for the proposed Lighthouse Point WRF:

- Lighthouse (historical attraction)
- Roof plaza for pedestrians
- Beach enhancement and picnic area
- Landscaping and building materials
- Public parking and restrooms

The visual mitigation strategy developed by the CWAC during the design charettes strives to integrate the proposed Lighthouse Point WRF into the surrounding marine environment by providing a lighthouse, picnic grounds, and walking paths along the beach. Public use of the site is promoted through public restrooms, parking along Marine Drive, and a roof plaza over part of the Facility Building that provides public access to the lighthouse as well as a scenic overlook of the beach and Semiahmoo Bay. Other features include a beach enhancement area, a raised plateau area for picnic tables, a covered walkway, and access to an existing marina.

Extensive landscaping will also be used to provide a visual screen to the proposed Lighthouse Point WRF from the road and other public use areas. The design elements of the visual mitigation strategy outlined above will be incorporated into the design of the proposed Lighthouse Point WRF.

Operations and Maintenance Staffing Requirements and Testing Requirements

Staffing was estimated using the *Water Environment Federation (WEF) Manual of Practice No. 8* (MOP 8) staffing for a municipal wastewater treatment plant in the 1- to 5-mgd range, and reviewed with City of Blaine Public Works staff. Table 7-9 presents the current staff at the existing WWTP and the proposed staff for the new WRF.

Testing requirements for the new WRF are consistent with those currently utilized at the existing sewage treatment plant. The new WRF will operate under the guidelines of the current NPDES and associated monitoring and testing requirements within. As reuse opportunities for the WRF effluent are identified for future use, additional testing may be required.

TABLE 7-9
Staffing Requirements

Staff Area	Full Time Equivalents	
	Current Staffing	Recommended Staffing
Management	1.0	1.0
Operations	1.0	4.0
Maintenance	1.0	0.5
Laboratory	--	1.0
Clerical	--	1.0
Total	3.0	7.5

Treatment Facility Future Expansion

The preliminary layout of the proposed Lighthouse Point WRF accounts for a level of expansion to accommodate future flow and loads beyond those included in the 2023 design criteria. The operating parameters of the secondary treatment system can be modified, allowing for an increase in treatment capacity. In particular, the MBR basin will be sized with spare space for additional membrane cassettes. The MLSS concentration within the bioreactor can be increased. The anoxic and aerobic zones will be sized to allow for in an increase in water surface, resulting in a larger bioreactor volume if warranted. The associated equipment for the bioreactor will be modified accordingly as the increase in capacity is required. These modifications to the secondary treatment system provide an increase in design flow from 1.55 mgd to 2.1 mgd. Table 7-10 lists the resulting design criteria and capacity for the future expansion.

TABLE 7-10
Proposed Lighthouse Point WRF: Future Expansion

Parameter	2023 Design Criteria	Future Expansion
Max Month Flow	1.55 mgd	2.1 mgd
Dry Weather Peak Hour Flow	3.1 mgd	4.2 mgd
Total SRT	15 days	15 days
Anoxic/Aerobic MLSS	7,700 mg/L	10,300 mg/L
MBR MLSS	9,600 mg/L	12,900 mg/L

The remaining unit processes within the WRF will need to accommodate the future expansion flow and load. An evaluation of the expansion requirements for these unit processes will be completed in the design stage of the project. The evaluation will determine

the economic viability of sizing equipment to accommodate the future expansion, or whether replacement with future equipment is warranted.

7.2.4 Reliability and Redundancy Requirements

EPA requires that wastewater facilities meet the requirements for reliability and redundancy in their treatment components and associated equipment. The reliability standards establish minimum levels of reliability for three classes of waterwater works. Ecology defines the reliability classifications in the Criteria for Sewage Works Design (the "Orange Book") and the applicable classification shall be established by the City and approved by Ecology. The guidelines for classifying Wastewater Works are defined in the following Table 7-11.

Ecology provides further guidance on the general requirements for facilities in each reliability classification in the Criteria for Sewage Works Design (the "Orange Book") as shown on Table 7-12.

The proposed Lighthouse Point WRF will discharge effluent through the existing outfall. The outfall is located in an area that includes a shellfish closure zone. Based on the discharge point, the proposed Lighthouse Point WRF shall be designed for Class I reliability.

TABLE 7-11
Guidelines for Classifying Wastewater Works

Reliability Class	Guideline
I	These are works whose discharge, or potential discharge, (1) is into public water supply, shellfish, or primary contact recreation waters, or (2) as a result of its volume and/or character, could permanently or unacceptably damage or affect the receiving waters or public health if normal operations were interrupted. Examples of Reliability Class I works are those with a discharge or potential discharge near drinking water intakes, into shellfish waters, near areas used for water contact sports, or in dense residential areas.
II	These are works whose discharge, or potential discharge, as a result of its volume and/or character, would not permanently or unacceptably damage or affect the receiving waters or public health during periods of short-term operations interruptions, but could be damaging if continued interruption of normal operations were to occur (on the order of several days). Examples of a Reliability Class II works are works with a discharge or potential discharge moderately distant from shellfish areas, drinking water intakes, areas used for water contact sports, and residential areas.
III	These are works not otherwise classified as Reliability Class I or Class II.

Source: Criteria for Sewage Works Design, December 1998, Washington State Department of Ecology.

TABLE 7-12
General Requirements for Each Reliability Classification

Reliability Class	General Requirements
I	For components included in the design of Reliability Class I works, the following backup requirements apply: A. **Mechanically Cleaned Bar Screens**. A backup bar screen, designed for mechanical or manual cleaning, shall be provided. Facilities with only two bar screens shall have at least one bar screen designed to permit manual cleaning. B. **Pumps**. A backup pump shall be provided for each set of pumps performing the same function. The capacity of the pumps shall be such that, with any one pump out of service, the remaining pumps will have the capacity to handle the peak flow. C. **Comminution Facility**. If comminution of the total wastewater flow is provided, an overflow bypass with a manually installed or mechanically cleaned bar screen shall be provided. The hydraulic capacity of the comminutor overflow bypass should be sufficient to pass the peak flow with all comminution units out of service. D. **Primary Sedimentation Basins**. The units should be sufficient in number and size so that, with the largest-flow-capacity unit out of service, the remaining units should have a design flow capacity of at least 50 percent of the total design flow. E. **Final Sedimentation Basins and Trickling Filters**. The units shall be sufficient in number and size so that, with the largest-flow-capacity unit out of service, the remaining units shall have a design flow capacity of at least 75 percent of the total design flow. F. **Activated Sludge Process Components**. 1. **Aeration Basin**. A backup basin will not be required; however, at least two equal-volume basins shall be provided. (For the purpose of this criterion, the two zones of a contact stabilization process are considered as only one basin.) 2. **Aeration Blowers or Mechanical Aerators**. There shall be a sufficient number of blowers or mechanical aerators to enable the design oxygen transfer to be maintained with the largest-capacity-unit out of service. It is permissible for the backup unit to be an uninstalled unit, provided that the installed units can be easily removed and replaced. However, at least two units shall be installed. 3. **Air Diffusers**. The air diffusion system for each aeration basin shall be designed so that the largest section of diffusers can be isolated without measurably impairing the oxygen transfer capability of the system. G. **Disinfectant Contact Basins**. The units shall be sufficient in number and size so that, with the largest-flow-capacity unit out of service, the remaining units shall have a design flow capacity of at least 50 percent of the total design flow.
II	The Reliability Class I requirements shall apply except as modified below: D/E. **Primary and Final Sedimentation Basins and Trickling Filters**. The units shall be sufficient in number and size so that, with the largest-flow-capacity unit out of service, the remaining units shall have a design flow capacity of at least 50 percent of the design basin flow.

TABLE 7-12
General Requirements for Each Reliability Classification

Reliability Class	General Requirements
III	The Reliability Class I requirements shall apply except as modified below: D/E. **Primary and Final Sedimentation Basins**. There shall be at least two sedimentation basins. F. **Activated Sludge Process Components**. 1**. Aeration Basin**. A single basin is permissible. 2. **Aeration Blowers/Mechanical Aerators or Rotors**. There shall be at least two blowers, mechanical aerators, or rotors available for service. It is permissible for one of the units to be uninstalled, provided that the installed unit can be easily removed and replaced. Aeration must be provided to maintain sufficient DO in the tanks to maintain the biota.

Source: Criteria for Sewage Works Design, December 1998, Washington State Department of Ecology.

7.3 Phase 3 Capital Improvements

The improvements implemented in Phase 3 will address the wastewater treatment and conveyance needs for the West Blaine community. Initially, the flows from West Blaine will continue to be treated by the existing WWTP, which should have sufficient hydraulic and treatment capacity once the East and Central Blaine flows are being treated through the proposed Lighthouse Point WRF. There are four potential long-term solutions to treat flows from West Blaine that were originally considered.

- Convey to proposed Lighthouse Point WRF on Marine Drive (Alternative 1)
- Build new WWTP/WRF located in Semiahmoo (Alternative 2)
- Convey West Blaine flows to existing Birch Bay WWTP (Alternative 3)
- Build new regional WWTP/WRF for West Blaine and North Birch Bay (Alternative 4)

The first three of these alternatives have been considered for further analysis. Alternative 4 would potentially be a variation of Alternative 2 and would require significant coordination and cooperation from the Birch Bay Water and Sewer District (BBWSD) to determine flows and loading, which could add several years to the implementation schedule. The City needs to abandon the existing WWTP site as soon as feasible due to the requirements in their settlement agreement with the Lummi Tribe.

7.3.1 Convey to Proposed Lighthouse Point WRF on Marine Drive

Alternative 1 would consist of conveying the West Blaine flows to the proposed Lighthouse Point WRF for treatment. The conceptual design for the proposed Lighthouse Point WRF that will be presented in the Facility Plan includes a treatment capacity of 1.55 mgd maximum month and a hydraulic capacity of 3.1 mgd peak flow. The maximum month flows for East and Central Blaine only require 1.11 mgd of treatment capacity and a peak hour flow of 5.5 mgd. With the proposed 400,000 gallons of equalization storage, the proposed Lighthouse Point WRF would be able to handle the West Blaine flows without additional expansion.

Alternative 1 would require additional conveyance facilities to bring the flows to the proposed Lighthouse Point WRF. These conveyance facilities would include:

- Lift station in the vicinity of the existing WWTP site to pump the West Blaine flows to the proposed Lighthouse Point WRF. Maximum capacity of this lift station would be approximately 1.2 mgd for 2023 flows. This lift station would include submersible pumps, a wet well, odor control, a small building, and a backup generator.
- Construction of a new 10-inch pipeline from the new lift station along the Spit and under the harbor to the existing equalization storage facility (constructed under the Phase 1 improvements).

7.3.2 Build New WWTP/WRF Located in Semiahmoo

Alternative 2 would consist of building a new WWTP or WRF located in Semiahmoo at a location in proximity to the existing WWTP so that the majority of the West Blaine flows could continue to gravity flow to the new WWTP. This new WWTP would most likely be a package plant, which could be either an MBR or an SBR plant. Alternative 2 would include:

- A WWTP sized to handle 0.4-mgd maximum month and peak hydraulic flows of 1.64 mgd. For planning purposes, it is assumed that the new WWTP is along Drayton Harbor east of Lift Station 8. The new WWTP would include an effluent pump station to convey the treated effluent to the existing outfall.
- Install a new 10-inch pipeline from the new WWTP along Drayton Harbor to the existing outfall.
- Additional conveyance improvements to drain the flow down to the new WWTP.

One potential variation on Alternative 2 that could occur in the future is that the portions of the Blaine collection system on Semiahmoo that could gravity drain down to the BBWSD could be piped to their collection system. This would include the small portion of sewer system in the vicinity of Lift Station Troon and any additional development that is south of that area. The wholesale costs that BBWSD would charge are unknown at this point, so a potential cost for this option is not included. When the implementation of the West Blaine solution approaches, this option could be considered further.

7.3.3 Convey West Blaine Flows to Existing Birch Bay WWTP

Alternative 3 would consist of conveying the West Blaine flows to the existing BBWSD WWTP for treatment and discharge. Alternative 3 would require additional conveyance facilities to bring the flows to the BBWSD WWTP. These conveyance facilities would include:

- Lift station in the vicinity of the existing Blaine WWTP site to pump the West Blaine flows to the BBWSD WWTP. This pump station would convey the flows on the north side of the drainage divide of the service basin. The capacity of this station is yet to be determined but for estimating purposes has been assumed to be half of the total basin flow or 0.6 mgd. This lift station would include submersible pumps, a wet well, odor control, a small building, and a backup generator.

- A second and a third lift station located somewhere along the southern part of the drainage divide of West Blaine and along the force main route to pump those flows to the BBWSD WWTP. These pump stations would convey the flows from the south side of the drainage divide of the service basin. The capacity of these stations would convey the entire flow of 1.2 mgd. These lift stations would include submersible pumps, a wet well, odor control, a small building, and a backup generator.
- Construction of a new 8-inch pipeline from the lift station near the existing Blaine WWTP site to the second lift station in the southern part of West Blaine. The pipeline length is approximately 18,500 feet.
- Construction of a new 10-inch pipeline from the lift station in the southern part of West Blaine to the third lift station along the pipeline route to BBWSD and a new 10-inch pipeline from the third lift station to the BBWSD WWTP. The pipeline length is approximately 40,000 feet.

7.4 Phase 3 Recommendations

The following sections present the evaluation results and the recommendations for the Phase 3 improvements to provide wastewater treatment and conveyance for the West Blaine community.

7.4.1 Summary of Alternatives Evaluation

This section presents the evaluation conducted of the various alternatives identified in the previous section. The major components evaluated are cost requirements and schedule requirements. Table 7-13 presents a summary of the costs associated with each alternative, including both an MBR and SBR for Alternative 2.

TABLE 7-13
Cost Analysis Evaluation

Alternative	Capital Costs	Annual Costs	Present Worth Costs
1	$3,310,000	$20,000	$3,650,000
2 (MBR)	$5,710,000	$310,000	$12,240,000
2 (SBR)	$4,960,000	$230,000	$9,810,000
3	$9,660,000	$53,000	$10,780,000

A detailed program implementation schedule was developed as part of the General Sewer Plan. Both Alternatives 1 and 2 could be implemented within the scheduled outlined. Alternative 1 could potentially shorten the design and construction of the West Blaine solution by 6 to 12 months.

Alternative 1 is the lowest-cost solution to addressing the wastewater service needs in West Blaine. This alternative would also require less time to implement. The current design of the proposed Lighthouse Point WRF includes sufficient capacity to accommodate flows from West Blaine without additional expansion. However, this will limit the available capacity for

East and Central Blaine flows if the growth in those areas exceeds the planning criteria assumptions over the next 20 years.

Alternative 2 would eliminate the underwater crossing of raw sewage, which has been expressed as a concern by several members of the CWAC. With current technology and high- quality control during construction, the pipeline can be implemented to maintain its water tightness and structural integrity. However, the costs for this alternative regardless of the treatment technology used are considerably higher than Alternative 1.

Alternative 3 is also considerably more expensive than Alternative 1. In addition, the costs shown do not include any service connection costs to the BBWSD WWTP. These costs would need to be determined through negotiations with Birch Bay and a long-term agreement reached to assess the full cost of this alternative.

7.4.2 Recommendations

A Blaine City Council work session was conducted on November 15, 2004, to review the preliminary results of the evaluation of alternatives to address the West Blaine wastewater treatment and conveyance needs. The Council adopted the recommendation to implement the lowest-cost alternative to address West Blaine flow. Conveyance to the proposed Lighthouse Point WRF under Alternative 1 is the tentative recommendation. This assumes that suitable precautions can be implemented to eliminate the concern of raw sewage leaking into the mouth of Drayton Harbor through the submarine pipeline crossing. If this proves to be a problem, the City Council agreed to pursue building a satellite treatment facility using MBR technology in West Blaine and discharge the effluent through the existing outfall. These facilities were described as part of Alternative 2.

These alternatives will be reviewed and revised at a later date once the Phase 2 facilities are online and operational. The City may choose a different route to implement at that time based on the current needs and constraints.

CHAPTER 8

Program Financing

Capital improvement program costs for the City were included in the City's recently approved General Sewer Plan (CH2M HILL, 2004). The City's future capital outlay expenditures represent approximately $28.4 million (in 2004 dollars) in capital improvements over the next 6 years. The projects are necessary to provide wastewater treatment for the City, to maintain the current level of service provided by existing facilities, to systematically replace aging facilities, to comply with State and Federal regulations, and to provide capacity to meet the needs of projected growth. Table 8-1 summarizes the capital improvement plan for the sewer system over the next 6 years, in 2004 dollars. These projected capital improvements will be paid for by a combination of funding programs and current and future revenues. The proposed Lighthouse Point WRF is considered Phase 2 of the wastewater treatment projects, or Project T2 in the General Sewer Plan. An implementation schedule for the overall wastewater treatment facilities is included as Appendix H.

This chapter presents the estimated capital and annual O&M costs of the recommended alternative for the City's proposed Lighthouse Point WRF. This chapter also discusses the rate impacts, including outside financial assistance programs, required to support the financing plan and ongoing operational costs. Outside financial assistance programs that are available are also discussed.

8.1 Capital Costs

The cost estimates in this Facility Plan are feasibility-level capital cost estimates, which were determined for each treatment configuration alternative presented in TM 2.02 (CH2M HILL, September 4, 2004). Capital costs were estimated using the proprietary cost -estimating model, CPES (CH2M HILL Parametric Cost Estimating System). The CPES model is based on numerous "mini-models" or cost estimates of facilities that are based on real projects. These mini-models have relationships (or algorithms) built into them that allow CPES to adjust their costs based on project-specific information. Estimates produced by CPES yield a much clearer picture of a project's scope as compared with traditional conceptual estimating techniques such as Unit Cost Estimates or Factored Cost Estimates. The CPES model was supplemented with vendor-supplied budgetary quotes for equipment where applicable.

Initial capital costs are presented to highlight various phases of the proposed Lighthouse Point WRF construction. Table 8-2 presents the estimated capital costs for the proposed Lighthouse Point WRF project, including conveyance facilities, the WRF, and mitigation.

The cost shown for visual mitigation is a combination of additional building costs above and beyond a basic building and additional landscaping to provide sight buffers. The cost of visual mitigation does not include the cost of the lighthouse that would eventually be a part of the park adjacent to the proposed Lighthouse Point WRF.

TABLE 8-1
Capital Improvement Program

	Project Description	2004	2005	2006	2007	2008	2009	2010	Total
CIP									
T1	Construct new wastewater equalization storage		$1,000,000	$5,200,000					$6,200,000
T2	Construct new WRF on Marine Drive location.		$600,000	$600,000	$9,000,000	$6,218,880			$16,418,880
T3	Construct new WWTPy for West Blaine or convey to Birch Bay.							$500,000	$500,000
A-1	Replace 10-inch gravity line with 4,800 feet of 14-inch pipeline between manholes H6-2 and E3-4.				$1,650,000				$1,650,000
B-1	Replace 8-inch gravity line with 1,000 feet of 10-inch pipeline between manholes J6-1 and H6-2.			$45,000					$45,000
B-2	Replace 8-inch gravity line with 280 feet of 10-inch pipeline between manholes D3-8 and D3-1.					$69,000			$69,000
P-1&2	Proposed sewer main extension along H Street.					$2,400,000			$2,400,000
P-10&11	Proposed sewer main extension along H Street.					$570,000			$570,000
G-1	Annual pipeline rehabilitation, replacement, and I/I program, including backyard sewer replacement.		$50,000	$50,000					$100,000
	Subtotal	$0	$1,650,000	$5,895,000	$10,650,000	$9,257,880	$0	$500,000	$27,952,880
City Project List									
T3	Repair to WWTP Outfall.	$60,000							$60,000
T4	Headworks Rehabilitation.	$50,000							$50,000
T5	Interim WWTP Improvements.	$100,000	$100,000						$200,000
LS-5	Install Controller and Telemetry on Lift Station 5.		$15,000						$15,000
LS-9	Install new pumps and controls at LS9.	$40,000							$40,000
G-2	Cathodic Protection System Expansion.	$50,000							$50,000
	Subtotal	$300,000	$115,000	$0	$0	$0	$0	$0	$415,000
TOTAL		$300,000	$1,765,000	$5,895,000	$10,650,000	$9,257,880	$0	$500,000	$28,367,880

TABLE 8-2
Capital Cost Estimate for the Proposed Lighthouse Point WRF

Base Project Costs		
Preliminary Treatment/Pumping		$1,032,000
Secondary Treatment		$5,794,000
Disinfection		$396,000
Solids Handling		$491,000
Odor Control		$203,000
	Subtotal	**$7,916,000**
Additional Project Costs		
Demolition and Overall Sitework		$130,000
Yard Electrical and Plant Control Systems		$230,000
Plant Computer System (2%)		$158,320
Yard Electrical (4%)		$316,640
Yard Piping (10%)		$791,600
	Subtotal	**$9,542,560**
Contractor Markups		
Overhead (10%)		$954,256
Profit (5%)		$524,841
Mobilization/Bonds/Insurance (5%)		$551,083
Contingency (20%)		$2,314,548
	Subtotal	**$13,887,288**
Additional Construction Costs		
Escalation (Mid-Point Construction) (8.59%)		$1,192,918
Location Adjustment Factor (1.5%)		$208,309
Pile Foundations		$168,000
Dewatering Conditions		$134,400
Building (Includes Operation, Maintenance, Administration)		$1,680,000
Visual Mitigation		$336,000
Shoring		$134,400
Contamination Removal Allowance		$100,000
	Subtotal	**$17,841,315**
Total Construction Cost		
Washington Sales Tax (8.1%)		$1,462,988
Total Project Cost		**$19,304,303**

Notes:

1. The costs are based on the January 2004 index
2. Interest Rate = 3.5%, Inflation Rate = 2.5%, Life Cycle = 25 years
3. MBR – Membrane Bioreactor, UV – Ultraviolet Disinfection

The total cost of the facility presented in Table 8-2 includes construction costs, contractor markups and profit, sales tax, and appropriate contingency. Development of specific costs for each facility requires development of specific requirements for each facility, including the design specifies, and is beyond the scope of this Facility Plan.

8.2 Annual Operation and Maintenance Costs

Table 8-3 presents the estimated annual O&M costs (expressed in 2004 dollars) anticipated at the proposed Lighthouse Point WRF. The components and assumptions included in the annual costs are as follows:

- Power at $0.07/kWh
- Labor burdened at $50 per hour
- Chemical costs
- Equipment replacement
- 20 percent contingency

The current O&M costs at the existing WWTP are approximately $410,000. Estimated O&M costs for the proposed Lighthouse Point WRF would be estimated to increase approximately $555,000 per year over current costs. Significant increases in annual O&M costs would include:

- Additional treatment plant staff
- Higher equipment maintenance
- Higher chemical costs
- Higher electricity costs

8.3 Rate Impact Analysis

A rate impact analysis was conducted as part of the General Sewer Plan, approved in September 2004 (CH2M HILL, 2004), that included the cost of the proposed Lighthouse Point WRF. In addition, an extensive rate study was conducted by Financial Consulting Solutions Group in late 2004 to assess the rate impacts from the CIP as well the utility's existing operations. The summary of the rate analysis is presented in Appendix I.

8.3.1 Existing Rate Structure

Table 8-4 presents the current sewer rate structure for the City. Prior to January 2005, the sewer rates had not been increased since January 2000. Between July 1996 and January 2000, the sewer rates were increased five separate times, for a total increase of 22 percent over that period. The rates were increased to help fund expansion of the existing WWTP, which has since been stopped. The rates were increased in January 2005 to $49.90 for the flat residential rate, which is a 25 percent increase, with Ordinance No. 04-2596, which is included as Appendix J. The commercial rates were also increased by 25 percent. This is the first of a series of rate increases designed to help the City keep up with operational expenses and fund the additional debt service they will incur for the CIP.

TABLE 8-3
Annual Operation and Maintenance Costs

Item	Annual O&M Cost* ($)
Labor	$698,200
Energy	$158,200
Maintenance Material and Supplies	$110,300
Total Annual O&M Costs	**$965,600**

*Costs based on January 2004 index.

TABLE 8-4
Current Sewer Rate Structure for the City of Blaine

Customer Class / Meter Size	Monthly Rate	Volume Allowance (ccf)	Commodity Charge ($/ccf)
Residential (single family)	$49.90	N/A	
Residential, Senior Discount	$38.33	N/A	
Multi-family Unit	$45.82	N/A	
Commercial I (average strength)			
¾”	$49.90	3	$7.38
1”	$124.70	7	$7.38
1.5”	$249.42	15	$7.38
2”	$399.05	24	$7.38
3”	$798.11	48	$7.38
4”	$1,247.06	75	$7.38
6”	$2,494.07	150	$7.38
8”	$3,990.52	240	$7.38
Commercial II (high strength)			
¾”	$64.21	3	$10.41
1”	$160.55	7	$10.41
1.5”	$321.10	15	$10.41
2”	$513.76	24	$10.41
3”	$1,027.53	48	$10.41
4”	$1,605.51	75	$10.41
6”	$3,211.00	150	$10.41
8”	$5,137.58	240	$10.41
Marinas			
Per pumpout station	$64.21	3	

8.3.2 Funding Options and Assumptions

The projected capital improvements will be paid for by a combination of funding programs and current and future revenues. The City has outlined a funding strategy that includes grants, low-cost loans, and available funding from rates and charges (primarily the General Facilities Fee [GFF]). Table 8-5 shows the anticipated funding sources required to fund the new wastewater treatment projects. The City will have to rely heavily on established funding programs, such as the Public Works Trust Fund (PWTF) and Ecology grants and loans, as well as additional sources of funding. Figure 8-1 shows anticipated funding sources for new wastewater treatment facilities, including the LS1 equalization storage project, the Marine Drive WRF, and wastewater treatment for West Blaine.

TABLE 8-5
Summary of Funding Sources by Year

Funding Source	2005	2007	2009	2011	Total
Grants					
Centennial Clean Water		$2,500,000		$2,000,000	$4,500,000
TIB Grant	$500,000				$500,000
Direct Federal Appropriations (i.e., STAG)		$2,000,000			$2,000,000
Rural Sales Tax		$500,000			$500,000
Subtotal	**$500,000**	**$5,000,000**		**$2,000,000**	**$7,500,000**
Other Funding Sources					
Centennial Clean Water		$2,500,000		$2,011598	$4,511,598
PWTF Loans	$5,080,000	$10,000,000		$2,779,539	$17,859,539
PWTF Pre-Construction Loan	$1,000,000		$1,000,000		$2,000,000
Rural Sales Tax		$500,000			$500,000
Capital Fund Balance		$2,787,134			$2,787,134
Subtotal	**$6,080,000**	**$15,787,134**	**$1,000,000**	**$4,791,137**	**$27,658,271**
Total Funding Sources	**$6,580,000**	**$20,787,134**	**$1,000,000**	**$6,791,137**	**$35,158,271**

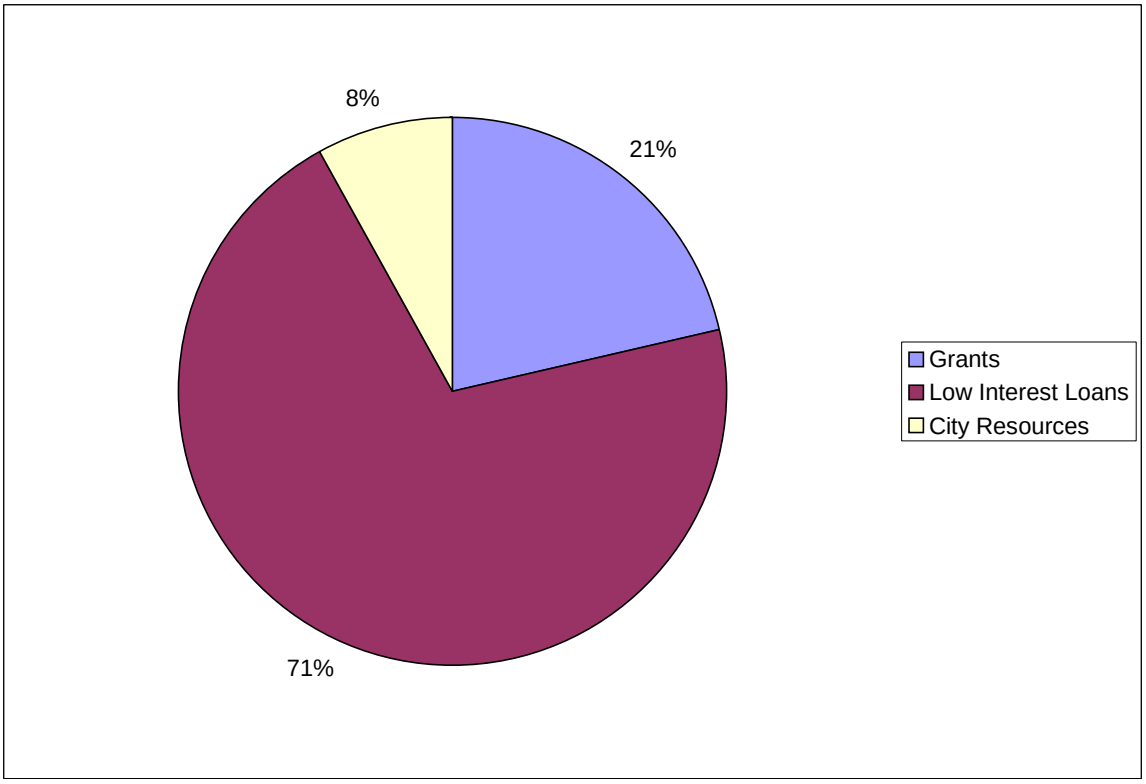


FIGURE 8-1
Summary of Funding for Wastewater Treatment Projects

8.3.3 Total Revenue Requirements

In order to fund the new wastewater solution, annual debt service is estimated to be a maximum of almost $1.4 million per year. In 2013, the total annual debt service payment, including new and existing debt, will be approximately $1.8 million. The City must rely predominantly on sewer rates and GFFs to fund this debt service. GFFs are revenue the City receives from new connections to the sewer system. The financial impact analysis assumes that only revenue from new customers and increased rates are available to fund the capital projects.

8.3.4 Rate Impacts

The rate impact analysis was developed to project annual revenue needs and determine the levels of rate increases needed to support those needs. The increases that are initially projected are then smoothed to provide orderly and predictable annual rate increases.

Given the assumptions and financial safeguards, Table 8-6 presents the projected annual revenues and expenditures for the sewer utility. It also provides the annual rate increases projected for the utility, and illustrates those by portraying the corresponding impact on the residential flat charge. It also indicates ending fund balances for the operating, capital, and debt reserve funds.

As Table 8-6 shows, there is a substantial rate increase projected over the next 5 years. In addition, a significant rate increase was warranted for 2005 because the current rates were not sufficient to meet current expenses plus debt service.

TABLE 8-6
Summary of Rate Impacts

Revenue Requirements	2005	2006	2007	2008	2009	2010	2011
Revenues							
Rate revenues under existing rates	1,509,313	$1,547,045	$1,585,722	$1,625,365	$1,665,999	$1,707,649	$1,750,340
Non-rate revenues	$145,826	$154,502	$155,537	$60,403	$61,486	$62,625	$64,186
GFF revenue for debt services (75%)	$247,695	$269,000	$291,215	$314,373	$253,880	$272,738	$292,380
Total Revenues	**$1,902,833**	**$1,970,547**	**$2,032,474**	**$2,000,140**	**$1,981,365**	**$2,043,011**	**$2,106,906**
Expenses							
Cash O&M expenses	$1,312,050	$1,370,980	$1,428,816	$1,475,149	$1,537,865	$2,240,340	$2,313,124
Existing debt service	$565,930	$563,320	$499,389	$498,888	$492,304	$492,535	$330,294
New debt service	$33,167	$276,525	$533,586	$963,948	$1,238,693	$1,289,571	$1,331,912
Total Expenses	**$1,911,146**	**$2,210,825**	**$2,461,790**	**$2,937,986**	**$3,268,862**	**$4,022,447**	**$3,975,331**
Annual Rate Adjustment	25.4%	20.0%	13%	0%	11.0%	15.0%	0.0%
Rate increases dictated by:	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*
Residential Rate	**$49.90**	**$59.88**	**$67.67**	**$67.67**	**$75.11**	**$86.38**	**$86.38**
General Facilities Fee	**$4,200**	**$4,450**	**$4,700**	**$4,700**	**$5,200**	**$5,450**	**$5,450**

As noted earlier, these increases have been "smoothed" to provide orderly rate increases. The first two increases of $10 per month for 2005 and 2006 are likely to be necessary regardless of the ultimate funding strategy, and in general will help the City contain subsequent rate increases. Subsequent increases are more dependent on success in obtaining grants, as well as actual construction schedules, and may be appropriately altered as greater certainty of costs is realized. The City will review the rate forecast as a part of its 2007 budget process to determine appropriate increases for 2007 and beyond.

8.4 Available Capital Funding Sources

The funding options available to the City for capital projects consist primarily of debt funding through a variety of available mechanisms, cash funding through various user charges, and/or cash funding through existing reserves.

8.4.1 State Capital Funding Sources

Historically, Federal and State grant programs were available to local utilities for capital funding assistance; however, these assistance programs have been mostly eliminated or replaced by loan programs. Remaining miscellaneous grant programs are generally lightly funded and heavily subscribed. Nonetheless, the benefit of even low-interest loans makes the effort of applying worthwhile. State programs identified as potential funding sources for the proposed Lighthouse Point WRF are summarized below.

- **Public Works Trust Fund.** The PWTF is a commonly used, low-cost revolving-loan fund established by the 1985 State Legislature to provide financial assistance to local governments for public works projects. Eligible projects include repair, replacement, rehabilitation, reconstruction, or improvement of eligible public works systems to meet current standards for existing users. With recent revisions to the program, growth-related projects consistent with 20-year projected needs are now eligible.

  PWTF loans are available at interest rates of 0.5 percent, 1 percent, and 2 percent, with the lower interest rates given to applicants who pay a larger share of the total project costs. The loan applicant must pay a minimum of 5 percent toward the project cost to qualify for a 2 percent loan, 10 percent for a 1 percent loan, and 15 percent for a 0.5 percent loan. The useful life of the project determines the loan term up to a maximum of 20 years.

  The applicant must be a local government, such as a city, county, or special-purpose utility, and have an approved long-term plan for financing its public works needs. Cities must adopt a local 0.25 percent Real Estate Excise Tax and have an updated comprehensive plan or capital facilities plan for their utility system. Local governments must compete for PWTF dollars, since more funds are requested each year than are available. The Public Works Board evaluates each application and transmits a prioritized list of projects to the legislature. The legislature then indicates its approval by passing an appropriation from the Public Works Assistance Account to cover the cost of the approved loans. Once the Governor has signed the appropriations bill into law, the local governments receiving the loans are offered a formal loan agreement with the appropriate interest rate and term, as determined by the Public Works Board.

- **Department of Ecology.** Ecology's Water Quality Financial Assistance Program sponsors four grant and loan programs: the Centennial Clean Water Fund, Federal 319 Programs, State Revolving Fund Loans, and the Aquatic Weeds Grant Programs. Funding is generally limited to 50 percent of the project cost and comes as either a grant or a low-interest loan (0 percent for up to 5 years, increasing to 4.8 percent for 15 to 20 years).

Of these programs, the PWTF is the most attractive program for the City. In absence of such subsidized funding sources, the most likely sources of capital funding probably are the existing reserves (discussed above) and revenue bond debt.

8.4.2 Federal Capital Funding Sources

There are multiple Federal agencies through which wastewater projects can be funded, including the EPA and the U.S. Department of Agriculture (USDA).

- **USDA RUS, Water and Waste Disposal Loans and Grants**. The USDA's Water and Waste Disposal loan and grant program provides financing for wastewater facilities for rural areas. The program is applicable for towns with populations less than 10,000, with priority given to communities with populations less than 5,500. The goal is to serve the most needy rural communities. Loan and grant funds can be used for construction, land acquisition, legal and engineering fees, and purchase of necessary equipment. In addition, only loans may be used for initial operating expenses, purchase of existing facilities, and interest incurred during construction. Grants are available only when necessary to reduce user cost to a reasonable level. Grant assistance is available for the City because the debt service portion of the average annual user cost would exceed 1.0 percent of the median home income (MHI). There are three levels of interest rates: poverty, intermediate, and market. The type of rate applied to a project is dependent on the MHI of the service area.

  Currently, the City has a grant/loan package dedicated for them from the previous expansion of the current wastewater treatment site. The City is involved in regular meetings with the USDA. This project is helping to push the process along toward using that funding. Whether the City may use the existing funding, or would have to reapply for additional funding, depends on the treatment alternative selected and the timing of implementation. One possible strategy would be to use a PWTF loan to pay off the higher interest USDA RUS loan as quickly as possible.

- **State and Tribal Assistance Grant (STAG)**. Funding for projects, such as a new WWTP and associated infrastructure, may also benefit from direct appropriations from Congress. The City has already benefited from funding through the STAG program and should consider this an appropriate avenue for future grants, particularly where there are joint benefits to both the City and the Lummi and Nooksack Tribes. Benefits may include improvements to water quality where shellfish harvesting for Tribal members is currently restricted due to water quality conditions and funding for final restoration of the current WWTP site to meet archaeological and/or historical requirements.

CHAPTER 9

Environmental Documents and Agency Review

This chapter presents the environmental documentation, necessary permits, agency approvals, and timelines to ensure construction of the proposed Lighthouse Point WRF will be implemented as anticipated. The information presented in this chapter is based on the assumption that both State and Federal funding sources will be used to finance the design and construction of the proposed Lighthouse Point WRF. The permits outlined are based on the regulations and procedures outlined in RUS Bulletin 1794A-602, the City of Blaine Municipal Code, and the City of Blaine Comprehensive Plan as well as additional information from communications with the City staff. This chapter also includes construction permits (e.g., building and electrical permits), which typically the construction contractor has the responsibility to obtain.

This Facility Plan has been prepared in accordance with the requirements of WAC 173-240-060, which is administered by Ecology. A checklist outlining the Ecology requirements and where the information is located in this Facility Plan is included as Appendix K.

9.1 Environmental Review

The type of environmental review required for a specific project depends on what agency sponsors the project with funding or leads the planning and development process. In this case, Federal funding is anticipated for the design and construction of the proposed Lighthouse Point WRF, which will trigger NEPA requirements to be followed. In Washington State, facilities funded through local revenue sources, such as utility rates, are also required to be reviewed under SEPA. Both NEPA and SEPA require that all potential environmental impacts of a proposed project be disclosed at an early stage of project development through an environmental document.

9.1.1 Review Process

When a project commences and environmental documentation is complete, the lead agency issues a decision document concluding whether the project alternatives are likely to have significant adverse impacts, or not, and which alternative has been selected to carry through design. For this project, the USDA RUS will be the lead agency for NEPA and the Blaine Community Development Department will be the lead agency for SEPA. Most environmental document must be circulated for public comment. The decision document is only issued after the public has had an opportunity to comment and each comment has been addressed to the satisfaction of the lead agencies.

There are three levels of environmental documentation that may be required: a Categorical Exclusion (CE), an Environmental Assessment (EA), and an EIS. If it has been predetermined that significant adverse environmental impacts are unlikely, then the environmental documentation can be a CE. If the project impacts are significant but can be

mitigated to less than significant, an EA will be required. Finally, if significant impacts are anticipated or there is considerable public concern, an EIS must be prepared.

A CE or EA may only require the evaluation of the no action and the proposed project actions. An EIS, however, must evaluate alternatives to the proposed action. In Washington State, both NEPA EAs and NEPA EISs can be adopted by local lead agencies to meet the requirements of SEPA, thus avoiding a duplicative process.

Specifically for the proposed Lighthouse Point WRF, the USDA RUS requires an Environmental Report (ER) be prepared for the proposed project to meet NEPA requirements. The ER enables the RUS to evaluate the environmental effects of the proposed project that would require either a CE or an EA. By using this process, RUS will determine if the effects of the proposed project can be mitigated or if a higher level of environmental review is required for the project. The information included in the ER must be sufficient for the RUS to determine if providing financial assistance will conflict with other environmental statutes, implementing regulations, policies, procedures, and Executive Orders that may be applicable to the proposed project. Once the RUS has reviewed the ER and determined the proposed project level and types of impacts, the ER is then adopted as a CE, an EA, or an EIS. This document can then be used for SEPA compliance by the Blaine Community Development Department.

9.1.2 Requirements for Lighthouse Point Water Reclamation Facility

The proposed project will need to comply with NEPA through the preparation of an ER. Requirements for the report's content and format are documented in RUS Bulletin 1794A-602. For this project, the following environmental resources have been evaluated in the Preliminary Environmental Report that will be included as Appendix L.

- Land Use/Farmland/Formally Classified Land
- Floodplains
- Wetlands
- Cultural Resources
- Biological Resources
- Water Quality Issues
- Coastal Resources
- Socioeconomic Issues
- Aesthetics
- Transportation

According to RUS Bulletin 1794A-602, further information gathering from and coordination with key agencies will be necessary before the ER is ready to be submitted to the RUS.

9.1.3 Environmental Document Approval Timeline

The timing for review and approval of the ER will be somewhat dependent on the workload of the lead agency. Assuming no significant impacts are associated with the proposed project, the timeline is currently estimated to be approximately 5 months between submittal of the ER to the USDA RUS and issuance of a decision, which is anticipated to be a Finding of No Significant Issues (FONSI). Once the FONSI is issued, the City can adopt the NEPA

document as their SEPA document under the provisions of WAC 197-11-610. After the ER is adopted by the City, preparation of the environmental permits would commence.

9.2 Permits and Approvals

The Table 9-1 provides a comprehensive list of the potential permits and approvals that may be required for construction of the proposed Lighthouse Point WRF, some of which may not be required once agency representatives have been consulted. It is recommended that a meeting with key agencies would occur before commencement of any permit work to determine exactly what permits and approvals are required. For copies of the permit application forms, see Appendix M.

TABLE 9-1
Proposed Lighthouse Point WRF Permit Requirements

Permit/Environmental Documentation	Timeline	Trigger
Federal		
Environmental Review – RUS	Approximately 5 months.	USDA RUS providing financial assistance for the project.
Joint Aquatic Resources Permit Application (JARPA)	See individual permits related to the JARPA (Permits with an "*").	The JARPA simplifies several permit application processes by allowing project information to be submitted to applicable permitting agencies in one application.
Section 404 Permit* – U.S. Army Corps of Engineers	6 months to 2 years.	Applicable to all construction proposals in the RUS programs. Specifically required when locating a structure, excavating, or discharging dredged or fill material in waters of the U.S. or transporting dredged material for the purpose of dumping it into ocean waters.
Biological Assessment/Biological Evaluation and Section 7 Consultation – U.S. Fish and Wildlife Service	Tied to the Section 404 Permit process.	Presence of Threatened and Endangered Species and/or conducive habitat.
State		
Section 401 Water Quality Certification* Ecology	Typically 30 days but up to 180 days.	Applying for a Federal permit or license to conduct any activity that might result in a discharge of dredge or fill material into water or non-isolated wetlands or excavation in water or non-isolated wetlands.
Coastal Zone Management (CZM)* – Ecology	60 days for Federal projects and 180 days for licenses, permits, or funding project to render a decision.	Federal-permitted/licensed or Federal-funded projects require a certification that they are consistent with Washington's CZM Program.

TABLE 9-1
Proposed Lighthouse Point WRF Permit Requirements

Permit/Environmental Documentation	Timeline	Trigger
NPDES Construction Stormwater General Permit – Ecology	Approximately 45 days.	Construction of a project on a site more than 5 acres. However, Ecology plans to have a permit applicable to sites between 1 to 5 acres by Fall 2005.
Section 106 Review – Office of Archaeology and Historic Preservation (OAHP)	Typically conducted during environmental documentation.	Any Federal undertaking, funding, license, or permit.
Archaeological Excavation Permit – OAHP	Between 45 to 60 days.	Excavating, altering, defacing, or removing archaeological objects.
Local		
Shoreline Substantial Development Permit* – City of Blaine	150 days (includes 30-day completeness review and 120-day permit review/issuance).	Construction within 200 feet of the ordinary high water mark and project cost exceeds $5,000 fair market value.
Critical Areas Ordinance* – City of Blaine	150 days (would be included as part of the Shoreline Substantial Development Permit).	Proposed project would occur in an area that is classified as a geologically unstable area.
Building Permit – City of Blaine	150 days (includes 30-day completeness review and 120-day permit review/issuance).	New building construction (drainage and site work review will be included under this permit).
Clearing, Grading, and Fill Permit – City of Blaine	Variable	Any removal or excavation.
Excavation Permit – City of Blaine	Variable	Any excavation done within City right-of-way.

9.3 Summary

The applicable assumptions for the proposed Lighthouse Point WRF include the following:

- The City will adopt the NEPA ER, therefore, a SEPA checklist would not have to be completed as part of the environmental review process. A SEPA checklist was created for the General Sewer Plan, which is included as Appendix N.
- The Section 404 Permit requirement should result in a nationwide permit, regional permit, or the proposed project would be authorized by letters-of-permission, which would streamline part of the permitting process. No structure, excavation, or discharged dredged or fill material in waters of the U.S. would occur as part of the project, therefore, an individual permit would not be required. The Seattle District of the U.S. Army Corps of Engineers would be contacted to determine the necessary type of permit.

- The proposed project should not result in discharge of dredge or fill material into water or non-isolated wetlands or excavation in water or non-isolated wetlands. Therefore, Section 401 Water Quality Certification would likely be approved and no further review would be required or Ecology would provide a Letter of Verification.
- No work will be performed that will divert, obstruct, or change the natural flow or bed of any fresh water or salt water of the State and will not have a direct impact on aquatic life and habitat so no Hydraulic Project Approval would be required.

The longest approval procedure will concern acquiring the decision document for the ER. It is anticipated that a couple of the permits covered under JARPA, may be waived because neither U.S. waters, nor sensitive habitat areas would be affected by the project. An important strategy will be to contact all interested agencies prior to the finalization of the ER to receive their input on mitigation and avoidance measures. This early coordination builds trust and confidence and may result in fewer permit applications.

TABLE A-1
Facility Plan Requirements and Organization

Department of Ecology Elements	Lighthouse Point WRF Facility Plan Chapters
Site Description, Problem Identification, and Map	Chapter 2 - Service Area and Characteristics
Description of Discharge Standards	Chapter 4 - Wastewater Characteristics
Background Information	Chapter 2 - Service Area and Characteristics Chapter 3 - Existing Wastewater Facilities Chapter 4 - Wastewater Characteristics
Future Conditions	Chapter 4 - Wastewater Characteristics
Alternatives	Chapter 5 - Treatment Facilities Development and Analysis Chapter 6 - Evaluation of Monetary and Nonmonetary Criteria
Final Recommended Alternative	Chapter 7 - Recommended Plan
Financial Analysis	Chapter 8 - Program Financing
Other	Chapter 9 - Environmental Documents and Agency Review

Year	Date	AVG FLOW (MGD)	AVG INFLUENT TSS (lbs/day)	AVG INFLUENT BOD (lb/day)	AVG INFLUENT NH3 (mg/L)
01/01/2004					
	01/01/2004	0.77	996.65	926.17	
	02/01/2004	0.70	1405.56	1455.88	
	03/01/2004	0.74	1065.39	1252.33	
	04/01/2004	0.44	878.00	1079.38	
	05/01/2004	0.42	941.49	1146.93	
		Avg Of Avg OfFLOW (MGD): 0.61	Avg Of AvgOfTSS RAW LBS: 1057.42	Avg Of AvgOfBOD RAW LBS: 1172.14	
		Min Of AvgOfFLOW (MGD): 0.42	Min Of AvgOfTSS RAW LBS: 878.00	Min Of AvgOfBOD RAW LBS: 926.17	
		Max Of Avg OfFLOW (MGD): 0.77	Max Of AvgOfTSS RAW LBS: 1405.56	Max Of AvgOfBOD RAW LBS: 1455.88	
01/01/2003					
	01/01/2003	0.88	1152.64	1193.23	12.00
	02/01/2003	0.67	1052.15	1124.40	19.50
	03/01/2003	0.78	1107.59	1244.89	20.00
	04/01/2003	0.64	816.43	1020.09	
	05/01/2003	0.60	1014.34	1151.91	
	06/01/2003	0.45	1004.12	1246.87	
	07/01/2003	0.39	938.90	1139.46	
	08/01/2003	0.42	949.67	1256.50	
	09/01/2003	0.40	1126.00	1342.56	
	10/01/2003	0.74	1070.97	1151.88	
	11/01/2003	0.69	815.93	940.47	
	12/01/2003	0.62	1083.08	1172.67	
		Avg Of AvgOfFLOW (MGD): 0.60	Avg Of AvgOfTSS RAW LBS: 1010.98	Avg Of AvgOfBOD RAW LBS: 1165.41	Avg Of AvgOfINFLUENT NH3 mgL: 17.17
		Min Of AvgOfFLOW (MGD): 0.39	Min Of AvgOfTSS RAW LBS: 815.93	Min Of AvgOfBOD RAW LBS: 940.47	Min Of AvgOfINFLUENT NH3 mgL: 12.00
		Max Of AvgOfFLOW (MGD): 0.88	Max Of AvgOfTSS RAW LBS: 1152.64	Max Of AvgOfBOD RAW LBS: 1342.56	Max Of AvgOfINFLUENT NH3 mgL: 20.00
01/01/2002					
	01/01/2002	0.76	851.07	970.11	16.50
	02/01/2002	0.85	1025.93	1076.33	15.00
	03/01/2002	0.68	1190.97	1148.00	19.00
	04/01/2002	0.67	948.99	1024.57	11.50
	05/01/2002	0.59	1240.56	1256.60	22.50
	06/01/2002	0.48	1379.43	1194.60	28.50
	07/01/2002	0.47	1382.69	1216.70	29.00
	08/01/2002	0.54	1529.61	1646.09	27.00
	09/01/2002	0.45	1106.56	1253.57	26.50

Year	Date	AVG FLOW (MGD)	AVG INFLUENT TSS (lbs/day)	AVG INFLUENT BOD (lb/day)	AVG INFLUENT NH3 (mg/L)
	10/01/2002	0.54	1340.11	1600.00	30.50
	11/01/2002	0.60	1312.31	1485.63	23.50
	12/01/2002	0.66	1003.12	1190.18	20.00
		Avg Of AvgOfFLOW (MGD): 0.61	Avg Of AvgOfTSS RAW LBS: 1192.61	Avg Of AvgOfBOD RAW LBS: 1255.20	Avg Of AvgOfINFLUENT NH3 mgL: 22.46
		Min Of AvgOfFLOW (MGD): 0.45	Min Of AvgOfTSS RAW LBS: 851.07	Min Of AvgOfBOD RAW LBS: 970.11	Min Of AvgOfINFLUENT NH3 mgL: 11.50
		Max Of AvgOfFLOW (MGD): 0.85	Max Of AvgOfTSS RAW LBS: 1529.61	Max Of AvgOfBOD RAW LBS: 1646.09	Max Of AvgOfINFLUENT NH3 mgL: 30.50
01/01/2001					
	01/01/2001	0.57	1020.33	955.29	14.00
	02/01/2001	0.45	751.74	920.00	17.50
	03/01/2001	0.50	1517.74	943.75	16.50
	04/01/2001	0.50	834.75	928.70	19.00
	05/01/2001	0.43	1000.11	1118.75	24.50
	06/01/2001	0.41	960.32	984.25	23.50
	07/01/2001	0.47	947.56	1218.83	26.50
	08/01/2001	0.51	907.93	1071.86	29.50
	09/01/2001	0.40	876.69	956.00	29.00
	10/01/2001	0.41	1147.53	979.14	18.00
	11/01/2001	0.54	692.70	691.63	16.50
	12/01/2001	0.71	798.61	895.31	17.00
		Avg Of AvgOfFLOW (MGD): 0.49	Avg Of AvgOfTSS RAW LBS: 954.67	Avg Of AvgOfBOD RAW LBS: 971.96	Avg Of AvgOfINFLUENT NH3 mgL: 20.96
		Min Of AvgOfFLOW (MGD): 0.40	Min Of AvgOfTSS RAW LBS: 692.70	Min Of AvgOfBOD RAW LBS: 691.63	Min Of AvgOfINFLUENT NH3 mgL: 14.00
		Max Of AvgOfFLOW (MGD): 0.71	Max Of AvgOfTSS RAW LBS: 1517.74	Max Of AvgOfBOD RAW LBS: 1218.83	Max Of AvgOfINFLUENT NH3 mgL: 29.50
01/01/2000					
	01/01/2000	0.58	785.45	954.25	18.50
	02/01/2000	0.55	919.95	1109.00	16.50
	03/01/2000	0.68	1358.23	1353.13	16.50
	04/01/2000	0.43	664.77	900.33	22.00
	05/01/2000	0.59	915.66	1110.50	17.50
	06/01/2000	0.54	800.56	1022.63	23.00
	07/01/2000	0.41	776.67	944.57	25.50
	08/01/2000	0.40	708.73	880.60	29.00
	09/01/2000	0.40	813.94	1128.52	27.00
	10/01/2000	0.47	973.68	1225.17	25.00
	11/01/2000	0.44	805.91	987.20	20.50
	12/01/2000	0.57	638.70	799.63	10.50

Year	Date	AVG FLOW (MGD)		AVG INFLUENT TSS (lbs/day)		AVG INFLUENT BOD (lb/day)		AVG INFLUENT NH3 (mg/L)	
		Avg Of AvgOfFLOW (MGD):	0.50	Avg Of AvgOfTSS RAW LBS:	846.85	Avg Of AvgOfBOD RAW LBS:	1034.63	Avg Of AvgOfINFLUENT NH3 mgL:	20.96
		Min Of AvgOfFLOW (MGD):	0.40	Min Of AvgOfTSS RAW LBS:	638.70	Min Of AvgOfBOD RAW LBS:	799.63	Min Of AvgOfINFLUENT NH3 mgL:	10.50
		Max Of AvgOfFLOW (MGD):	0.68	Max Of AvgOfTSS RAW LBS:	1358.23	Max Of AvgOfBOD RAW LBS:	1353.13	Max Of AvgOfINFLUENT NH3 mgL:	29.00
01/01/1999									
	01/01/1999	0.72		696.20		725.60		12.00	
	02/01/1999	0.70		805.00		688.50		10.50	
	03/01/1999	0.48		639.25		898.50		14.00	
	04/01/1999	0.30		475.00		512.60		21.00	
	05/01/1999	0.28		373.25		406.25		24.00	
	06/01/1999	0.27		422.75		539.50		26.00	
	07/01/1999	0.24		417.00		501.00		23.50	
	08/01/1999	0.40		908.00		1182.75		29.50	
	09/01/1999	0.36		838.80		1075.80		34.00	
	10/01/1999	0.31		573.75		742.00		29.00	
	11/01/1999	0.49		1028.25		613.00		18.00	
	12/01/1999	0.80		884.33		939.80		9.00	
		Avg Of AvgOfFLOW (MGD):	0.44	Avg Of AvgOfTSS RAW LBS:	671.80	Avg Of AvgOfBOD RAW LBS:	735.44	Avg Of AvgOfINFLUENT NH3 mgL:	20.88
		Min Of AvgOfFLOW (MGD):	0.24	Min Of AvgOfTSS RAW LBS:	373.25	Min Of AvgOfBOD RAW LBS:	406.25	Min Of AvgOfINFLUENT NH3 mgL:	9.00
		Max Of AvgOfFLOW (MGD):	0.80	Max Of AvgOfTSS RAW LBS:	1028.25	Max Of AvgOfBOD RAW LBS:	1182.75	Max Of AvgOfINFLUENT NH3 mgL:	34.00
01/01/1998									
	01/01/1998	0.67		788.20		803.80		10.50	
	02/01/1998	0.41		669.75		579.50		20.00	
	03/01/1998	0.46		677.75		584.75		18.00	
	04/01/1998	0.30		773.20		527.80		25.00	
	05/01/1998	0.29		595.50		458.75		27.00	
	06/01/1998	0.26		514.75		654.00		23.00	
	07/01/1998	0.24		482.40		504.20		27.00	
	08/01/1998	0.22		583.50		451.50		31.00	
	09/01/1998	0.20		445.00		527.00		29.50	
	10/01/1998	0.21		466.20		341.00		31.00	
	11/01/1998	0.52		842.75		695.75		17.50	
	12/01/1998	0.72		733.00		746.75		16.50	
		Avg Of AvgOfFLOW (MGD):	0.38	Avg Of AvgOfTSS RAW LBS:	631.00	Avg Of AvgOfBOD RAW LBS:	572.90	Avg Of AvgOfINFLUENT NH3 mgL:	23.00
		Min Of AvgOfFLOW (MGD):	0.20	Min Of AvgOfTSS RAW LBS:	445.00	Min Of AvgOfBOD RAW LBS:	341.00	Min Of AvgOfINFLUENT NH3 mgL:	10.50
		Max Of AvgOfFLOW (MGD):	0.72	Max Of AvgOfTSS RAW LBS:	842.75	Max Of AvgOfBOD RAW LBS:	803.80	Max Of AvgOfINFLUENT NH3 mgL:	31.00

Year	Date	AVG FLOW (MGD)	AVG INFLUENT TSS (lbs/day)	AVG INFLUENT BOD (lb/day)	AVG INFLUENT NH3 (mg/L)
01/01/1997					
	01/01/1997	0.81	655.36	591.79	7.00
	02/01/1997	0.58	582.67	665.42	10.00
	03/01/1997	0.59	712.75	686.75	17.50
	04/01/1997	0.40	451.00	535.50	22.00
	05/01/1997	0.37	448.00	494.20	21.50
	06/01/1997	0.37	591.50	686.25	16.00
	07/01/1997	0.40	672.50	492.50	24.50
	08/01/1997	0.26	698.60	597.20	27.00
	09/01/1997	0.25	366.00	484.20	26.00
	10/01/1997	0.35	468.80	467.20	23.50
	11/01/1997	0.50	615.50	633.25	18.00
	12/01/1997	0.53	1374.00	867.50	17.00
		Avg Of AvgOfFLOW (MGD): 0.45	Avg Of AvgOfTSS RAW LBS: 636.39	Avg Of AvgOfBOD RAW LBS: 600.15	Avg Of AvgOfINFLUENT NH3 mgL: 19.17
		Min Of AvgOfFLOW (MGD): 0.25	Min Of AvgOfTSS RAW LBS: 366.00	Min Of AvgOfBOD RAW LBS: 467.20	Min Of AvgOfINFLUENT NH3 mgL: 7.00
		Max Of AvgOfFLOW (MGD): 0.81	Max Of AvgOfTSS RAW LBS: 1374.00	Max Of AvgOfBOD RAW LBS: 867.50	Max Of AvgOfINFLUENT NH3 mgL: 27.00

Pretreatment ordinance to be provided by City of Blaine.

Issuance Date: March 13, 2003
Effective Date: April 1, 2003
Expiration Date: June 1, 2007

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WASTE DISCHARGE PERMIT No. WA-002264-1

State of Washington
DEPARTMENT OF ECOLOGY
Northwest Regional Office
3190 160th Avenue SE
Bellevue, WA 98008-5452

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1251 et seq.

CITY OF BLAINE

1200 Yew Street

Blaine, WA 98230

Plant Location: 9235 Semiahmoo Parkway Blaine, WA 98230	Receiving Water: Semiahmoo Bay (Strait of Georgia)
Water Body I.D. No.: WA-01-0010	Discharge Location: Latitude: 48° 58'46" N Longitude: 122° 48'05" W
Plant Type: Rotating Biological Contactors Secondary Municipal Treatment	

is authorized to discharge in accordance with the special and general conditions that follow.

Richard M. Grout, Manager
Bellingham Field Office
Washington State Department of Ecology

TABLE OF CONTENTS

SUMMARY OF PERMIT REPORT SUBMITTALS 4

SPECIAL CONDITIONS

S1. DISCHARGE LIMITATIONS 5
- A. Effluent Limitations
- B. Mixing Zone Descriptions

S2. MONITORING REQUIREMENTS 6
- A. Monitoring Schedule
- B. Sampling and Analytical Procedures
- C. Flow Measurement
- D. Laboratory Accreditation
- E. Process Control Testing
- F. Submarine Force Main Testing

S3. REPORTING AND RECORDKEEPING REQUIREMENTS 8
- A. Reporting
- B. Records Retention
- C. Recording of Results
- D. Additional Monitoring by the Permittee
- E. Noncompliance Notification
- F. Reporting - Shellfish Protection

S4. FACILITY LOADING 10
- A. Design Criteria
- B. Plans for Maintaining Adequate Capacity
- C. Duty to Mitigate
- D. Notification of New or Altered Sources
- E. Infiltration and Inflow Evaluation
- F. Waste Load Assessment

S5. OPERATIONS AND MAINTENANCE 12
- A. Certified Operator
- B. O & M Program
- C. Short-term Reduction
- D. Electrical Power Failure
- E. Prevent Connection of Inflow
- F. Bypass Procedures
- G. Operations and Maintenance Manual

S6. PRETREATMENT 15
- A. General Requirements
- B. Wastewater Discharge Permit Required
- C. Identification and Reporting of Existing, New, and Proposed Industrial Users
- D. Industrial User Survey
- E. Duty to Enforce Discharge Prohibitions

S7. RESIDUAL SOLIDS 17

S8. ACUTE TOXICITY 18
- A. Testing Requirements
- B. Sampling and Reporting Requirements

S9. CHRONIC TOXICITY 19
A. Testing Requirements
B. Sampling and Reporting Requirements
S10. ADDITIONAL CHEMICAL ANALYSIS OF INFLUENT AND EFFLUENT 21
A. General Requirements
B. Monitoring Requirements
C. Protocols
D. Quality Assurance/Quality Control Procedures
S11. OUTFALL EVALUATION 24

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS 25
G2. RIGHT OF INSPECTION AND ENTRY 26
G3. PERMIT ACTIONS 26
G4. REPORTING A CAUSE FOR MODIFICATION 27
G5. PLAN REVIEW REQUIRED 28
G6. COMPLIANCE WITH OTHER LAWS AND STATUTES 28
G7. DUTY TO REAPPLY 28
G8. TRANSFER OF THIS PERMIT 28
G9. REDUCED PRODUCTION FOR COMPLIANCE 29
G10. REMOVED SUBSTANCES 29
G11. DUTY TO PROVIDE INFORMATION 29
G12. OTHER REQUIREMENTS OF 40 CFR 29
G13. ADDITIONAL MONITORING 29
G14. PAYMENT OF FEES 29
G15. PENALTIES FOR VIOLATING PERMIT CONDITIONS 29
G16. UPSET 30
G17. PROPERTY RIGHTS 30
G18. DUTY TO COMPLY 30
G19. TOXIC POLLUTANTS 30
G20. PENALTIES FOR TAMPERING 30
G21. REPORTING PLANNED CHANGES 31
G22. REPORTING ANTICIPATED NONCOMPLIANCE 31
G23. REPORTING OTHER INFORMATION 31
G24. REPORTING REQUIREMENTS APPLICABLE TO EXISTING MANUFACTURING, COMMERCIAL, MINING, AND SILVICULTURAL DISCHARGERS 31
G25. COMPLIANCE SCHEDULES 32

SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions of this permit for additional submittal requirements.

Permit Section	Submittal	Frequency	First Submittal Date
S2.F.	Submarine Force Main Test	Annually	Thirty (30) days after receipt of this permit
S3.	Discharge Monitoring Report	Monthly	May 15, 2003
S3.E	Noncompliance Notification	As necessary	
S3.F	Shellfish Protection	As necessary	
S4.B.	Plans for Maintaining Adequate Capacity	As necessary	
S4.C.	Notification of New or Altered Sources	As necessary	
S4.E.	Infiltration and Inflow Evaluation	Annually	December 20, 2003, and annually thereafter
S4.F.	Waste Load Assessment	Annually	November 30, 2003
S5.G.	Operations and Maintenance Manual	As necessary	
S6.D.	Industrial User Survey	1/permit cycle	June 2006
S7.B.	Residual Solids Management Plan	1/permit cycle	
S8.A	Acute Toxicity Effluent Characterization with Permit Renewal Application	2/permit cycle	June 7, 2006 and December 7, 2006
S9.A	Chronic Toxicity Effluent Characterization with Permit Renewal Application	2/permit cycle	June 7, 2006 and December 7, 2006
S10.A	Chemical Analysis of Effluent	1/permit cycle	Upon application for new permit or prior to connection to another waste water facility
S11.	Outfall Evaluation	1/permit cycle	By December 15, 2004
G1.	Notice of Change in Authorization	As necessary	
G4.	Permit Application for Substantive Changes to the Discharge	As necessary	
G5.	Engineering Report for Construction or Modification Activities	As necessary	
G7.	Application for Permit Renewal	1/permit cycle	December 1, 2006
G21.	Notice of Planned Changes	As necessary	
G22.	Reporting Anticipated Noncompliance	As necessary	

SPECIAL CONDITIONS

S1. DISCHARGE LIMITATIONS

A. Effluent Limitations

All discharges and activities authorized by this permit shall be consistent with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit shall constitute a violation of the terms and conditions of this permit.

The discharge of any pollutant not specifically authorized by this permit in concentrations which violate receiving water quality standards established under section 307(a) of the Clean Water Act or Chapter 173-201A WAC, shall also be a violation of this permit and the Clean Water Act.

Beginning on the effective date of this permit and lasting through the expiration date, the Permittee is authorized to discharge municipal wastewater at the permitted location subject to complying with the following limitations:

EFFLUENT LIMITATIONS[a]: OUTFALL # 1		
Parameter	**Average Monthly**	**Average Weekly**
Biochemical Oxygen Demand[b] (5 day)	30mg/L, 200 lbs./day	45 mg/L, 300 lbs./day
Total Suspended Solids[b]	30mg/L, 200 lbs./day	45 mg/L, 300 lbs./day
Fecal Coliform Bacteria	200/100 mL	400/100 mL
pH[c]	Daily minimum is equal to or greater than 6, and the daily maximum is less than or equal to 9.	
Parameter	**Average Monthly**	**Maximum Daily[d]**
Total Residual Chlorine (if WQ-based)	0.35 mg/L, 2.3 lbs./day	0.9 mg/L, 6.0 lbs./day

[a] The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken with the exception of fecal coliform, which is based on the geometric mean.

[b] The average monthly effluent concentration for BOD_5 and Total Suspended Solids shall not exceed 30 mg/L or 15 percent of the respective monthly average influent concentrations, whichever is more stringent.

[c] Indicates the range of permitted values. When pH is continuously monitored, excursions between 5.0 and 6.0, or 9.0 and 10.0, shall not be considered violations provided no single excursion exceeds 60 minutes in length and total excursions do not exceed 7 hours and 30 minutes per month. Any excursions below 5.0 and above 10.0 are violations. The instantaneous maximum and minimum pH shall be reported monthly.

[d] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average measurement of the pollutant over the day.

B. Mixing Zone Descriptions

The maximum boundaries of the mixing zones are defined as follows:

A zone where chronic criteria may be exceeded extends a maximum of 200 feet in any horizontal direction from any individual discharge port. The dilution attained within the chronic mixing zone for the critical conditions is 71.8:1 in the plume flowing in the direction of the current.

A zone where acute criteria may be exceeded extends a maximum distance of 190 feet in any direction from any individual discharge port. The dilution attained within the acute mixing zone for the critical conditions is 19.3 in the plume flowing in the direction of the current.

S2. MONITORING REQUIREMENTS

A. Monitoring Schedule

Category	Parameter	Units	Sample Point	Minimum Sampling Frequency	Sample Type
Wastewater Influent	BOD_5	mg/L	Headworks	1/week	24-hr. composite
"	TSS	mg/L	Headworks	1/week	24-hour composite
Wastewater Effluent	Flow	MGD	Final Effluent	Continuous	Measurement
"	BOD_5	mg/L	Final Effluent	1/week	24-hr. composite
"	TSS	mg/L	Final Effluent	1/week	24-hr. composite
"	pH	Standard Units	Final Effluent	7/week	Grab
"	Fecal Coliform	#CFU/100mL	Final Effluent	4/week	Grab
"	Chlorine	mg/L	Final Effluent	7/week	Grab
Submarine Force Main		Pressure test and Cathodic Protection test annually			
Pretreatment	As specified in Section S6.				
Acute Toxicity Testing			Final Effluent	June 7, 2006 & December 7, 2006	24-hr. composite
Chronic Toxicity Testing			Final Effluent	June 7, 2006 & December 7, 2006	24-hr. composite
Additional Chemical Analysis of Effluent	Constituents outlined in Part D of NPDES application form 2A	Sample analysis shall be conducted in accordance with 40 CFR Part 136	Sampling shall be conducted in accordance with 40 CFR Part 136	Ten samples of effluent from wastewater treatment, with sampling times at least one week apart	Sampling shall be conducted in accordance with 40 CFR Part 136

* Continuous means uninterrupted except for brief lengths of time for calibration, for power failure, or for unanticipated equipment repair or maintenance.

B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit shall be representative of the volume and nature of the monitored parameters, including representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions affecting effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit shall conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136 or to the latest revision of *Standard Methods for the Examination of Water and Wastewater* (APHA), unless otherwise specified in this permit or approved in writing by the Department of Ecology (Department).

C. Flow Measurement

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the quantity of monitored flows. The devices shall be installed, calibrated, and maintained to ensure that the accuracy of the measurements is consistent with the accepted industry standard for that type of device. Frequency of calibration shall be in conformance with manufacturer's recommendations and at a minimum frequency of at least one calibration per year. Calibration records shall be maintained for at least three (3) years.

D. Laboratory Accreditation

All monitoring data required by the Department shall be prepared by a laboratory registered or accredited under the provisions of, *Accreditation of Environmental Laboratories*, Chapter 173-50 WAC. Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. Conductivity and pH shall be accredited if the laboratory must otherwise be registered or accredited. The Department exempts crops, soils, and hazardous waste data from this requirement pending accreditation of laboratories for analysis of these media.

E. Process Control Testing

The Permittee shall conduct in-plant process control testing to the extent necessary to evaluate the efficiency of the treatment processes and to allow the operator to make informed adjustments to optimize the process efficiency.

F. Submarine Force Main Testing

The Permittee shall conduct an annual pressure test of the submarine force main. This test shall be of adequate duration to ensure the integrity of the force main as specified by the pressure test protocol written for the city by CH2MHill on December 5, 2000. The pressure test and cathodic protection test shall take place thirty (30) days after receipt of this permit and at least once a year thereafter. If, for technical reasons, the test cannot be performed thirty (30) days after receipt of this permit, the City shall submit to Ecology a written request for extension. The Permittee shall also ensure that the submarine force main is protected from corrosion by testing annually using either a nationally recognized practice or a testing protocol developed by an individual certified by the National Association of Corrosion Engineers (N.A.C.E.).

S3. REPORTING AND RECORDKEEPING REQUIREMENTS

The Permittee shall monitor and report in accordance with the following conditions. The falsification of information submitted to the Department shall constitute a violation of the terms and conditions of this permit. The Permittee shall maintain a copy of the most current permit at the facility at all times.

A. Reporting

The first monitoring period begins on the effective date of the permit. Monitoring results shall be submitted monthly. Monitoring data obtained during each monitoring period shall be summarized, reported, and submitted on a Discharge Monitoring Report (DMR) form provided, or otherwise approved, by the Department. DMR forms shall be received by the Department no later than the 15th day of the month following the completed monitoring period, unless otherwise specified in this permit. Priority pollutant analysis data shall be submitted no later than forty-five (45) days following the monitoring period. The report(s) shall be sent to the Department of Ecology, Bellingham Field Office, 1204 Railroad Avenue, Suite 200, Bellingham, WA 98225; and Northwest Regional Office, 3190 160th Avenue S.E., Bellevue, WA 98008-5452, respectively.

All laboratory reports providing data for organic and metal parameters shall include the following information: sampling date, sample location, date of analysis, parameter name, CAS number, analytical method/number, method detection limit (MDL), laboratory practical quantitation limit (PQL), reporting units, and concentration detected.

Discharge Monitoring Report forms must be submitted monthly whether or not the facility was discharging. If there was no discharge during a given monitoring period, submit the form as required with the words "no discharge" entered in place of the monitoring results.

B. Records Retention

The Permittee shall retain records of all monitoring information for a minimum of three (3) years. Such information shall include all calibration and maintenance records and all original recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit. This period of retention shall be extended during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by the Department.

C. Recording of Results

For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place, method, and time of sampling or measurement; (2) the individual who performed the sampling or measurement; (3) the dates the analyses were performed; (4) the individual who performed the analyses; (5) the analytical techniques or methods used; and (6) the results of all analyses.

D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by this permit using test procedures specified by Condition S2 of this permit, then the results of such monitoring shall be included in the calculation and reporting of the data submitted in the Permittee's DMR.

E. Noncompliance Notification

In the event the Permittee is unable to comply with any of the terms and conditions of this permit due to any cause, the Permittee shall:

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance, correct the problem and, if applicable, repeat sampling and analysis of any noncompliance immediately and submit the results to the Department within thirty (30) days after becoming aware of the violation.
2. Immediately notify the Department of the failure to comply.
3. Submit a detailed, written report to the Department within thirty (30) days (five [5] days for upsets and bypasses), unless requested earlier by the Department. The report shall contain a description of the noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

F. Reporting - Shellfish Protection

Unauthorized discharges, such as collection system overflows, plant bypasses, or failure of the disinfection system, shall be reported immediately to the Department of Ecology and the Department of Health, Shellfish Program. The Department of Ecology's Northwest Regional Office 24-hr. number is 425-649-7000, and the Department of Health's Shellfish 24-hr. number is 360-753-5992. In addition, the Bellingham Field Office shall be notified by calling 360-676-2198.

S4. FACILITY LOADING

A. Design Criteria

Flows or waste loadings of the following design criteria for the permitted treatment facility shall not be exceeded:

Average flow for the maximum month:	.80 MGD
BOD_5 loading for maximum month:	2088 lbs./day
TSS loading for maximum month:	2642 lbs./day

B. Plans for Maintaining Adequate Capacity

When the actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three (3) consecutive months, or when the projected increases would reach design capacity within five (5) years, which ever occurs first, the Permittee shall submit to the Department, a plan and a schedule for continuing to maintain capacity at the facility sufficient to achieve the effluent limitations and other conditions of this permit. This plan shall address any of the following actions or any others necessary to meet this objective.

1. Analysis of the present design including the introduction of any process modifications that would establish the ability of the existing facility to achieve the effluent limits and other requirements of this permit at specific levels in excess of the existing design criteria specified in paragraph A above.
2. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
3. Limitation on future sewer extensions or connections or additional waste loads.
4. Modification or expansion of facilities necessary to accommodate increased flow or waste load.
5. Reduction of industrial or commercial flows or waste loads to allow for increasing sanitary flow or waste load.

Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by the Department prior to any construction. The plan shall specify any contracts, ordinances, methods for financing, or other arrangements necessary to achieve this objective.

C. Duty to Mitigate

The Permittee is required to take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment

D. Notification of New or Altered Sources

The Permittee shall submit written notice to the Department whenever any new discharge or a substantial change in volume or character of an existing discharge into the POTW is proposed which: (1) would interfere with the operation of, or exceed the design capacity of, any portion of the POTW; (2) is not part of an approved general sewer plan or approved plans and specifications; or (3) would be subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act. This notice shall include an evaluation of the POTW's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the POTW, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

E. Infiltration and Inflow Evaluation

1. The Permittee shall conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, *I/I Analysis and Project Certification*, available as Publication No. 97-03 at: Publications Office, Department of Ecology, P.O. Box 47600, Olympia, WA, 98504-7600. Plant monitoring records may be used to assess measurable infiltration and inflow.

2. A report shall be prepared which summarizes any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the first report based on equivalent rainfall, the report shall contain a plan and a schedule for: (1) locating the sources of infiltration and inflow; and (2) correcting the problem.

3. The report shall be submitted by December 20, 2003, and every year thereafter.

F. Waste Load Assessment

The Permittee shall conduct an annual assessment of their flow and waste load and submit a report to the Department by November 30, 2003, and annually thereafter. The report shall contain the following: an indication of compliance or noncompliance with the permit effluent limitations; a comparison between the existing and design monthly average dry weather and wet weather flows, peak flows, BOD, and total suspended solids loadings; and (except for the first report) the percentage increase in these parameters since the last annual report. The report shall also state the present and design population or population equivalent, projected population growth rate, and the estimated date upon which the design capacity is projected to be reached, according to the most restrictive of the parameters above. The interval for review and reporting may be modified if the Department determines that a different frequency is sufficient.

S5. OPERATIONS AND MAINTENANCE

The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems, which are installed by a Permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

A. Certified Operator

An operator certified by the State of Washington for at least a Class II plant shall be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class I plant shall be in charge during all regularly scheduled shifts.

B. O & M Program

The Permittee shall institute an adequate operation and maintenance program for their entire sewage system. Maintenance records shall be maintained on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records shall clearly specify the frequency and type of maintenance recommended by the manufacturer and shall show the frequency and type of maintenance performed. These maintenance records shall be available for inspection at all times.

C. Short-term Reduction

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limitations on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee shall give written notification to the Department, if possible, thirty (30) days prior to such activities, detailing the reasons for, length of time of, and the potential effects of the reduced level of treatment. This notification does not relieve the Permittee of their obligations under this permit.

D. Electrical Power Failure

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations either by means of alternate power sources, standby generator, or retention of inadequately treated wastes. The Permittee shall maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment plant, which requires primary sedimentation and disinfection.

E. Prevent Connection of Inflow

The Permittee shall strictly enforce their sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

F. Bypass Procedures

Bypass, which is the intentional diversion of waste streams from any portion of a treatment facility, is prohibited, and the Department may take enforcement action against a Permittee for bypass unless one of the following circumstances (1, 2, or 3) is applicable.

1. Bypass for essential maintenance without the potential to cause violation of permit limits or conditions.

   Bypass is authorized if it is for essential maintenance and does not have the potential to cause violations of limitations or other conditions of this permit, or adversely impact public health as determined by the Department prior to the bypass. The Permittee shall submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass which is unavoidable, unanticipated, and results in noncompliance of this permit.

   This bypass is permitted only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. There are no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment downtime (but not if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance), or transport of untreated wastes to another treatment facility.

   c. The Department is properly notified of the bypass as required in condition S3E of this permit.

3. Bypass which is anticipated and has the potential to result in noncompliance of this permit

The Permittee shall notify the Department at least thirty (30) days before the planned date of bypass. The notice shall contain: (1) a description of the bypass and its cause; (2) an analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing; (3) a cost-effectiveness analysis of alternatives including comparative resource damage assessment; (4) the minimum and maximum duration of bypass under each alternative; (5) a recommendation as to the preferred alternative for conducting the bypass; (6) the projected date of bypass initiation; (7) a statement of compliance with SEPA; (8) a request for modification of water quality standards as provided for in WAC 173-201A-110, if an exceedance of any water quality standard is anticipated; and (9) steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

For probable construction bypasses, the need to bypass is to be identified as early in the planning process as possible. The analysis required above shall be considered during preparation of the Engineering Report or facilities plan and plans and specifications and shall be included to the extent practical. In cases where the probable need to bypass is determined early, continued analysis is necessary up to and including the construction period in an effort to minimize or eliminate the bypass.

The Department will consider the following prior to issuing an administrative order for this type bypass:

a. If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.

b. If there are feasible alternatives to bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.

c. If the bypass is planned and scheduled to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, the Department will approve or deny the request. The public shall be notified and given an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Approval of a request to bypass will be by administrative order issued by the Department under RCW 90.48.120.

G. Operations and Maintenance Manual

The approved Operations and Maintenance Manual shall be kept available at the treatment plant, and all operators shall follow the instructions and procedures of this manual. The manual shall be updated as necessary.

S6. PRETREATMENT

A. General Requirements

The Permittee shall work with the Department to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) are in compliance with the pretreatment regulations promulgated in 40 CFR Part 403 and any additional regulations that may be promulgated under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

B. Wastewater Discharge Permit Required

The Permittee shall not allow significant industrial users (SIUs) to discharge wastewater to the Permittee's sewerage system until such user has received a wastewater discharge permit from the Department in accordance with Chapter 90.48 RCW and Chapter 173-216 WAC, as amended.

C. Identification and Reporting of Existing, New, and Proposed Industrial Users

1. The Permittee shall take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewerage system (see Appendix B of Fact Sheet for definitions).

2. Within thirty (30) days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be an SIU, the Permittee shall notify such user by registered mail that, if classified as an SIU, they shall be required to apply to the Department and obtain a State Waste Discharge Permit. A copy of this notification letter shall also be sent to the Department within this same thirty (30)-day period.

3. The Permittee shall also notify all PSIUs, as they are identified, that if their classification should change to an SIU, they shall be required to apply to the Department for a State Waste Discharge Permit within thirty (30) days of such change.

D. Industrial User Survey

1. The Permittee shall complete and submit to the Department an Industrial User Survey listing all SIUs and PSIUs discharging to the POTW. The survey shall be received by the Department with your next permit application. At a minimum, the list of SIUs and PSIUs shall be developed by means of a telephone book search, a water utility billing records search, and a physical reconnaissance of the service area. Information on PSIUs shall at least include: the business name, telephone number, address, description of the industrial process(es), and the known wastewater volumes and characteristics. For assistance with the development of the Industrial User Survey, the Permittee shall refer to the Department's guidance document entitled "Performing an Industrial User Survey."

E. Duty to Enforce Discharge Prohibitions

1. In accordance with 40 CFR 403.5(a), the Permittee shall not authorize or knowingly allow the discharge of any pollutants into its POTW which cause pass through or interference, or which otherwise violates general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC-173-216-060.

2. The Permittee shall not authorize or knowingly allow the introduction of any of the following into their treatment works:

   a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).

   b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0 standard units, unless the works are specifically designed to accommodate such discharges.

   c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.

   d. Any pollutant, including oxygen demanding pollutants, (BOD, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.

   e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.

f. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.

g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40° C (104° F) unless the Department, upon request of the Permittee, approves, in writing, alternate temperature limits.

h. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.

i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (Chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).

3. All of the following are prohibited from discharge to the POTW unless approved in writing by the Department under extraordinary circumstances (such as a lack of direct discharge alternatives due to combined sewer service or the need to augment sewage flows due to septic conditions):

a. Non-contact cooling water in significant volumes.

b. Stormwater, and other direct inflow sources.

c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.

4. The Permittee shall notify the Department if any industrial user violates the prohibitions listed in this section.

S7. RESIDUAL SOLIDS

Residual solids include screenings, grit, scum, primary sludge, waste activated sludge, and other solid waste. The Permittee shall store and handle all residual solids in such a manner so as to prevent their entry into state ground or surface waters. The Permittee shall not discharge leachate from residual solids to state surface or ground waters.

S8. ACUTE TOXICITY

A. Testing Requirements

The Permittee shall conduct acute toxicity testing on the final effluent to determine the presence and amount of acute (lethal) toxicity. Effluent characterization for acute toxicity shall be conducted biannually for one year. The Permittee shall test final effluent once in the last summer and once in the last winter prior to submission of the application for permit renewal. Acute toxicity testing shall follow protocols, monitoring requirements, and quality assurance/quality control procedures specified in this section. A dilution series consisting of a minimum of five concentrations and a control shall be used to estimate the concentration lethal to 50% of the organisms (LC_{50}). The percent survival in 100% effluent shall also be reported.

The two species listed below shall be used on each sample and the results submitted to the Department as a part of the permit renewal application process. The Permittee shall conduct acute toxicity testing on a series of five concentrations of effluent and a control in order to be able to determine appropriate point estimates and an NOEC. The percent survival in 100% effluent shall also be reported.

Acute toxicity tests shall be conducted with the following species and protocols:

1. Fathead minnow, *Pimephales promelas* (96-hour static-renewal test, method: EPA/600/4-90/027F)

2. Daphnid, *Ceriodaphnia dubia*, *Daphnia pulex*, or *Daphnia magna* (48-hour static test, method: EPA/600/4-90/027Option, Supplemental Species- rainbow trout: See Permit Writer's Manual for an explanation of the benefits and difficulties of trout testing.

B. Sampling and Reporting Requirements

1. All reports for effluent characterization or compliance monitoring shall be submitted in accordance with the most recent version of Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria,* in regards to format and content. Reports shall contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data on floppy disk for electronic entry into the Department's database, then the Permittee shall send the disk to the Department along with the test report, bench sheets, and reference toxicant results.

2. Testing shall be conducted on grab samples. Samples taken for toxicity testing shall be cooled to 4 degrees Celsius while being collected and shall be sent to the lab immediately upon completion. The lab shall begin the toxicity testing as soon as possible but no later than 36 hours after sampling was ended.

3. All samples and test solutions for toxicity testing shall have water quality measurements as specified in Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* or most recent version thereof.

4. All toxicity tests shall meet quality assurance criteria and test conditions in the most recent versions of the EPA manual listed in subsection A and the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If test results are determined to be invalid or anomalous by the Department, testing shall be repeated with freshly collected effluent.

5. Control water and dilution water shall be laboratory water meeting the requirements of the EPA manual listed in subsection A or pristine natural water of sufficient quality for good control performance.

6. Effluent samples for whole effluent toxicity testing shall be collected just prior to the chlorination step in the treatment process.

7. The Permittee may choose to conduct a full dilution series test during compliance monitoring in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the ACEC.

8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing and do not comply with the acute statistical power standard of 29% as defined in WAC 173-205-020 must be repeated on a fresh sample with an increased number of replicates to increase the power.

S9. CHRONIC TOXICITY

A. Testing Requirements

Permittee shall also test final effluent once in the last summer and once in the last winter prior to submission of the application for permit renewal. All of the chronic toxicity tests listed below shall be conducted on each sample. The results of this chronic toxicity testing shall be submitted to the Department as a part of the permit renewal application process.

The Permittee shall conduct chronic toxicity testing on a series of at least five concentrations of effluent and a control in order to be able to determine appropriate point estimates and an NOEC. This series of dilutions shall include the acute critical effluent concentration (ACEC). The ACEC equals at least 25% effluent. The Permittee shall compare the ACEC to the control using hypothesis testing at the 0.05 level of significance as described in Appendix H, EPA/600/4-89/001.

Chronic toxicity tests shall be conducted with the following species and the most recent version of the following protocols:

Saltwater Chronic Toxicity Test Species		Method
Topsmelt	*Atherinops affinis*	EPA/600/R-95/136
Mysid shrimp	*Holmesimysis costata* or *Mysidopsis bahia*	EPA/600/R-95/136 or EPA/600/4-91/003

The Permittee shall use the West Coast mysid (*Holmesimysis costata*) for toxicity testing unless the lab cannot obtain a sufficient quantity of a West Coast species in good condition in which case the East Coast mysid (*Mysidopsis bahia*) may be substituted.

B. Sampling and Reporting Requirements

1. All reports for effluent characterization or compliance monitoring shall be submitted in accordance with the most recent version of Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria,* in regards to format and content. Reports shall contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data on floppy disk for electronic entry into the Department's database, then the Permittee shall send the disk to the Department along with the test report, bench sheets, and reference toxicant results.

2. Testing shall be conducted on grab samples. Samples taken for toxicity testing shall be cooled to 4 degrees Celsius while being collected and shall be sent to the lab immediately upon completion. The lab shall begin the toxicity testing as soon as possible but no later than 36 hours after sampling was ended.

3. All samples and test solutions for toxicity testing shall have water quality measurements as specified in Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria* or most recent version thereof.

4. All toxicity tests shall meet quality assurance criteria and test conditions in the most recent versions of the EPA manual listed in subsection A and the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If test results are determined to be invalid or anomalous by the Department, testing shall be repeated with freshly collected effluent.

5. Control water and dilution water shall be laboratory water meeting the requirements of the EPA manual listed in subsection A or pristine natural water of sufficient quality for good control performance.

6. Effluent samples for whole effluent toxicity testing shall be collected just prior to the chlorination step in the treatment process.

7. The Permittee may choose to conduct a full dilution series test in order to determine dose response. In this case, the series must have a minimum of five effluent concentrations and a control. The series of concentrations must include the ACEC and the CCEC. The ACEC and CCEC may either substitute for the effluent concentration that is closest to it in the dilution series or be an extra effluent concentration.

8. All whole effluent toxicity tests that involve hypothesis testing and do not comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020 must be repeated on a fresh sample with an increased number of replicates to increase the power.

S10. ADDITIONAL CHEMICAL ANALYSIS OF INFLUENT AND EFFLUENT

A. General Requirements

The Permittee shall conduct chemical analyses of effluent samples collected from the wastewater treatment system in accordance with protocols, monitoring requirements, and QA/QC procedures specified in this section.

Effluent samples shall be analyzed for constituents found in NPDES form 2A Part D, expanded effluent testing data. The constituents to be analyzed are included in the following tables and are taken directly from NPDES form 2A Part D.

B. Monitoring Requirements

1. The following samples shall be collected for analyses: ten samples of effluent from wastewater treatment, with sampling times at least one week apart.

2. Each sample of the effluent shall be a representative composite consisting of continuous sampling or six grab samples equally spaced over a 24-hour period.

Metals

Antimony	Nickel
Arsenic	Selenium
Beryllium	Silver
Cadmium	Thallium
Chromium	Zinc
Copper	Cyanide
Lead	Total Phenolic Compounds
Mercury	Hardness (as $CaCo_3$)

Volatile Organic Compounds

acrolein	1,1-dichloroethyene
acrylonitrile	1,2-dichloropropane
Benzene	1,3-dichloro-propylene
Bromoform	Ethylbenzene
Carbon tetrachloride	Methyl bromide
Clorobenzene	Methyl chloride
Chlorodibromo-methane	Methylene chloride
Chloroethane	1,1,2,2-tetrachloro-ethane
2-chloro-ethylvinyl ether	Tetrachloro-ethylene
Chloroform	Toluene
Dichlorobromo-methane	1,1,1-trichloroethane
1,1-dichloroethane	1,1,2-trichloroethane
1,2-dichloroehtane	Trichloroethylene
Trans-1,2-dichloro-ethylene	Vinyl chloride

Acid-extracable Compounds

P-chloro-M-cresol	2-nitrophenol
2-chlorphenol	4-nitrophenol
2,4-dichlorophenol	Pentachlorophenol
2,4-dimethylphenol	Phenol
4,6-dintiro-o-cresol	2,4,6-trichlorophenol
2,4-dinitrophenol	

Base-neutral Compounds

Acenaphthene	1,4-dichlorbenzene
Acenaphthylene	3,3-dichlorobenzidine
Anthracene	Diethyl phthalate
Benzidine	Dimethyl phthalate
Benzo(A)anthracene	2,4-dinitrotoluene
Benzo(A)pyrene	2,6-dinitrotoluene
3,4-benzo-fluoranthene	1,2-diphenylhydrazine
Benzo(GHI)perylene	Fluoranthene
Benzo(K)fluoranthene	Fluorene
Bis (2-chlorethoxy) methane	Hexachlorobenzene
Bis (2-chloroethyl)-ether	Hexachlorobutadiene
Bis (2-chloroiso-proyl) ether	Hexachlorocyclo-pentadiene
Bis (2-ethylhexyl) phthalate	Hexachloroethane
4-bromophenyl phenyl ether	Indeno(1,2,3-CD)Pyrene
Butyl benzyl phthalate	Isophorone
2-chloronaphthalene	Naphthalene
4-chlorphenyl phenyl ether	Nitrobenzene
Chrysene	N-Nitrosodi-N-Propylamine
di-N-butyl phthalate	N-Nitrosodi-Methylamine
di-N-octyl phthalate	N-Nitrosodi-phenylamine
Dibenzo(A,H) Anthracene	Phenanthrene
1,2-dichlorobenzene	Pyrene
1,3-dichlorobenzene	1,2,4-trichlorobenzene

A written report shall be submitted to the Department with your next permit application or prior to connection with another wastewater facility.

C. Protocols

Sample analysis shall be conducted in accordance with 40 CFR Part 136.

D. Quality Assurance/Quality Control Procedures

The Permittee shall follow the quality assurance procedures of 40 CFR Part 136.

S11. OUTFALL EVALUATION

The Permittee shall inspect the submerged portion of the outfall line and diffuser to document its integrity and continued function. This inspection shall be completed by December 15, 2004. If conditions allow for a photographic verification, it shall be included in the report. If the findings of the inspection call for major repair and maintenance, the inspection report and plan of action shall be submitted to the Department for review and approval six (6) months prior to the commencement of the repairs and maintenance.

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

All applications, reports, or information submitted to the Department shall be signed and certified.

A. All permit applications shall be signed by either a principal executive officer or a ranking elected official.

B. All reports required by this permit and other information requested by the Department shall be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to the Department.

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

C. Changes to authorization. If an authorization under paragraph B.2 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph B.2 above must be submitted to the Department prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section shall make the following certification:

"I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. RIGHT OF INSPECTION AND ENTRY

The Permittee shall allow an authorized representative of the Department, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.

B. To have access to and copy - at reasonable times and at reasonable cost - any records required to be kept under the terms and conditions of this permit.

C. To inspect - at reasonable times - any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

D. To sample or monitor - at reasonable times - any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon the Department's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

A. The following are causes for terminating this permit during its term or for denying a permit renewal application:

1. Violation of any permit term or condition.
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
3. A material change in quantity or type of waste disposal.
4. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination [40 CFR Part 122.64(3)].
5. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit [40 CFR Part 122.64(4)].
6. Nonpayment of fees assessed pursuant to RCW 90.48.465.
7. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

B. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

1. A material change in the condition of the waters of the state.
2. New information not available at the time of permit issuance that would have justified the application of different permit conditions.
3. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.
4. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.
5. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.
6. The Department has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.
7. Incorporation of an approved local pretreatment program into a municipality's permit.

C. The following are causes for modification or alternatively revocation and reissuance:

1. Cause exists for termination for reasons listed in A1 through A7 of this section, and the Department determines that modification or revocation and reissuance is appropriate.
2. The Department has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G8) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. REPORTING A CAUSE FOR MODIFICATION

The Permittee shall submit a new application, or a supplement to the previous application, along with required engineering plans and reports whenever a material change to the facility or in the quantity or type of discharge is anticipated which is not specifically authorized by this permit. This application shall be submitted at least sixty (60) days prior to any proposed changes. The filing of a request by the Permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not relieve the Permittee of the duty to comply with the existing permit until it is modified or reissued.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications shall be submitted to the Department for approval in accordance with Chapter 173-240 WAC. Engineering reports, plans, and specifications shall be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities shall be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit shall be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. DUTY TO REAPPLY

The Permittee shall apply for permit renewal at least one hundred and eighty (180) days prior to the specified expiration date of this permit.

G8. TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee shall notify the succeeding owner or controller of the existence of this permit by letter, a copy of which shall be forwarded to the Department.

A. Transfers by Modification

Except as provided in paragraph (B) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

B. Automatic Transfers

This permit may be automatically transferred to a new Permittee if:

1. The Permittee notifies the Department at least thirty (30) days in advance of the proposed transfer date.
2. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.
3. The Department does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G9. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, shall control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G10. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall not be re-suspended or reintroduced to the final effluent stream for discharge to state waters.

G11. DUTY TO PROVIDE INFORMATION

The Permittee shall submit to the Department, within a reasonable time, all information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The Permittee shall also submit to the Department upon request, copies of records required to be kept by this permit [40 CFR 122.41(h)].

G12. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G13. ADDITIONAL MONITORING

The Department may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G14. PAYMENT OF FEES

The Permittee shall submit payment of fees associated with this permit as assessed by the Department.

G15. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit shall be deemed guilty of a crime, and upon conviction thereof shall be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit shall incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation shall be a separate and distinct offense, and in case of a continuing violation, every day's continuance shall be deemed to be a separate and distinct violation.

G16. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that: 1) an upset occurred and that the Permittee can identify the cause(s) of the upset;
2) the permitted facility was being properly operated at the time of the upset;
3) the Permittee submitted notice of the upset as required in condition S3.E; and
4) the Permittee complied with any remedial measures required under S5 of this permit.

In any enforcement proceeding, the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G17. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G18. DUTY TO COMPLY

The Permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G19. TOXIC POLLUTANTS

The Permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G20. PENALTIES FOR TAMPERING

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this Condition, punishment shall be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G21. REPORTING PLANNED CHANGES

The Permittee shall, as soon as possible, give notice to the Department of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in: 1) the permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b); 2) a significant change in the nature or an increase in quantity of pollutants discharged; or 3) a significant change in the Permittee's sludge use or disposal practices. Following such notice, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation of the terms and conditions of this permit.

G22. REPORTING ANTICIPATED NONCOMPLIANCE

The Permittee shall give advance notice to the Department by submission of a new application or supplement thereto at least one hundred and eighty (180) days prior to commencement of such discharges, of any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility or activity which may result in noncompliance with permit limits or conditions. Any maintenance of facilities, which might necessitate unavoidable interruption of operation and degradation of effluent quality, shall be scheduled during non-critical water quality periods and carried out in a manner approved by the Department.

G23. REPORTING OTHER INFORMATION

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to the Department, it shall promptly submit such facts or information.

G24. REPORTING REQUIREMENTS APPLICABLE TO EXISTING MANUFACTURING, COMMERCIAL, MINING, AND SILVICULTURAL DISCHARGERS

The Permittee belonging to the categories of existing manufacturing, commercial, mining, or silviculture must notify the Department as soon as they know or have reason to believe:

A. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following "notification levels":

1. One hundred micrograms per liter (100 μg/l).
2. Two hundred micrograms per liter (200 μg/l) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/l) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/l) for antimony.

3. Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).

4. The level established by the Director in accordance with 40 CFR 122.44(f).

B. That any activity has occurred or will occur which would result in any discharge, on a non-routine or infrequent basis, of a toxic pollutant which is not limited in this permit, if that discharge will exceed the highest of the following "notification levels":

1. Five hundred micrograms per liter (500μg/L).

2. One milligram per liter (1 mg/L).

3. Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7).

4. The level established by the Director in accordance with 40 CFR 122.44(f).

G25. COMPLIANCE SCHEDULES

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than fourteen (14) days following each schedule date.

City of Blaine
Wastewater Treatment Plant
Facility Plan

Council Work Session

October 18, 2004

Work Session Agenda

- Overview of WWTP Facility Plan Requirements
- Overview of Deliverable Status
- Presentation of WWTP Alternatives
  - Process Descriptions
  - Monetary Evaluation Results
  - Nonmonetary Evaluation Results
  - Cost - Benefits Results
- General Discussion of Results (Q&A)
- Discussion of Follow-up Activities
- Adjourn

What are the Facility Plan goals?

- Meet the requirements and be consistent with all applicable federal, state (WAC 173-240-060), and local regulations, policies, and planning/design requirements.
- Further define the process requirements for the proposed treatment facilities to meet the discharge permit limits.
- Define the capital and annual costs, including the funding implications.
- Develop preliminary site and facility layout requirements.

Deliverables Status
Technical Memoranda (TM) (as of 10/15/04)

- Several deliverables have been submitted for City review/comment, which support the development and conclusions presented this evening.
- Submitted deliverables include the following:
  - TM 1.01: Data Request
  - TM 1.02: Design Criteria
  - TM 2.01: Wastewater Treatment Process Components
  - TM 2.02: Treatment Facility Alternatives
  - TM 3.01/3.02: Monetary and Nonmonetary Evaluation

Deliverables Status
Technical Memoranda (TM) (as of 10/15/04)

- Current Work in Progress
  - TM 2.03: Conveyance Requirements
  - TM 2.04: Mitigation (visual, noise, & odor) Requirements
  - TM 4.01: Recommended WWTP Alternative w/ Drawings
  - TM 4.02: City-wide Wastewater Management
    Subject of the November Work Session
  - TM 5.01: Environmental Report (NEPA and SEPA)
  - TM 5.02: Required Permits and Timelines
  - TM 6.01: Updated Cash Flow Analysis
  - Draft/Final Facility Plan

Summary of Treatment Alternatives

- Alternative 1 and 2 unit processes:
  - Preliminary treatment using coarse screening and grit removal.
  - Secondary treatment using conventional activated sludge technology with anoxic selection.
  - Disinfection using ultraviolet (UV) irradiation or liquid chlorine with dechlorination system.
  - Solids handling consisting of storage and thickening.
- Alternative 3 and 4 unit processes:
  - Preliminary treatment using coarse screening and grit removal.
  - Secondary treatment using sequencing batch reactor (SBR) activated sludge technology.
  - Disinfection using ultraviolet (UV) irradiation or liquid chlorine with dechlorination system.
  - Solids handling consisting of storage and thickening.

Summary of Treatment Alternatives (cont.)

- Alternative 5 and 6 unit processes:
  - Preliminary treatment using coarse screening and grit removal.
  - Secondary treatment using extended aeration activated sludge technology.
  - Disinfection using ultraviolet (UV) irradiation or liquid chlorine with dechlorination system.
  - Solids handling consisting of storage and thickening.
- Alternative 7 unit processes:
  - Preliminary treatment using fine screening and grit removal.
  - Secondary treatment using membrane bioreactor (MBR) technology.
  - Disinfection using ultraviolet (UV) irradiation.
  - Solids handling consisting of storage, thickening, and dewatering.
  - Solids treatment including aerobic digestion for sludge stabilization.

Summary of Treatment Alternatives (cont.)

- Alternative 7A and 8 unit processes:
  - Preliminary treatment using fine screening and grit removal.
  - Secondary treatment using membrane bioreactor (MBR) technology.
  - Disinfection using ultraviolet (UV) irradiation or liquid chlorine with dechlorination system.
  - Solids handling consisting of storage and thickening.
- Alternative 9 and 10 unit processes:
  - Preliminary treatment using fine screening and grit removal.
  - Secondary treatment using fixed film (RBC) secondary treatment technology.
  - Disinfection using ultraviolet (UV) irradiation or liquid chlorine with dechlorination system.
  - Solids handling consisting of storage and thickening.

Alternative	Secondary Process					Disinfection		Solids	
	Conventional Activated Sludge	Sequencing Batch Reactor (SBR)	Extended Aeration	Membrane Bioreactor (MBR)	Fixed Film (RBC)	UV	Chlorine	Handling	Treatment
1	✓					✓		✓	
2	✓						✓	✓	
3		✓				✓		✓	
4		✓					✓	✓	
5			✓			✓		✓	
6			✓				✓	✓	
7				✓		✓		✓	✓
7A				✓		✓		✓	
8				✓			✓	✓	
9					✓	✓		✓	
10					✓		✓	✓	

Summary of Capital Cost Results

LIGHTHOUSE POINT WRF – ALTERNATIVE MONETARY SUMMARY

Alt.	Treatment Processes	Monetary Criteria	
		Capital Costs ($M)	Ranking
1	CAS, UV	$17.62	5
2	CAS, Chlorine	$17.84	6
3	SBR, UV	$16.37	1
4	SBR, Chlorine	$16.59	3
5	Extended AB, UV	$19.00	9
6	Extended AB, Chlorine	$19.23	10
7	MBR, UV, Solids Treatment	$23.21	11
7A	MBR, UV	$18.36	7
8	MBR, Chlorine	$18.51	8
9	RBC, UV	$16.39	2
10	RBC, Chlorine	$16.61	4

Summary of Life-Cycle Cost Results

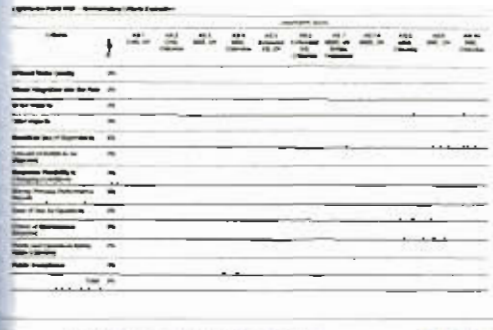
LIGHTHOUSE POINT WRF – ALTERNATIVE MONETARY SUMMARY

Alt.	Treatment Processes	Monetary Criteria	
		Present Worth ($M)	Ranking
1	CAS, UV	$34.71	6
2	CAS, Chlorine	$35.25	5
3	SBR, UV	$35.17	2
4	SBR, Chlorine	$34.71	1
5	Extended AB, UV	$36.46	8
6	Extended AB, Chlorine	$36.06	7
7	MBR, UV, Solids Treatment	$52.84	11
7A	MBR, UV	$42.98	10
8	MBR, Chlorine	$42.01	9
9	RBC, UV	$35.73	4
10	RBC, Chlorine	$35.27	3

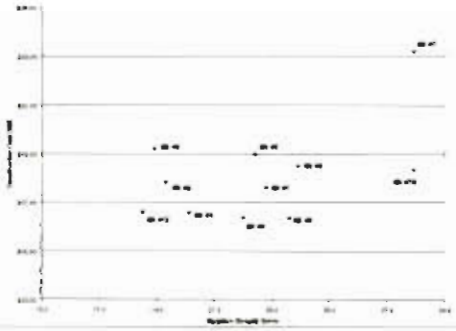
Non-Monetary Criteria

- Effluent Water Quality
- Integration into the Master Plan
- Noise Impacts
- Odor Impacts
- Beneficial Use of Byproducts
- Amount of Solids to be Disposed
- Strong Process Performance Record
- Ease of Use by Operators
- Extent of Maintenance Required
- Public and Operators Safety Risks (chlorine)
- Public Acceptance

Summary of Nonmonetary Results



Cost vs. Benefit Results



Questions and Answers

City of Blaine Wastewater Treatment Plant Facility Plan

Council Work Session
November 15, 2004

Work Session Agenda

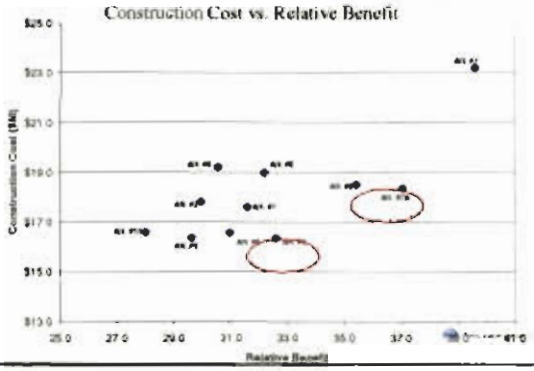
- Review of Progress
- Lighthouse Point WRF Process Alternative Selection
  - Membrane Bioreactor (MBR)
  - Sequencing Batch Reactor (SBR)
- West Blaine Alternative Selection
  - Convey to Lighthouse Point WRF
  - New plant on Birch Point
  - Convey to Birch Bay Treatment Facilities
- Next Steps
- Adjourn

Review of Progress Thus Far

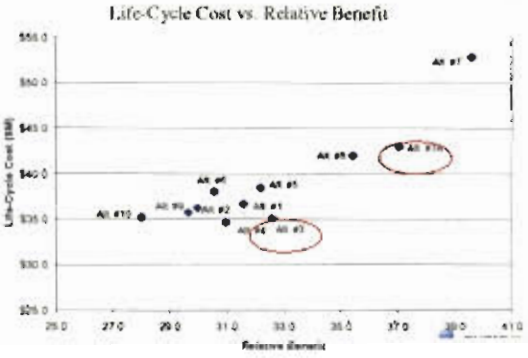
- Last Work Session held October 18th
- Summarized Lighthouse Point WRF process alternatives - 11 total
- Short-listed two alternatives for further evaluation
  - Membrane bioreactors (MBRs)
  - Sequencing batch reactors (SBRs)

Alternative	Secondary Process					Disinfection		Solids	
	Conventional Activated Sludge	Sequencing Batch Reactor (SBR)	Extended Aeration	Membrane Bioreactor (MBR)	Fixed Film (RBC)	UV	Chlorine	Handling	Treatment
1	✓					✓		✓	
2	✓						✓	✓	
3		✓				✓		✓	
4		✓					✓	✓	
5			✓			✓		✓	
6			✓				✓	✓	
7				✓		✓		✓	✓
7A				✓		✓		✓	
8				✓			✓	✓	
9					✓	✓		✓	
10					✓		✓	✓	

Summary of Cost Benefit Analysis



Summary of Cost Benefit Analysis



Additional Analysis Conducted for MBRs and SBRs

	Advantages	Disadvantages
SBR	• Flexible process that removes nitrogen and phosphorus • High tolerance for peak flows and shock loadings • Eliminates secondary clarifier and RAS pumping • Minimizes MLSS washout during peak flow events	• Requires tertiary treatment to achieve reuse quality effluent • Discontinuous effluent discharge • Relatively large bioreactor volumes • Increased operational requirements • Susceptible to foaming problems • System control is complex
MBR	• Produces high quality effluent • Sludge production is reduced • Compact footprint • Processes are easily automated to reduce the operation requirements • Could reduce of shellfish closure zone • Potential for multiple discharge options	• Higher annual costs due of energy requirements for pumping and aeration • More expensive construction cost • Membrane design is proprietary • Susceptible to the wide range of flow variation • Emerging Technology

MBRs process would be substantially smaller

- Summary of volume and basin size requirements

Process	Volume(MG)	SWD (ft)	Area (sf)	Area (ac)
SBR	1.70	23.0	10,800	0.25
MBR	0.35	12.0	3,899	0.09

- MBR building would be 140' x 170'
- SBR building would be 140' x 240'

MBR

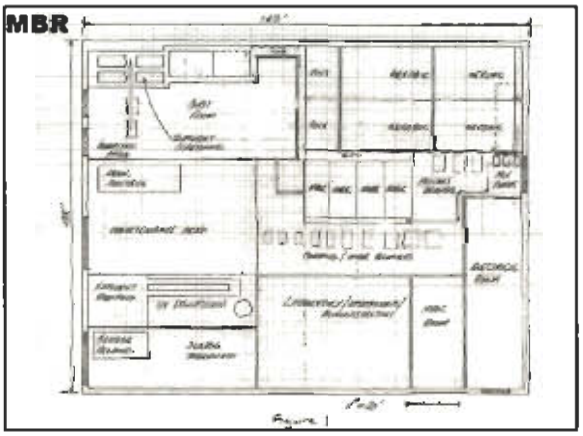


Figure 1

SBR

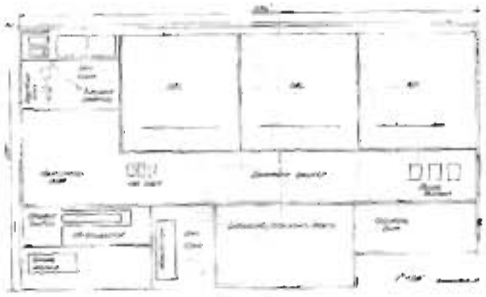


Figure 2

SBR at 7.1 mgd (no equalization storage)

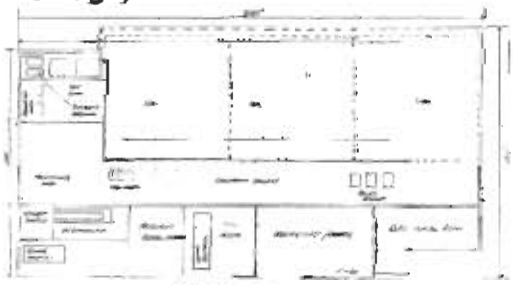


Figure 3

MBR cost differential approximately $2 million

- Additional costs analyzed
  - SBR with a tertiary process added to provide reuse quality water
  - SBR sized to handle 7.1 mgd to eliminate equalization storage

Process	Flow Rate - 3.1 mgd		Flow Rate - 7.1 mgd	
	Construction Cost	Annual Cost	Construction Cost	Annual Cost
MBR	$18.36M	$1.14M	NA	NA
SBR	$16.57M	$0.87M	$20.79M	$0.89M
SBR w/ Filters	$17.77M	~$0.90M	$22.20M	~$0.95M

Cost Comparison of West Blaine Treatment Alternatives

- Several alternatives were considered for treatment of flows from West Blaine
  - Convey West Blaine flows to Lighthouse Point WRF
  - Build new plant in Semiahmoo for West Blaine flows
  - Convey West Blaine flows to Birch Bay WWTP
- Associated capital and annual costs were developed for each alternative
- Updated implementation schedule

Alternative #1 - Convey to Lighthouse Point WRF

- Conceptual design and costs presented for Lighthouse Point WRF include sufficient capacity for West Blaine flows
- Additional conveyance facilities required:
  - New lift station in vicinity of existing WWTP, 1.2 mgd

    New 10-inch pipeline from lift station to newly constructed equalization storage, under the harbor (10,000 feet)

Alternative #2 - New WWTP in Semiahmoo

- Build new WWTP or WRF, located along Drayton Harbor east of Lift Station #8
- Improvements required:
  - WWTP sized to handle 0.4 mgd max month, 1.64 peak hour flows, MBR or SBR plant

    New 10-inch pipeline to existing outfall (8,750 feet)
  - Additional conveyance improvements to drain flow to new WWTP
- Could include Birch Bay portion of Birch Point

Alternative #3 - Convey to existing Birch Bay WWTP

- Additional conveyance facilities required:

  New lift station in vicinity of existing WWTP to pump flows on north side of drainage divide
  - Two additional lift stations along the southern portion of the drainage divide
  - New 8-inch pipeline from lift station at existing WWTP to second lift station (18,500 feet)
  - New 10-inch pipeline from second lift station to third lift station (40,000 feet)

Summary of Costs for West Blaine Alternatives

Alternative	Construction Costs	Annual Costs	Present Worth Costs
1	$3,310,000	$20,000	$3,650,000
2 (MBR)	$5,710,000	$310,000	$12,240,000
2 (SBR)	$4,960,000	$230,000	$9,810,000
3	$9,660,000	$53,000	$10,780,000

- Conveying West Blaine flows to the Lighthouse Point WRF (Alt. #1) is the lowest cost solution and shortest implementation schedule

Next Steps

Tonight

- Select MBR or SBR for Lighthouse Point WRF
- Select an alternative for West Blaine flows

Beyond

- Develop specific layouts, process flow diagrams for selected process
- Develop conveyance and mitigation requirements
- Draft Facility Plan to City for review
- Submit Facility Plan to DOE

Questions and Answers

Facility Plan
for the
Lighthouse Point Water Reclamation Facility

Council Session
January 24, 2008

CH2MHILL

Session Agenda

- Overview of Facility Plan Goals and Applicable Regulations
- Overview of Facility Plan Document Organization
- Summary of Council Work Sessions
  - October 18th (Summary of Treatment Alternatives)
  - November 15th (MBR vs SBR, West Blaine Alternative)
- Development of Recommended Alternative
- Financial Impact Analysis
- Schedule of Next Steps
- Questions and Answers

What are the Facility Plan goals?

- Meet the requirements and be consistent with all applicable federal, state (WAC 173-240-060), and local regulations, policies, and planning/design requirements.
- Further define the process requirements for the proposed treatment facilities to meet the discharge permit limits.
- Define the capital and annual costs, including the funding implications.
- Develop preliminary site and facility layout requirements.

The Facility Plan must comply with and address several regulations

Federal Regulations

- National Pollutant Discharge Elimination System Program (NPDES)
- EPA Site Limitations for environmentally sensitive lands

State and Local Regulations

- Department of Ecology Criteria for Sewage Works Design and Reliability Requirements
- State Environmental Policy Act and State Environmental Review
- City of Blaine Regulations and Ordinances

Facility Plan Document Organization

- Chapter 1 - Introduction
- Chapter 2 - Service Area Characteristics
- Chapter 3 - Existing Wastewater Facilities
- Chapter 4 - Wastewater Characteristics
- Chapter 5 - Process Component Evaluation
- Chapter 6 - Facilities Development
- Chapter 7 - Facilities Monetary & Nonmonetary Evaluation
- Chapter 8 - Recommended Plan
- Chapter 9 - Program Financing
- Chapter 10 - Environmental Documentation

October 18th - Council Work Session

- Presented Description of Eleven Treatment Alternatives
- Presented Preliminary Monetary Analysis
- Presented Preliminary Nonmonetary Analysis
- Graphically Evaluated the Cost vs Benefits of Each Alternative
- Shortlisted Two Alternatives for Additional Evaluation

Alternative	Secondary Process: Conventional Activated Sludge	Secondary Process: Sequencing Batch Reactor (SBR)	Secondary Process: Extended Aeration	Secondary Process: Membrane Bioreactor (MBR)	Secondary Process: Fixed Film (RBC)	Disinfection: UV	Disinfection: Chlorine	Solids: Handling	Solids: Treatment
1	✓					✓		✓	
2	✓						✓	✓	
3		✓				✓		✓	
4		✓					✓	✓	
5			✓			✓		✓	
6			✓				✓	✓	
7				✓		✓		✓	✓
7A				✓		✓		✓	
8				✓			✓	✓	
9					✓	✓		✓	
10					✓		✓	✓	

Summary of Construction Cost

LIGHTHOUSE POINT WRF – ALTERNATIVE MONETARY SUMMARY

Alt.	Treatment Processes	Monetary Criteria: Construction Costs ($M)	Monetary Criteria: Ranking
1	CAS, UV	$17.62	5
2	CAS, Chlorine	$17.84	6
3	SBR, UV	$16.37	1
4	SBR, Chlorine	$16.59	3
5	Extended AB, UV	$19.00	9
6	Extended AB, Chlorine	$19.23	10
7	MBR, UV, Solids Treatment	$23.21	11
7A	MBR, UV	$18.36	7
8	MBR, Chlorine	$18.61	8
9	RBC, UV	$16.39	2
10	RBC, Chlorine	$16.61	4

Summary of Life-Cycle Cost Results

LIGHTHOUSE POINT WRF – ALTERNATIVE MONETARY SUMMARY

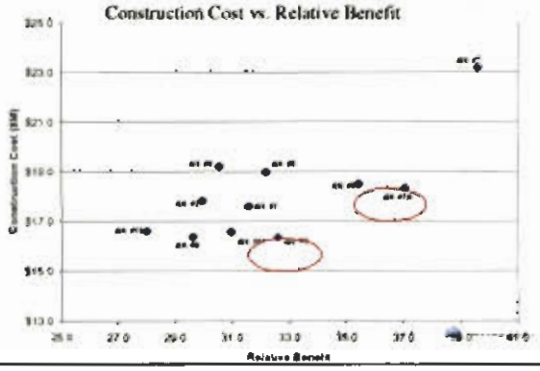
Alt.	Treatment Processes	Monetary Criteria: Present Worth ($M)	Monetary Criteria: Ranking
1	CAS, UV	$36.71	6
2	CAS, Chlorine	$36.25	5
3	SBR, UV	$35.17	2
4	SBR, Chlorine	$34.71	1
5	Extended AB, UV	$38.48	8
6	Extended AB, Chlorine	$38.06	7
7	MBR, UV, Solids Treatment	$52.84	11
7A	MBR, UV	$42.98	10
8	MBR, Chlorine	$42.01	9
9	RBC, UV	$35.73	4
10	RBC, Chlorine	$35.27	3

Non-Monetary Criteria

- Performance Criteria
  - Flexibility to Changing Conditions
  - Strong Process Performance Record
  - Extent of Maintenance Required
  - Ease of Use by Operators
- Environmental Criteria
  - Effluent Water Quality
  - Public and Operators Safety Risks
    Beneficial Byproducts
  - Amount of Solids Disposed
- Implementation Criteria
  - Integration into the Master Plan
  - Public Acceptance
  - Noise and Odor Impacts

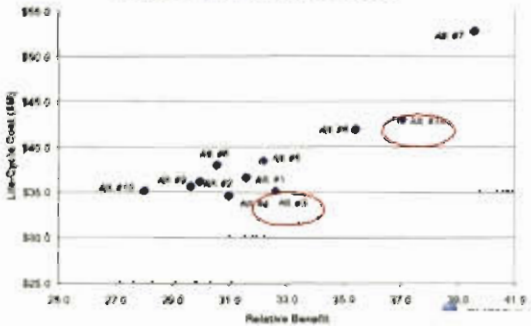
Summary of Cost - Benefit Analysis

Construction Cost vs. Relative Benefit



Summary of Cost - Benefit Analysis

Life-Cycle Cost vs. Relative Benefit



November 15th - Council Work Session

- Presented Further Evaluation Results of Shortlisted Alternatives
  - Monetary and Nonmonetary Criteria
- Reviewed Potential Treatment Capacity Requirements to Eliminate Equalization Storage (SBR Only)
- Presented Description and Evaluation of the West Blaine Treatment Alternatives

MBR Cost Differential Approximately $2.0 Million

- Additional Costs Analysis
  - SBR with Tertiary Process Added to Provide Reuse Quality Water
  - SBR Sized to Handle 7.1 mgd to Eliminate Equalization Storage

Process	Flow Rate - 3.1 mgd		Flow Rate - 7.1 mgd	
	Construction Cost	Annual Cost	Construction Cost	Annual Cost
MBR	$18.36M	$1.14M	NA	NA
SBR	$16.37M	$0.87M	$20.79M	$0.89M
SBR w/ Filters	$17.77M	~$0.90M	$22.20M	~$0.91M

MBR Process Substantially Smaller Than SBR Process

- Summary of Volume and Basin Size Requirements

Process	Volume (MG)	SWD (ft)	Area (sf)	Area (ac)
SBR	1.70	23.0	10,800	0.25
MBR	0.35	12.0	3,899	0.09

- MBR Building Would be 140' x 170'
- SBR Building Would be 140' x 240'

Cost Analysis of West Blaine Treatment Alternatives

- Several Alternatives Were Considered For Treatment of Flows From West Blaine
  - Convey West Blaine Flows to Lighthouse Point WRF
  - Build New Plant in Semiahmoo For West Blaine Flows
  - Convey West Blaine Flows to Birch Bay WWTP
- Associated Construction and Annual Costs Were Developed for Each Alternative
- Updated Implementation Schedule

Summary of Costs for West Blaine Alternatives

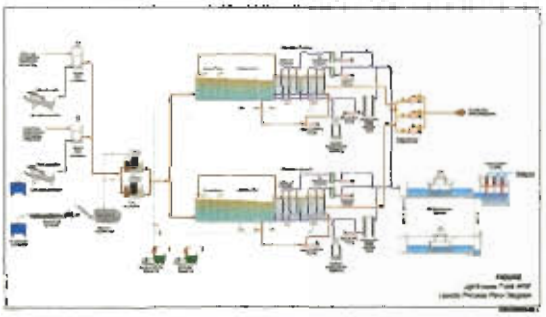
Alternative	Construction Costs	Annual Costs	Present Worth Costs
1	$3,310,000	$20,000	$3,650,000
2 (MBR)	$5,710,000	$310,000	$12,240,000
2 (SBR)	$4,960,000	$230,000	$9,810,000
3	$9,660,000	$53,000	$10,780,000

- Conveying West Blaine Flows to the Lighthouse Point WRF (Alt. #1) is the Lowest Cost Solution and Requires the Shortest Implementation Schedule

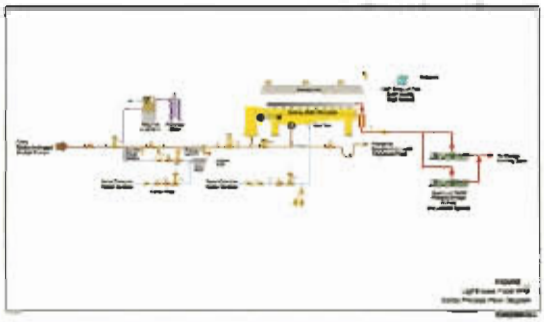
Activity Since Nov 15th Work Session

- Preliminary Design of Facilities
  - Process Schematics (Liquids and Solids Stream)
  - Treatment Facilities Layout and Space Allocation
  - Treatment Facilities Site Plan
- Refined Preliminary Cost Analysis and Financing
  - Construction and Annual Costs
  - Financing Summary
- Program Schedule

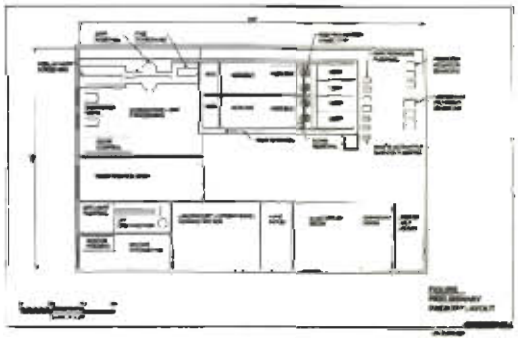
Process Schematics (Liquids Stream)



Process Schematics (Solids Stream)



Preliminary Facility Layout



Preliminary Facility Site Plan

Cost Estimate for the Recommended Alternative

Basic Plant Costs

Preliminary Treatment/Pumping	$1,164,000
Secondary Treatment	$6,227,000
Disinfection	$396,000
Solids Handling	$697,000
Odor Control	$703,000
Subtotal	**$7,577,000**

Annual O&M Costs

Labor	$696,200
Energy	$158,200
Maintenance Material and Supplies	$110,300
Total Annual O&M Costs	**$965,600**

Total Life-Cycle Cost Analysis for the Lighthouse Point WRF

Base Project Costs	
Treatment, Conveyance, and Odor Control	$7,577,000
Demolition, Sitework, Yard Piping, Site Electrical	$1,041,830
Overhead/Profit, Mob/Bonds/Insurance, Contingency	$3,924,199
Pile Foundations, Shoring, Dewatering Conditions	$650,000
Building and Architectural Aesthetics	$2,530,000
Location Adjustment Factor	$188,147
Escalation and Location Adjustment Factor	$1,077,455
WA Sales Tax	$1,376,087
Total Construction Costs	**$18,364,818**
Estimated Life-Cycle Costs	
Total Project Cost	**$18,364,818**
Est. Annual O&M	**$965,600**
Est. Present Worth	**$40,235,661**

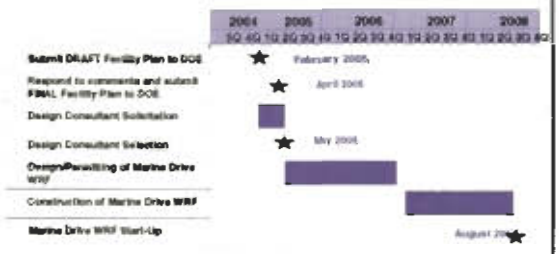
Implementation of the WRF will have to rely heavily on grant/loan programs

- Total Capital Cost for WRF Project is $18.36 M

Debt Repayment Will Require the City to Raise Rates Substantially Over The Next Five Years

- Maximum annual debt service approximately $1.6 million/year
- City must rely predominantly on sewer rates and GFFs to fund this debt service
- Significant rate increase for 2005 (25%) to meet current expenses plus debt service
- City may raise rates an additional 50% over the next five years (to approximately $74.66)
  - Heavily dependent on grant funding
- GFFs will undergo proportional increases
- Rate impact analysis has not yet taken into account increase in annual O&M expenses estimated for Lighthouse Point WRF

Schedule for Implementation of the Lighthouse WRF



Lighthouse Point Water Reclamation Facility

Questions and Answers

AGREEMENT TO STORE AND APPLY BIOSOLIDS

THIS AGREEMENT, is made and entered by and between the CITY OF BLAINE, a Third Class Optional Municipal Code City in the State of Washington, having its principal place of business and home office in Blaine, Whatcom County, Washington, hereinafter referred to as "CITY", and TJOELKER ENTERPRISES INCORPORATED hereinafter referred to as "TJOELKER", for the disposition of CITY OF BLAINE Waste Water Treatment Plant (WWTP) biosolids as follows:

WHEREAS, CITY OF BLAINE produces WWTP biosolids, the preferred means of disposition of which is land utilization as a soil amendment and fertilizer; and

WHEREAS, CITY OF BLAINE's National Pollution Discharge Elimination System (NPDES) Permit No WA-002264-1 paragraph S7 states: "...The Permittee shall store and handle all residual solids [includes screenings, grit, scum, primary sludge, waste activated sludge, and other solid waste] in such a manner so as to prevent their entry into state ground and surface waters. The Permittee shall not discharge leachate from residual solids to state surface or ground waters..."; and

WHEREAS, CITY OF BLAINE itself or through separate contract with one or more vendors provides for the testing, transportation, transfer, storage and application of its WWTP biosolids; and

WHEREAS, TJOELKER has been receiving WWTP biosolids since 1991 under an agreement through the interlocal municipal authority BBBLENS; and since 1997 under an amended agreement allowing CITY OF BLAINE to contract directly with TJOELKER; and

WHEREAS, TJOELKER has leased real property within Whatcom County that is suitable for the utilization of WWTP biosolids, with the approval of the owner for this purpose, and that is presently permitted as a WWTP biosolids land utilization site; and

WHEREAS, TJOELKER has existing storage facilities available on the leased real property suitable for WWTP biosolids storage pending land application or other disposition; and

WHEREAS, TJOELKER offers its above-described real property and storage facilities to CITY OF BLAINE as a WWTP biosolids utilization storage and land utilization area on the terms and conditions provided herein; and

WHEREAS, TJOELKER has equipment suitable for the storage and uniform application of WWTP biosolids and desires to land apply said biosolids as a vendor for CITY OF BLAINE; and

WHEREAS, both parties have agreed verbally and desire to reduce their agreement to writing; and

Now therefore the parties hereto agree as follows:

1. Delivery. CITY OF BLAINE, itself or though its contracted vendor(s), shall deliver WWTP biosolids to TJOELKER's storage facilities for storage in accordance with state and county guidelines and regulations.

2. Storage. TJOELKER shall provide storage facilities with adequate capacity to store WWTP biosolids pending land application or other disposition by TJOELKER, and particularly, but not as a limitation, for homogenization and for storage during times that land application is barred or deferred. In this regard, both parties understand that Whatcom County presently bars the land application of WWTP biosolids from November 1st through March 1st of each calendar year. CITY OF BLAINE also understands that TJOELKER may, at their exclusive discretion, defer WWTP biosolids land application when unfavorable field or crop conditions are such that application would cause undue damage. When possible, TJOELKER shall notify CITY OF BLAINE of poor conditions at least 24 hours prior to the affected scheduled land application. TJOELKER shall store all biosolids in such a manner so as to prevent their entry into state ground and surface waters. TJOELKER shall not discharge leachate from biosolids to state surface or ground waters.

3. Application. TJOELKER agrees to land apply all WWTP biosolids that CITY OF BLAINE delivers to TJOELKER according to the conditions of applicable permits, operating plans, and schedules as prescribed by CITY OF BLAINE and the Whatcom County Health and Human Services Department, all of which are deemed a part of this Agreement. The real property that will actually receive WWTP biosolids has been mutually identified by the parties, and is designated on the site map attached to the site plan and permit. TJOELKER shall handle all biosolids in such a manner so as to prevent their entry into state ground and surface waters. TJOELKER shall not discharge leachate from biosolids to state surface or ground waters.

4. Delivery Schedule. CITY OF BLAINE agrees to provide appropriate schedules for the delivery of WWTP biosolids to TJOELKER.

5. Waiver Regarding Damage. CITY OF BLAINE will not be liable for crop, field, or other property damage due to WWTP biosolids or equipment being placed or operated on the site. TJOELKER shall indemnify, defend, and hold harmless CITY OF BLAINE for any such damage, except for such damage caused by the negligence of the CITY OF BLAINE.

6. Biosolids and Application Data. TJOELKER shall prepare, maintain, and provide to CITY OF BLAINE, records of the following:

A. Dates of application to site and amount applied.
B. Wind speed and minimum ground water depth at time of application.
C. Parcel and/or acres covered.
D. All sites monitoring data required by the Whatcom County Health and Human Services Department.

CITY shall procure and maintain records of the following items and shall make such records available to TJOELKER upon request:

A. Analyses of biosolids.
B. Volume of biosolids delivered as obtained from transportation records.

7. Compensation. CITY OF BLAINE shall compensate TJOELKER at the rate of $.055 per gallon of WWTP biosolids that CITY OF BLAINE delivers to TJOELKER.

8. Billing. TJOELKER shall prepare and send to CITY OF BLAINE on a monthly interval a dated invoice for all biosolids volumes that CITY OF BLAINE delivered to TJOELKER during the preceding month. CITY OF BLAINE shall process and return payment to TJOELKER within thirty (30) days of the invoice date. TJOELKER shall send all billing statements to CITY OF BLAINE's address and contact person as noted in Section 16 of this Agreement.

9. Term of Agreement. This Agreement shall commence on November 1, 2003 and shall continue in full force and effect through October 31, 2005. The term of this Agreement shall automatically renew upon the expiration hereof for three (3) additional terms of two (2) years each, unless terminated in accordance with Section 10 hereof, or unless either party gives written notice to the other party at least six (6) months prior to the date of expiration of the primary term or of each current renewal term.

10. Early Termination. CITY OF BLAINE may unilaterally terminate this Agreement before its expiration date (1) in its entirety, or (2) only with respect to storage or application to TJOELKER's real property, at any time after the land utilization site permit(s) for the real property are withdrawn, revoked or not renewed, whether or not because of misapplication or other fault of TJOELKER. TJOELKER may obtain release from its land application obligations herein if the land utilization site permit(s) for the TJOELKER real property are withdrawn, revoked or not renewed through no fault of TJOELKER, provided that TJOELKER shall immediately notify CITY OF BLAINE in writing. If CITY OF BLAINE elects to terminate this Agreement as provided in this Section, CITY OF BLAINE shall advise TJOELKER accordingly in writing.

11. Maintenance of Permits. TJOELKER shall use all reasonable efforts to obtain annual renewal of all permits necessary for land utilization and storage on TJOELKER's property. CITY OF BLAINE shall cooperate and provide all necessary information and testimony necessary to apply for appearances at any public hearing or appeals related to permit issuance or application.

12. Indemnification - Hold Harmless. CITY OF BLAINE shall indemnify and hold TJOELKER, (including any employees and agents of TJOELKER) harmless against any and all suits, claims, actions, losses, costs, liabilities, penalties, damage or expenses of whatsoever kind or nature resulting from, arising out of, or in connection with, or incident to, any act or omission related to the performance of any obligation of CITY OF BLAINE under this Agreement, including but not limited to the content or nature, or the delivery, of WWTP biosolids; EXCEPT

to the extent any of the foregoing is performed by TJOELKER, or results from an act or omission by TJOELKER, or any entity of which TJOELKER is a partner or owner, or any third party under contract with TJOELKER. TJOELKER shall indemnify and hold harmless CITY OF BLAINE, its members, agents and employees, from and against and all suits, claims, actions, losses, costs, liabilities, penalties, damage or expenses of whatsoever kind and nature, including attorneys' fees arising out of, or in connection with, or incident to, any act or omission related to the performance of any obligation of TJOELKER under this Agreement.

13. Dispute Resolution. All disputes concerning this Agreement shall be submitted to binding arbitration. The decision of the arbitrator shall be final and binding. The arbitrator shall have complete authority to control the manner and the timing of the arbitration, including determining the permissible scope of discovery if any. The decision of the arbitrator may be reduced to a judgment in a court of competent jurisdiction as provided herein. In the event of arbitration, the parties shall select an independent and unbiased arbitrator who is not affiliated directly or indirectly with either party within ten (10) days after any party demands arbitration. If the parties fail to select, or cannot agree upon, an arbitrator within this time, then either party may apply to the Superior Court of Whatcom County pursuant to RCW 7.04 et seq. for an order appointing an arbitrator. Such application may be made at any time after the ten day period has expired. Upon application to the court for an arbitrator, the Court shall select an arbitrator, who shall render his/her decision no later than 60 days after his/her appointment. If the arbitrator requests a hearing prior to rendering his/her decision, such hearing shall be held in Whatcom County, Washington within 30 days of the arbitrator's appointment. The arbitrator's decision shall be binding on both parties. Each party shall bear its own expenses associated with the arbitration but shall share equally the costs of the arbitrator. This paragraph shall be referred to herein as the "Binding Arbitration Clause." The foregoing Binding Arbitration Clause, RCW Chapter 7.04, and Rules 5.2 through 5.4 of the Mandatory Arbitration Rules for Superior Court ("MAR") shall govern the arbitration. In the event of any inconsistencies between the Binding Arbitration Clause, RCW Chapter 7.04, and MAR 5.2 through 5.4, the terms of the Binding Arbitration Clause shall take precedence over RCW Chapter 7.04 and MAR 5.2 through 5.4; and RCW Chapter 7.04 shall take precedence over MAR 5.2 through 5.4.

14. Relationship of Parties. This Agreement is an agreement between an independent contractor and a municipal corporation and does not, nor is it intended to create any relationship of employment, general agency, partnership, or co-venture; and neither party is authorized or empowered hereunder to contractually bind the other to any third party.

15. Assignment. Neither party shall assign or subcontract any interest or obligation in this Agreement without prior written consent of the other party.

16. Notices. Notices and other communications required under this Agreement must be in writing and must be given and will be deemed received if and when either hand delivered, mailed, or sent via telephone facsimile ("fax") to:

TO: TJOELKER ENTERPRISES
9410 Deltop Drive
Blaine, WA 98230
Tel: (360) 354-2367
Fax: (360) 354-2367
Attention: Clarence Tjoelker

CITY OF BLAINE
1200 Yew Avenue
Blaine, WA 98230
Tel: (360) 332-8820
Fax: (360) 332-7124
Attention: Public Works Director

17. Nonwaiver of Breach. Failure of either party at any time to require performance of any provision of this agreement shall not limit such party's right to enforce such provision, nor shall any waiver of any breach of any provision of this agreement constitute a waiver of any succeeding breach of such provision or a waiver of such provision itself.

18. Complete Agreement. This agreement constitutes the entire agreement between TJOELKER and CITY OF BLAINE, and supercedes all previous agreements. No oral or written statements made by either party prior to or following entry of this agreement shall be considered a part of this agreement unless expressly incorporated herein in writing. This agreement may be modified in writing only, upon mutual agreement of the parties.

In Witness Whereof, the parties have executed this Agreement on the 18th day of November, 2003.

TJOELKER:

By: _____
Ladd Tjoelker
President

By: _____
Shannon Tjoelker
Secretary/Treasurer

CITY OF BLAINE:

By: _____
Gary Tomsic
City Manager

STATE OF WASHINGTON)
) ss.
COUNTY OF WHATCOM)

On this day personally appeared before me Ladd Tjoelker and Shannon Tjoelker, as President and Secretary/Treasurer, respectively, of Tjoelker Enterprises, Incorporated, to me known to be the individuals described herein and who executed the within and foregoing Agreement to Store and Apply Biosolids, and acknowledged to me that they signed the same as their free and voluntary act for the Corporation for the purposes herein mentioned.

Dated this 18th day of November, 2003.

Shirley R. Thorsteinson

Notary Public in and for the State of Washington
Residing in Bellingham.
My commission expires: 9-10-04.

STATE OF WASHINGTON)
) ss.
COUNTY OF WHATCOM)

On this day personally appeared before me Gary Tomsic, as City Manager of the City of Blaine, to me known to be the individual described herein and who executed the within and foregoing Agreement to Store and Apply Biosolids, and acknowledged to me that he signed the same as his free and voluntary act for the purposes herein mentioned.

Dated this 18th day of November, 2003.

Shirley R. Thorsteinson

Notary Public in and for the State of Washington
Residing in Bellingham
My commission expires: 9-10-2004

SHIRLEY R. THORSTEINSON
EXPIRES
9-10-04
STATE OF WASHINGTON

Wheeler Consulting Group
INCORPORATED

PO BOX 29586 · BELLINGHAM · WA · 98228

FAX

Date February 16, 2005

Number of pages including cover sheet 6

To:	**Steve Banham**	**From:**	**Edward Wheeler**
	City of Blaine	Phone	**(360) 724-0476**
Phone		Fax	**(360) 724-0477**
Fax	**(360) 332-7124**		
CC:			

REMARKS:

	☐ Urgent	✓ For your review	☐ Reply ASAP	☐ Please comment
Original will:	☐ follow via	☐ regular mail	☐ overnight mail	☐ courier
	✓ not follow			

Enclosed is the addendum to the conditions of approval of Tjoelker Enterprises, Inc. for coverage under the statewide General Permit for Biosolids Management.

Do not hesitate to let me know if you have questions.

Regards,

Edward Wheeler
Wheeler Consulting Group, Inc.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Avenue SE • Bellevue, Washington 98008-5452 • (425) 649-7000

October 30, 2002

CERTIFIED MAIL
7001 2510 0002 0897 6620

Mr. Ladd Tjoelker
Tjoelker Enterprises, Inc.
9410 Deltop Road
Blaine, WA 98230

Permit Number:	BT9911		
Issuance Date:	3/25/98	Final Coverage:	9/30/02
Effective Date:	5/15/02	Expiration Date:	5/14/03

Dear Mr. Tjoelker:

RE: Coverage under the Statewide General Permit for Biosolids Management, Tjoelker Enterprises, Inc., Beneficial Use Facility, Permit BT9911.

The purpose of this letter is to provide an addendum to the conditions of final approval coverage under the statewide General Permit for Biosolids Management issued by Ecology for Tjoelker Enterprises, Inc. This addendum modifies and/or clarifies specific conditions stipulated in the permit issued on September 30, 2002 to better reflect new information specific to the operation of your Beneficial Use Facility and your site specific land application plan in accordance with your application for coverage dated September 1, 1998. These changes are highlighted in italics in the text below. You are required to comply with all the requirements of the general permit as they apply to your operation, including all approved plans, and also with all applicable requirements of Chapter 173-308 WAC, *Biosolids Management*. The following additional or more stringent requirements must also be complied with as a condition of this approval.

The complete set of permit conditions is detailed below with modified/clarified conditions inserted in place of the originally stated conditions.

1. Tjoelker Enterprises, Inc. must receive written approval from Whatcom County Health Department (WCHD) prior to receiving biosolids from sources not identified in its Application for Coverage.

2. Tjoelker Enterprises, Inc must notify WCHD at least one (1) day before and land application or sampling event.

3. *Prior to application, Tjoelker must submit its proposed application rates to WCHD to allow at least 7 days for review/comment. The review/comment period commences upon WCHD verification of receipt. WCHD has 7 days from the commencement of the review/comment period to approve or object to the application rate proposal. If WCHD objects to the application rate, Tjoelker must resubmit a new proposal under the conditions described above. If WCHD does not notify Tjoelker of its approval or objection within 7 days from the commencement of the review/comment period, application may commence at the rate proposed by Tjoelker.*

4. *To establish a benchmark for soil conditions at the site, prior to determining an initial application rate under this permit, Tjoelker must representatively sample the site soil for Total Kjeldahl Nitrogen, total or available potassium, total or available phosphorus to be reported in mg/kg on a dry weight basis.*

5. Biosolids may only be applied to the sites associated with the soil tests submitted in the application rate proposals.

6. *All biosolids managed at the facility must be tested for fecal coliform concentration by the seven sample alternative in accordance with WAC 173-308-170(3)(a)(i)-(ii), or biosolids must receive lime stabilization treatment in accordance with WAC 173-308-170(3)(b)(v), prior to land application. Biosolids that have been stored for greater than 90 days must be retested for fecal coliform concentration or re-limed to meet the Class B standards in WAC 173-308-170(3).*

7. *Prior to land application, biosolids must meet the vector attraction reduction requirements of WAC 173-308-180 (5), (the pH of the biosolids must be raised to twelve or higher by alkali addition and, without the addition of more alkali, must remain at twelve or higher for two hours and then at 11.5 or higher for an additional twenty-two hours), or the biosolids must be immediately injected into the soil, or incorporated within 6 hours following land application.*

8. *Mixed biosolids managed at the facility must be tested for total Kjeldahl nitrogen, nitrate nitrogen, ammonia nitrogen, phosphorus and percent solids content at the frequency specified by WAC 173-308-150.*

9. *No additional organic or inorganic fertilizers may be applied to sites receiving biosolids without prior approval from WCHD. Tjoelker must submit to WCHD in writing any proposal to apply organic or inorganic fertilizers to sites receiving biosolids and allow WCHD at least 14 days for review/comment. The review/comment period commences upon WCHD verification of receipt. WCHD has 14 days from the commencement of the review/comment period to approve or object to the fertilizer application proposal, following consultation with Ecology and Conservation District staff. If WCHD objects to the fertilizer application, Tjoelker may resubmit a new proposal under the conditions described above. If WCHD does not notify Tjoelker of its approval or objection within 14 days from the*

commencement of the review/comment period, fertilizer application may commence at the rate proposed by Tjoelker.

10. A reservoir of potable water and soap of sufficient volume for employee personal hygiene must be available near active application sites and storage sites, or another means for adequate personal hygiene must be available.

11. During land application of biosolids and for at least 30 days following land application, the sites to which the Class B biosolids are applied must be posted with no trespassing signs or informational signs. The informational signs must contain the following: a) Name, address and phone number of Tjoelker Enterprises, Inc., b) name, address and phone number of the Whatcom County Health Department, Environmental Health, Solid Waste Program, c) the material that is being applied (biosolids or a more detailed description) and d) a notice that access is restricted, and if desired, the date after which access is no longer restricted. The signs must be posted at all significant access points and along the perimeter of the property so that the signs may be noticed and read by a "reasonably observant person."

12. Liquid biosolids application using a big gun sprinkler shall not occur when wind speed exceeds 10 mph as measured by a wind speed indicator located at the application site in an area representative of conditions existing in the application area.

13. Biosolids may not be applied when percolation and/or incorporation of the material into the soil is precluded due to frozen soil, excessive snow cover, soil saturation or similar site conditions.

14. When biosolids are applied to agricultural sites, all sites must be seeded or otherwise planted within 90 days following biosolids application.

15. Land application sites must be monitored daily during active applications. Tjoelker Enterprises, Inc. must keep an inspection/monitoring log that includes at a minimum: site identification number or name, date and time of inspection, person performing the inspection, weather conditions, land application site conditions, conditions of buffer zones, conditions of roadways and access areas, equipment inspection and calibration setting and any problems and/or incidents of non-compliance. The inspection log must be available for review by Ecology and HHS.

16. Communication equipment capable of immediately contacting the appropriate persons must be available at all times during active applications in the event of an emergency or condition that might pose a threat to human health or the environment.

17. Liquid biosolids may only be stored in the four aboveground tanks at the facility. Semi-solid biosolids may not be mixed, and may only be stored in the covered bunker located at the facility. No biosolids residue may be allowed to leave the facility at any time.

18. The total mass of biosolids stored at any time may not exceed the amount required to meet the agronomic rates of the approved land application sites.

19. Biosolids may be stored for no more than 180 days prior to land application.

20. WCHD must approve any new biosolids storage site prior to utilization.

21. *Tjoelker must maintain records for biosolids in accordance with WAC 173-308-290.*

22. Records must be available for review by WCHD or Ecology.

23. An Annual Report must be submitted to HHS, the Ecology Northwest Regional Office and the office of the State Biosolids Coordinator by March 1 of each year.

The Annual Report must contain information from the preceding calendar year. An electronic version of the Annual Report may be obtained from Ecology. In addition to the requested information in the Annual Report form, the following information must also be included:

A. In section C, #1 on the Annual Report form, include information on the mass or volume of biosolids received from each generator.

B. In Section C, #1 on the Annual Report form, include information on the mass or volume of biosolids currently in storage at the facility.

C. Biosolids, groundwater, surface water and soil sampling data and any other requested sampling data.

24. Upon application for any new or expanded land application site Tjoelker must submit to WCHD a signed letter from each landowner showing approval for the land application of non-exceptional quality biosolids, and public notice must be conducted in accordance with WAC 173-308-310(11)(c)(ii) or (iii).

25. *WCHD may require additional groundwater, drinking water, surface water, biosolids, or soil sampling at any time if WCHD believes that the additional sampling are necessary to protect public health and the environment from any adverse effect of a pollutant in the biosolids.*

26. Tjoelker Enterprises, Inc. must notify WCHD and Ecology of any violations of permit conditions. Notification may be made by phone, email or letter. Tjoelker Enterprises, Inc. must provide a written explanation of the violation upon request from WCHD or Ecology.

You have the right to appeal as provided by law. Your appeal must be filed with the Pollution Control Hearings Board and be served on the department within thirty (30)

days. The right of appeal under the state biosolids rule is addressed in WAC 173-308-310(24) and in Section 8.21 of the General Permit for Biosolids Management. The basic process for an appeal is outlined in RCW 43.21B.310. Other rules and laws may also govern your appeal.

Your Northwest Regional staff contact for this permit is:

Marietta Sharp
Department of Ecology, NWRO
3190 160th Ave. SE
Bellevue WA 98008-5452
(425) 649-7258
mars461@ecy.wa.gov.

If you still have questions after reviewing your permit, please contact Marietta Sharp at the Washington State Department of Ecology, (425) 649-7258 or mars461@ecy.wa.gov.

Sincerely,

George Sidles
Solid Waste Section Manager
Northwest Regional Office
Washington State Department of Ecology

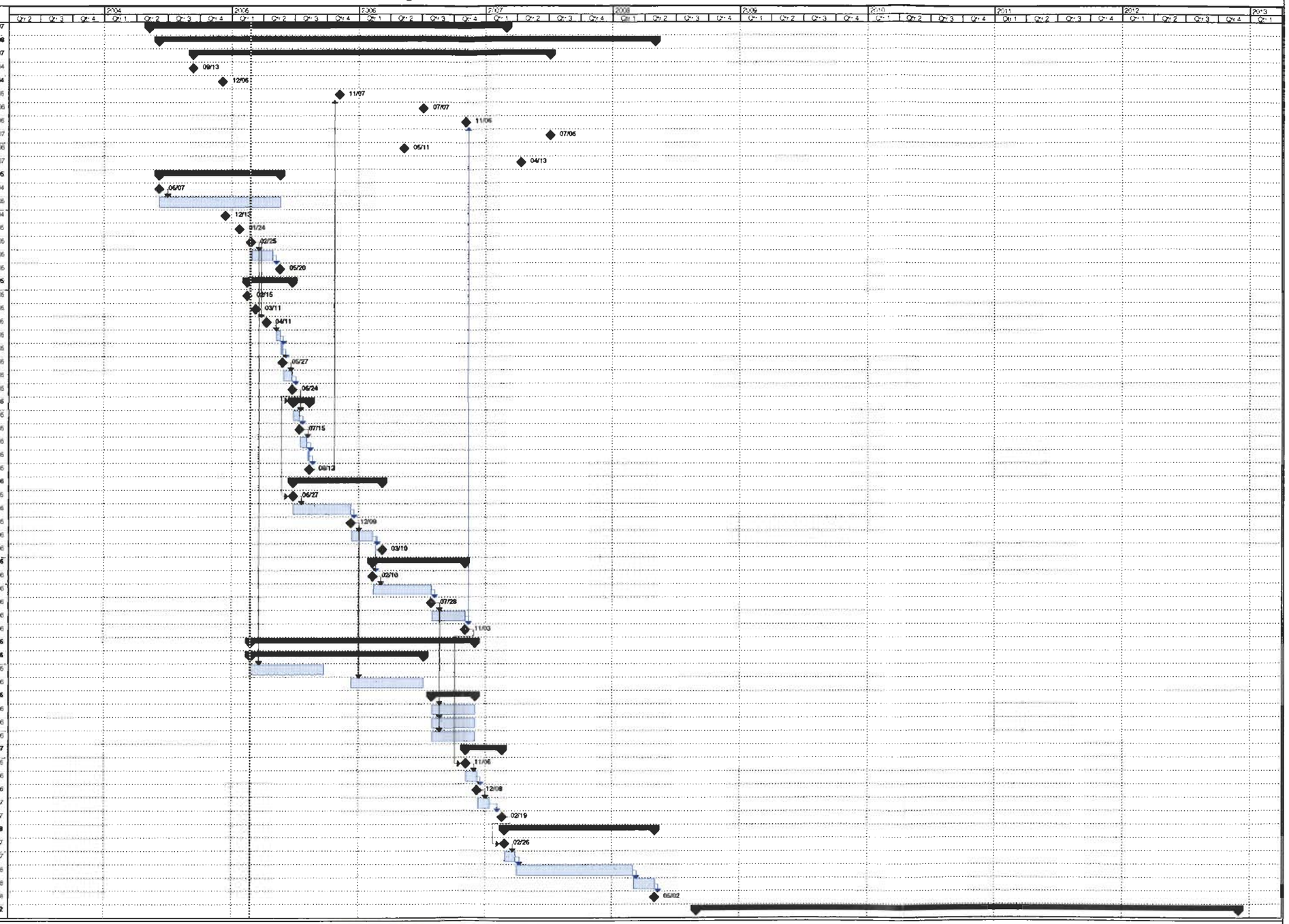
GS:ms:jc

Cc: Kyle Dorsey, Headquarters
Regina Delahunt, Whatcom County Health
Dick Grout, Bellingham Field Office
Marietta Sharp, NWRO

Blaine WWTP
Program Schedule

Updated: February 28, 2005

ID	Task Name	Duration	Start	Finish
	Phase 1 Activities (Flow EQ, LS #1 Improvements)	**735 days**	**Mon 05/10/04**	**Fri 03/02/07**
	Phase 2 Activities (Marine Drive WRF)	**1020 days**	**Mon 06/07/04**	**Fri 05/02/08**
51	**Phase 2 - Funding Activities**	**734 days**	**Mon 09/13/04**	**Fri 07/06/07**
52	Submit for PWTF Pre-Construction Funds	0 days	Mon 09/13/04	Mon 09/13/04
53	Receive PWTF Pre-Construction Funds	0 days	Mon 12/06/04	Mon 12/06/04
54	Submit for Centennial Construction Funds	0 days	Mon 11/07/05	Mon 11/07/05
55	Receive Centennial Construction Funds	0 days	Fri 07/07/06	Fri 07/07/06
56	Submit for Centennial Construction Funds	0 days	Mon 11/06/06	Mon 11/06/06
57	Receive Centennial Construction Funds	0 days	Fri 07/06/07	Fri 07/06/07
58	Submit for PWTF Construction Funds	0 days	Thu 05/11/06	Thu 05/11/06
59	Receive PWTF Construction Funds	0 days	Fri 04/13/07	Fri 04/13/07
60	**Phase 2 - Facility Planning Activities**	**250 days**	**Mon 06/07/04**	**Fri 05/20/05**
61	NTP - Facility Planning Activities	0 days	Mon 06/07/04	Mon 06/07/04
62	Facility Planning Activities	250 days	Mon 06/07/04	Fri 05/20/05
63	Blaine Council Adoption of Recommended Alternative	0 days	Mon 12/13/04	Mon 12/13/04
64	Blaine Council Presentation of Draft Facility Plan	0 days	Mon 01/24/05	Mon 01/24/05
65	Submit Draft Facility Plan to DOE	0 days	Fri 02/25/05	Fri 02/25/05
66	DOE Review of Draft Facility Plan	45 days	Mon 02/28/05	Fri 04/29/05
67	Submit Final Facility Plan to DOE	0 days	Fri 05/20/05	Fri 05/20/05
68	**Phase 2 - Design Consultant Selection Process**	**94 days**	**Tue 02/15/05**	**Fri 06/24/05**
69	Issue SOQ for Consultants	0 days	Tue 02/15/05	Tue 02/15/05
70	Receive and Review SOQs	0 days	Fri 03/11/05	Fri 03/11/05
71	Issue RFP for Design Services	0 days	Mon 04/11/05	Mon 04/11/05
72	Receive and Review Proposals	10 days	Mon 05/09/05	Fri 05/20/05
73	Conduct Interviews of Short Listed Firms	5 days	Mon 05/23/05	Fri 05/27/05
74	Select Design Consultant	0 days	Fri 05/27/05	Fri 05/27/05
75	Negotiate Design Services Scope & Budget	20 days	Mon 05/30/05	Fri 06/24/05
76	Execute Contract	0 days	Fri 06/24/05	Fri 06/24/05
77	**Phase 2 - Equipment Preselection Process**	**35 days**	**Mon 06/27/05**	**Fri 08/12/05**
78	Develop Design Criteria for Equipment	15 days	Mon 06/27/05	Fri 07/15/05
79	Issue RFP for Equipment Procurement	0 days	Fri 07/15/05	Fri 07/15/05
80	Receive and Review Proposals	15 days	Mon 07/18/05	Fri 08/05/05
	Conduct Interviews of Short Listed Vendors	5 days	Mon 08/08/05	Fri 08/12/05
	Select Equipment Vendor	0 days	Fri 08/12/05	Fri 08/12/05
	Phase 2 - Predesign Activities	**194 days**	**Mon 06/27/05**	**Fri 03/10/06**
84	NTP - Predesign Activities	0 days	Mon 06/27/05	Mon 06/27/05
85	Predesign Activities	120 days	Mon 06/27/05	Fri 12/09/05
86	Submit Draft Predesign Report to DOE	0 days	Fri 12/09/05	Fri 12/09/05
87	DOE Review of Draft Predesign Report	45 days	Mon 12/12/05	Fri 02/10/06
88	Submit Final Predesign Report to DOE	0 days	Fri 03/10/06	Fri 03/10/06
89	**Phase 2 - Final Design Activities**	**190 days**	**Fri 02/10/06**	**Fri 11/03/06**
90	NTP - Final Design Activities	0 days	Fri 02/10/06	Fri 02/10/06
91	Final Design Activities	120 days	Mon 02/13/06	Fri 07/28/06
92	Submit 90-Percent Design Documents for Permitting	0 days	Fri 07/28/06	Fri 07/28/06
93	DOE Review of 100-Percent Documents	70 days	Mon 07/31/06	Fri 11/03/06
94	Submit Final Contract Documents	0 days	Fri 11/03/06	Fri 11/03/06
95	**Phase 2 - Permitting Activities**	**461 days**	**Fri 02/25/05**	**Fri 12/01/06**
96	**Environmental Permitting**	**356 days**	**Fri 02/25/05**	**Fri 07/07/06**
97	SEPA Checklist w/ Support Documents	150 days	Fri 02/25/05	Thu 09/22/05
98	Shoreline Permit	150 days	Mon 12/12/05	Fri 07/07/06
99	**Construction Permitting**	**90 days**	**Mon 07/31/06**	**Fri 12/01/06**
100	Clearing & Grading Permit	90 days	Mon 07/31/06	Fri 12/01/06
101	Drainage Permit	90 days	Mon 07/31/06	Fri 12/01/06
102	Building Permit	90 days	Mon 07/31/06	Fri 12/01/06
103	**Phase 2 - Bidding Activities**	**75 days**	**Mon 11/06/06**	**Mon 02/19/07**
104	Bid Advertisement Date	0 days	Mon 11/06/06	Mon 11/06/06
105	Bid Advertisement Period	25 days	Mon 11/06/06	Fri 12/08/06
106	Bid Submittal Date	0 days	Fri 12/08/06	Fri 12/08/06
107	Bid Evaluation	25 days	Mon 12/11/06	Fri 01/12/07
108	Bid Award	0 days	Mon 02/19/07	Mon 02/19/07
109	**Phase 2 - Construction / Startup Activities**	**310 days**	**Mon 02/26/07**	**Fri 05/02/08**
110	NTP Construction Activities	0 days	Mon 02/26/07	Mon 02/26/07
111	Contractor Mobilization	25 days	Mon 02/26/07	Fri 03/30/07
112	Construction Activities	240 days	Mon 04/02/07	Fri 02/29/08
113	Startup Activities	45 days	Mon 03/03/08	Fri 05/02/08
	Commission the WWTP	0 days	Fri 05/02/08	Fri 05/02/08
	ase 3 Activities (West Blaine WW Management)	**1110 days**	**Mon 09/01/08**	**Fri 11/30/12**



Project: WWTP_ProjectSchedule_0228
Date: Tue 02/22/05

Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary

FN:\WWTP_ProjectSchedule_022805.mpp

City of Blaine
Sewer Rate Forecast
Summary

Important Note: This model accounts for debt issued through only year 2014.

Capital Funding	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total Capital Projects	$ -	$ 2,800,000	$ 3,399,000	$ 10,239,968	$ 10,547,187	$ 166,826	$ 811,492	$ 1,976,157	$ 2,035,441	$ -	$ -	$ -
Grants and Developer Donations	-	233,333	466,667	2,500,000	2,500,000	-	-	1,000,000	1,000,000	-	-	-
Centennial Clean Water	-			2,500,000		-	-	976,157	1,035,441	-	-	-
PWTF Loan Proceeds	-	2,566,667	2,932,333	4,739,968	5,280,032	-	811,492	0	0	-	-	-
PWTF Loan Pre-Construction	-	1,500,000	-	-	-	1,000,000	-	-	-	-	-	-
Rural Sales Tax	-	-	-	500,000	-	-	-	-	-	-	-	-
Rural Development Loan	-	-	-	-	-	-	-	-	-	-	-	-
Revenue Bond Proceeds	-	-	-	-	-	-	-	-	-	-	-	-
Use of Capital Fund (includes 0% of GFF)		-	-	-	2,767,134	-	-	-	-	-	-	-
Direct Rate Funding	-	-	-	-	-	-	-	-	-	-	-	-
Total Funding Sources	$ -	$ 4,300,000	$ 3,399,000	$ 10,239,968	$ 10,547,187	$ 1,000,000	$ 811,492	$ 1,976,157	$ 2,035,441	$ -	$ -	$ -

Revenue Requirements	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Revenues												
Rate Revenues Under Existing Rates	$ 1,462,744	$ 1,509,310	$ 1,547,045	$ 1,585,722	$ 1,625,365	$ 1,665,999	$ 1,707,649	$ 1,750,340	$ 1,794,098	$ 1,838,951	$ 1,884,925	$ 1,932,048
Non-Rate Revenues	139,981	145,826	154,502	156,537	60,433	61,866	62,625	64,186	70,589	72,099	73,531	75,010
GFF Revenue for Debt Service (100%)	163,176	247,697	269,000	281,215	314,373	253,640	272,738	292,380	342,099	304,197	355,290	379,354
Use of Debt Reserve for Debt Service	-	-	-	-	-	-	-	-	-	-	-	-
Total Revenues	$ 1,765,901	$ 1,902,833	$ 1,970,547	$ 2,032,474	$ 2,000,140	$ 1,981,365	$ 2,043,011	$ 2,106,906	$ 2,177,621	$ 2,245,167	$ 2,314,745	$ 2,386,413
Expenses												
Cash O&M Expenses	$ 1,297,604	$ 1,312,050	$ 1,370,980	$ 1,426,816	$ 1,475,149	$ 1,537,865	$ 2,243,343	$ 2,313,124	$ 2,388,350	$ 2,466,603	$ 2,548,472	$ 2,629,548
Existing Debt Service	570,689	565,930	563,320	499,380	498,688	492,304	492,535	330,294	327,535	324,269	258,023	248,482
New Debt Service	-	33,167	276,525	533,586	963,948	1,238,653	1,289,571	1,331,912	1,383,085	1,426,610	1,414,893	1,403,276
Rate Funded System Reinvestment	-	-	-	-	-	-	-	-	-	-	-	-
Rate Funded CIP	-	-	-	-	-	-	-	-	-	-	-	-
Total Expenses	$ 1,868,353	$ 1,911,146	$ 2,210,825	$ 2,461,790	$ 2,937,986	$ 3,268,862	$ 4,022,447	$ 3,975,331	$ 4,098,970	$ 4,216,882	$ 4,219,388	$ 4,281,306
Annual Rate Adjustment	0.00%	25.45%	20.00%	13.00%	0.00%	11.00%	15.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Rate Increases Dictated by:	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*	*Policy*
Rate Revenues After Rate Increase	$ 1,462,744	$ 1,892,433	$ 2,328,922	$ 2,697,474	$ 2,764,811	$ 3,145,777	$ 3,708,065	$ 3,800,767	$ 3,895,867	$ 3,993,202	$ 4,093,032	$ 4,195,358
Net Cash Flow After Rate Increase	(102,452)	375,867	541,599	682,438	201,700	192,282	21,001	182,022	180,360	182,537	303,464	388,417
Coverage After Rate Increases	1.32	1.19	1.22	1.17	1.06	1.10	1.04	1.24	1.21	1.27	1.14	1.14
Residential Rate $39.78	$ 39.78	$ 49.90	$ 59.88	$ 67.67	$ 67.67	$ 75.11	$ 86.38	$ 86.38	$ 86.38	$ 86.38	$ 86.38	$ 86.38
General Facilities Fee	$ 2,400	$ 4,200	$ 4,450	$ 4,700	$ 4,950	$ 5,200	$ 5,450	$ 5,700	$ 5,950	$ 6,200	$ 6,450	$ 6,700

Fund Balances	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Operating Fund	$ 264,420	$ 264,330	$ 293,888	$ 300,779	$ 313,700	$ 324,573	$ 345,574	$ 489,575	$ 505,730	$ 522,329	$ 539,488	$ 557,231
Capital Fund	317,614	2,203,040	2,823,292	3,608,875	1,357,667	2,301,180	2,484,142	2,718,880	3,006,228	3,497,396	4,042,354	4,661,123
Debt Reserve Fund	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776
Total	$ 1,121,809	$ 3,007,145	$ 3,636,865	$ 4,432,229	$ 1,991,143	$ 3,145,531	$ 3,349,492	$ 3,728,240	$ 4,131,733	$ 4,539,495	$ 5,101,618	$ 5,758,180
Combined Minimum Target Balance	*$ 948,629*	*$ 944,662*	*$ 950,430*	*$ 899,871*	*$ 907,412*	*$ 915,567*	*$ 1,027,745*	*$ 941,184*	*$ 953,222*	*$ 965,471*	*$ 915,471*	*$ 917,923*

City of Blaine
Sewer Rate Forecast
Summary

Capital Funding	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total Capital Projects	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Grants and Developer Donations	-	-	-	-	-	-	-	-	-
Centennial Clean Water	-	-	-	-	-	-	-	-	-
PWTF Loan Proceeds	-	-	-	-	-	-	-	-	-
PWTF Loan Pre-Construction	-	-	-	-	-	-	-	-	-
Rural Sales Tax	-	-	-	-	-	-	-	-	-
Rural Development Loan	-	-	-	-	-	-	-	-	-
Revenue Bond Proceeds	-	-	-	-	-	-	-	-	-
Use of Capital Fund (Includes 0% of GFI	-	-	-	-	-	-	-	-	-
Direct Rate Funding	-	-	-	-	-	-	-	-	-
Total Funding Sources	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Revenue Requirements		2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenues										
Rate Revenues Under Existing Rates		$ 1,980,349	$ 2,029,858	$ 2,080,004	$ 2,132,819	$ 2,185,935	$ 2,240,583	$ 2,296,598	$ 2,354,013	$ 2,412,863
Non-Rate Revenues		76,538	78,108	79,724	81,386	83,098	84,859	86,673	88,539	90,461
GFT Revenue for Debt Service (100%)		392,700	402,585	412,650	422,866	433,540	444,379	455,488	466,870	478,548
Use of Debt Reserve for Debt Service		-	-	-	-	-	-	-	-	-
Total Revenues		$ 2,449,654	$ 2,510,551	$ 2,572,978	$ 2,636,872	$ 2,702,573	$ 2,769,821	$ 2,838,759	$ 2,909,428	$ 2,981,872
Expenses										
Cash O&M Expenses		$ 2,698,609	$ 2,787,099	$ 2,878,379	$ 2,990,502	$ 3,088,617	$ 3,189,971	$ 3,294,774	$ 3,403,147	$ 3,515,218
Existing Debt Service		114,175	112,079	-	-	-	-	-	-	-
New Debt Service		1,391,059	1,380,042	1,368,425	1,356,636	1,345,192	1,333,575	1,321,958	1,310,341	1,298,724
Rate Funded System Reinvestment		-	-	-	-	-	-	-	-	-
Rate Funded CIP		-	-	-	-	-	-	-	-	-
Total Expenses		$ 4,204,643	$ 4,279,221	$ 4,246,804	$ 4,347,400	$ 4,433,809	$ 4,523,546	$ 4,616,732	$ 4,713,488	$ 4,813,942
Annual Rate Adjustment		-10.00%	-10.00%	-10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Rate Increases Dictated by:		*Policy*	*Policy*	*Policy*	*Analysis*	*Analysis*	*Analysis*	*Analysis*	*Analysis*	*Analysis*
Rate Revenues After Rate Increase		$ 3,570,218	$ 3,906,973	$ 4,066,148	$ 4,630,890	$ 4,746,682	$ 4,855,329	$ 4,958,982	$ 5,111,630	$ 5,239,427
Net Cash Flow After Rate Increase		134,879	188,446	311,717	787,843	829,493	871,021	912,292	953,584	994,494
Coverage After Rate Increases		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Residential Rate	$39.78	$ 77.74	$ 69.97	$ 62.97	$ 62.97	$ 62.97	$ 62.97	$ 62.97	$ 62.97	$ 62.97
General Facilities Fee		$ 6,768	$ 6,768	$ 6,768	$ 6,768	$ 6,768	$ 6,768	$ 6,768	$ 6,768	$ 6,768

Fund Balances	2016	2017	2018	2019	2020	2021	2022	2023	2024
Operating Fund	$ 575,564	$ 594,517	$ 614,114	$ 634,360	$ 655,338	$ 677,012	$ 699,428	$ 722,613	$ 746,595
Capital Fund	5,115,888	5,604,212	6,258,050	7,416,938	8,666,554	10,010,804	11,453,041	12,997,167	14,647,662
Debt Reserve Fund	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776	519,776
Total	$ 6,211,228	$ 6,718,505	$ 7,391,940	$ 8,571,094	$ 9,841,777	$ 11,207,592	$ 12,672,245	$ 14,239,556	$ 15,913,452
Combined Minimum Target Balance	*$ 931,673*	*$ 945,887*	*$ 960,586*	*$ 975,786*	*$ 991,503*	*$ 1,007,759*	*$ 1,024,571*	*$ 1,041,960*	*$ 1,059,946*

ORDINANCE NO. 04-2596

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF BLAINE, WASHINGTON AMENDING BLAINE MUNICIPAL CODE SECTIONS 13.07.060 RATES - WASTEWATER, 13.14.030 WASTEWATER GENERAL FACILITY FEES AND 13.14.070 WASTEWATER RATES AND CHARGES AND AMENDING ORDINANCES 96-2266, 97-2348 AND 00-2480

WHEREAS, the City of Blaine must construct new wastewater facilities to replace outdated treatment facilities, to provide adequate collection, storage and treatment facilities to protect the environment, and to accommodate projected growth as addressed in the recently adopted updated General Sewer Plan, and

WHEREAS, such construction will require funding from a variety of sources, including both connection fees and monthly service charges for wastewater services, and

WHEREAS, the costs of operating existing treatment facilities have increased due to inflation and accelerating maintenance demands of the aging wastewater treatment plant, and

WHEREAS, wastewater connection fees and service rates currently in effect have not been raised since the year 2000, and

WHEREAS, the City has engaged the services of FCSG, financial consultants, to review current rates, costs, capital improvement plans and create a rate model for financial stability of the utility, and

WHEREAS, the City Council and staff have carefully evaluated all projections for wastewater service costs, growth needs and construction alternatives, and recommendations of experts which resulted in recommended rate increases for wastewater services,

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF BLAINE DOES ORDAIN AS FOLLOWS:

SECTION 1: Section 13.07.060, Subsection A of the Blaine Municipal Code, is hereby amended to read as follows:

13.07.060 Rates – Wastewater.

A. Wastewater Service Charges. A wastewater service charge shall be assessed for connection to and utilization of the municipal wastewater system for the purpose of receiving wastewater service pursuant to the utility rate schedule established for wastewater service. To preserve a reservation of capacity in the system obtained by the payment of a general facilities fee, owners of vacant structures shall pay minimum monthly charges listed at Section 13.14.070 to support costs of operating and maintaining the wastewater system which has been designed to accommodate their active use. Failure to pay these minimum monthly charges will result in assessment of the current general

facilities fee prior to restoring service. Service outside the city limits will be permitted only with Council approval, and if approved, all fees and services shall be 150% of the municipal rate within the city limits.

SECTION 2: Section 13.07.060, Subsection A.3 is hereby amended to read as follows:

13.07.060A.3.

3. Residential Multifamily Service Charge. The residential multifamily service charge shall be a flat monthly base rate per the number of units served. A "multifamily unit" is defined as three or more living units.

SECTION 3. Section 13.14.030, Subsections A., B. and C., is hereby amended to read as follows:

13.14.030 Assessments – Wastewater.

A. General Facility Fee: $4,200 per ERU.

B. Inspection Fee.

1. Lateral connection at property line: $40.00
2. Lateral connection at main or manhole: $150.00

SECTION 4. Section 13.14.070 BMC is hereby amended to read as follows:

13.14.070 WASTEWATER SERVICE RATES *(Effective for 2005)*

A. RESIDENTIAL

Customer Class	Within City Limits	Outside* City Limits	Vacation/ Vacant
Single Family/Duplex	$ 49.90	$ 74.85	$ 37.40
Senior/Disabled/Low Income	$ 38.33	N/A	$ 28.73
Multi-family	$ 45.82	$ 68.73	$ 34.34

*see 13.07.060A. for limitations on service outside the city limits

B. NON-RESIDENTIAL

1. Base charges for specific user classes based on meter size:

		BASECHARGE			
Meter Size	Volume Allowance (CCF)	Vacant Building (No water usage)	Commercial I average strength	Federal Agency	Commercial II high strength
3/4"	3	$ 37.40	$ 49.90	$ 54.39	$ 64.21
1"	7	$ 93.46	$ 124.70	$ 135.93	$ 160.55
1.5"	15	$ 186.94	$ 249.42	$ 271.88	$ 321.10
2"	24	$ 299.09	$ 399.05	$ 434.96	$ 513.76
3"	48	$ 598.18	$ 798.11	$ 869.94	$ 1,027.53
4"	75	$ 934.67	$ 1,247.06	$ 1,359.29	$ 1,605.51
6"	150	$ 1,869.30	$ 2,494.07	$ 2,718.54	$ 3,211.00
8"	240	$ 2,990.89	$ 3,990.52	$ 4,349.67	$ 5,137.58

2. Volume charges for specific user classes:

COMMODITY CHARGE/CCF (In excess of volume allowance)		
Commercial I average strength	Federal Agency	Commercial II high strength
$ 7.38	$ 8.04	$ 10.41

C. MARINAS

1. Base Charge (per pump-out station): $64.21
2. Volume allowance included in base charge: 3 ccf
3. Commodity Charge (in excess of allowance): $10.41 per ccf

D. BULK TRANSPORT DISPOSAL SERVICES

1. Base Charge (no volume allowance): $72.00
2. Commodity Charge: $14.65 per ccf

SECTION 5. EFFECTIVE DATE. This ordinance shall become effective for the first billing cycle of the year 2005.

SECTION 6. All ordinances or parts of ordinances in conflict herewith are hereby repealed.

SECTION 7. If any section, subsection, clause or phrase of this ordinance is for any reason held to be invalid or unconstitutional, such decision shall not affect the validity of the remaining portions of this Ordinance.

SECTION 8. This Ordinance shall take effect upon approval by the City Council of the City of Blaine, Washington and at the stated effective date.

PASSED BY THE CITY COUNCIL OF THE CITY OF BLAINE, WASHINGTON, on the _____ day of _____, 2004, and approved by the Mayor on the same day.

_____
JOHN LIEBERT, Mayor

ATTEST:

_____
SHERI SANCHEZ
City Clerk

_____
MEREDITH G. RILEY, CPA
Finance Director

APPROVED:

_____
JON SITKIN, City Attorney

Facilities Plan/Engineering Report Checklist

A. GENERAL INFORMATION

Project: Facility Plan - Lighthouse Point Water Reclamation Facility

Project Contact: Steve Banham, P.E. Phone: (360) 332-8820

Review Date: _____ Loan/Grant No.: _____

Reviewer: _____

Recipient: _____

Recipient Contact: _____

A/E Firm: CH2M HILL HILL

A/E Contact: Ron Brown, P.E. Phone: (425) 453-5000

Location: Bellevue, WA

Scheduled Start Date: _____ Actual Start Date: _____ Completion Date: _____

Contract Amount: $

Contractor: _____

Location: _____

Has an preliminary eligibility determination in accordance with Water Quality Program Policy 5–02 been made: YES ☐ NO ☐

If no, Policy 5–02 must be followed prior to approval of facilities plans

Report stamped and signed by P.E. YES ☒ NO ☐

	Adequate	Not Adequate	N/A
1. Project Description (describes why, what, and where of proposal)	☒	☐	☐
2. Location map (adequate to drive to site)	☒	☐	☐
3. Sewer service area map	☒	☐	☐
4. Level of treatment, required (final effluent limits) copy of current permit or draft permit for new discharge, compliance in order	☒	☐	☐

B. BACKGROUND INFORMATION

1. Existing Environment	☒	☐	☐
a. Water	☒	☐	☐
b. Air	☒	☐	☐
c. Land	☒	☐	☐
d. Sensitive Areas	☒	☐	☐
(1) Floodplains	☒	☐	☐
(2) Shorelands	☒	☐	☐

	Adequate	Not Adequate	N/A
(3) Wetlands	☐	☐	☒
(4) Wild & scenic rivers (SRF/SERP only)	☐	☐	☒
(5) Historic & archaeological sites (SRF/SERP only)	☒	☐	☐
(6) Threatened species (SRF/SERP only)	☐	☐	☒
(7) Prime and unique farm lands (SRF/SERP only)	☐	☐	☒
e. Endangered species/habitat	☐	☐	☒
f. Public Health	☒	☐	☐
2. Demography and Land Use	☒	☐	☐
a. Current population	☒	☐	☐
b. Current land use zoning	☒	☐	☐
c. Current zoning map	☒	☐	☐
3. Current Wastewater Treatment	☒	☐	☐
a. Describe current treatment process	☒	☐	☐
(1) Location of WWTPs, biosolids reuse, pump stations	☒	☐	☐
(2) Existing design capacity and wastewater flow and character	☒	☐	☐
(3) Developed areas within service area that are currently on onsite systems	☒	☐	☐
(4) WWTP performance compared to permit limits	☒	☐	☐
(5) Current O&M program for plant and collection system	☐	☐	☒
b. Flow diagram (showing sampling points)	☒	☐	☐
c. Site layout map	☒	☐	☐
d. Current plant loading (table of at least one year of data)	☒	☐	☐
e. Current biosolids management	☒	☐	☐
f. Location and waste characteristics of current industrial wastes treated	☐	☐	☒
g. Sources of plant loadings	☒	☐	☐
(1) Industrial	☒	☐	☐
(2) Commercial	☒	☐	☐
(3) Domestic	☒	☐	☐
(4) Infiltration	☒	☐	☐
(5) Inflow	☒	☐	☐
h. Seasonal loading variations	☒	☐	☐
i. Flow meter accuracy checked. Date checked: _____	☐	☐	☒
j. Lab analysis checked for accuracy (certified lab req.)	☐	☐	☒
k. Plant bypasses	☐	☐	☐
(1) Frequency	☐	☐	☒
(2) Impacts	☐	☐	☒
(3) Time of year	☐	☐	☒
4. Receiving Water Evaluations	☐	☐	☒
a. AWT need evaluated	☐	☐	☒
a) Is reclaimed water reuse feasible?	☒	☐	☐
b) Does a market exist for reclaimed water?	☒	☐	☐
b. Water quality analyzed	☐	☐	☒
c. Dilution zone analysis	☐	☐	☒

	Adequate	Not Adequate	N/A
d. Toxics in effluent	☐	☐	☒
e. Nutrient impacts/bacteria impacts	☐	☐	☒
f. Are water quality standards being met now?	☒	☐	☐
g. Receiving water flows	☐	☐	☒
(1) Average minimum by month	☒	☐	☐
(2) 7-day 10-year low flow	☒	☐	☐
(3) 30-day 10-year low flow	☒	☐	☐
5. I/I Studies	☒	☐	☐
a. Degree in collection system	☐	☐	☐
(1) Methods used and data adequate to support excessive or nonexcessive I/I determination	☐	☐	☒
(2) Nonexcessive I/I determined and used as part of base flow in design	☐	☐	☒
(3) Schedule for sewer rehab including where rehab is proposed and amount of correction from rehab is realistic	☐	☐	☒
b. Sewer overflows? Yes ☒ No ☐	☐	☐	☐
(1) Fixes recommended	☒	☐	☐
c. Combined sewer overflows Yes ☐ No ☒	☐	☐	☐
(1) Fixes evaluated	☐	☐	☒
d. CSO report approved? (173-245) Yes ☐ No ☐	☐	☐	☒
e. Map locating CSOs and SOs	☐	☐	☒
f. Discussion of frequency and volume of overflow	☐	☐	☒
g. Impacts of overflow on receiving water	☐	☐	☒
6. Unsewered Communities	☐	☐	☒
a. Health emergency Yes ☐ No ☐	☐	☐	☒
b. Sanitary survey conducted	☐	☐	☒
c. Statistics/data on total on-site systems and number of failures	☐	☐	☒
d. Local Health Department/ Department of Health involved	☐	☐	☒
e. Reasons for failures	☐	☐	☒
(1) Soils	☐	☐	☒
(2) Overload	☐	☐	☒
(3) System design	☐	☐	☒

C. FUTURE CONDITIONS

2. Demography or land use	☒	☐	☐
a. Population projections based on appropriate data source	☒	☐	☐
b. Future land use changes/zoning densities	☒	☐	☐
c. Future service area	☒	☐	☐
d. Recreation and open space alternatives	☒	☐	☐
3. Waste load	☒	☐	☐
a. Future flows and loadings	☒	☐	☐
(1) Domestic	☒	☐	☐
(2) Commercial	☒	☐	☐
(3) Industrial	☒	☐	☐

	Adequate	Not Adequate	N/A
(4) I/I	☒	☐	☐
b. Continued use of existing on-site possible?	☒	☐	☐
D. ALTERNATIVES			
1. Locations	☒	☐	☐
a. Alternative sites	☒	☐	☐
b. Proximity of residences or developed areas	☒	☐	☐
c. 25-year and 100-yr floodway and floodplains	☒	☐	☐
d. Adequacy of site soils to support the facility	☒	☐	☐
e. Site difficulties	☒	☐	☐
2. Design Criteria	☒	☐	☐
a. Flow	☒	☐	☐
b. BOD, TSS nutrients	☒	☐	☐
c. Recycle streams	☒	☐	☐
d. Special handling for industrial wastes	☒	☐	☐
e. Treatability	☒	☐	☐
f. Pretreatment needs	☒	☐	☐
g. Biosolids Class, Vol, Disposal site identified	☒	☐	☐
3. Types of systems evaluated (i.e., all practicable waste treatment technologies)	☒	☐	☐
a. Fixed growth	☒	☐	☐
b. Suspended growth	☒	☐	☐
c. Land treatment	☐	☐	☒
d. Lagoons	☐	☐	☒
e. Operational improvements	☒	☐	☐
f. Water Reclamation and Reuse	☒	☐	☐
g. Revenue producing capabilities	☐	☐	☒
4. Types of collection systems evaluated	☒	☐	☐
a. Modify and continue to use on-site systems	☐	☐	☒
b. Standard gravity systems	☒	☐	☐
c. Small diameter gravity	☒	☐	☐
d. STEP/grinder pump	☐	☐	☒
e. Vacuum collection	☐	☐	☒
5. Biosolids treatment/management & reuse alternative	☒	☐	☐
a. Aerobic	☒	☐	☐
b. Anaerobic	☐	☐	☒
c. Composting	☐	☐	☒
d. Land disposal	☒	☐	☐
e. Beneficial utilization	☐	☐	☒
6. Effects of flow reduction measures	☒	☐	☐
7. Evaluate and rank alternatives	☒	☐	☐
a. Criteria	☒	☐	☐
(1) Total capital costs	☒	☐	☐
(2) Environmental impacts	☒	☐	☐
(3) Public acceptability	☒	☐	☐

	Adequate	Not Adequate	N/A
(4) Meet effluent limits	☒	☐	☐
(5) Ease of maintenance	☒	☐	☐
(6) Present worth (including O&M)	☒	☐	☐
8. Select final alternatives to further evaluate and rank	☒	☐	☐
a. Evaluate and rank final alternatives	☒	☐	☐
b. Select recommended alternative	☒	☐	☐
E. FINAL RECOMMENDED/SELECTED ALTERNATIVE			
1. Site layout	☒	☐	☐
2. Flow diagram	☒	☐	☐
3. Hydraulic profiles (high plant flow, high receiving water flow or elevation)	☒	☐	☐
4. Follows recommendations in Criteria manual?	☒	☐	☐
5. Design criteria for each process unit	☒	☐	☐
6. Sizing calculations for each process unit	☒	☐	☐
7. Age and adequacy of existing process	☒	☐	☐
8. Units to be retained	☒	☐	☐
9. Biosolids treatment	☒	☐	☐
10. Recycle flow accounted for?	☒	☐	☐
11. If Land Treatment, has DOH reviewed and given comments?	☐	☐	☒
12. If Water Reclamation and Reuse, has DOH reviewed and given Approval?	☒	☐	☐
13. Biosolids management plan	☒	☐	☐
a. Description of plan	☒	☐	☐
b. Actions required to implement	☒	☐	☐
14. Ability to expand treatment plant	☒	☐	☐
15. Ability to expand collection system	☒	☐	☐
16. O&M staffing requirements	☒	☐	☐
17. Lab staffing requirements	☒	☐	☐
18. Solids mass balance	☒	☐	☐
F. FINANCIAL			
1. Capital, O&M, costs of selected alternative	☒	☐	☐
2. User charges for selected alternative with grant and without grant	☒	☐	☐
3. Funding of project	☒	☐	☐
a. Project Evaluated with out Public Funding			
b. Evaluation with Public Funding Assistance			
(1) Possible funding sources identified	☒	☐	☐
(2) Effects of possible funding sources on project and user costs evaluated.	☒	☐	☐
G. OTHER REQUIREMENTS			
1. WQMP conformance	☒	☐	☐
2. SEPA/GMA compliance achieved	☒	☐	☐

	Adequate	Not Adequate	N/A
a. Project identified in a	☒	☐	☐
(1) General Sewer Plan	☒	☐	☐
(2) Capital Improvement Plan	☒	☐	☐
b. SERP compliance			
(1) Public Participation	☒	☐	☐
(2) Concurrence memo in file	☐	☐	☐
c. GMA			
(1) Comp. Plan Adopted	☒	☐	☐
(2) Critical Areas Ordinance Adopted	☒	☐	☐
(3) Dev. Reg's Adopted – All or Portion	☒	☐	☐
3. List of needed permit approvals for proposal	☒	☐	☐
4. Review of existing sewer use system and user charges	☒	☐	☐
5. O&M for collection system, treatment plants, on-site systems	☒	☐	☐
6. Implementation	☒	☐	☐
7. Financial Aspects (Capital financing plan)	☒	☐	☐
8. Legal and administration	☒	☐	☐
9. Staffing and management	☒	☐	☐

10. Will Value-engineering be required during design phase? Yes ☐ No ☒

For Water Reclamation Projects the following is taken from "Water Reclamation and Reuse Standards" September 1997, Section 1 General Requirements.

Article 8. Engineering Report

Section 1. Scope and Minimum Requirements

(a) No person shall produce or supply reclaimed water for a direct beneficial use or a controlled use that would not otherwise occur unless he files an engineering report with the Washington Departments of Health and Ecology.

(b) The report shall be prepared by an engineer registered in Washington and experienced in the field of wastewater treatment, and shall contain a description of the design of the proposed reclamation system. The report shall clearly indicate the means for compliance with these standards and any other reclamation requirements specified by the Washington Departments of Health and Ecology. The engineering report shall also meet the regulatory requirements found within chapter 173-240-060 WAC (Submission of Plans and reports for Construction of Wastewater Facilities) and chapter 246-290 (Group A Public Water Systems) for applicable sections (i.e. Cross-connection control WAC 246-290-490, Water System Plans WAC 246-290-100 (cross-connection control programs, conservation programs (including reuse) also see Planning Handbook available from Health).

(c) The engineering report shall contain but not be limited to the following elements:

(1) Process description and diagram that delineates the secondary treatment process, the reclamation process and reliability features and controls.

(2) Identification of the basis for design predicated on such sources as pilot plant results, recognized design standards published by industry professional organizations, accepted

engineering design and operation references, USEPA, state regulatory agencies or site specific experience and operations data.

(3) Description and results of any pilot plant studies undertaken to assess the applicability of selected and alternative treatment processes and used to define unit design and operations parameters.

(4) Reliability assessment of complete treatment trains, unit processes, major and/or significant equipment and/or components.

(5) Engineering design calculations for the reclamation process that include: disinfection contact time, coagulation process, filtration process (if Class A), irrigation process and water balance (if necessary). Design approaches shall be consistent with accepted engineering practice as defined by Water Environment Federation, American Society of Civil Engineers, American Water Works Association, USEPA, USDA, Soil Conservation Service and recognized engineering references.

(6) A summary checklist should be submitted that outlines if each article within the standard was addressed in the report or why a particular section(s) were omitted (see appendix 1 for example).

(d) The report shall contain a contingency plan which will assure that no untreated or inadequately-treated wastewater will be delivered to the use area.

(e) The report shall discuss cross-connection control issues and detail the water purveyors program for cross-connection control and whom will be responsible for compliance and testing of cross-connection control activities.

Inspection Completed:

Project Engineer's Signature	*Date*

APPENDIX K
WAC 173-240-060 Engineering Report / Facility Plan Requirements

WAC Requirement	Included in Facility Plan (Chapter/Paragraph)
(1) The engineering report for a domestic wastewater facility shall include each appropriate (as determined by the department) item required in WAC 173-240-050 for general sewer plans unless an up-to-date general sewer plan is on file with the department. Normally, an engineering report is not required for sewer line extensions or pump stations. See WAC 173-240-020(13) and 173-240-030(5). The facility plan described in federal rule 40 CFR 35 is an "engineering report."	An approved Sewer Plan is on file with Department of Ecology
(2) The engineering report must be sufficiently complete so that plans and specifications can be developed from it without substantial changes. Three copies of the report must be submitted to the department for approval, except as waived under WAC 173-240-030(5).	NA
(3) The engineering report shall include the following information together with any other relevant data as requested by the department:	
(a) The name, address, and telephone number of the owner of the proposed facilities, and the owner's authorized representative	Cover sheet of report
(b) A project description that includes a location map and a map of the present and proposed service area.	Chapter 2, Section 2.2
(c) A statement of the present and expected future quantity and quality of wastewater, including any industrial wastes that may be present or expected in the sewer system.	Chapter 4, Section 4.1 Chapter 4, Section 4.3
(d) The degree of treatment required based upon applicable permits and rules, the receiving body of water, the amount and strength of wastewater to be treated, and other influencing factors.	Chapter 4, Section 4.3 Chapter 5, Section 5.2
(e) A description of the receiving water, applicable water quality standards, and how water quality standards will be met outside any applicable dilution zone.	Chapter 4, Section 4.4
(f) The type of treatment process proposed, based upon the character of the wastewater to be handled, the method of disposal, the degree of treatment required, and a discussion of the alternatives evaluated and the reasons they are unacceptable.	Chapter 5, Section 5.2
(g) The basic design data and sizing calculations of each unit of the treatment works. Expected efficiencies of each unit and also of the entire plant, and character of effluent anticipated.	Chapter 7, Section 7.2
(h) Discussion of the various sites available and the advantages and disadvantages of the site or sites recommended. The proximity of residences or developed areas to any treatment works. The relationship of the twenty-five-year and one hundred-year flood to the treatment plant site and the various plant units.	Chapter 7, Section 7.2.1 Refer General Sewer Plan
(i) A flow diagram that shows general layout of the various units, the location of the effluent discharge, and a hydraulic profile of the system that is the subject of the engineering report and any hydraulically related portions.	Chapter 7, Section 7.2
(j) A discussion of infiltration and inflow problems, overflows and bypasses, and proposed corrections and controls.	Chapter 4, Section 4.2
(k) A discussion of any special provisions for treating industrial wastes, including any pretreatment requirements for significant industrial sources.	Chapter 4, Section 4.1
(l) Detailed outfall analysis or other disposal method selected.	Chapter 3, Section 3.2

APPENDIX K
WAC 173-240-060 Engineering Report / Facility Plan Requirements

WAC Requirement	Included in Facility Plan (Chapter/Paragraph)
	Chapter 7, Section 7.2.2
(m) A discussion of the method of final sludge disposal and any alternatives considered.	Chapter 7, Section 7.2
(n) Provision for future needs.	Chapter 7, Section 7.2
(o) Staffing and testing requirements for the facilities.	Chapter 7, Section 7.2
(p) An estimate of the costs and expenses of the proposed facilities and the method of assessing costs and expenses. The total amount shall include both capital costs and also operation and maintenance costs for the life of the project, and must be presented in terms of total annual cost and present worth.	Chapter 6, Section 6.4 Chapter 8, Section 8.1 Chapter 8, Section 8.2
(q) A statement regarding compliance with any applicable state or local water quality management plan or any plan adopted under the Federal Water Pollution Control Act as amended.	Chapter 1, Section 1.2
(r) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.	Chapter 9, Section 9.1
(4) The engineering report for projects that use land application, including seepage lagoons, irrigation, and subsurface disposal, shall include information on the following together with appropriate parts of subsection (3) of this section, as determined by the department:	NA
(a) Soils and their permeability;	NA
(b) Geohydrologic evaluation of factors such as:	NA
(i) Depth to ground water and ground water movement during different times of the year;	NA
(ii) Water balance analysis of the proposed discharge area;	NA
(iii) Overall effects of the proposed facility upon the ground water in conjunction with any other land application facilities that may be present;	NA
(c) Availability of public sewers;	NA
(d) Reserve areas for additional subsurface disposal	NA
(5) The engineering report for projects funded by the Environmental Protection Agency shall, in addition to the requirements of subsection (3) or (4) of this section, follow EPA facility plan guidelines contained in the EPA publication, "Guidance for Preparing a Facility Plan" (MCD-46), and shall indicate how the special requirements contained in 40 CFR35.719.1 will be met.	

Lighthouse Point Water Reclamation Facility

Environmental Report - Draft

Prepared for

United States Agricultural Department
(Rural Utilities Service)

City of Blaine

Prepared by

CH2M HILL

February 4, 2005

PRELIMINARY DRAFT

Lighthouse Point Water Reclamation Facility

City of Blaine, Washington

Draft Environmental Report

In accordance with the National Environmental Protection Act and pursuant to the Council of Environmental Quality regulations 40 Code of Federal Regulations (CFR) 1500 – 1508

Contents

1.0 Purpose and Need for Project 1
- 1.1 Project Description 1
- 1.2 Purpose and Need of the Project 3
  - 1.2.1 Currently Exceeding Capacity 3
  - 1.2.2 Projected Design Criteria through 2023 4
  - 1.2.3 Environmental Quality Sensitivity 5

2.0 Alternatives to the Proposed Action 7
- 2.1 Development of Reasonable Alternatives 7
- 2.2 CWAC Recommendations of Preferred Alternative 8

3.0 Affected Environment/Environmental Consequences 13
- 3.1 Land Use/Farmland/Formally Classified Land 14
  - 3.1.1 Affected Environment 14
  - 3.1.2 Environmental Consequences 16
  - 3.1.3 Measures to Minimize Harm 16
- 3.2 Floodplains 17
  - 3.2.1 Affected Environment 17
  - 3.2.2 Environmental Consequences 17
  - 3.2.3 Measures to Minimize Harm 18
- 3.3 Wetlands 18
  - 3.3.1 Affected Environment 18
  - 3.3.2 Environmental Consequences 18
  - 3.3.3 Measures to Minimize Harm 19
- 3.4 Cultural Resources 19
  - 3.4.1 Affected Environment 19
  - 3.4.2 Environmental Consequences 20
  - 3.4.3 Measures to Minimize Harm 21
- 3.5 Biological Resources 21
  - 3.5.1 Affected Environment 21
  - 3.5.2 Environmental Consequences 22
  - 3.5.3 Measures to Minimize Harm 22
- 3.6 Water Resource 22
  - 3.6.1 Affected Environment 23
  - 3.6.2 Environmental Consequences 24
  - 3.6.3 Measures to Minimize Harm 25
- 3.7 Coastal Resources 25
  - 3.7.1 Affected Environment 25
  - 3.7.2 Environmental Consequences 26
  - 3.7.3 Measures to Minimize Harm 26
- 3.8 Social and Economic Issues 27
  - 3.8.1 Affected Environment 27
  - 3.8.2 Environmental Consequences 29
  - 3.8.3 Measures to Minimize Harm 30
- 3.9 Aesthetics 30

3.9.1 Affected Environment 30
3.9.2 Environmental Consequences 31
3.9.3 Measures to Minimize Harm 32
3.10 Transportation 32
3.10.1 Affected Environment 32
3.10.2 Environmental Consequences 32
3.10.3 Measures to Minimize Harm 33
3.11 Air Quality 33
3.11.1 Affected Environment 33
3.11.2 Environmental Consequences 34
3.11.3 Measures to Minimize Harm 34
3.12 Noise 35
3.12.1 Affected Environment 35
3.12.2 Environmental Consequences 36
3.12.3 Measures to Minimize Harm 37
4.0 Proposed Mitigation Measures for the Action Alternative 39
5.0 Correspondence 41
6.0 Figures 43
7.0 References 45

1.0 Purpose and Need for Project

The City of Blaine, Washington (City) requires a new wastewater treatment facility to address the anticipated growth in population and wastewater flows over the next 20 years. The City of Blaine is located in the northwestern part of Washington State, directly adjacent to the United States - Canadian border along US Interstate 5 (I-5). The City surrounds Drayton Harbor, which divides the incorporated area into two parts. Semiahmoo Spit and majority of Birch Point lie west of Drayton Harbor, while the remaining portion of the City, including about two square miles of business and residential area, is east of the harbor (see Figure 1-1).

The City's existing wastewater treatment plant, located west of Drayton Harbor on Semiahmoo Spit, began operation in 1980 (see Figure 1-1). In 1994, through the adoption of a General Sewer Plan and the *City of Blaine Wastewater Facilities Engineering Report* (Brown & Caldwell, 1994), it was decided that a new treatment plant was required. The construction of new treatment facility began in 1999. During excavation of the expansion area, sensitive Native American artifacts were identified, and as a result, the project ceased. The existing treatment plant site on Semiahmoo Spit is no longer considered a feasible long-term treatment site. Since this decision, interim improvements have been made to improve capacity in the short term until a new site can be identified and approved for construction. An update to the City's General Sewer Plan in 2004 included a detailed alternatives analysis to recommend a new location for the wastewater treatment facility.

1.1 Project Description

The proposed project under evaluation is the development of a new wastewater reclamation facility (WRF) to replace the City's existing treatment plant at Semiahmoo Spit. The new Lighthouse Point Water Reclamation Facility would be located within the currently undeveloped Marine Park, along Marine Drive (see Figure 1-2). This location takes advantage of existing conveyance infrastructure to minimize environmental impact and cost. The proposed name reflects the fact that, in the near future, the city plans on installing a mock lighthouse as an educational facility adjacent to the project site. The facility would include all aspects of wastewater treatment except the outfall and disposal of solids. Discharges of treated effluent would continue at the present outfall location offshore of the existing treatment plant, consistent with current NPDES permit (Permit No. WA-002264-1) for discharge into Semiahmoo Bay. The digested solids would be transported by truck to Tjolker Farms for disposal, as they are at the existing treatment plant.

The facility is proposed as an approximately 23,000-square-foot, enclosed building that would contain facilities for preliminary treatment, secondary treatment, disinfection, and solids handling. Figure 1-3 shows a preliminary site plan of the wastewater reclamation facility. The site currently contains abandoned wastewater treatment equipment, which would be removed as part of this project. The WRF is planned as a two-story building with the bottom floor underground, resulting in only one-story visible above ground.

TABLE 1-1
Preliminary Design Criteria for the Proposed Water Reclamation Facility

Process Units	Design Criteria
Preliminary/Primary Treatment	
Grit Removal	(2) Vortex Type, 3.1 mgd (ea.)
Fine Screens	(2) 2-mm Rotary Mechanical, 3.1 mgd (ea.)
Secondary Treatment	
Number of Treatment Trains (Design / Future)	(2-Trains / 2- Trains)
Anoxic Basins	1 per Train, 26,300 gal.
Anoxic Mixing System	2 per Basin, Submersible Mixer
Aeration Basins	2 Reactors per Train, 131,300 gal
Aeration System	Fine Bubble Diffused Aeration
Membrane Basins	(3) Cassettes per Train, Vol. 15,500 gal.
Membrane Aeration System	(3) Air Scour Blowers
Permeate Pumps	(3) Vacuum Type, 1,400 gpm (ea.)
Recirculation Pumps	(2) Axial-Flow Type, 700 gpm (ea.)
Waste Activated Sludge Pumps	(3) Solids Handling Centrifugal, 20 gpm (ea.)
Disinfection System	
UV Disinfection	2 Channels, Low Pressure, 3.1 mgd (ea.)
Solids Treatment	
Waste Sludge Storage	(1) 20,000 gal. Tank, (1) Submersible Mixer
Sludge Thickening System	(1) 1-Meter Gravity Belt Thickener, 150 gpm/meter
Thickened Waste Sludge Pumping	(2) Progressing Cavity Pumps, 50 gpm (ea.)
Thickened Waste Sludge Storage	(1) 20,000 gal. Tank, (1) Submersible Mixer
Chemical Systems	
Sodium Hypochlorite Storage	(1) _____ gal Tank
Sodium Hypochlorite Pumping	(2) Chemical Metering
Polymer Storage	(1) _____ gal Tank
Polymer Pumping	(2) Chemical Metering
Odor Control Systems	
Influent Lift Station Odor Control	Carbon System
Headworks Odor Control	(1) Chemical Scrubber, 12,000 cfm
Solid Process Odor Control	(1) Chemical Scrubber, 12,000 cfm

In order to support functions and services of the facility, parking, service loading areas and administrative facilities would be included on the site. The proposed design also includes other enhancement features to integrate the WRF into the Marine Park location, such as a viewing deck on the rooftop, public restrooms, an enhanced parking lot, and appropriate

landscaping. It is estimated that an approximate area of up to 3 acres may be required for the entire site plan.

1.2 Purpose and Need of the Project

The City of Blaine is planning for an efficient, cost-effective wastewater reclamation facility to serve existing and planned growth through 2023 in a manner that provides for economic development, leverages progress already made, protects water quality, and is community-friendly. The current wastewater treatment facility (WWTF) will reach its capacity and the end of its service life within five years under the No Action Alternative.

The City's 2004 General Sewer Plan determined that the current WWTF cannot be expanded to meet the future requirements of the City of Blaine and Urban Growth Area (UGA). Due to the sensitive archaeological findings at the existing site, the City has entered into an agreement with the Lummi Indian Nation to remove the existing WWTF once a new facility on a new site is operational.

1.2.1 Currently Exceeding Capacity

The Washington State Department of Ecology (DOE) requires that wastewater utilities plan for maintaining adequate capacity for their treatment facilities. The existing facility exceeded DOE's limit of 85 percent of its capacity for maximum month influent flows in 2002. According to 2003 data collection, flows have continued to increase since that time, and the facility is rapidly nearing its process capacity for organic and solids loading. At least 21 non-permitted discharges have occurred within the City's system during the past 10 years, ranging in volume from several thousand to over 250,000 gallons. These have resulted in the DOE issuing several Notices of Violation (NOVs), two separate Notices of Penalty Incurred and Due (No. DE97WQ-N115 and No. DE 99WQ-N304), and an Administrative Order (DE99WQ-N392), which requires Blaine to take immediate action to stop overflows. The City has entered into two settlement agreements through the Pollution Control Hearings Board that provide an implementation schedule with milestones for completion of a facility plan and environmental review, design, and construction of a replacement treatment plant.

To reduce the immediate risk of overflow, the City has installed a temporary system involving bladders and reuse of an old storage structure. The bladders have a less than 10-year life expectancy and do not provide adequate volume should the City experience a major (10+ year design frequency) storm. The operation of this temporary system is included in a *Wet Weather Emergency Plan* developed by the City in 2000 to prevent further overflows. The City has drafted and submitted to DOE the *Lift Station #1 and Marine Drive Headworks Facility Plan*, which is currently being finalized to make necessary improvements to the existing system. In addition, the City is installing an equalization storage facility along Marine Drive to minimize effects of wet weather peak conditions on the existing and future treatment facilities. This is the first of three phases of major capital improvements to resolve the pending issues related to wastewater treatment for the City of Blaine. The No Action alternative would not satisfy DOE and NPDES permit criteria on a routine basis for over 5 years from 2002.

1.2.2 Projected Design Criteria through 2023

The planning horizon for a new WRF is to meet conditions for the next 20 years, or through the year 2023. The hydraulic design capacity of the water reclamation facility has been estimated for the 2023 projected peak hour capacity, and the treatment process capacity is based on the 2023 projected maximum month average day conditions. The annual average daily influent wastewater flow and maximum month average daily influent wastewater flow at the Blaine WRF for the 2023 design criteria were projected from influent data for the existing treatment plant from 1998 to 2003. The general trend of this data indicates a steady increase in influent wastewater flow over the 5-year period. Anticipated wastewater flow projections in 2023 are determined from population growth factors and expansion of sewered areas. Table 1-2 shows the projected annual percent increase in population for the City of Blaine; the 2004 General Sewer Plan contains additional information on how future service area population and wastewater flows were estimated.

TABLE 1-2
City of Blaine Annual Projected Population Growth Rates

Location	2002-2007	2007-2012	2012-2017	2017-2022
Central Blaine	0.9%	0.9%	0.8%	0.7%
East Blaine	2.9%	2.9%	3.0%	3.4%
West Blaine	9.7%	6.3%	4.1%	3.3%

Source: *City of Blaine Population Growth Allocations 2002-2022*

Table 1-3 shows the hydraulic capacity needed for the new WRF in 2023, based on historical average annual conditions, projected future growth, and/or other factors as noted in the table.

TABLE 1-3
City of Blaine 2023 Hydraulic Design Criteria

	Minimum Flow (mgd)	Annual Average (mgd)	Maximum Month (mgd)	Dry Weather Peak Hour (mgd)	Wet Weather Peak Hour (mgd)
Central and East Blaine, and East Blaine UGA	0.31	0.77	1.11	1.39	5.50[1]
West Blaine	0.09	0.23	0.39	0.41	1.64[2]
City of Blaine Total	0.4	1.00	1.5	1.80	7.14

1. Central Blaine, East Blaine, and East Blaine UGA wet weather peak hour based on the 2023 baseflow and 25-year storm, 24-hr duration
2. West Blain wet weather peak hour flow is an estimated value based on the peaking factor from the Central Blaine, East Blaine, and East Blaine UGA annual average to wet weather peak hour flow (7.14)

mgd=million gallons per day

As noted in Table 1-3, the peak flow in the City of Blaine's sewer system occurs during wet weather conditions. This is because rainwater enters the sewer system during storms through surface flow into manholes or storm drains (known as inflow) and/or through cracks in below-ground sewer pipes (known as infiltration). The new WRF would be designed to treat flows from the Central Blaine service area up to the level expected to occur during the 25-year storm. This amounts to approximately 3,820 gallons per minute, or 5.50 million gallons per day, which is over 7 times annual average daily flow during dry weather. As previously mentioned, flow equalization storage is being installed on Marine Drive to address this large difference between dry-weather and wet-weather flows.

Based on these factors, the new WRF would be designed with a capacity of 3.1 mgd. A reserve capacity would be included at the WRF to allow for eventual treatment of flows from the City's entire service area.

1.2.3 Environmental Quality Sensitivity

Other aspects of the project need concern the protection and eventual improvement of sensitive environmental conditions near the proposed project location. Marine Park is located on fill material adjacent to Drayton Harbor. Since 1995, the U.S. Environmental Protection Agency (USEPA) has included Drayton Harbor on its Clean Water Act Section 303(d) list of Impaired Water Bodies for unacceptably high levels of fecal coliform. This has resulted in restrictions on shellfish harvesting in an area historically known for its excellent shellfish. Currently, wastewater is transported by pipe across the mouth of Drayton Harbor between Lift Station 1 and the existing wastewater treatment plant. There is high public concern for any potential threat of wastewater spills to the harbor waters and aquatic area. Additionally, the harbor is planned to be the focal point for continued economic development for the City. It is easily visible from I-5, which connects United States with Canada and the symbolic Peace Arch Park at the border crossing. This prominent entry increases the visual sensitivity of this environment and its surroundings.

The new facility would address these issues in several ways. First, it is part of a multi-phase water quality improvement program that would eventually reduce eliminate the need to pump raw sewage across the mouth of Drayton Harbor. Second, it proposes to treat wastewater to a much higher level than the existing facility through use of a membrane technology that removes an extremely high level of solids and pathogens. This would enhance water quality in Semiahmoo Bay, another important aquatic resource. The facility would be designed to provide improvements to Marine Park and an attractive visual focus for this important and visible area of downtown Blaine. The alternatives analysis process used to identify the new site included preservation of water quality, enhancing livability, and minimizing environmental impacts as some of its primary objectives. Hence, planning for this site has incorporated many measures to protect and enhance environmental quality.

2.0 Alternatives to the Proposed Action

2.1 Development of Reasonable Alternatives

The evaluation of alternatives for Blaine's future wastewater treatment was accomplished through a structured decision process. In order to ensure that the final decision would represent the priorities of the City's stakeholder groups, the Blaine Citizen's Wastewater Advisory Committee (CWAC) was formed to help guide criteria development, alternative screening, and decision-making on the preferred alternative. The CWAC was appointed by the City Council in May 2003. The charge of the committee, as agreed to at its first meeting was to provide guidance to the Blaine City Council on future wastewater treatment. Specifically, the CWAC worked to fulfill this purpose by:

- Providing ongoing communication and input for the duration of the siting process
- Assisting in outreach for the siting process to ensure that stakeholders in Blaine had the necessary information and opportunities to participate
- Ranking, in order of preference, preferred treatment solutions (including siting considerations) that represented the best interests of the City, given the CWAC's assessment of community values and guiding principles
- Identifying the critical issues for each of the feasible alternatives and the specific features that the community would like to see incorporated into the design
- Serving as an advocate for the project and the process in external communications and organizations

Members of the CWAC represented a broad cross-section of the Blaine community, including neighborhood, business, civic, and political interests, as well as a representative of the Lummi Nation. In addition to being involved in the CWAC process, the City had three informal meetings with the Lummi to provide regular status updates and discuss the progress of this project.

The decision process that the CWAC developed and applied used a set of decision criteria grouped under five overall objectives for wastewater treatment. These criteria were:

- Safeguard the beneficial uses of marine waters to support fish, wildlife and shellfish harvest
- Protect and enhance community livability
- Meet other non-technical community objectives
- Meet growth and development requirements in a timely fashion
- Ensure highest constructability, operability, reliability and cost efficiency

Fourteen alternatives for the treatment of the City of Blaine's wastewater were initially developed for evaluation. The locations of each alternative are illustrated in Figure 2-1. The CWAC evaluated each alternative against the weighted objectives and criteria in three rounds over the course of two meetings. To allow values and benefits to be weighted

separately from costs, cost effectiveness was the last criterion applied. Table 2-1 briefly describes each alternative and, for those not chosen, why they were not selected.

2.2 CWAC Recommendations of Preferred Alternative

As a result of the CWAC's evaluation, Alternatives 2, 10, and 14 were recommended to the City Council for further consideration in October 2003 The City held a public meeting on October 8, 2003 to gather additional input and comments on the alternatives and the evaluation process. Information on the alternative evaluation process, including scoring results from the three rounds of evaluation, was provided at these meetings.

The Council concurred with the CWAC's recommendation, and determined that Alternative 10—conveyance of Blaine's wastewater flows to the Greater Vancouver Regional District's Annacis Island Treatment Plant—provided the best ratio of cost to benefit. Accordingly, the Council directed staff to proceed with developing a memorandum of agreement that would lead to a sewer service contract with the City of Surrey, British Columbia, which would convey Blaine's flows to the Annacis Island facility. However, in early November 2003, the City received a letter from the Greater Vancouver Sewerage and Drainage District stating that this option was not available to the City of Blaine.

Based on this feedback, the City concluded that the alternative of building a new WWTP on Marine Drive should be carried into facility planning. To refine this alternative, the City held a design charrette with representatives of the CWAC, the Lummi Indian Nation, the Port of Bellingham, the Department of Ecology, and staff from various departments of the City of Blaine. The charrette was designed to determine how a wastewater treatment facility might be integrated into existing development plans for the Marine Drive area, as well as which of several potential sites on Marine Drive would best support the community's needs and could feasibly fit a new treatment facility.

The charrette participants selected a preferred site on the south side of Marine Drive, on property currently owned by the Port of Bellingham. However, the Port subsequently determined that use of this site for a treatment plant would negatively affect its plans for future development on this property. In light of the Port's decision, on April 12, 2004, the Blaine City Council unanimously approved the use of a City-owned property on Marine Drive as the location for the future wastewater treatment plant (refer to Figure 1-2).

The selected alternative includes one plant at Marine Drive that will serve East and Central Blaine, with a later planning decision to be made regarding the treatment of flows from West Blaine. Until the solution for treatment of West Blaine flows is determined, these flows would continue to be treated at the existing WWTP.

TABLE 2-1
Alternatives

	Alternative	Alternative Description	Reason for Elimination
Marine Drive Alternatives	Alt. #1	Build one new plant in Central Blaine on Marine Drive. Pump untreated West Blaine flow through a new pipeline under the harbor entrance to the new plant and pump treated flow to the existing outfall at the site of the existing WWTP.	Potential threat to water quality because alternative involved conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor.
	Alt. #2	Install two new plants, a larger one on Marine Drive and a smaller one in West Blaine. Combine the plant effluents and use the existing outfall at the site of the present WWTP.	This alternative was selected for implementation using a phased approach.
	Alt. #3	Build one new WWTP in Central Blaine on Marine Drive, with the plant effluent being discharged through the existing outfall. The untreated West Blaine flow would be conveyed to the Birch Bay Water and Sewer District WWTP.	This alternative was not selected because of the perceived political difficulty and high capital expense of a regional conveyance and treatment solution with the Birch Bay Water and Sewer District.
Dakota Creek Alternatives	Alt. #4	Build one new membrane bioreactor plant with the plant effluent discharged to a shallow, freshwater outfall on Dakota Creek.	Perceived potential threat to water quality of conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor, along with water quality issues associated with discharge into Dakota Creek and the difficulty of permitting such a discharge. High capital cost and the lengthy schedule implications of siting a new outfall location.
	Alt. #5	Build a treatment system along Dakota Creek utilizing a natural treatment system such as constructed wetlands.	Perceived potential threat to water quality of conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor, along with water quality issues associated with discharge into Dakota Creek and the difficulty of permitting such a discharge. High capital cost and the lengthy schedule implications of siting a new outfall location.

TABLE 2-1
Alternatives

	Alternative	Alternative Description	Reason for Elimination
West Blaine Alternatives	Alt. #6	Build one new conventional plant on the West Blaine uplands and use the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	Potential threat to water quality because alternative involved conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor.
	Alt. #7	Build one new conventional plant on the West Blaine lowlands and use the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	Potential threat to water quality because alternative involved conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor.
	Alt. #8	Build one new conventional plant on Semiahmoo Spit and use the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	Perceived potential threat to water quality of conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor. High capital cost and the lengthy schedule implications for siting a new outfall location. High potential for discovering cultural resources during excavation on Semiahmoo Spit.
	Alt. #9	Build one new conventional plant on the West Blaine uplands and discharge from a new deep, saltwater outfall at Birch Point. Pump untreated East Blaine flow to the new treatment plant.	Potential threat to water quality because alternative involved conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor.
Conveyance to Others Alternatives	Alt. #10	Build force main to City of Surrey and convey Blaine wastewater to GVRD's Annacis Island plant from new lift station in Central Blaine. Pump untreated West Blaine flow to new East Blaine lift station.	Not selected because the Greater Vancouver Sewerage and Drainage District was not interested in changing legislation that would allow for treatment in Canada.
	Alt. #11	Separately pump East Blaine and West Blaine flow to Birch Bay for treatment in an expanded Birch Bay WWTP.	This alternative was not selected because of the perceived political difficulty and high capital expense of a regional conveyance and treatment solution with the Birch Bay Water and Sewer District.
East Blaine Upland Alternatives	Alt. #12	Build one new conventional plant on the East Blaine uplands and use existing outfall.	Potential threat to water quality because alternative involved conveying untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor.
	Alt. #13	Build one new conventional plant in the Blaine commercial/industrial area and use existing outfall.	This alternative had high capital costs compared with other equally viable alternatives.

TABLE 2-1
Alternatives

	Alternative	Alternative Description	Reason for Elimination
Additional Alternatives	Alt. #14	Build one new WWTP in West Blaine uplands and convey East Blaine flow to Annacis Island.	This alternative had high capital and annual costs, and would also have required changes in legislation to allow treatment of Blaine wastewater in Canada (see Alternative 10).

3.0 Affected Environment/Environmental Consequences

Section 3 describes the existing environmental, social, and economic setting for the areas affected by the No Action and the Build Alternatives. This report has been prepared according to the Rural Utilities Service (RUS) Bulleting 1794A-602, *Guide for Preparing the Environmental Report for Water and Waste Projects*, revised March 2001. For each resource evaluated, the project area is generally the northwest end of Marine Drive, including a portion of Marine Park (refer to Figure 1-2 and 1-3, which delineate the proposed project area and the parameters for construction activity). The area affected is primarily limited to the proposed WRF site location of approximately 3 acres, with no other related construction areas, although a larger context may be described as necessary to accurately evaluate the resource. The discussion covers data, information, issues, and values that have a bearing on the possible impacts, and mitigation measures.

Data collection involved requesting data from key resource agencies, reviewing the Wastewater Facility Plan, visiting the site, and gathering key data from pertinent web sites. All correspondence with regulatory agencies is documented in chronological order in Section 5, and Section 4 provides a summary of all proposed mitigation measures. No technical reports were prepared in support of this document. Due to the nature of this project, the proposed site location, and the technology being proposed, the analysis concluded that the following resources would not be affected:

- Important Farmlands, Prime Rangeland and Forest Land
- Formally classified lands
- Floodplains
- Wetlands
- Cultural Resources
- Socio-economic/Environmental Justice
- Biological Resources

The following resources could experience effects, either beneficial or negative, during construction or operation of the proposed project:

- Land use, park and recreational resources
- Water quality
- Coastal resources
- Visual quality
- Air quality
- Noise

This section includes discussions of direct, indirect and cumulative impacts on each resource for both the No Action and Action alternatives. In evaluating cumulative impacts, consideration was given to the history of how the site was built up as fill from solid waste disposal and the dredging of the Blaine Marina. In the present, a number of smaller projects are considered, including the boardwalk along the shoreline of the Drayton Harbor, improvements to the wastewater and stormwater utility lines, and the lighthouse that is planned near the proposed WRF. All of the present projects are very short-term construction projects with limited impacts, and therefore cumulative impacts are minimal in nature.

3.1 Land Use/Farmland/Formally Classified Land

This section describes the affected environment and anticipated impacts on land use, including farmland and formally classified land resources, as a potential result of the implementation of the proposed action. Community plans are developed to ensure economic, social and physical health, as well as the safety and welfare of the community. This section reviews consistency with adopted plans, compatibility with current and proposed land use, and potential adverse effects on community facilities. Community impacts may include intrusion in a neighborhoods or adverse effects to schools, pedestrian/bicycle trails, and key community facilities. Because the project area is a spit of land created by the placement of fill in Semiahmoo Bay, the area does not contain viable farmland resources, nor are there any classified lands within the project area.

3.1.1 Affected Environment

The proposed project location is within the city limits of Blaine. The north city limits of Blaine also doubles as the international boundary with Canada. Blaine's downtown is located less than one mile south of the border crossing, east of Drayton Harbor and Semiahmoo Bay. Access to the downtown area is via the first interchange on I-5 south of the Canadian border. The interchange connects to Marine Drive, Peace Portal Drive and D Street. The proposed project site is accessed via Marine Drive, which extends westward from downtown to the Blaine Marina on Drayton Harbor.

The downtown area, which parallels the Drayton Harbor shoreline on a bluff. The, includes a mix of residential, commercial, manufacturing, and public facilities. The City is planning to build a pedestrian boardwalk between the downtown and the Drayton Harbor shore that would be approximately 400 feet above the water's edge (City of Blaine, 2004).

A Burlington Northern Santa Fe (BNSF) Railroad line runs along the shoreline just behind the downtown area with an at-grade crossing at Marine Drive. Marine Drive provides access to properties owned by the Port of Bellingham, which include the Blaine Marina and several other light-industrial buildings on the south side, and to the city-owned Marine Park on the north side. The land along both sides of Marine Drive is fill placed during the original dredging of the marina and during the operation of a solid waste landfill, now closed. This spit of land, together with Semiahmoo Spit, divides Drayton Harbor from Semiahmoo Bay; the mouth of the harbor is between the two spits (refer to Figure 1-1).

The Blaine Comprehensive Plan, as amended in 1999, sets the goals and objectives to direct future growth and economic development for the City. The current land use and zoning designation of the project area is Marine-Commercial (MC), which is included in the manufacturing category (Blaine Comprehensive Plan, 1999; refer to Figure 3-1). The current

shoreline designation for the project area is Urban, which permits a wide variety of development. Public utilities uses, such as the WRF, are permitted according to the Marine Commercial zone (BMC 17.16.020).

Table 3-1 lists list several goals from the Blaine Comprehensive Plan related to land use activities surrounding the project area.

TABLE 3-1
Applicable Goals from the Blaine Comprehensive Plan, 1999

Chapter and Goal #	Goal Description
Chapter 4, Goal 2	To maintain the small town character of the City of Blaine, while allowing sufficient growth in the population and tax base to help finance infrastructure, public services and amenities.
Chapter 4, Goal 4	To protect scenic beauty, water quality, wildlife habitat areas, open spaces and cultural resources which contribute to the quality of life and give the Blaine area a rural character.
Chapter 4, Goal 6	To implement the City of Blaine Comprehensive Plan, Blaine Urban Waterfront Development Plan, Whatcom County-wide Planning Policies and the Goals of the Washington Growth Management Act.
Chapter 7, Goal 4	Create and enhance a user friendly park system for the citizens and visitors of Blaine.

Source: Blaine Comprehensive Plan, 1999.

There are no important farmlands, prime forest lands, or prime range lands within the vicinity of the project area, since the land is fill and surrounded by bay waters on three sides. The soils in the area are classified as Blainegate-Urban land complex (NRCS, 2004). Blainegate is used for lawns, gardens, or parks, but due to the waterfront location, the soil is poorly drained because of the high water table.

Marine Park is an 8.6-acre park and recreational use area and the site of a proposed marine education center. Within the park are picnic tables, pedestrian and bike paths, an amphitheater and public restrooms (refer to Figure 1-2). The open space at the proposed site location is currently grass and gravel with paths and picnic tables nearby. It provides public access to both Semiahmoo Bay and Drayton Harbor.

Other than Marine Park, there are two parks within one mile of the site that are managed by other agencies outside of the City. Peace Arch State Park is 20 acres in size and is managed by the State of Washington. This is an international facility, located on both sides of the U.S./Canadian border, which commemorates the peace and friendship of the peoples of the two countries. The park is used for formal, organized functions as well as less formal uses by travelers, visitors and residents of Blaine (Blaine Comprehensive Plan, 1999).

Semiahmoo Park, which includes 20.27 acres of uplands and 274 acres of tidelands, is owned and managed by Whatcom County Parks Department. Located on the southwest end of Semiahmoo Spit across the Drayton Harbor from central Blaine, it contains beach areas and a museum showing the history of the Semiahmoo Indians and the fish processing industry (Blaine Comprehensive Plan, 1999).

3.1.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no direct land use impacts. However, continuing planned growth in the Blaine service area would contribute new wastewater flows to the existing treatment plant, causing it to exceed its design capacity within the next 5 years. As a result, the City would be unable to approve applications for new development, and Semiahmoo Bay and associated waters would be in jeopardy of contamination from treatment plant overflows and process upsets. The No Action Alternative would conflict with Goals 2, 4, and 6 from Chapter 4 of the Blaine Comprehensive Plan.

Action Alternative

Construction

The proposed WRF would be constructed on land that is currently used for Marine Park. During construction activities, a pedestrian and bicycle path in the park may be affected and possibly removed. Some passive recreational uses, such as jogging, birding, and walking, may also be affected during construction These effects would be temporary and short-term in nature.

Operation

The proposed WRF would permanently remove as much as 3 acres of parkland from Marine Park. However, the site plan has been developed with attributes (such as viewing deck, restrooms and enhanced parking with landscaping) that are complementary to and compatible with existing plans for park development, as well as and goal 4 from Chapter 7 of the Blaine Comprehensive Plan. Indirectly, the proposed project provides the needed utility infrastructure to support the City's planned growth and development activities. In the cumulative sense, all improvements are contributing to the health and welfare of the City of Blaine to support land use planning objectives. The Action Alternative would support goals 2, 4, and 6 from Chapter 4 of the Blaine Comprehensive Plan.

3.1.3 Measures to Minimize Harm

TABLE 3-2
Proposed Mitigation Measures: Land Use Resources

		Mitigation	
Impact	**Impact Type**	**No Build**	**Build**
Moratorium on new development due to lack of WWTP capacity	Operation	No mitigation is possible	N/A
Reduced use of Marine Park	Construction	N/A	Provide announcements up to 3 months in advance to help notice recreationists. Provide pathway detours or fencing to ensure safety of construction site.
Removal of 3 acres of park land and associated recreational activities	Operation	N/A	Relocate existing pathway to ensure continued connectivity of path network. Follow through with plans to integrate park development goals into the WRF site, such as an enclosed, one story-above ground

TABLE 3-2
Proposed Mitigation Measures: Land Use Resources

Impact	Impact Type	Mitigation	
		No Build	Build
			building to reduce visual impacts, amenities such as restrooms or backboard to vary the types of recreational opportunities. Design facilities with marine themes to be compatible with planned park development.
Conflict between WRF building and park uses	Operations	N/A	Building will include restrooms, parking and amenities that enhance passive recreation in the park (such as a viewing deck, and relocated trail).

3.2 Floodplains

A floodplain is an area susceptible to being inundated from any source, usually a flat land area in the bottom of a river valley or adjacent to tidal lands. Construction within a floodplain is discouraged by the Federal Emergency Management Agency (FEMA) because of the potential to endanger both lives and property. Altering a floodplain by placing fill or excavating within it can change the natural floodplain boundary, causing flood impacts to properties otherwise outside of the floodplain. The 100-year floodplain boundaries within the project were inventoried in accordance with Executive Order 11988, which provides floodplain protection guidance for federal agencies. This was done through a review of available mapping and literature, field inspections completed by CH2M HILL, and interviews with the Blaine Community Development Department.

3.2.1 Affected Environment

The project site is a manmade spit of land that was once part of the tidal flats of Drayton Harbor and Semiahmoo Bay. Starting in the 1950s and continuing for approximately 25 years, the tidal flats were filled in with dredge materials from the marina and related construction debris; in addition, a portion of the area was the site of the City's municipal landfill. According to FEMA maps, the project site is not located within either a 100-year or 500-year floodplain, and no flooding has been known to occur there. Current mapping from FEMA classifies the area where the WRF would be located as Zone X, in which flood insurance is not required. Thus, this area is outside the jurisdiction of both FEMA and local agency regulations regarding floodplain protection.

3.2.2 Environmental Consequences

No Action Alternative

No direct, indirect, or cumulative impacts to local floodplains would occur under the No Action Alternative.

Action Alternative

No direct, indirect, or cumulative impacts to local floodplains would occur under the Action Alternative.

3.2.3 Measures to Minimize Harm

No mitigation would be required.

3.3 Wetlands

Wetland resources are protected by Presidential Executive Order 11990, "Protection of Wetlands," with regulatory oversight under Section 404 of the Clean Water Act, administered by the US Army Corps of Engineers (USACE). For this project, field observations of wetland hydrology, soils, and vegetation were recorded on field data sheets for each potential wetland site on January 25, 2005. Dominant vegetation was assessed visually and identified. Hydric soil evaluations were made using field observation for characteristics such as gleying, mottling, oxidized root zones, sulfuric odor, and moisture content. Soil-color evaluations were made using a *Munsell Soil Color Chart* (1998). Prior to the field visit, soils were researched using data from the USDA Natural Resources Conservation (NRCS, 1998), and the hydric soils were also reviewed while in the field. Wetland hydrology was visually assessed using indicators such as inundation, soil saturation, water marks, drift lines, waterborne sediment deposits, water-stained leaves, surface scouring, drainage patterns, and oxidized roots.

3.3.1 Affected Environment

The proposed WRF site is located in an area that was once tidal flats and has been filled in with dredge materials and construction debris beginning in the 1950s. The National Wetlands Inventory (NWI) maps do not indicate any wetlands within the project site limits. A wetland reconnaissance was performed to determine if wetlands and wetland buffers are located within the project site. Wetland conditions were not identified in the majority of the area, but a potential wetland may exist along the Semiahmoo Bay shoreline (refer to Figure 3-2).

The tidal flats that surround much of the project area are classified as Marine (M) and Estuarine (E) wetland systems. The marine system consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides. The estuarine system consists of deep water tidal habitats and adjacent tidal wetlands that are semi-enclosed by lands but have open, partially obstructed, or sporadic access to the open ocean, and in which open water is at least occasionally diluted by freshwater runoff from the land. The project would not include any in-water work and would have no impact on these wetland systems.

The soils in the project area are classified as Blainegate-Urban Land complex according to the NRCS. The native vegetation associated with this soil is mainly trees and shrubs, and the main use for the soil is lawns, gardens or parks. The soil has a high water capacity; the effective rooting depth is limited by a seasonal high water table, and runoff is usually very slow.

3.3.2 Environmental Consequences

No Action Alternative

No direct, indirect, or cumulative impacts would occur to any of the wetlands in the area.

Action Alternative

Construction

No wetlands or wetland buffers are near the proposed WRF proposed site, because the entire construction site is over 50 feet from the water's edge. This is outside the limits of the potential shoreline wetland shown in Figure 3-2 and well outside the marine and estuarine wetland systems of Drayton Harbor and Semiahmoo Bay. Therefore, no environmental consequences to wetlands are associated with the project.

Operation

The project would be constructed outside of any wetlands and associated buffers; therefore, no long-term direct, indirect, or cumulative impacts would be associated with the project.

3.3.3 Measures to Minimize Harm

No mitigation is required.

3.4 Cultural Resources

This section addresses potential effects to archeological, historical, and architectural sites (collectively known as cultural resources) associated with the development of the WRF. Federal laws protecting cultural resources include the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.) and the Advisory Council on Historic Preservation's (ACHP) implementing regulations, 36 CFR Part 800. Among its provisions, the Act established the Advisory Council on Historic Preservation and authorized the Secretary of the Interior to maintain a National Register of Historic Places. Section 106 of the Act requires that Federal agencies take into account the effects of their actions on properties that are listed on, or are eligible for listing on, the National Register.

Archaeological and historical resources within Washington are protected by both federal and state laws. The Washington State Office of Archaeology and Historic Preservation (OAHP) maintains a comprehensive inventory of properties within the state that are of known archaeological, historic, or cultural importance. Those structures or sites that are eligible or listed on the National Register of Historic Places (NRHP) or the State Registration of Historic Places (SRHP) are available on the Washington Information System for Architectural and Archeological Records Data website: http://www.oahp.wa.gov/pages/wisaardIntro.htm. This section summarizes those NRHP resources that are documented near the project area. During project design and permitting, the OAHP would be consulted to determine if there is the possibility for further historic or cultural resources to exist within the project site. In addition, the Lummi Nation would be consulted to determine whether any cultural resources of value to the tribe may be located within the project site.

3.4.1 Affected Environment

The area around the proposed WRF was originally inhabited by the Coast Salish Indians, as evidenced by the location of the Si'ke village on the Semiahmoo Spit. Blaine was first settled in 1856 and soon became the site of salmon canneries and logging activities located along the shoreline. Many of the facilities used by the industries were located in the project area, but were built up over the water on piers. In the early 20th century, a railway trestle was constructed over the tide flats along the alignment of what is now Marine Drive. As time

went by, the roadway replaced the railway trestle, although, as shown in Figure 3-3, the project site was still mostly tidelands. The City's municipal landfill operated between the 1950s and mid-1970s in the area to the east of the proposed WRF site. The site itself was filled in over the years, as shown in Figures 3-4 and 3-5, with construction debris and soils overlying dredged fill from the marina.

The City of Blaine Comprehensive Plan indicates that there are no homes in the project area on either the NRHP or State Registration of Historic Places, although there are homes within ½ mile of the proposed site location that may be eligible for listing. Preliminary investigation with OAHP was performed on December 2005 and identified the following three cultural resources in the area:

MV Plover. The MV Plover foot-passenger ferry was built in 1944 to transport cannery workers back and forth from Blaine and is the oldest passenger foot ferry in Washington State. It was listed on the NRHP on June 4, 1997, and is still in operation today as transport between downtown Blaine and Semiahmoo Spit. The ferry is moored in the Blaine Harbor at 245 Marine Drive, which is at the westernmost end of Marine Drive.

Peace Arch. The 67-foot Peace Arch, jointly maintained by the United States and Canada, is located in Peace Arch State Park at the US-Canadian border, over one mile from the proposed site location. The concrete structure was the inspiration of Sam Hill, railroad builder and industrialist. Construction was completed on September 6, 1921; the site was listed in the NRHP on December 13, 1996. The Arch commemorates the signing of the Treaty of Ghent in 1814 and the Rush-Bagot Agreement in 1817. Entered into by the King of England and President Monroe, these treaties provided for an unguarded United States/Canadian border from the Strait of Juan de Fuca to the Bay of Fundy.

Si'ke village with historic area called Tsi'lich. The specific location of this Coast Salish Indian village cannot be listed to protect the resource; however it is over 1 mile away from the proposed WRF location. The village is located on Semiahmoo Spit near the existing WWTP and was placed on the NRHP on June 30, 2000.

3.4.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, continued operation of the existing WWTP would result in continued activity in an area where culturally sensitive sites have been identified. The associated risk of further disturbance poses a threat to cultural resources, even though this alternative would not involve construction at the existing or the proposed site.

Action Alternative

Construction

The chronological photo history of the site (Figures 3-3 through 3-5) indicates that the site is man-made within the last 50 years; therefore, it is unlikely that culturally sensitive resources are present there. As a result, no impacts are expected due to construction. Before any construction and/or if any unknown cultural resources are found during construction, the OAHP would be notified to verify whether a Section 106 consultation would be necessary.

Operation

The WRF is not anticipated to have a negative impact on any of the known cultural resources in the area.

3.4.3 Measures to Minimize Harm

TABLE 3-3.
Proposed Mitigation Measures: Cultural Resources

Impact	Impact Type	Mitigation	
		No Build	Build
Ongoing potential at the existing WWTF site for effects on cultural resources	Operation	No mitigation is available	N/A
Potential for unidentified archaeological and cultural resources	Construction	N/A	If previously undocumented historic or prehistoric sites are encountered during construction work in the immediate vicinity would be stopped until the OAHP is contacted and the site is evaluated by an archaeologist. If such an evaluation results in the discovery of a site that is eligible for listing on the National Register, interagency coordination procedures would be followed to ensure that appropriate mitigation occurs.

3.5 Biological Resources

This section discusses the affected environment and potential effects that the proposed project would have on biological resources. The analysis was conducted to meet requirements of the Federal Endangered Species Act, Migratory Bird Treaty Act, Fish and Wildlife Coordination Act, and other provisions of the Washington Department of Fish and Wildlife regulations. Washington Department of Fish and Wildlife Habitats and Species maps in the vicinity of project site (included as Figures 3-6, 3-7 and 3-8 and 3-9) have been reviewed to determine if the project would have any impacts on any threatened or endangered species.

3.5.1 Affected Environment

The project site location can be described as a man-made landscape of park grass and gravel. There is no native vegetation or sensitive habitat. However, the project site provides some of the finest winter bird watching opportunities in the area. A number of species of birds flock to the area during migration or as a winter resting spot. Drayton Harbor and Semiahmoo Bay are classified as marine estuaries and provide food and shelter to a large variety of bird species during the winter months and during migration seasons; they have been designated as important bird areas in Washington State.

Marine Park offers birds ample space to rest and feed during the winter months. The intertidal area of Drayton Harbor is an estuary system receiving water from Dakota Creek and California Creek. The intertidal mud flats and eelgrass beds of Drayton Harbor provide

food and habitat for a variety of fish and invertebrate species including herring, surf smelt, and Dungeness crab. Drayton Harbor's estuarine wetland also provides habitat for harbor seals, and porpoises, and the harbor is also home to a wide variety of unique and colorful waterfowl, which attract many bird enthusiasts to the area.

There are no priority habitats or species within the proposed site. A glaucous winged gull colony is located in the near vicinity and the surrounding waters contain herring spawning areas and Dungeness crab habitat, but none of these species are listed or candidates for listing.

3.5.2 Environmental Consequences

No Action Alternative

In the short term, no impacts on any biological resources would result from the No Action Alternative. However, within the next 5 years, the existing WWTF is anticipated to be at or exceeding capacity for organic and solids loading. This is likely to result in additional non-permitted discharges, which would degrade habitat and water quality for water dependent wildlife species.

Action Alternative

Construction

Construction of the WRF would result in the loss of open land area, but much of this land is currently used as a parking lot and pedestrian trails, so loss of habitat is expected to be minimal. Although a few trees nearby may contain nests or perches for hunting, none have been identified to contain nests or perches for listed or candidate species. Construction activities would reduce the value of these features for other fowl.

Operation

There are no threatened or endangered species located within the proposed project area or within close proximity. The operation of the proposed project is not expected to have any long-term impacts on listed or candidate species, nor would the WRF building affect the glaucous winged gull, herring, or Dungeness crab habitat areas. The water quality improvements afforded by the proposed treatment process would benefit aquatic life in Semiahmoo Bay and Drayton Harbor, as well as other species that depend on these aquatic organisms for forage.

3.5.3 Measures to Minimize Harm

No mitigation is required for either alternative. In order to proceed with the Action Alternative, the USFWS and NOAA Fisheries may require that a pre-construction biological survey be conducted to ensure that conditions and presence of listed and/or candidate species have not changed.

3.6 Water Resource

Water resources include (1) wetlands, as regulated by USACE under Section 404 of the Clean Water Act (CWA); and (2) Waters of the United States (also defined by the USACE), including blue line streams, lakes, and other surface waters. Surface waters, wetlands, and associated channels are sensitive resource areas because they: (1) convey floodwaters, or by storing floodwater may attenuate downstream flooding risk; (2) typically provide important

species habitat, including wetland and riparian (streamside), and estuarine habitats; (3) provide direct pathways of contamination to downstream ecological or human resources, and the presence of wetland or riparian vegetation may provide cleansing of contaminants; and (4) provide locations for groundwater recharge. . As described in Section 3.3 above, a wetland reconnaissance was performed for this project in January 2005. No soil borings or water table tests have been done for this project to determine the existing surface water or groundwater quality.

3.6.1 Affected Environment

The source of drinking water for Blaine is from the Dakota Creek Watershed, a 30 square mile groundwater aquifer system located east of the City that drains to Drayton Harbor.

Water quality is an important issue to many of the residents within Blaine and the surrounding area. Drayton Harbor is listed on Ecology's 303(d) list of water quality impaired water bodies for unacceptable high levels of fecal coliform. Shellfish harvesting was prohibited in certain sections in 1995 and in 1999 was prohibited in the entire water body. Recently, portions of Drayton Harbor have been reopened for harvest, but are subject to restriction based on rainfall. There are many contributors to water quality issues in Drayton Harbor, including on-site septic systems, municipal wastewater discharges, agricultural practices, boats and marinas, stormwater runoff, and, wildlife populations.

In recent years, the City of Blaine has completed a number of projects to improve its sewer system and reduce water quality impacts on Drayton Harbor. They include:

- **City of Blaine Illicit Connections Project** - In 1999 conducted smoke and dye testing in some of the older portions of the wastewater collections system.
- **Replacement of the underwater sewer line (1996)** - Replaced the 10" diameter fiberglass force main sewer pipe that crosses under the mouth of Drayton Harbor with a 14" diameter ductile iron, segmented pipe because fiberglass pipe was failing and leaking.
- **Overflow storage** (2000) - Installed 4- 50,000 inflatable storage bladders at Lift Station # 1 on Marine Drive to provide additional storage for sewage during storm events/ overflow situations.
- **Inspection and repair of the sewer line along Marine Drive** – 2000/2001
- **Pressure testing of the Blaine sewer force main (2001)** – Underwater force main, across the mouth of Drayton Harbor, tested and passed.
- **National Pollution Discharge Elimination System (NPDES) permit review/renewal (2002)** – Pressure testing of the underwater sewer main and stricter requirements for monitoring were incorporated into the permit.
- **Marine Drive dye test (2003)** – This testing process indicated that the Blaine sewer system does not appear to be contributing to the high fecal coliform levels in Drayton Harbor.

3.6.2 Environmental Consequences

No Action Alternative

Under the No Action Alternative, the current WWTF may exceed its capacity and release non-permitted discharges that may negatively affect water quality.

Action Alternative

Construction

The project does not involve construction of any new discharge, outfall, or disposal facilities. The project would tie into a recently improved sewer conveyance line (see figure 1-2) and discharge through the existing outfall. NPDES construction stormwater regulations for sites less than 5 acres in size would apply.

Construction would not include working inside or within 50 feet of any water body. However, because the construction site is on fill material near the bay and the water table is relatively shallow, considerations must be made for potential seepage into the water table that could leach into the bay. All equipment fueling would be conducted off-site at approved fueling stations. All solvents and non-water-based liquids would be enclosed and managed over a plastic-lined area so as to minimize accidental hazardous material spills. Exposed earth would be minimized and/or managed through the use of best management practices to avoid erosion and sedimentation in nearby waters.

Operation

The proposed WRF would not have any impact on the Dakota Creek Watershed nor the associated aquifer. Operation would not involve a new outfall location; the existing permitted outfall can handle the additional capacity and has recently undergone improvements to ensure optimum discharge characteristics. The additional impervious surface created as a result of the project would drain to either a storm drain inlet or an onsite retention pond, rather than directly into surface waters.

The project's beneficial impacts during operation would outweigh any negative impacts. The quality of the discharge from the new WRF's membrane treatment process would be a significant improvement over the quality produced by the existing treatment plant. In addition, it is anticipated that the increased capacity of the WRF would allow more residents with on-site septic systems to be added to the sewer system, further improving water quality.

There may be a slightly higher level of stormwater runoff due to the increased impervious surface area created by the Action Alternative. However, the additional runoff would be minimal compared to the overall runoff generated within the drainage basin.

3.6.3 Measures to Minimize Harm

TABLE 3-4.
Proposed Mitigation Measures: Water Quality

Impact	Impact Type	Mitigation	
		No Build	Build
Non-permitted discharges due to exceeding WWTP capacity	Operation	No mitigation is available	N/A
Erosion and sedimentation	Construction	N/A	Develop an erosion and sedimentation control plan in compliance with phase II NPDES regulations prior to construction and implement best management practices.
Hazardous Material Spills	Construction	N/A	Protection measures would be in place to prevent any chemical spills from reaching the surrounding water bodies.

3.7 Coastal Resources

The Washington State Department of Ecology (DOE) is the lead agency for managing the state's shorelines under the state Shoreline Management Act, passed in 1971. The Act applies throughout the state, to all marine waters, submerged tidelands, lakes over 20 acres, and all streams with a mean annual flow greater than 20 cubic feet per second. Wetlands (marshes, bogs, and swamps) associated with the lakes, streams and marine waters are also included, as is a 200-foot wide shoreline area landward from the water's edge. The primary intent of the SMA is to ensure that "*...development of these shorelines...will promote and enhance the public interest.*" The Act directs that this goal shall be attained through both preservation of the shoreline "to the greatest extent feasible" through the protection of natural shorelines, and through encouragement of water-related and water-dependent uses. DOE's Shorelands and Environmental Assistance Program works with local governments and others to develop plans to maintain and improve shoreline quality while allowing for reasonable and appropriate shoreline uses.

3.7.1 Affected Environment

Blaine is located in Whatcom County, one of the 15 counties in Washington State included in the Coastal Zone Management System of Washington State. The coastal zone includes all lands and waters from the coastline seaward for three nautical miles. The coastline along the inland marine waters is located at the seaward limit of rivers, bays, estuaries, or Puget Sound. The shoreline around the project area is located in the Puget Sound Basin and is classified as a sheltered marine environment. Large numbers of birds migrate to Semiahmoo Bay and Drayton Harbor for breeding and resting during migration, and the water bodies are home to shellfish, crab, and a herring spawning area. All uses and activities within this area must comply with the policies of the Coastal Zone Management (CZM) System of Washington State and the regulations contained in the City of Blaine Shoreline Management Master Program (SMMP) adopted in 1996.

The SMMP shoreline classification for the project area is Urban Environment. The Urban Environment is defined in Blaine's Master Program as areas of existing high-intensity land use and/or areas designated for future urban uses that require a marine location or are marine-related. The proposed project would be consistent with regulations for developments in the Urban Environment. Before construction would be allowed to commence, a CZM approval would be required by the DOE, and the City of Blaine would review the project under its Shoreline Substantial Development Permit process to determine whether the project complies with all the policies and regulations in their SMMP.

The Coastal Barrier Resources Act and the Coastal Barrier Improvement Act are not applicable to this project.

3.7.2 Environmental Consequences

No Action Alternative

The WRF would not be constructed; therefore, no environmental consequences would occur.

Action Alternative

Construction

No construction would occur within the water bodies that surround the project site, but spills, erosion and sedimentation could occur during construction which may enter the water bodies. The potential for these impacts would be minimized through the use of best management practices, as mandated by the construction stormwater NPDES permit and local clearing and grading regulations.

Operation

The proposed project would not have any direct impacts on the coastal zone, and would contribute to improving water quality in Semiahmoo Bay as well as eliminating the potential for non-permitted discharges resulting from capacity exceedances at the existing WWTP. The project would also protect water quality by adding capacity that would allow septic system users the opportunity to connect to the sewer system.

3.7.3 Measures to Minimize Harm

TABLE 3-5.
Proposed Mitigation Measures: Coastal Resources

		Mitigation	
Impact	**Impact Type**	**No Build**	**Build**
Non-permitted discharges due to existing WWTP exceeding capacity	Operation	No mitigation is available	N/A
Erosion and sedimentation	Construction	N/A	Erosion control and spill prevention measures will be developed as part of the construction management plan and monitored during construction.

3.8 Social and Economic Issues

This section describes the existing social and economic conditions in the project area and analyzes how the proposed no Action and Action alternatives could affect community cohesion, economic stability, mobility, and public facilities. This section also addresses Executive Order 12898 regarding disproportionate effects on minority, low-income, and elderly groups. EO 12898 requires that Federally funded project prepare an environmental justice impact analysis if there is a likelihood that ethnic minorities, elderly, and low-income populations may bear disproportionate burdens of adverse environmental effects that may result from a proposed project.

3.8.1 Affected Environment

Population

The population of Blaine, according to the 2000 U.S. Census, is 3,770. The population of Blaine grew by 1,281 residents since the 1990 Census and by the year 2023 is anticipated to grow by 64 percent to 6,193 residents. Table 3-6 illustrates this projected growth in population. The majority of the residents are Caucasian. Other than those occasional boat owners that sleep over, there are no residents near the proposed project area. The nearest residents are located in the downtown area, over one-half mile from the project site.

TABLE 3-6
Existing and Projected Population for the City of Blaine

Location	2000	2003	2013	2023
Population	3,770	4,053	5,169	6,193
Increase over Census 2000	N/A	288	1,399	2,423
Percent Change	N/A	7.5	37	64

Source: *City of Blaine Population Growth Allocations 2002-2022*

TABLE 3-7
Population Ethnicity for the City of Blaine

Ethnic Group	Number of Residents	Percent of Population
Caucasian	3,307	87.7
Black or African American	45	1.2
American Indian and Alaska Native	43	1.1
Asian	158	4.2
Native Hawaiian and other Pacific Islander	25	0.7
Some other race	50	1.3
Two or more races	142	3.8
Hispanic or Latino (of any race)	164	4.4

TABLE 3-7
Population Ethnicity for the City of Blaine

Ethnic Group	Number of Residents	Percent of Population

Source: *US 2000 Census*

Economy, Employment and Income

Due to the proximity of Canada, the City of Blaine's economy of Blaine is closely tied to the Canadian economy. During the 1990s, the expansion in Blaine's economy was primarily based on retail sales and service. The businesses which rely on the Canadian shoppers tend to fluctuate with the Canadian dollar; when it loses value against the US dollar, business drops, and as the Canadian dollar rises, so does business. The three industries that provide the largest employment base within Blaine are retail trade, education and health services, and tourist associated services, such as art, entertainment, recreation, accommodations and food services, which in total make up over 40 percent of the employment base. Major employers include the Resort Semiahmoo and the Blaine School District. Table 3-8 illustrates employment by industry in Blaine. According to the 2000 census, the median household income in Blaine ($36,900) is lower then the median income for Whatcom County ($40,005).

TABLE 3-8
Employment by Industry in the City of Blaine

Industry	Blaine Number of Workers	Blaine (% of Population)
Agriculture, forestry, fishing and hunting, and mining	17	1.1
Construction	92	5.9
Manufacturing	178	11.4
Wholesale trade	64	4.1
Retail Trade	225	14.3
Transportation and warehousing, and utilities	79	5.0
Information	35	2.2
Finance, insurance, real estate, and rental and leasing	153	9.8
Professional, scientific, management, administrative, and waste management services	113	7.2
Educational, health and social services	239	15.2
Arts, entertainment, recreation, accommodation and food services	202	12.9
Other service	66	4.2
Public administration	105	6.7

Source: *2000 Census*

Community Facilities

Community facilities include a 38-acre school complex that serves grades 1 through 12, a community/senior center, a community library, and a public cemetery. These facilities are all located outside of the project area.

Environmental Justice

The project is not anticipated to pose disproportionately high and adverse human health or environmental effects to minority and low-income populations. The project site is located in an area zoned Marine Commercial, and no residential neighborhoods or homes are in the immediate vicinity. The closest residential units are located approximately one-half mile from the proposed project site. Census information from Census Tract 104.01, Block Group 1, which encompasses the project area, was compared to the census information from Blaine as a whole to determine if the general project area includes a disproportionate number of protected populations. . As shown in Table 3-9, the project area is quite similar to the City overall in its population characteristics

TABLE 3-9
Census Information Comparison

Census Category	Blaine	Census Tract 104.1 Block Group 1
Population	3,770	689
Caucasian	3,307 (87.7%)	606 (87.9%)
Hispanic or Latino (of any race)	164 (4.4%)	12 (1.7%)
Median Income	$36,900	$35,052
Individuals below the poverty level	567 (15.5%)	109 (15.8%)

Source: *US 2000 Census*

3.8.2 Environmental Consequences

No Action Alternative

There are no direct impacts associated with the No Action Alternative. However, by not constructing the WRF, Blaine would be faced with potentially restricting planned growth within the community, thereby adversely affecting both residential and business sectors of the local economy.

Action Alternative

Construction

Businesses and recreationalists may be inconvenienced by construction activities. Conversely, construction of the facility may have a short-term beneficial impact on the economy by using local labor and purchasing local materials. In addition, workers spend money in the local economy.

Operation

There are no direct impacts associated with the operation of the proposed WRF. The WRF may have an indirect beneficial impact on Blaine by allowing the City to promote growth and attract new residents and businesses to the area, as well as being able to further

promote tourism. The completed project would also have a positive effect on water quality, which could lead to an enhanced perception of quality of life in the area. No cumulative impacts are anticipated.

3.8.3 Measures to Minimize Harm

TABLE 3-10.
Proposed Mitigation Measures: Social and Economic

		Mitigation	
Impact	**Impact Type**	**No Build**	**Build**
Short-term inconvenience due to construction equipment on Marine Drive	Construction	N/A	Preparation of a public outreach plan to ensure that the effects of construction on the community are minimized and the community is aware of the activities in advance.

3.9 Aesthetics

Visual resources are the landscape features that the public values based on aesthetic and cultural mores. This section describes the visual qualities of the project area, the local policies that protect these resources, and the types of viewers that make one landscape more sensitive to change than others. It identifies the types and degree of impact of building a WRF, based on a consideration of the visual sensitivity of the views affected

3.9.1 Affected Environment

The proposed project location is visible from the sloped terrain around the bay, but is difficult to view from the Canadian border crossing and from the downtown area where the boardwalk is proposed (Figure 3-10). Both of these popular viewing areas have other obstacles that block the view of the proposed project site. Viewers can see Drayton Harbor and the Marine Drive area from I-5 as it approaches downtown Blaine, from Semiahmoo Spit, and from the marina and park facilities (refer to Figure 1-1 for a map of the general project area, and Figure 3-11 for a view from Semiahmoo Spit). A wide variety of people use the Marina and park facilities, including tourists, boaters, fishermen, park users, and birdwatchers. In addition, the Chamber of Commerce, restaurants, and other businesses are located along Marine Drive.

The City of Blaine considers Drayton Harbor a scenic focal point, as exemplified by the Urban Waterfront Development Plan, adopted in 1993. The community listed 11 strengths around which to create a revitalization plan, many of which built upon the waterfront and park area scenic resources. A boardwalk along the Drayton Harbor shoreline is featured on the Blaine web site. Therefore, Marine Park and its surroundings are a highly valued scenic resource. The Blaine Comprehensive Plan incorporates goals to protect these scenic resources, as exemplified by Chapter 4, goal 4 (see table 3-1 of this section).

Views from the proposed site are also highly scenic. They include Semiahmoo Bay (northwest), Peace Arch Park (northeast), and Blaine Marina (South). All of these views are considered scenic (refer to Figures 3-12, 3-13, and 3-14). There are also aspects of the site that

are not scenic, such as the remaining abandoned industrial equipment (refer to Figure 3-12) at the proposed project site, and unfinished portions of Marine Park, such as the gravel parking lot (refer to Figure 3-15, which shows the site location of the proposed WRF building). Opposite the proposed site location on Marine Drive, the Marina building is a two-story, pitched roof structure (refer to Figure 3-10).

3.9.2 Environmental Consequences

No Action Alternative

No negative or positive effects on the scenic quality of the project area would result under the No Action Alternative.

Action Alternative

Construction

The Action Alternative would result in short term impacts due to the presence of construction equipment and staging materials for 16 to 18 months during the construction period. The building would be built within 1-year, and the internal infrastructure and exterior site landscaping and parking development would continue over the following 6 to 8 months.

Operation

The proposed WRF is planned to be enclosed in a 23,000 square foot building split over two-stories. The bottom floor would be underground, thus reducing the overall bulk of the structure and resulting in a somewhat lower profile than the existing Marina Building. Viewers from downtown would not see the structure from the boardwalk. Community interest and concern for the visual impacts resulted in a charrette in 2003 to design the project to be compatible with its Marine Park location. Thus, many aspects of the design concept anticipate and avoid potential visual impacts (refer to Figure 3-16 for concept level drawings).

The WRF building would occupy and create a visual presence on land designated for park activities. However, the site would incorporate recreational opportunities, the abandoned industrial equipment would be removed, and enhanced parking and landscaping would improve the overall visual quality of the environment. The WRF building concept includes a viewing deck on the second story that would contribute recreational value of the park for sightseeing, bird-watching, and sunset viewing. The building is planned in conjunction with a future lighthouse structure, which is consistent with other parks on the Pacific Coast that have been built around light house locations. Also consistent with the park activities, public restroom facilities (not currently present at the park) would be incorporated into the WRF building plans. Finally, to soften the building and minimize disturbance to the park, landscaping and replacement pathways would be incorporated into the site design. This will enable the structure to blend into the environment and promote the marine-oriented atmosphere in the area. Therefore views to and from the site location would be preserved and enhanced, and there would be no conflict with community comprehensive planning goals.

Cumulatively, the proposed project and other planned projects, such as the boardwalk, the lighthouse, and removal of the industrial equipment on the site, would provide enhanced

viewing opportunities and improve the overall visual quality of the Blaine Marina and Marine Park.

3.9.3 Measures to Minimize Harm

TABLE 3-11.
Proposed Mitigation Measures: Aesthetics

Impact	Impact Type	Mitigation	
		No Build	Build
Visual disturbance due to equipment and construction activities	Construction	N/A	When possible, storage materials will be consolidated or located to minimize visual and recreational opportunities to minimize effects on park users. Equipment will be kept to a minimum during construction period.

3.10 Transportation

3.10.1 Affected Environment

Blaine is the location of two of the busiest border crossings between the US and Canada in the western United States. The two border crossings, one for passenger vehicles (Peace Arch) and the other mainly for truck freight (Pacific Highway) are located approximately one mile apart. The intersection of Marine Drive and Peace Portal Drive is immediately adjacent to a 4-point interchange with Interstate 5 (I-5). This interchange is the last off-ramp prior to entering Canada from the U.S. and provides access to Peace Portal Drive, which in turn provides access to Marine Drive and the project area. Peace Portal Drive is a state highway that provides access to the downtown area. The WRF would be located on Marine Drive, a dead-end two-lane two-way roadway. Marine Drive provides access to the Blaine Marina, a number of businesses related to the seafood industry, and Marine Park.

Whatcom Transit Authority provides bus service to Blaine. Currently there is one bus route serving Blaine (Route 70X, Blaine Express), and the closest transfer point is approximately one mile from the project site by Blaine City Hall. BNSF operates and maintains a railway line approximately one-half mile from the proposed project site. The railway mainly carries freight, but a daily Amtrak passenger train runs along the tracks. The nearest passenger stations are located in Bellingham to the south and Vancouver, British Columbia, to the north. The City of Blaine owns and operates a public airport with a 2,100 foot long asphalt runway located approximately two miles to the east of the project site. A paved trail alongside Marine Drive is one of few bicycle path facilities within Blaine.

3.10.2 Environmental Consequences

No Action Alternative

The No Action Alternative would not have any impacts on transportation.

Action Alternative

Construction

There may be a short-term increase in truck traffic on Marine Drive during construction of the project and the nearby interchange on and off of I-5. The number of heavy trucks and

associated construction vehicles would increase, but there should be no impact on overall traffic flow.

Operation

There may be as many as six City personnel visiting the site daily, as well as weekly truck deliveries associated with the WRF. However this additional traffic would be minimal and would not impose any impact to the existing transportation system. No indirect or cumulative impacts would be associated with the WRF.

3.10.3 Measures to Minimize Harm

TABLE 3-12.
Proposed Mitigation Measures: Transportation

		Mitigation	
Impact	**Impact Type**	**No Build**	**Build**
Conflicts between truck hauling and local traffic circulation.	Construction	N/A	Construction vehicles will remain on I-5 until the interchange that provides direct connection to the site, and stagger their operation to avoid peak circulation periods. Construction contractor will develop a construction route for trucks to minimize wear and tear on inadequate roads.

3.11 Air Quality

Air quality impacts may result from the construction and operation of a project. Short-term impacts would result from construction activities, while impacts associated with the operation of the proposed action could potentially affect air quality over the life of the project.

National air quality policies are regulated through the Federal Clean Air Act (CAA). Pursuant to this act, the USEPA has established national ambient air quality standards (NAAQS) for the following air pollutants (termed "criteria" pollutants): CO, ozone, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), PM_{10}, and lead. The act was amended in 1977 to require each state to maintain a State Implementation Plan (SIP) for achieving compliance with the NAAQS. In 1990, the act was amended again to strengthen regulation of both stationary and motor vehicle emission sources.

3.11.1 Affected Environment

The concentration of a pollutant in the atmosphere is dependent on the amount of pollutant released, the nature of the source and the ability of the atmosphere to transport and disperse the pollutant. The main determinants of transport and dispersion are wind, atmospheric stability or turbulence, topography, and the existence of inversion layers. Certain photo-chemically active pollutants such as NO_X and ROG react under the presence of sunlight and can cause elevated levels of ground-level ozone, or smog. Warm temperatures accelerate the creation of ground-level ozone and can exacerbate conditions of poor air quality.

The pollutants of primary concern when assessing the potential impacts of transportation-related activities are CO, ozone and PM_{10}. Increased traffic can affect regional air quality if emissions of ozone precursors (NO_X and ROG) from traffic are greater with the project than without the project. CO and PM_{10} concentrations can also accumulate near areas of heavy traffic congestion where average vehicle speeds are low. Therefore, emissions of CO and PM_{10} are of primary concern when assessing local air quality impacts.

3.11.2 Environmental Consequences

No Action Alternative

No effect would result from the No Build Alternative.

Action Alternative

Construction

Short-term impacts to air quality would result from emissions from equipment used during site preparation and project construction to perform activities such as clearing, grading, excavating, and demolition. These activities would involve the use of heavy duty off-road diesel and gasoline-powered equipment that would generate emissions of criteria pollutants, namely, oxides of nitrogen (NO_X), carbon monoxide (CO), particulate matter less than 10 microns in equivalent diameter (PM_{10}), sulfur oxides (SO_X), and reactive organic gases (ROG). In addition, PM_{10} would be generated from earth moving activities such as grading and excavating and from travel on unpaved surfaces.

Operation

Long-term impacts to air quality associated with the operation of a WRF would primarily result from emissions from motor vehicles coming to and from the facility. The volume of traffic generated for the operation of a WRF is not substantial enough to be measurable. Likewise, emissions resulting from the required power generation for electricity required for a build alternative is unlikely to be noticeable because it would not exceed the limitations of existing power sources for the Blaine community.

3.11.3 Measures to Minimize Harm

TABLE 3-13.
Proposed Mitigation Measures: Air Quality Resources

		Mitigation	
Impact	**Impact Type**	**No Build**	**Build**
Construction emissions	Construction	N/A	The following methods to reduce fugitive dust emissions are recommended under Rule 430 by the NCUAQMD: Cover open-bodied trucks when used for transporting materials likely to give rise to airborne dust. Use water or other dust palliatives for control of dust in construction operations, grading of roads, or the clearing of land. Apply water on dirt roads, material stockpiles, and other surfaces which can give rise to

	airborne dust. Promptly remove earth or other material from paved streets onto which earth or other material have been transported by trucking or earth moving equipment, erosion by water, or other means. These types of mitigation measures are proposed to control fugitive dust in the construction area. To mitigate emissions from heavy equipment operation, construction vehicles should be kept in proper running condition and operated to reduce equipment idle time.

3.12 Noise

Noise is defined as unwanted sound. There are several different ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. In this subsection, predicted noise levels are stated in terms of decibels on the A-weighted scale (dBA). Noise levels stated in terms of dBA reflect the response of the human ear by filtering out some of the noise in the low and high frequency ranges that the ear does not detect well. The A-weighted scale is used in most noise ordinances and standards.

The City of Blaine has established a nuisance ordinance (BMC title 8, chapter 10, section E), which restricts noise near residential property between the hours of 7:00 p.m. and 7:00 a.m. on weekdays; 6:00 p.m. and 9:00 a.m. on Saturdays or at any time on Sundays and nationally recognized holidays. The city manager (or designee) may grant a waiver of the above limitations to allow construction noise not later than 10:00 p.m. on weekdays or Saturdays or between the hours of 9:00 a.m. and 6:00 p.m. on Sundays or nationally recognized holidays. Such waivers are approved when deemed necessary to reasonably accommodate construction activities.

3.12.1 Affected Environment

The site is located adjacent to a wastewater lift station and across the street from a boat marina. Traffic volume is low near the proposed site. Low ambient noise levels result from traffic flow on I-5, which is between one-quarter and one-half mile away of the proposed site. Other noise sources include motors from boats using the marina. Overall, noise levels are low and compatible with the marina atmosphere.

For noise impacts, sensitive receptors are generally:

Residents: people who live in residences in the vicinity of the project (to the northwest, northeast, and southeast)

Recreationists: people who are using Drayton Harbor, the ferry, and Marine Park

Residents are considered to be sensitive receptors because noise can affect sleep and their general enjoyment of non-work hour leisure. The closest sensitive receptors are the occasional overnight boat owners. The only other residences are located in downtown

Blaine, one-half mile away, or on Semiahmoo Spit, over 2 miles feet away from the proposed project site.

Recreationists are considered to be a sensitive receptor as well. They generally value and are enjoying recreation in the context of the natural surroundings, with limited disturbance from motorized vehicles and construction. Recreationists' focus is usually on their surroundings while they are touring or relaxing. Recreationists include boaters, people at the park for picnics, and those who are viewing the harbor, jogging, sightseeing, or taking the ferry. The number of recreationists varies according to weather and season, but is generally higher during the weekend and summer.

3.12.2 Environmental Consequences

No Action Alternative

No effect would result from the No Build Alternative.

Action Alternative

Construction

Construction activities would increase noise levels substantially as compared to existing conditions. As indicated in Table 3-14, activities involved in construction would generate noise levels ranging from 82 to 86 dBA at a distance of 100 feet. Noise at several distances from various equipment is presented in Table 3-15. As shown in the table, noise levels decrease rapidly with distance from the noise source; as a result, noise levels at the nearest residential receptors one-half mile away are not expected to increase noticeably over existing conditions as a result of construction activities. Businesses on Marine Drive would be most likely to notice increased noise. The precise noise level would depend on the type, number and location of each piece of equipment operating and is expected to vary with construction phase.

TABLE 3-14
Construction Equipment Noise

Construction Phase	Loudest Equipment	Maximum Sound Level at 100 Feet (dBA)
Clearing and Grubbing	Bulldozer, backhoe	83 dBA
Earthwork	Scraper, bulldozer	85 dBA
Foundation	Backhoe, loader	82 dBA
Superstructure	Crane, loader	83 dBA
Base Preparation	Truck, bulldozer	85 dBA
Paving	Paver, truck	86 dBA

TABLE 3-15
Noise Levels from Common Construction Equipment at Various Distances

Construction Equipment	Typical Sound Pressure Level at 50 feet (dBA)	Typical Sound Pressure Level at 375 feet (dBA)	Typical Sound Pressure Level at 1,500 feet (dBA)
Dozer (250-700 hp)	88	70	58
Front End Loader (6-15 cu. yds.)	88	70	58
Trucks (200-400 hp)	86	68	56
Grader (13 to 16 ft. blade)	85	67	55
Shovels (2-5 cu. yds.)	84	66	54
Portable Generators (50-200 kW)	84	66	54
Derrick Crane (11-20 tons)	83	65	53
Mobile Crane (11-20 tons)	83	65	53
Concrete Pumps (30-150 cu. yds.)	81	63	51
Tractor (3/4 to 2 cu. yds.)	80	62	50
Unquieted Paving Breaker	80	62	50
Quieted Paving Breaker	73	55	43

Noise would also be generated during the construction phase by increased truck traffic on area roadways associated with the transport of heavy materials and equipment. Construction activities would be temporary in nature and are anticipated to occur during normal daytime working hours. Construction noise impacts could result in annoyance or sleep disruption if nighttime operations occur or if unusually noisy equipment is used.

Operation

The WRF would be designed with enclosed mechanical processes, and noise baffling would be used for any outdoor equipment. No perceptible noise beyond the building envelope is anticipated from the operation of the WRF.

3.12.3 Measures to Minimize Harm

TABLE 3-16.
Proposed Mitigation Measures: Noise

Impact	Impact Type	Mitigation	
		No Build	Build
Construction noise	Construction	N/A	Maintain compliance with the City noise ordinance, and minimize construction activities between 7 p.m. and 7 a.m. If night work is required, provide 24 hours advance notice to sensitive receptors. Haul trucks and other engine-powered equipment shall be equipped with mufflers that meet the minimum original equipment manufacturer

	specifications. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies. The City shall establish a telephone number for use by the public to report any significant undesirable noise conditions associated with the construction project. If the telephone is not staffed 24 hours per day, an automatic answering feature, with date and time stamp recording, shall answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained throughout the project.

4.0 Proposed Mitigation Measures for the Action Alternative

Land Use Resources		
Reduced use of Marine Park	Construction	Provide announcements up to 3 months in advance to help advise recreationists. Provide pathway detours or fencing to ensure safety of construction site.
Removal of 3 acres of park land and recreational activities	Operation	Relocate the pathway to ensure continued connectivity of path network. Integrate park development goals into the WRF plans, such as using an enclosed, one-story above ground building to reduce visual impacts and providing amenities such as restrooms or backboard to vary the types of recreational opportunities. Use marine design themes to integrate WRF with surrounding land uses and downtown waterfront planning.
Building will conflict with park uses	Operation	Building will include restrooms, parking, and amenities that enhance passive recreation in the park (such as a viewing deck and relocated trail).
Cultural Resources		
Unknown archaeological and cultural resources.	Construction	If previously undocumented historic or prehistoric sites are encountered during construction, work in the immediate vicinity would be stopped until the OAHP is contacted and the site is evaluated by an archaeologist. If such an evaluation results in the discovery of a site that is eligible for listing on the National Register, interagency coordination procedures would be followed to ensure that appropriate mitigation occurs.
Water Quality		
Erosion and sedimentation	Construction	Develop an erosion and sedimentation control plan in compliance with Phase II NPDES regulations prior to construction and implement best management practices.
Hazardous Material Spills	Construction	Protection measures would be implemented to prevent any hazardous materials from reaching the surrounding water bodies.
Coastal Resources		
Erosion and sedimentation	Construction	Erosion control and spill prevention measures will be developed as part of the construction management plan and monitored during construction.
Social and Economic		
Short-term inconvenience due to construction equipment on Marine Drive	Construction	Preparation of a public outreach plan to ensure that the effects of construction on the community are minimized and the community is aware of the activities in advance.
Aesthetic		
Visual disturbance due to equipment and construction activities	Construction	When possible, storage materials will be consolidated or located away from visual and recreational opportunities to minimize effects on park users. Equipment storage onsite will be kept to a minimum during the construction period.

Impact	Phase of Project	Mitigation
Transportation		
Conflicts between truck hauling and local traffic circulation.	Construction	Construction operations will avoid peak circulation periods for downtown traffic. A construction route for trucks will be developed to minimize wear and tear on inadequate roads.
Air Quality		
Construction emissions	Construction	The following methods to reduce fugitive dust emissions are recommended under Rule 430 by the NCUAQMD: Cover open-bodied trucks when used for transporting materials likely to give rise to airborne dust. Use water or other dust palliatives for control of dust in construction operations, grading of roads, or the clearing of land. Apply water on dirt roads, material stockpiles, and other surfaces which can give rise to airborne dust. Promptly remove earth or other material from paved streets onto which earth or other material have been transported by trucking or earth moving equipment, erosion by water, or other means. These types of mitigation measures are proposed to control fugitive dust in the construction area. To mitigate emissions from heavy equipment operation, construction vehicles should be kept in proper running condition and operated to reduce equipment idle time.
Noise		
Noise during evening hours	Construction	Maintain compliance with the City noise ordinance, and minimize construction activities between 7 p.m. and 7 a.m. If night work is required, provide 24 hours advance notice to sensitive receptors. Haul trucks and other engine-powered equipment shall be equipped with mufflers that meet the minimum original equipment manufacturer specifications. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies. The City shall establish a telephone number for use by the public to report any significant undesirable noise conditions associated with the construction project. If the telephone is not staffed 24 hours per day, an automatic answering feature, with date and time stamp recording, shall answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained throughout the project.

5.0 Correspondence

6.0 Figures

CHAPTER 1

1-1 Vicinity Map

1-2 Proposed Project Site

1-3 Preliminary Site Plan for the Wastewater Reclamation Facility

CHAPTER 2

2-1 Site Locations Alternatives Considered

CHAPTER 3

3-1 Land Use zoning

3-2 Wetlands map – Ask Brown about his sources

3-3 Aerials photograph of 1950's

3-4 Aerials photograph of 1970's

3-5 Aerials photograph of 2000's

3-6 Habitat and Species Maps

3-7 Habitat and Species Maps

3-8 Habitat and Species Maps

3-9 Habitat and Species Maps

3-10 View from Downtown at Proposed Boardwalk Location

3-11 View from Site from Semiahmoo Spit

3-12 View from Site towards Semiahmoo Bay

3-13 View from Site towards Peace Park

3-14 View from Site towards Blaine Marina

3-15 Site Location of WRF Building Size on Proposed Site Location

3-16 Preliminary Conceptual Drawing of the Proposed Lighthouse Point Water Reclamation Facility

7.0 References

City of Blaine. 1995. *City of Blaine Comprehensive Plan*. City of Blaine, Community Development, Blaine, WA. Adopted August 1995, with updates in 1996, 1998, and 1999.

City of Blaine. 1996. *City of Blaine Shoreline Management Master Program 1996*. City of Blaine, Blaine, WA. Adopted 1996.

CH2M HILL. *General Sewer Plan*. CH2M HILL, Bellevue, WA. September 2004.

CH2M HILL. *Blaine WWTP Site Wetland Reconnaissance*. CH2M HILL, Bellevue, WA. February 2005.

DOE. *Managing Washington's Coast – Washington State's Coastal Zone Management Program*. Washington State Department of Ecology, Olympia, WA. February 2001.

Federal Emergency Management Agency. Flood Hazard Zone Designations. http://www.fema.gov/fhm/fq_gen13.shtm, last updated October 25, 2004, accessed on January 31, 2005.

Federal Emergency Management Agency. FEMA DFIRM Data Viewer. http://gis.msc.fema.gov/Website/DFIRM_Viewer/Viewer.htm, last updated October 24, 2004, accessed on February 1, 2005.

Marine Resources of Whatcom County. Drayton Harbor Shellfish Protection District. http://whatcomshellfish.wsu.edu/Drayton/projects.htm, last updated 2004, last accessed on February 5, 2005.

Office of Archeology and Historic Preservation. Washington Information System for Architectural and Archeological Records Data. http://www.oahp.wa.gov/pages/wisaardIntro.htm, accessed February 2, 2005.

RETEC. *Results of Brownfields Scoping Analysis for the Blaine Landfill*. RETEC, Seattle, WA. June 2004.

U.S. Census Bureau. American FactFinder. http://factfinder.census.gov/servlet/SAFFFacts?_event=Search&geo_id=&_geoContext=&_street=&_county=Blaine&_cityTown=Blaine&_state=04000US53&_zip=&_lang=en&_sse=on, accessed on February 1, 2005.

U.S. Census Bureau. American FactFinder. Census 2000 Summary File 1 (SF 1) - Sample Data. http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF1_U&_lang=en&_ts=125864328368, accessed on February 1, 2005.

U.S. Census Bureau. American FactFinder. 1990 Summary Tape File 3 (STF 3) - Sample data http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_1990_STF1_&_lang=en&_ts=125864479212, accessed February 1, 2005.

USDA Rural Development. Water and Environmental Programs. http://www.usda.gov/rus/water/ees/environ.htm, accessed on January 27, 2005.

U.S. Fish and Wildlife. Wetlands Online Mappers. http://wetlandsfws.er.usgs.gov/wtlnds/launch.html, last updated February 7, 2005, accessed on February 7, 2005.

Washington State Department of Ecology. Washington Coastal Atlas. http://apps.ecy.wa.gov/website/coastal_atlas/viewer.htm, last updated February 25, 2003, accessed on February 3, 2005.

Washington Department of Health. News Release. http://www.doh.wa.gov/Publicat/2004_news/04-054.htm, last updated November 18, 2004, accessed on January 31, 2005.

WDFW. *Habitats and Species Report and Map in the Vicinity of T40R01E Section 6*. Washington Department of Fish and Wildlife, Olympia, WA. January 24, 2005.

CITY OF BLAINE

SITE PLAN REVIEW APPLICATION & INFORMATION PACKET

TYPE I-ADM REVIEW PROCESS

DEPARTMENT OF COMMUNITY DEVELOPMENT
344 H STREET
BLAINE, WASHINGTON 98230

PACKET CONTENTS

- ⇒ Site Plan Review Information Bulletin #35
- ⇒ Submittal Requirements for Site Plan Review
- ⇒ Review Process Flow Chart
- ⇒ Master Land Use Permit Application Form
- ⇒ Site Plan Review Supplemental Application Form
- ⇒ SEPA Information Bulletin #27
- ⇒ SEPA Environmental Checklist

City of Blaine
Department of Community Development
INFORMATION BULLETIN

35

Site Plan Review:
General Information, Instructions, and Submittal Requirements

May 2004

This Information Bulletin summarizes the City of Blaine application requirements and review process for site plan review. This information bulletin is intended to provide general information about Site Plan Review and offer detailed instructions about the application and submittal requirements and the review process. **Applicants should read the entire document carefully before submitting an application.**

What is Site Plan Review?

Site plan review is a component of the City's project review and approval procedures system administered by the Department of Community Development. Site Plan Review is intended to ensure consistent and coordinated application and implementation of the Blaine's codes, regulations, policies, design standards and other regulatory devices that affect land development for proposed development projects. Site Plan Review provides a forum through which project proponents and City staff can work together to ensure that new developments contribute positively to Blaine's residential neighborhoods and commercial areas.

When is Site Plan Review Required?

Site Plan Review and approval is required prior to the use of land for the location of any new or expanded commercial, industrial or public building or activity and for the location of any building in which five or more dwelling units would be contained. Site Plan Review under is not required as part of subdivision, short plat, binding site plan or planned unit development review.

A site plan review is required in addition to any other permit review and approvals required by other city codes. However, site plan review may be processed, to the extent possible, concurrently with any permit and environmental review process required in the City's Code.

Based on the type of land use and/or the scale and complexity of the proposed project, the Director of Community Development may in their discretion, waive the requirement for a site plan review or waive one or more of the required contents of a complete application as described in Section 17.69.040, Blaine Municipal Code (BMC) if, in their opinion, information obtained would not be relevant or helpful to an informed decision.

Other Permits Required

Site Plan Review permits **do not** take the place of any other required permit associated with a particular proposal. A project or development may also require, among others, a building or grading permit, a variance or conditional use, a shorelines permit or other environmental approvals, or a State

Department of Ecology Water Quality Certification.

What to do Before Submitting a Project for Site Plan Review

Pre-Application Conference

The Department of Community Development strongly encourages applicants to have a Pre-Application Conference with relevant City Staff. These staff members can assist and advise applicants on the Site Plan Review process at any stage of a project's site plan development; however, consultation early in project planning most often will result in smoother processing of the Site Plan Review submittals. Call the Department of Community Development (360) 332-8311 to have a Pre-Application Conference packet sent to you or pick one up at the department's service counter at 322 "H" Street, Blaine. Completed forms may be dropped off, mailed or faxed

Filing a Site Plan for Review

Once the pre-application conference process is completed, the Applicant's next step is to complete and assemble the necessary submittal materials for a Site Plan Review. A complete submittal package must include the following:

- ❑ A completed and signed **Master Land Use Application** and a **Site Plan Review, Supplemental Form**. If other local reviews, (e.g. Design Review), and/or other permits are required for the proposed project, then additional applications must also be submitted.
- ❑ A Site Plan (see attached Site Plan Requirements – Appendix A).
- ❑ A completed and signed SEPA Environmental Checklist, if applicable (See attached Environmental checklist & Information Bulletin 27). If necessary see WAC 197-11-800 for list of Categorical Exemptions.
- ❑ Application Fees (Fees are due at the time of application and are charged in accordance with the fee schedule, which is established annually by the City Council with a Unified Fee Schedule Resolution).

Site Plan Review Process (See attached Process Flow Chart – Appendix B)

Step 1 – Application Submission

The completed and signed application materials must be submitted, together with the required number of copies and fees, to the Department of Community Development, 322 "H" Street, Blaine.

Step 2 – Determination of Completeness

Following submittal of your application, staff will make a determination within 14 days as to whether your application is complete. You may be required to submit additional information within a specified time period if the application is deemed incomplete.

Step 3 – Distribution of Proposed Site Plan

Following the determination of completeness, a final decision must be made by the City within 90 calendar days, though typically the timeframe is considerably shorter. There are instances, however, when the "clock" is stopped to obtain additional information or pursue studies relevant to project review. The specific process to be followed is determined by the Site Plan Review Procedure as established in Chapter 17.07.040, Blaine Municipal Code.

In this step, Community Development Director will route copies of the proposal for comments to other relevant agencies and internal staff. If applicable, staff will also send out a SEPA notice and make a public Notice of Application, stating that an application was filed with the City. In these circumstances, the public has 14 days from the date of the newspaper publication notice in which to comment to the City on the proposed site plan.

Step 4 – TRC Meeting & Director's Review

The Technical Review Committee (TRC) that is comprised of staff from various City departments' meets with the proponent and, if so desired their designers and engineers, to

discuss the technical elements of the proposed Preliminary Site Plan.

Following this meeting and the close of the formal comment period, if relevant, the Community Development Director will review all comments received on the project and begin to prepare a determination.

Step 5 – Directors Decision

The Director's determination shall either be an approval, an approval with conditions, a request for revisions to the proposal or additional information deemed by the Director to be necessary for further review, or denial of the Preliminary Site Plan.

Step 6 – Implementation of Required Improvements & Issuing of Building and other Related Construction Permits

If the proposed Preliminary Site Plan is approved the proponent shall notify the Director, in writing, of which of the following methods the applicant proposes to insure that all required improvements are constructed, or will be constructed, prior to the issuance of an occupancy permit for the building or use of the site.

a: By actual installation of the improvements - in accordance with the provisions of this code and the requirements of the approved site plan and design, subject to inspection and approval by the City prior to the issuance of an occupancy permit.

b: The deposit of a performance bond or other surety - with the City in an amount not less that 150 percent of the cost estimate for the project. Said bond shall be conditioned on the completion of the project within a period agreed upon with the Director.

Based on the selected method of accomplishing site improvements, the applicant shall prepare and submit to the City construction drawings, in accordance with the requirements of Blaine Municipal Code and the City's *Development Guidelines and Public Works Standards.*

Upon receipt of the construction drawings, or verification of the performance bond (if selected), the City shall review to determine that the drawings are in accordance with the approved site plan and design, and development standards of the City.

If the City finds that the improvements are not in accordance with the approved site plan and design and/or developments requirements and standards of the City's Code, the Director shall return the drawings to the Applicant along with a notice of the issues or decisions that were not complied with.

If the drawings meet the approved site plan and design and/or developments requirements and standards of this code, the Engineer and Public Works Superintendent shall sign the drawings as approved. Upon approval of the construction drawings, the Public Works Director shall notify the applicant to arrange for a pre-construction meeting and to make application for such permits as are necessary to proceed with the installation of any or all of the required improvements.

The Director and other appropriate parties will review the approved site plan and design, and any other particulars with the applicant prior to the applicant's being given necessary construction permits or proceeding with site improvements. The parties will review and resolve any issues of concern.

Step 7 – Final Site Plan Review & Director's Decision

Final Site Plan review shall be conducted prior to the issuance of occupancy permits for building(s) associated with the development project and/or use of improvements approved with the Preliminary Site Plan. Approval of the Final Site Plan shall be granted by the Director provided that the improvements to the site are consistent with the approved Preliminary Site Plan. If applicable, the Applicant shall prepare as-build drawings and submit such drawings to the City for review.

If the City determines that the as-built drawings are not in accordance with the approved site

plan and design and/or developments requirements and standards of this code, the shall return the drawings to the applicant along with a notice of the issues or decisions that were not complied with. If the City finds that the drawings meet the approved site plan and design and/or developments requirements and standards of the City's Code, the Public Works Director shall sign a reproducible copy furnished by the applicant.

All required improvements and other conditions of site plan and design approval shall be met prior to occupancy of any site or building unless required sooner as a condition of approval. Provided, however, that completion and occupancy may be accomplished in phases if approved by the Director as part of the site plan and design review process.

Step 8 - Appeals

As with other administrative decisions, the Site Plan Review decision is appealable by any interested party, including the applicant, a department of the City or any aggrieved person. Final decisions on Site Plan Review may be appealed only if a complete appeal application and appeal fee is submitted within 14 calendar days from the filing of a formal written decision of the land use decision. Appeals are heard by the City's Hearing Examiner. The Hearing Examiner must afford substantial weight to the Director's decision, basing any decision to the contrary on a finding of clear error or omission, not simply a differing opinion or conclusion.

Additional information on appeals can be obtained in the *Information Bulletin #11.*

Approval Criteria and Permit Conditions

Approval of the Preliminary Site Plan shall be granted when it is determined that the proposed project is one permitted within the subject zoning designations and complies with all of the applicable provisions of this title and all other applicable regulations, including prescribed development/performance standards and all applicable development standards and design guidelines.

Vesting for an Approved Site Plan

Upon the making a determination of complete application the Applicant shall be vested as to zoning requirements and requirements of the City's Code, provided that this is not to be construed as a limitation on the authority to impose conditions as part of any other City, state or federal approval or permit needed for the proposal. Approval of a Preliminary Site Plan shall be effective for a period not to exceed five (5) years. For those Site Plan Review applications that included the filing and received approval for a phasing plan, the effective period of approval extends to length of the phasing plan.

Upon approval of the Preliminary Site Plan, the Applicant shall be vested as to the general layout, including building location, size and shape of open space, pedestrian and traffic circulation patterns, design and construction standards for streets and utilities. However, the applicant shall not be vested as to building construction and permits required under Chapters 15.04 and 15.08, BMC.

Building Permits

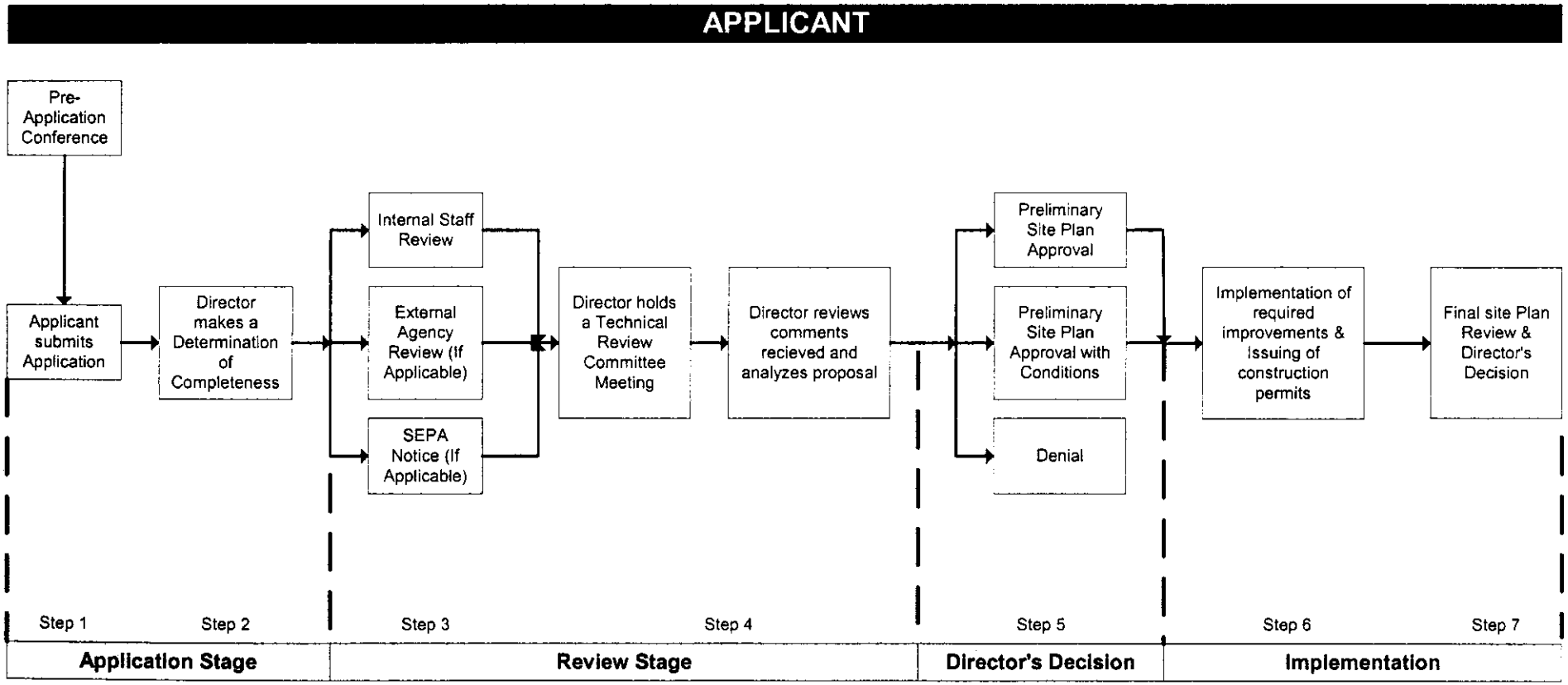
While the concept of the Site Plan Review process allows for the potential incorporation of a Building Permit component, in some instances it may be prudent to forgo the expense of a Building Permit application concurrently. This is due to the possibility that Site Plan Review decision-making may affect the project's original design in a way that could require revisions to the footprint and other elements of the Building Permit drawings.

While proponents may elect to incorporate a Building Permit application in a particular Site Plan Review application, in general one should wait at least until the proposed Site Plan has garnered Preliminary approval.

The City of Blaine's Community Development Department has created information bulletins to inform the general public about the effect of codes and regulations on their projects. These bulletins are not intended to be complete statements of all laws and rules and should not be used as substitutes for them. If conflicts and questions arise, current codes and regulations are final authority. Because the codes and regulations may be revised or amended at any time, consult City of Blaine, CD staff to be sure you understand all requirements before beginning work. It is the applicant's responsibility to ensure that the project meets all requirements of applicable codes and regulations.

APPENDIX B

Site Plan Review Process



CITY OF BLAINE

DEPARTMENT OF COMMUNITY DEVELOPMENT

344 H STREET • BLAINE, WA • 98230
PHONE: (360) 332-8311 • FAX: (360) 332-8330
www.ci.blaine.wa.us

Master Land Use Permit Application Form

FOR OFFICE USE ONLY

Total Fees $ _____

Receipt # _____

STAMP IN DATE

APPLICANT INFORMATION

Name of Applicant:		Telephone #:
Address:		
City:	State / Province:	Zip / Postal Code:
Name of Agent (if applicable):		Telephone #:
Address:		
City:	State / Province:	Zip / Postal Code:

PROPERTY INFORMATION

Project / Development Name:

Site Address / Description:

Location: QTR.SEC. QTR.SEC. SEC. TWP. R. BLK. LOT(S)

Subdivision Name:

Tax Parcel Number(s): (include 12-digit parcel number for all parcels within project boundaries):

Land Area of Project Site (acres/square feet):	Zoning:

DESCRIPTION OF PROPOSED PROJECT (include separate sheets as necessary)

PERMITS REQUIRED (TO BE COMPLETED BY OFFICE STAFF)

Supplemental Applications or Questionnaires may be required for some permits.

Type I-ADM Permits

- ☐ Boundary Line Adjustment
- ☐ Binding Site Plan – Specific
- ☐ Critical Areas & Wetlands Review
- ☐ Site Plan Review
- ☐ Flood Area Development Review
- ☐ Home Occupation
- ☐ Land Disturbance
- ☐ Landscaping Review
- ☐ Long Subdivision – Final
- ☐ Shorelines Exemption
- ☐ Short Subdivision, Preliminary & Final
- ☐ SEPA Categorical Exemption

Type II-HE Permits

- ☐ Appeal of a Type I-ADM Decision
- ☐ Revocation

Type II-PC Permits

- ☐ Binding Site Plan - General
- ☐ Conditional Use
- ☐ Design Guideline & Sign Review Appeals
- ☐ Long Subdivision - Preliminary
- ☐ Short Subdivision with Variance Request
- ☐ Shorelines Conditional Use
- ☐ Shorelines Substantial Development
- ☐ Shorelines Variance
- ☐ Variance

Type II-CC Permits

- ☐ Annexations
- ☐ Land Use & Development Code Amendment
- ☐ Comprehensive Plan Amendment
- ☐ Major Development Project
- ☐ Manufactured Home on Single Lot in PR Zone
- ☐ Planned Unit Development
- ☐ Shoreline Management Master Program Amendment
- ☐ Appeal of a Type II-HE or Type II-PC Decisions

ACKNOWLEDGEMENT

By signing the application form, the applicant/owner attests that the information provided herein is true and correct to the best of their knowledge. Any material falsehood or any omission of a material fact made by the applicant/owner with respect to this application may result in an issued permit being null and void.

I, the applicant/owner, certify that this application is being made with the full knowledge and consent of all owners of the property in question. I also agree to provide access and right of entry to City of Blaine and its employees, representatives or agents for the sole purpose of application review and any required later inspections. This right of entry shall expire when the City (through the Director or designee) concludes the application has complied with all applicable laws and regulations. Access and right of entry to the applicant's property shall be requested and shall occur only during regular business hours.

_____ _____
(APPLICANT OR AUTHORIZED REPRESENTATIVE SIGNATURE) (DATE)

I hereby designate _____ to act as my agent in matters related to this application for permit(s).

_____ _____
(APPLICANT SIGNATURE) (DATE)

CITY OF BLAINE

DEPARTMENT OF COMMUNITY DEVELOPMENT

344 H STREET • BLAINE, WA • 98230
PHONE: (360) 332-8311 • FAX: (360) 332-8330
www.ci.blaine.wa.us

FOR OFFICE USE ONLY

STAMP IN DATE

Site Plan Review

Supplemental Application

Project Name: _____ Page 3

Applications must be completed and submitted to the Department of Community Development. Applications that are incomplete (i.e., that do not include all of the information required below) will be returned to the applicant.

CONTACT INFORMATION

Contact Person:		Firm or Company Name:
Address:		Telephone #:
City:	State / Province:	Zip / Postal Code:
Contractor:		Telephone #:
Address:		City / State / Zip:
State Contractor's License #	Expiration Date:	**City of Blaine Business License:**
Architect of Record:		Firm or Company Name:
Address:		Telephone #:
City:	State / Province:	Zip / Postal Code:
Engineer of Record:		Firm or Company Name:
Address:		Telephone #:
City:	State / Province:	Zip / Postal Code:

ACKNOWLEDGEMENT

By signing the application form, the applicant/owner attests that the information provided herein is true and correct to the best of their knowledge. Any material falsehood or any omission of a material fact made by the applicant/owner with respect to this application may result in an issued permit being null and void.

I, the applicant/owner, certify that this application is being made with the full knowledge and consent of all owners of the property in question. I also agree to provide access and right of entry to City of Blaine and its employees, representatives or agents for the sole purpose of application review and any required later inspections. This right of entry shall expire when the City (through the Director or designee) concludes the application has complied with all applicable laws and regulations. Access and right of entry to the applicant's property shall be requested and shall occur only during regular business hours.

_____ _____

(APPLICANT OR AUTHORIZED REPRESENTATIVE SIGNATURE) (DATE)

I hereby designate _____ to act as my agent in matters related to this application for permit(s).

_____ _____

(APPLICANT SIGNATURE) (DATE)

City of Blaine
Department of Community Development
INFORMATION BULLETIN

27

SEPA Review Process:
General Information, Instructions, and Submittal Requirements

May 2004

WHAT IS SEPA?

The term "SEPA" stands for the State Environmental Policy Act. The purpose of SEPA is to encourage harmony among humans and their environment, to promote efforts that will prevent or eliminate damage to the environment, to stimulate human health and welfare, and to enrich citizen understanding of the ecological systems and natural resources that are so important to Washington State.

SEPA is designed to ensure that the following occurs:

- Environmental values are considered during land use decisions.
- Adequate and timely environmental information is gathered and provided to decision-makers.
- Public involvement is included in the decision-making process.

WHO IS RESPONSIBLE FOR SEPA IN THE CITY OF BLAINE?

SEPA requires that all state and local governmental agencies determine the environmental impact of land use decisions. Government agencies, such as the City of Blaine, are required to conduct an environmental review and determine if a proposal will cause a "probable significant adverse impact" to the environment. An environmental impact statement (EIS) is required if the agency determines that there probably will be significant adverse impacts.

The Department of Community Development (CD) is the agency responsible for SEPA compliance associated with the review of private development proposals that require building or land use permits in the incorporated area of the City of Blaine. The "Responsible Official" who administers SEPA procedures is the Director of CD Department, or the Director's designee. The Community Planner in the Current Planning Section within the CD Department is specifically responsible for reviewing permit applications subject to SEPA review. One of the missions of the Current Planning Section is to implement the Blaine Municipal Code (BMC), Chapter 16.04 that adopts the SEPA Rules.

HOW IS THE CURRENT PLANNING SECTION INVOLVED IN THE PERMIT PROCESS?

Once a complete permit application subject to SEPA review is filed with CD Department, a planner from the Current Planning Section is assigned to review the project. The CD planner may assist in the following tasks:

- Conduct environmental reviews and determine whether proposed development plans will cause probable environmental impacts.
- Design ways to reduce environmental impacts.
- Oversee the EIS process.
- Represent the City of Blaine at SEPA appeal hearings and meetings.

The environmental review process in SEPA is designed to work with other regulations to provide a comprehensive review of a proposal. Most regulations focus on particular aspects of a proposal, while SEPA requires the identification and evaluation of probable impacts for all elements of the environment. The CD planner will collaborate with other reviewers within the City and other agencies as part of the SEPA review process. Combining the review processes of SEPA and other laws reduces duplication and delay by combining study needs, combining comment periods and public notices, allowing agencies, applicants, and the public to consider all aspects of a proposal at the same time.

The SEPA process provides information to the decision-maker on the environmental impacts of a development proposal for which a permit is required. Under SEPA, the permit decision-maker may condition a proposal based on the environmental impacts identified in the SEPA document (Reference WAC 197-11-660).

WHAT TYPES OF DEVELOPMENT PROPOSALS ARE EXEMPT FROM SEPA?

Construction permit applications and other land use decisions are subject to SEPA review, unless specifically exempted. Some of the more common exemptions include the following:

- Construction of ten (10) or fewer residential units (not a subdivision);
- Agricultural structures of 10,000 square feet or less in a rural zone;
- Commercial structures less than 10,000 square feet with 30 or fewer parking spaces; and
- Excavation and/or fill projects of 250 cubic yards or less of cut and/or fill.

For a complete list of activities exempt from SEPA, refer to WAC 197-11-800. Some exemptions may not apply if sensitive areas are present on a site, if the project is located on lands covered by water, or if a series of actions is proposed that could have cumulative impacts. To determine if a proposal is exempt, review WAC 197-11-800 and 197-11-305, or contact a CD planner at 360-332-8311 with questions.

HOW IS AN ENVIRONMENTAL CHECKLIST FILLED OUT?

When you apply for any permit requiring a SEPA review, you will need to complete an Environmental Checklist to initiate the SEPA process. The Checklist contains questions about the natural environment (earth, air, water, etc.) and the built environment (traffic, schools, noise, etc.) of the site. Answer each question on the environmental checklist accurately and to the best of your knowledge. In many cases, you should be able to answer the questions based on your own observations or project plans without hiring experts to assist you. If you have a large or complex project or your site contains sensitive areas, however, you may need the advice of expert consultants. You may also contact a CD planner at 360-332-8311 if you need clarification on any questions or parts of the checklist.

If you do not know the answer to a question, or the question does not apply to your project, state this clearly on the checklist. A CD planner will review the checklist for accuracy and will record any needed clarifications or changes. Your complete and accurate answers to the questions will help speed up the environmental review process.

The questions on the checklist apply to the entire project -- including future plans for development. The SEPA process requires an evaluation of cumulative impacts. For this reason, it is critical to state all current and future development intentions clearly on the checklist. For example, if you are planning a phased project, such as an apartment complex with 10 buildings involving construction over five years, disclose this information up front. The checklist should read, "I only want to apply for permits for five buildings at this time. I want to build five more buildings at a later date and will apply for those permits then."

WHAT HAPPENS DURING THE ENVIRONMENTAL REVIEW PROCESS?

What is a threshold determination?

When SEPA review is required for a project, the responsible official must decide if the project is likely to have a "probable significant adverse impact" on the environment. This decision is called a "threshold determination."

If a project may have a probable significant adverse impact, a determination of significance (DS) is issued, and an environmental impact statement (EIS) is required.

If the project will not have a probable significant adverse impact, a determination of non-significance (DNS) is issued.

During the threshold determination process, CD staff may identify measures that can be taken to reduce impacts to the environment. If the proposal is then clarified, changed, or conditioned to include these measures, the responsible official may issue a mitigated determination of non-significance (MDNS). Mitigation measures become conditions of the permit and are implemented during construction and/or before final approval.

How are threshold determinations made?

A threshold determination is based on the environmental checklist that has been completed for the project, together with other documents, reports, or maps submitted by the applicant. In addition, the CD planner will review other information available through the City, such as the Critical Areas Map Folio and any EIS's prepared for neighboring properties.

Early in the review process, the CD planner will decide which elements of the proposal pose potential significant adverse impacts and determine which agencies have the appropriate technical expertise to comment on these issues.

The CD planner may request additional information and studies from the applicant. Commonly requested studies include wildlife use and habitat, stream characteristics, wetland delineation and mitigation, traffic and water quality. When there is enough information to warrant evaluating a proposal's environmental impacts, a threshold determination is made. In determining a project's potential impacts, the CD planner must consider the following factors:

1. The planner must consider whether the same proposal may have a significant adverse impact in one location but not in another.
2. The planner must consider whether the proposal may result in a significant adverse impact regardless of where the project is located.
3. The planner must determine whether several small impacts, when considered together, may result in a significant adverse impact.
4. If there is incomplete or unknown information, the planner must decide whether it is possible to adequately determine environmental impacts.
5. As a final consideration, the DDES planner must try to determine whether a project will, to a significant degree, result in any of the following:
   a. An adverse affect to environmentally sensitive or special areas, such as loss or destruction of historic, scientific, and cultural resources; parks; prime farmlands; wetlands; wild and scenic rivers; or wilderness;
   b. An adverse affect to endangered or threatened species or their habitat;
   c. A conflict with local, state, or federal laws or requirements for the protection of the environment; and
   d. Establish a precedent for future actions with significant effects, involve unique and unknown risks to the environment, or affect public health or safety.

During the threshold determination process, the DDES planner will identify ways to reduce or eliminate impacts to the environment.

How are mitigation measures developed?

A mitigation measure is a condition placed on a proposal to avoid, minimize, or reduce impacts. Mitigation measures must be reasonable, must be able to be accomplished, and must be grounded on existing City regulatory policies, plans or standards.

Applicants may ask the responsible official if a DS project is being considered. If the responsible official indicates that a DS is likely, the applicant may revise the project to eliminate the impact or to reduce it to an acceptable level. An MDNS is then issued that identifies the specific changes to the proposal, including the mitigation measures.

What types of proposals receive a DS and why?

Because the City of Blaine has many strong environmental regulations in place, few development applications receive a determination of significance (DS) requiring an environmental impact statement (EIS). If a project receives a DS at the threshold stage, an EIS is required. Any project could potentially receive a DS, depending on the likelihood of significant or cumulative impacts. A proposal may receive a DS because of a single issue, such as traffic, school capacity, or water quality, or it may receive a DS because of a entire spectrum of issues.

The project may also have several marginal impacts that, together, could create a significant impact. Each project is considered on its own merits, including the proposal itself, the site, and its surroundings. The same proposal may have a significant adverse impact in one location, but not in another location. The applicant is encouraged to consider alternative development scenarios that would achieve a lower degree of environmental degradation. A proposed development that is designed to avoid environmental impacts will be less likely to receive a DS.

How is the public notified about land use proposals?

It is an important objective of the City of Blaine to provide adequate opportunities for public input and comment on development proposals. A minimum 15-day public comment period is provided for all projects subject to SEPA review. The City publishes a legal advertisement in *The Bellingham Herald* newspaper and, at times, the local newspaper.

The City will also post a 1½-foot by 2-foot notice board that can be easily seen on or near the property for the required comment period. The City is responsible for sign installation, maintenance, and removal at the appropriate times. Property owners within a 500-foot radius of the proposal site are notified of the permit application by mail. The Applicant is responsible for mailing these notifications.

The City also mails notices to individuals and groups who have specifically requested to be "parties of record." A party of record will be notified of events throughout the permit process.

To get on the mailing list for a SEPA process on a particular project, call the Department of Community Development at 360-332-8311 with the permit number (from the land use sign, newspaper, or mailed notice) and ask to become a party of record.

How can a threshold determination be commented on or appealed?

Pursuant to Ordinance No. 02-2508, effective May 28, 2002, appeals of a SEPA Determination for a land use permit shall be filed and heard by the City's Hearing Examiner.

Once the DNS or MDNS threshold determination is issued, there is minimum 15-day comment period during which individuals who believe the determination was issued in error may appeal it or submit comments. All comments submitted to the Current Planning Section at the Department of Community Planning, will be reviewed to determine if they present information previously unknown to the responsible official. If this is the case, and the comment leads to a determination that the

proposal will have a probable significant adverse impact, the responsible official must withdraw the previous threshold determination and modify the decision to address significant impacts. Any determination may be appealed by asking the responsible official to consider additional information; to add, revise, or delete mitigation measures; or to request that the hearing examiner rule on the requirement for an EIS.

A nonrefundable fee, pursuant to the City of Blaine Unified Fee Schedule, is required to appeal a threshold determination to the Hearing Examiner. During the time allowed for filing an appeal, you may contact a CD planner at 360-332-8311 for information about the decision and/or to discuss your statement of appeal to ensure that it is as specific as possible.

When you appeal a proposal, please note that the purpose of the appeal is to help the City determine if there was an error with regard to the threshold determination. Your statement of appeal must clearly identify the decision being appealed, the specific reasons why the decision should be reversed or modified, any harm you have suffered or anticipate suffering as a result of the decision, and the relief you seek.

If the determination is appealed, an appeal hearing date is set, and a hearing is held. If a project involves other land use hearings, such as those for subdivisions, rezones, and conditional use permits, every attempt will be made to consolidate these hearings with the SEPA appeal into one proceeding. The City Code provides for consolidation of hearings and authorizes the Hearing Examiner to make final decisions on such consolidated hearings.

After hearing all testimony, the City's Hearing Examiner will decide whether the threshold determination is correct and will issue a decision on the appeal and a recommendation on the permit to the City Council or the Planning Commission, if applicable. A CD planner will represent the City of Blaine during the appeal hearing. If there are no appeals to the threshold determination, the project applicant must comply with any conditions specified in the threshold determination and the City must enforce those conditions.

The Blaine Municipal Code authorizes the Hearing Examiner, or any party, to call a pre-hearing conference to identify, to the extent possible, the facts in dispute, issues, laws, parties, and witnesses in the case, and to set a timeline for the presentation of the case. The pre-hearing conference will be scheduled so that at least 14 days notice is available to those who are "parties of record" to the hearing. Refer to the Hearing Examiner' Rules of procedure for a complete definition of "party" for purposes of a SEPA appeal.

What is an EIS?

An environmental impact statement (EIS) is a document designed to provide decision makers and the public with impartial information about a project and analyze alternatives to the proposal, including ways to avoid or minimize adverse impacts or to enhance environmental quality. The SEPA Rules stress that an EIS should be concise and focused on the significant issues. The Applicant is responsible for producing the EIS and typically will rely on the applicant hire appropriate experts to draft the document—this is done at the applicant's expense.

What is the EIS process?

After publication of a DS, there is a 21-day comment period, which is referred to as "Scoping." Scoping is the first step in the EIS process. This time period provides an opportunity for the public and technical experts to give input to the agency about what they believe should be included in the EIS. Based on comments received, reasonable alternatives are identified by the DDES planner and a plan is developed to investigate each significant impact.

The EIS contains a description of the proposal and the alternatives, including a no-action alternative. For each element of the environment in the scope (air, water, earth, etc.) there is a description of existing conditions, significant adverse impacts, anticipated suggested mitigation measures,

and unavoidable impacts. Technical studies may be included in an appendix to the EIS.

A draft EIS (DEIS) is published first, and citizens, agencies, and tribes are invited to comment on this document's adequacy during a 30-day comment period. Comment letters are incorporated into the final EIS (FEIS), along with a written response to each letter. Additional analysis may also be included in the FEIS, based on comments received. The FEIS is published, and the decision-maker uses both the DEIS and FEIS during the decision making process.

How much does it cost to go through the SEPA process?

Applicants are charged a review fee, based on City of Blaine Unified Fee Schedule. To ask questions regarding current fees and estimated costs, please call a CD planner at 360-332-8311.

How long will the SEPA process take?

A threshold determination is generally made within 120 days after a complete permit application is filed, as specified in BMC Chapter 17.06. When reviewing the file, the CD planner may request that the applicant provide supporting documentation. Depending on how long it takes for the applicant to provide supporting information, the 120-day period may need to be extended. After all requested information is received and reviewed for completeness, the threshold determination is completed.

The City of Blaine's Community Development Department has created information bulletins to inform the general public about the effect of codes and regulations on their projects. These bulletins are not intended to be complete statements of all laws and rules and should not be used as substitutes for them. If conflicts and questions arise, current codes and regulations are final authority. Because the codes and regulations may be revised or amended at any time, consult City of Blaine, CD staff to be sure you understand all requirements before beginning work. It is the applicant's responsibility to ensure that the project meets all requirements of applicable codes and regulations.

CITY OF BLAINE

DEPARTMENT OF COMMUNITY DEVELOPMENT

344 H STREET • BLAINE, WA • 98230
PHONE: (360) 332-8311 • FAX: (360) 332-8330
www.ci.blaine.wa.us

Commercial / Multi-family Residential Building Permit Application Form

FOR OFFICE USE ONLY

Plan Check
Deposit $ _____

Receipt # _____

STAMP IN DATE

APPLICANT INFORMATION

Project Name/Tenant:		***Value of Construction:**
Site Address:		**Tax Parcel Number:**
General Location:		Lot Number:
Contact Person:		Firm or Company Name:
Address:		Telephone #:
City:	State / Province:	Zip / Postal Code:
Contractor:		Telephone #:
Address:		City / State / Zip:
State Contractor's License #	Expiration Date:	**City of Blaine Business License:**
Architect of Record:		Firm or Company Name:
Address:		Telephone #:
City:	State / Province:	Zip / Postal Code:
Engineer of Record:		Firm or Company Name:
Address:		Telephone #:
City:	State / Province:	Zip / Postal Code:
Property Owner:		Telephone #:
Address:		
	State / Province:	Zip / Postal Code:

DESCRIPTION OF WORK TO BE DONE (include separate sheets as necessary): _____

Total Area of Construction (sq.ft.): _____ UBC Occupancy Type(s): _____

Building Square Footage (new): _____ (existing): _____ (total): _____

Number of Stories (new): _____ (existing): _____ (total): _____

TYPE OF WORK

- ❑ New Commercial Building
- ❑ Commercial Addition
- ❑ Tenant Improvement
- ❑ Rack Storage
- ❑ New Multi-Family Building
- ❑ Multi-Family Addition
- ❑ Multi-Family Alteration
- ❑ Reroofing

Building Contains Asbestos? ❑ **Yes** ❑ **No** If yes, Puget Sound Clean Air Agency Code # _____

* **Value of Construction** – The value of construction shall include the prevailing fair market value of all labor, materials & equipment, whether actually paid or not, as well as all finish work, painting, roofing, electrical, plumbing, heating, air conditioning, elevators, fire-extinguishing systems, automatic sprinkler systems, other mechanical systems and other permanent work of equipment, not including furnishings. The Building Official shall make the final determination of the value of construction as specified in Section 107.2 of the Uniform Building Code.

Expiration of Plan Review – Applications for which no permit is issued within 180 days following the date of application shall expire and all fees paid shall be forfeited. Upon written request of the applicant, t Building Official may grant a 180-day extension to the Plan Review time as specified in Section 107.4 of the Uniform Building Code. No application shall be extended more than once.

ACKNOWLEDGEMENT

By signing the application form, the applicant/owner attests that the information provided herein is true and correct to the best of their knowledge. Any material falsehood or any omission of a material fact made by the applicant/owner with respect to this application may result in an issued permit being null and void.

I, the applicant/owner, certify that this application is being made with the full knowledge and consent of all owners of the property in question. I also agree to provide access and right of entry to City of Blaine and its employees, representatives or agents for the sole purpose of application review and any required later inspections. This right of entry shall expire when the City (through the Director or designee) concludes the application has complied with all applicable laws and regulations. Access and right of entry to the applicant's property shall be requested and shall occur only during regular business hours.

_____ _____
(APPLICANT OR AUTHORIZED REPRESENTATIVE SIGNATURE) (DATE)

I hereby designate _____ to act as my agent in matters related to this application for permit(s).

_____ _____
(APPLICANT SIGNATURE) (DATE)

CITY OF BLAINE
PUBLIC WORKS DEPARTMENT
1200 YEW AVENUE BLAINE, WA 98230
PH (360) 332-8820 FAX (360) 332-7124

STREET EXCAVATION PERMIT AND APPLICATION

THIS VALIDATED PERMIT MUST BE ON THE JOB SITE WHEN UNDERSAID WORK IS PERFORMED. FOR ANY QUESTIONS CONCERNING THIS APPLICATION FOR PERMIT, PLEASE CONTACT THE PUBLIC WORKS FOREMAN AT (360) 332-8820.

TO BE COMPLETED BY APPLICANT

APPLICATION DATE

APRROXIMATE DATE OF JOB

☐ I AM A CONTRACTOR LICENSED WITH THE CITY OF BLAINE

☐ I AM THE OWNER OF PROPERTY ABUTTING PROPOSED WORK SITE

OWNER NAME

MAILING ADDRESS

CITY STATE ZIP CODE

PHONE NUMBER FAX NUMBER

JOB SITE ADDRESS

CONTRACTOR NAME

MAILING ADDRESS

CITY STATE ZIP CODE

COB LICENSE NUMBER

STATE LICENSE NUMBER

WORK TO BE PERFORMED (CONTINUE ON REVERSE SIDE IF NECESSARY)

PERMIT CONDITIONS

S PERMIT MAY BE DENIED OR REVOKED IF THE PROPOSED USE IS INCONSISTENT WITH THE CITY'S FUTURE RIGHT TO UTILIZE THE PROPERTY FOR STREET PURPOSES. IF SUCH WORK SHALL BE DEEMED IN NEED OF MOVING AT A LATER TIME, SUCH REMOVAL SHALL BE AT THE TOTAL EXPENSE OF THE APPLICANT AND/OR ABUTTING PROPERTY OWNER.

THIS PERMIT IS SUBJECT TO THE FOLLOWING CONDITIONS:

1. ALL WORK MUST BE PERFORMED IN ACCORDANCE WITH THE STANDARD PLANS, SPECIFICATIONS AND SPECIAL REQUIREMENTS OF THE CITY OF BLAINE.
2. THE CITY PUBLIC WORKS DEPARTMENT MUST BE NOTIFIED 24 HOURS IN ADVANCE OF ANY CONSTRUCTION.
3. WHERE STREET CLOSURE IS INVOLVED, A DIAGRAM OF TRAFFIC CONTROL, DETOURS AND SIGNING MUST BE SUBMITTED PRIOR TO ISSUANCE OF THIS PERMIT.
4. THIS PERMIT BECOMES NULL AND VOID IF THE WORK OR CONSTRUCTION AUTHORIZED IS NOT COMMENCED WITHIN 180 DAYS OR IF CONSTRUCTION OR WORK IS SUSPENDED OR ABANDONED FOR A PERIOD OF 180 DAYS AT ANY TIME AFTER WORK IS COMMENCED.
5. CONTRACTOR IS SUBJECT TO A 12 MONTH WARRANTY FROM THE DATE OF COMPLETION OF WORK TO ENSURE ADEQUATE BACKFILL, BASE, AND SURFACE HAS BEEN PERFORMED WITHIN THE RIGHT-OF-WAY.
6. ALL WORK SHALL BE DONE SUBJECT TO THESE ADDITIONAL REQUIREMENTS:

I HEREBY CERTIFY THAT I HAVE READ AND EXAMINED THIS APPLICATION, AND KNOW THE SAME TO BE TRUE AND CORRECT. I HAVE RECEIVED AND READ A COPY OF THE BLAINE MUNICIPAL CODE GOVERNING THIS TYPE OF PERMIT. ALL PROVISIONS OF LAWS AND ORDINANCES GOVERNING THIS TYPE OF WORK WILL BE COMPLIED WITH WHETHER SPECIFIED HEREIN OR NOT. THE GRANTING OF A PERMIT DOES NOT PRESUME TO GIVE AUTHORITY, VIOLATE OR CANCEL THE PROVISIONS OF ANY OTHER STATE OR LOCAL LAW REGULATING CONSTRUCTION OR PERFORMANCE OF CONSTRUCTION. FURTHER, I HEREBY CERTIFY THAT I AM A LICENSED CONTRACTOR AND THAT SAID LICENSES ARE IN FULL FORCE AND EFFECT, OR THAT I AM THE LEGAL OWNER OF THE ABOVE DESCRIBED REAL PROPERTY AND THAT THIS PERMIT IS NOT VALID UNTIL ALL FEES HAVE BEEN PAID, SURETY OR BONDING COMPANY INFORMATION HAS BEEN PROVIDED AND A SIGNATURE OF AUTHORIZATION HAS BEEN GRANTED.

SIGNATURE DATE

TO BE COMPLETED BY CITY OF BLAINE

PERMIT FEE AMOUNT $ RECEIPT #

BOND AMOUNT $ BOND PAPERS ON FILE

SIX MONTH REVIEW INITIALED

ELEVEN MONTH REVIEW INITIALED

PUBLIC WORKS FOREMAN AUTHORIZATION DATE DATE COMPLETED

WASHINGTON

JOINT AQUATIC RESOURCE PERMITS APPLICATION (JARPA)

—INSTRUCTIONS—

This Joint Application can be used to apply for Hydraulic Project Approvals, Shoreline Management Permits, Approvals for Exceedance of Water Quality Standards, Water Quality Certifications, Coast Guard Bridge Permits, Department of Natural Resources Use Authorization, and Army Corps of Engineers Permits. ***You must submit readable copies of the completed application form together with detailed drawings, prepared in accordance with the drawing guidance in Appendix A to the appropriate agencies. You do not need to send the example drawings, the instructions, or the Appendices.*** Remember, depending on the type of project you are proposing, other permits may be required that are not covered by this application.

☞ Use the following checklist to determine which permits to apply for. Your project may require some or all of these permits. If you have trouble deciding which permits you need, please contact the appropriate agency for questions. Agency telephone numbers are in Appendix B. **IF YOU CHECK ANY BOX UNDER A PERMIT TITLE, THEN YOU MUST APPLY FOR THAT PERMIT.** Complete Sections A & C for any of the permits listed below. Also complete Section B for Shoreline and Army Corps of Engineers permits. Detailed drawings are required for any of these permits (see Appendix A for drawing requirements).

◆ **Hydraulic Project Approval** from the Department of Fish and Wildlife under 75.20 RCW is required if your project includes construction or other work, that:

☐ will use, divert, obstruct, or change the natural flow or bed of any fresh or salt water of the state. This includes all construction or other work waterward and over the ordinary high water line, including dry channels, and may include projects landward of the ordinary high water line (e.g., activities outside the ordinary high water line that will directly impact fish life and habitat, falling trees into streams or lakes, etc.).

◆ **Shoreline Substantial Development, Conditional Use, Variance Permit, or Exemption** from Local Government (under the Shoreline Management Act, 90.58 RCW;) required for work or activity in the 100-year floodplain, or within 200 feet of the ordinary high water mark of certain waters; and which includes any one of the following:

☐ dumping; ☐ drilling; ☐ dredging; ☐ filling; ☐ placement or alteration of structures (whether temporary or permanent); or
☐ any activity which substantially interferes with normal public use of the waters regardless of cost.

◆ **Floodplain Management permits and/or Critical Areas Ordinances** review by Local Government for:

☐ work in frequently flooded areas, geologically unstable areas, wildlife habitats, aquifer recharge areas, and wetlands.

◆ **Section 401 Water Quality Certification** from the Department of Ecology under 33 USC § 1341 is needed when a federal approval is required for a project, including the following:

☐ Corps of Engineers Nationwide Permit--Send to Ecology's Environmental Review Section;
☐ FERC hydropower license--Attach FERC exhibit E and send to Ecology's Water Resources Program; and
☐ A Corps of Engineers individual permit--Send only to Corps of Engineers; the Corps will notify Ecology.

◆ **Approval to Allow Temporary Exceedance of Water Quality Standards** from the Department of Ecology, under 90.48 RCW, if your project results in:

☐ a temporary exceedance of water quality criteria established by WAC 173-201A for in water work (e.g., changes in turbidity from sediment disturbances and pH changes from concrete curing) -- send to Ecology's regional office. **NOTE:** Application of aquatic herbicides and pesticides are covered by a separate application).

◆ **Aquatic Resources Use Authorization Notification** from the Department of Natural Resources is required if your project:

☐ is on, crosses, or impacts the bedlands, tidelands or shorelands of a navigable water.

- **Section 404 Permit** from the Corps of Engineer under 33 USC § 1344 is required if your project includes:

  ☐ discharge or excavation of dredged or fill material waterward of the ordinary high water mark, or the mean higher high tide line in tidal areas, in waters of the United States, **including wetlands**;
  ☐ mechanized land clearing in waters of the United States, **including wetlands.**

- **Section 10 Permit** from the Corps of Engineer is required for:

  ☐ any work in or affecting navigable waters of the United States (e.g., floats, piers, docks, dredging, piles, buoys, overhead power lines, etc.).

- **Section 9 Permit** from the Coast Guard is required for:

  ☐ construction of a new bridge or modification to an existing bridge over a navigable waterway.

USEFUL DEFINITIONS

The following definitions are presented to help applicants in completing the JARPA. They may not necessarily represent specific language from the laws implemented through JARPA.

***Ordinary High Water Mark or Line** means the visible line on the banks where the presence and action of waters are so common as to leave a mark upon the soil or vegetation: Provided, that in any area where the ordinary high water line cannot be found the ordinary high water line adjoining saltwater shall be the line of mean higher high water and the ordinary high water line adjoining freshwater shall be the elevation of the mean annual flood.*

***Mean Lower Low** is the 0.0 tidal elevation, determined by averaging each day's lowest tide at a particular location over a period of 19 years. It is the tidal datum for vertical tidal references in the salt water area.*

Mean High Water and Mean Higher High Water Tidal Elevations at any specific location can be found in tidal benchmark data compiled by the United States Department of Commerce, Environmental Science Services Administration, Coast and Geodetic Survey, dated January 24, 1979. This information can be obtained from the Corps of Engineers at (206) 764-3495.

The determination of tidal elevation is obtained by averaging each day's highest tide at a particular location over a period of 19 years, measured from mean lower low water, which equals 0.0 tidal elevation.

Shorelands or shoreland areas means those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of 90.58 RCW.

Shorelines means all water areas of the state, including reservoirs, and their associated wetlands, together with the lands underlying them, except stream segments upstream of the point where mean annual flow is less than 20 cubic feet per second, and lakes less than 20 acres in size.

Wetlands means areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Bridge means any structure including pipelines and conveyor belts, which transports traffic or materials across a navigable water.

Aquatic Tidelands means the area between the ordinary high tide line and extreme low tide line, unless otherwise established.

Aquatic Shorelands means the shore areas of non-tidal navigable lakes or rivers between the ordinary high water line and the line of navigability unless otherwise established.

Aquatic Bedlands means the area waterward of and below the line of navigability on non-tidal rivers and lakes, or below the extreme low tide mark in navigable tidal waters, or below the outer harbor line where a harbor has been created.

AGENCY USE ONLY

Agency Reference #:_____ Date Received:_____

Other:_____

JARPA FORM

(for use in Washington State)

PLEASE TYPE OR PRINT IN BLUE OR BLACK INK

Based on the preceding checklist, I am sending copies of this application to the following: *(check all that apply)*

- ☐ Local Government for shoreline: ☐ Substantial Development ☐ Conditional Use ☐ Variance ☐ Exemption; or, if applicable ☐ Floodplain Management ☐ Critical Areas Ordinance
- ☐ Washington Department of Fish and Wildlife for HPA
- ☐ Washington Department of Ecology for: ☐ Approval to Allow Temporary Exceedance of Water Quality Standards ☐ 401 Water Quality Certification Nationwide Permits
- ☐ Washington Department of Natural Resources for: ☐ Aquatic Resources Use Authorization Notification
- ☐ Corps Engineers for: ☐ Section 404 ☐ Section 10 permit
- ☐ Coast Guard for: ☐ Section 9 Bridge Permit

SECTION A - Use for all permits covered by this application. Be sure to also complete Section C (Signature Block) for all permit applications.

1. APPLICANT		
MAILING ADDRESS		
WORK PHONE	HOME PHONE	FAX #

n agent is acting for the applicant during the permit process, complete #2.

AUTHORIZED AGENT		
MAILING ADDRESS		
WORK PHONE	HOME PHONE	FAX #

3. RELATIONSHIP OF APPLICANT TO PROPERTY: ☐ OWNER ☐ PURCHASER ☐ LESSEE ☐ OTHER: __

4. NAME, ADDRESS, AND PHONE NUMBER OF PROPERTY OWNER(S), IF OTHER THAN APPLICANT:

5. LOCATION (STREET ADDRESS, INCLUDING CITY, COUNTY AND ZIP CODE, WHERE PROPOSED ACTIVITY EXISTS OR WILL OCCUR)

WATERBODY				TRIBUTARY OF
1/4 SECTION	TOWNSHIP	RANGE	GOVERNMENT LOT	SHORELINE DESIGNATION
				ZONING DESIGNATION
TAX PARCEL NO.:				DNR STREAM TYPE, IF KNOWN

6. DESCRIBE THE CURRENT USE OF THE PROPERTY, AND STRUCTURES EXISTING ON THE PROPERTY. IF ANY PORTION OF THE PROPOSED ACTIVITY IS ALREADY COMPLETED ON THIS PROPERTY, INDICATE MONTH AND YEAR OF COMPLETION.

IS THE PROPERTY AGRICULTURAL LAND? ☐ YES ☐ NO

ARE YOU A USDA PROGRAM PARTICIPANT? ☐ YES ☐ NO

7a. DESCRIBE THE PROPOSED WORK: COMPLETE PLANS AND SPECIFICATIONS SHOULD BE PROVIDED FOR ALL WORK WATERWARD OF THE ORDINARY HIGH WATER MARK OR

7b. DESCRIBE THE PURPOSE OF THE PROPOSED WORK.

7c. DESCRIBE THE POTENTIAL IMPACTS TO CHARACTERISTIC USES OF THE WATER BODY. THESE USES MAY INCLUDE FISH AND AQUATIC LIFE, WATER QUALITY, WATER SUPPLY, RECREATION, and AESTHETICS. IDENTIFY PROPOSED ACTIONS TO AVOID, MINIMIZE, AND MITIGATE DETRIMENTAL IMPACTS, AND PROVIDE PROPER PROTECTION

PREPARATION OF DRAWINGS: SEE APPENDIX A - SAMPLE DRAWINGS AND CHECKLIST FOR COMPLETING THE DRAWINGS. ***ONE SET OF ORIGINAL OR GOOD QUALITY REPRODUCIBLE DRAWINGS MUST BE ATTACHED.*** NOTE: APPLICANTS ARE ENCOURAGED TO SUBMIT PHOTOGRAPHS OF THE PROJECT SITE, BUT THESE DO NOT SUBSTITUTE FOR DRAWINGS. ***THE CORPS OF ENGINEERS AND COAST GUARD REQUIRE DRAWINGS ON 8-1/2 X 11 INCH SHEETS. LARGER DRAWINGS MAY BE REQUIRED BY OTHER AGENCIES***

8. WILL THE PROJECT BE CONSTRUCTED IN STAGES? ☐ YES ☐ NO

PROPOSED STARTING DATE: __

ESTIMATED DURATION OF ACTIVITY: __

9. CHECK IF ANY STRUCTURES WILL BE PLACED:

☐ WATERWARD OF THE ORDINARY HIGH WATER MARK OR LINE FOR FRESH OR TIDAL WATERS; AND/OR

☐ WATERWARD OF THE MEAN HIGH WATER LINE IN TIDAL WATERS

10. WILL FILL MATERIAL (ROCK, FILL, BULKHEAD, PILINGS OR OTHER MATERIAL) BE PLACED:

☐ WATERWARD OF THE ORDINARY HIGH WATER MARK OR LINE FOR FRESH WATERS? IF YES, VOLUME (CUBIC YARDS)___/AREA___(ACRES

☐ WATERWARD OF THE MEAN HIGHER HIGH WATER FOR TIDAL WATERS? IF YES, VOLUME (CUBIC YARDS)___/AREA___(ACRES)

11. WILL MATERIAL BE PLACED IN WETLANDS? ☐ YES ☐ NO

IF YES:

A. IMPACTED AREA IN ACRES: __

B. HAS A DELINEATION BEEN COMPLETED? IF YES, PLEASE SUBMIT WITH APPLICATION. ☐ YES ☐ NO

C. HAS A WETLAND REPORT BEEN PREPARED? IF YES, PLEASE SUBMIT WITH APPLICATION. ☐ YES ☐ NO

D. TYPE AND COMPOSITION OF FILL MATERIAL (E.G., SAND, ETC.): __

E. MATERIAL SOURCE: __

F. LIST ALL SOIL SERIES (TYPE OF SOIL) LOCATED AT THE PROJECT SITE, & INDICATE IF THEY ARE ON THE COUNTY'S LIST OF HYDRIC SOILS. SOILS INFORMATION CAN BE OBTAINED FROM THE NATURAL RESOURCES CONSERVATION SERVICE (NRCS):

12. WILL PROPOSED ACTIVITY CAUSE FLOODING OR DRAINING OF WETLANDS? ☐ YES ☐ NO

IF YES, IMPACTED AREA IS __ ACRES

13. WILL EXCAVATION OR DREDGING BE REQUIRED IN WATER OR WETLANDS? ☐ YES ☐ NO

IF YES:

A. VOLUME: __(CUBIC YARDS)/AREA ___ (ACRES)

B. COMPOSITION OF MATERIAL TO BE REMOVED: __

C. DISPOSAL SITE FOR EXCAVATED MATERIAL: __

D. METHOD OF DREDGING: __

14. LIST OTHER APPLICATIONS, APPROVALS, OR CERTIFICATIONS FROM OTHER FEDERAL, STATE OR LOCAL AGENCIES FOR ANY STRUCTURES, CONSTRUCTION, DISCHARGES, OR OTHER ACTIVITIES DESCRIBED IN THE APPLICATION (I.E., PRELIMINARY PLAT APPROVAL, HEALTH DISTRICT APPROVAL, BUILDING PERMIT, SEPA REVIEW, FERC LICENSE, FOREST PRACTICES APPLICATION, ETC.) ALSO INDICATE WHETHER WORK HAS BEEN COMPLETED AND INDICATE ALL EXISTING WORK ON DRAWINGS.

TYPE OF APPROVAL	ISSUING AGENCY	IDENTIFICATION NO.	DATE OF APPLICATION	DATE APPROVED	COMPLETED?
SEPA LEAD AGENCY		SEPA DECISION:		SEPA DECISION DATE:	

15. HAS ANY AGENCY DENIED APPROVAL FOR THE ACTIVITY DESCRIBED HEREIN OR FOR ANY ACTIVITY DIRECTLY RELATED TO THE ACTIVITY DESCRIBED HEREIN? ☐ YES ☐ NO IF YES, EXPLAIN:

SECTION B - Use for Shoreline and Corps of Engineers permits only:

16. TOTAL COST OF PROJECT. THIS MEANS THE FAIR MARKET VALUE OF THE PROJECT, INCLUDING MATERIALS, LABOR, MACHINE RENTALS, ETC.

17. LOCAL GOVERNMENT WITH JURISDICTION:

18. FOR CORPS, COAST GUARD, AND DNR PERMITS, PROVIDE NAMES, ADDRESSES, AND TELEPHONE NUMBERS OF ADJOINING PROPERTY OWNERS, LESSEES, ETC. PLEASE NOTE: SHORELINE MANAGEMENT COMPLIANCE MAY REQUIRE ADDITIONAL NOTICE -- CONSULT YOUR LOCAL GOVERNMENT.

NAME	ADDRESS	PHONE NUMBER

SECTION C - This section MUST be completed for any permit covered by this application.

19. APPLICATION IS HEREBY MADE FOR A PERMIT OR PERMITS TO AUTHORIZE THE ACTIVITIES DESCRIBED HEREIN. I CERTIFY THAT I AM FAMILIAR WITH THE INFORMATION CONTAINED IN THIS APPLICATION, AND THAT TO THE BEST OF MY KNOWLEDGE AND BELIEF, SUCH INFORMATION IS TRUE, COMPLETE, AND ACCURATE. I FURTHER CERTIFY THAT I POSSESS THE AUTHORITY TO UNDERTAKE THE PROPOSED ACTIVITIES. I HEREBY GRANT TO THE AGENCIES TO WHICH THIS APPLICATION IS MADE, THE RIGHT TO ENTER THE ABOVE-DESCRIBED LOCATION TO INSPECT THE PROPOSED, IN-PROGRESS OR COMPLETED WORK. I AGREE TO START WORK ONLY AFTER ALL NECESSARY PERMITS HAVE BEEN RECEIVED.

SIGNATURE OF APPLICANT OR AUTHORIZED AGENT	DATE

I HEREBY DESIGNATE _____

TO ACT AS MY AGENT IN MATTERS RELATED TO THIS APPLICATION FOR PERMIT(S). I UNDERSTAND THAT IF A FEDERAL PERMIT IS ISSUED, I MUST SIGN THE PERMIT.

SIGNATURE OF APPLICANT _____ DATE _____

SIGNATURE OF LANDOWNER (EXCEPT PUBLIC ENTITY LANDOWNERS, E.G. DNR)	DATE

THIS APPLICATION MUST BE SIGNED BY THE APPLICANT AND THE AGENT, IF AN AUTHORIZED AGENT IS DESIGNATED.

18 U.S.C §1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious, or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious, or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than 5 years or both.

COMPLETED BY LOCAL OFFICIAL

A. Nature of the existing shoreline. (Describe type of shoreline, such as marine, stream, lake, lagoon, marsh, bog, swamp, flood plain, floodway, delta; type of beach, such as accretion, erosion, high bank, low bank, or dike; material such as sand, gravel, mud, clay, rock, riprap; and extent and type of bulkheading, if any:)

B. In the event that any of the proposed buildings or structures will exceed a height of thirty-five feet above the average grade level, indicate the approximate location of and number of residential units, existing and potential, that will have an obstructed view

C. If the application involves a conditional use or variance, set forth in full that portion of the master program which provides that the proposed use may be a conditional use, or, in the case of a variance, from which the variance is being sought:

These Agencies are Equal Opportunity and Affirmative Action employers.
For special accommodation needs, please contact the appropriate agency from Appendix B.

APPENDIX A:
GUIDANCE CHECKLIST FOR COMPLETION OF DRAWINGS

neral Information. Three types of illustrations are needed to properly depict the proposed activity: Vicinity Map, Plan View, and ɔss-Sectional View. Drawings to scale should be prepared using clear printing, black ink, and the fewest number of sheets possible. Include the scale. The importance of clear accurate drawings cannot be overstated. At a minimum, drawings must contain the following information; other information may be required depending on project type. If you have questions regarding completing the drawings, call the appropriate agency.

1. Vicinity Map. A copy of a county or city road map, or a U.S. Geological Survey topographic map may be used. Include:

( ) a. North arrow.
( ) b. Name of waterbody (and river mile if appropriate).
( ) c. Location of the proposed activity (indicate with a circle, arrow, X, or similar symbol).
( ) d. Provide latitude and longitude of the site to the nearest second.
( ) e. Provide directions to the site.

2. Plan View. This drawing illustrates the proposed project area as if you were looking down at the site from overhead.

( ) a. North arrow.
( ) b. Name of waterbody and direction of water flow.
( ) c. Location of existing shoreline.
Tidal Waters: Show the Ordinary High, Mean High, Mean Low, Mean Higher High, and Mean Lower Low Water Marks or Lines, and/or wetland boundaries. Indicate elevation above datum.
Non-tidal waters: Show the Ordinary High Water Mark or Line, Meander Line, and/or wetland boundary.
( ) d. Dimensions of the activity or structure and impervious surfaces, distance from property lines, and the distance it extends into the waterbody beyond the Ordinary High, Mean High, Mean Higher High, and Mean Low Water Mark or Line, and/or wetland boundaries, as appropriate.
( ) e. For Corps permits, indicate the distance to Federal projects and/or navigation channels (if applicable). To ascertain, call the Corps Regulatory Branch Office at (206) 764-3495.
( ) f. Show existing structures on subject and adjoining properties.
( ) g. Indicate adjoining property ownership.
h. If fill material is to be placed, identify the type of material, amount of material (cubic yards), and area to be filled (acres).
( ) i. If project involves dredging, identify the type of material, amount of material (cubic yards), area to be dredged, method of dredging, and location of disposal site. Dredging in areas shallower than -10 feet needs to be clearly identified on drawings.
( ) j. Identify any part of the activity that has been completed.
( ) k. Indicate types and location of aquatic, wetland, and riparian vegetation.
( ) l. Erosion control measures, stabilization of disturbed areas, etc.
( ) m. Utilities, including water, sanitary sewer, power and stormwater conveyance systems (e.g., bioswales).
( ) n. Indicate stormwater discharge points.

3. Cross-Sectional View. This drawing illustrates the proposed activity as if it were cut from the side and/or front. Include:

( ) a. Location of water lines.
Tidal Waters: Show the Ordinary High, Mean High, Mean Higher High, and Mean Lower Low Water Marks or Lines, and/or wetland boundary.
Non-tidal waters: Show the Ordinary High Water Mark or Line, and/or wetland boundary.
( ) b. Water depth or tidal elevation at waterward face of project.
( ) c. Dimensions of the activity or structure, and the distance it extends into the waterbody beyond the Ordinary High, the Mean High, the Mean Higher High and Mean Low Water Mark or Line, and/or wetland boundaries.
( ) d. Indicate dredge and/or fill grades as appropriate.
( ) e. Indicate existing and proposed contours and elevations.
( ) f. Indicate types and location of aquatic, wetland, and riparian vegetation present on site.
( ) g. Indicate type and location of material used in construction and method of construction.
( ) h. Indicate height of structure.

4. Clearance and Elevations. Applies to Coast Guard Bridge Permits only.

( ) a. Vertical clearance measured from Mean Higher (tidal waters) or Ordinary High (non-tidal water).
b. Horizontal clearance between piers or pilings.
c. Bottom elevation of the waterway at the bridge.

APPENDIX B:
AGENCY CONTACTS

Below is a list of agencies to which a copy of the Joint Application may be sent, and which permit each agency issues. Technical assistance and information is also available from these offices.

Department of the Army Permit (Section 404 or Section 10)

U.S. Army Corps of Engineers, Seattle District Regulatory Branch Post Office Box 3755 Seattle, WA 98124-2255	Telephone (206) 764-3495 FAX (206) 764-6602
U.S. Army Corps of Engineers Eastern Washington Information	Telephone (509) 238-4570 FAX (509) 238-4570
U.S. Army Corps of Engineers Central Washington Information	Telephone (509) 682-7010 FAX (509) 682-7710

Department of Ecology Permits (401 and Approval to Exceed Water Quality Standards)

Washington State Department of Ecology 300 Desmond Drive Post Office Box 47600 Olympia, WA 98504-7600	Telephone (360) 407-7037 FAX (360) 407-6904
Central Region	Telephone (509) 575-2490 FAX (509) 575-2809
Eastern Region	Telephone (509) 456-2926 FAX (509) 456-6175
Northwest Region	Telephone (206) 649-7000 FAX (206) 649-7098
Southwest Region	Telephone (360) 407-6300 FAX (360) 407-6305

Department of Fish and Wildlife (Hydraulic Project Approval) - Submit all HPA applications to Headquarters. Contact regional offices for questions or assistance.

Headquarters

Washington State Department of Fish and Wildlife 600 Capitol Way North Olympia, Washington 98501-1091	Telephone (360) 902-2534 TDD (360) 902-2207 FAX (360) 902-2946

Region 1 (Pend Oreille, Ferry, Stevens, Spokane, Lincoln, Whitman, Columbia, Garfield, Asotin, and Walla Walla Counties)

Washington State Department of Fish and Wildlife Region 1 8702 North Division Street Spokane, WA 99218-1199	Telephone (509) 456-4082 FAX (509) 456-4071

Region 2 (Okanogan, Douglas, Grant, Adams, and Franklin Counties)

Washington State Department of Fish and Wildlife Region 2 1550 Alder Street NW Ephrata, WA 98823-9652	Telephone (509) 754-4624 FAX (509) 754-5257

Region 3 (Chelan, Kittitas, Yakima, and Benton Counties)

Washington State Department of Fish and Wildlife
Region 3
1701 South 24th Avenue
Yakima, WA 98902-5720

Telephone (509) 575-2740
FAX (509) 575-2474

Region 4 (Whatcom, Skagit, Snohomish, King, Pierce, Island, and San Juan Counties)

Washington State Department of Fish and Wildlife
Region 4
16019 Mill Creek Boulevard
Mill Creek, WA 98012-1296

Telephone (206) 775-1311
FAX (206) 338-1066

Region 5 (Lewis, Wahkiakum, Cowlitz, Skamania, Clark, and Klickitat Counties)

Washington State Department of Fish and Wildlife
Region 5
5404 NE Hazel Dell Ave.
Vancouver, WA 98663-1299

Telephone (306) 696-6211
FAX (360) 690-7238

Region 6 (Pacific, Thurston, Grays Harbor, Mason, Jefferson, Clallam, and Kitsap Counties)

Washington State Department of Fish and Wildlife
Region 6
48 Devonshire Road
Montesano, WA 98563-9618

Telephone (360) 249-6522
FAX (360) 664-0689

Local Government (Shoreline Management Act Approval)

Appropriate City or County Planning, Building, or Community Development Department

ural Resources Conservation Service (NRCS), formerly Soil Conservation Service (SCS) for information regarding activities on ..ricultural land)

NRCS
Suite 450
Rock Point Tower Two
West 316 Boone Avenue
Spokane, WA 99201-2348

Telephone (509) 353-2335

Coast Guard (Section 9 Bridge Permit)

Commander 13th Coast Guard District (OAN)
915 Second Avenue
Seattle, WA 98174-1067
Attn: Austin Pratt

Telephone (206) 220-7282

Department of Natural Resources Aquatic Resources regarding authorization to use bedlands, tidelands, or shorelands of navigable waters.

Central Region	Telephone (360) 748-2383
Northwest Region	Telephone (360) 856-3500
Southwest Region	Telephone (360) 577-2025
South Puget Sound Region	Telephone (360) 825-1631
Northeast Region	Telephone (590) 925-8510
Southeast Region	Telephone (509) 925-8510
Olympic Region	Telephone (360) 374-6131
Headquarters	Telephone (360) 902-1100

WAC 197-11-960 Environmental Checklist

This document is a preliminary checklist that will be updated for the final Plan.

WAC 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1. Name of proposed project, if applicable:

Blaine General Sewer Plan

2. Name of applicant:

City of Blaine Public Works Department

3. Address and phone number of applicant and contact person:

Stephen R. Banham, P.E., Public Works Director
City of Blaine
1200 Yew Avenue
Blaine, WA 98230

4. Date checklist prepared:

May 2004

5. Agency requesting checklist:

6. Proposed timing or schedule (including phasing, if applicable):

The proposal covers a 20-year planning period from 2003 to 2023. Individual wastewater system improvements would be designed and constructed throughout this period in accordance with the Capital Improvement Program (CIP) and increases in system demand.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No. All sewer system improvements foreseen within the planning horizon are included in the CIP.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

City of Blaine Comprehensive Plan (amended 1999)

Semiahmoo Spit and Uplands Master Plan, Draft Environmental Impact Statement (1984)

Project-level environmental review under SEPA and/or NEPA, as appropriate, will be conducted during the design phase of individual projects that implement this plan.

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

None known

10. List any government approvals or permits that will be needed for your proposal, if known.

The sewer plan must be adopted by the Blaine City Council and approved by the Washington State Department of Ecology. Individual projects included in the CIP will also be subject to project-level environmental review and permitting, as applicable.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposal is a compilation of planning data, sewage generation projections, and related information for the sewer service area defined in the sewer plan. The plan includes a description of major capital facilities required during the City's 20-year planning period for growth within its designated urban growth area (UGA). Projects in the CIP include both wastewater treatment facilities to improve water quality and serve future growth, and sewer collection system projects to address existing system deficiencies.

Near-term wastewater treatment projects include repairs to the headworks at the existing WWTP; other interim improvements to the WWTP to increase efficiency and performance; and repair of a hole in the existing marine outfall. To address longer-term needs, the City proposes to construct a new WWTP at a City-owned site on Marine Drive that will treat all flows from Central and East Blaine. At some time beyond 2008, the City will provide treatment for West Blaine flows, either at a new WWTP or by conveying the flows to the Birch Bay Water and Sewer District's treatment plant to the south.

Sewer collection system improvements include a total of nine projects. These improvements have been prioritized according to their environmental health benefits, impact on the community, and populations served. A majority of these projects will be

constructed after the new treatment plant is built. They consist primarily of replacement of existing pipe sections with larger-diameter pipes to alleviate surcharge conditions that could result in overflows.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The General Sewer Plan addresses service to the City's 20-year Urban Growth Area. This area encompasses approximately 5,900 acres. Boundaries of the UGA are shown in the General Sewer Plan.

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other . . . . . .

b. What is the steepest slope on the site (approximate percent slope)?

The steepest slopes within the service area are the bluffs near Birch Point (approximately 40 percent slope).

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Soils in the area are generally stratified sand and gravel of varying thickness. Gravel and sandy loam soils in the uplands provide good drainage; silt and silty clay in lower areas have poor drainage characteristics.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

The City's critical areas mapping identifies some potentially unstable slopes are located along the eastern and southern shorelines of Drayton Harbor.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

It will be necessary to excavate and backfill soils when constructing improvements described in the plan. Sewer lines will be constructed within public rights-of-way to the extent practicable; approximately 1 cubic yard of excavation/fill will be required per foot of sewer constructed. Grading will also be required for the new water reclamation facility. Excavation and fill quantities for all capital projects will be estimated during design development and discussed in project-level environmental review documents.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

Erosion and sediment transport could occur during trench excavation, lift station and treatment plant construction, material import and export, stockpiling, and backfill operations. Exposed soils during excavation are subject to erosion prior to resurfacing or revegetation. Transfer of excavated material and fill material to and from construction areas could leave mud and excavated material on nearby streets. Proper construction methods, including best management practices, will control short-term erosion; no long-term erosion impacts are anticipated.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Proposed projects would be constructed mainly within existing paved and developed areas, and would thus involve minimal increases in impervious surface area.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

During construction and land clearing, contractors would be required to follow best management practices, such as installation of silt fences, interceptor ditches, rock check dams, temporary sediment traps, straw bale diversion, gravel outlets, and temporary sediment ponds. The level of BMPs implemented would be appropriate to the size of the excavation and conditions in the immediate area. Disturbance of areas over 5 acres in size would require preparation of a Stormwater Pollution Prevention Plan in compliance with the Department of Ecology's requirements for temporary stormwater permits under the National Pollutant Discharge Elimination System (NPDES) program. Other measures to minimize erosion include covering of stockpiled soils and revegetation of disturbed soils as soon as possible, particularly near surface waters.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

Exhaust from equipment during construction will be minimal. Some dust may result from excavation activities. Lift Station 1 may produce small amounts of air emissions from the operation of backup generators, but is not likely to generate any noticeable odors. It is anticipated that the new treatment plant will use a high level of odor control technology to minimize odors; this will also serve to limit the emission of volatile organic compounds (VOCs).

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

No.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

During construction, all equipment will be fitted with required exhaust control systems, and dust control methods will be employed as necessary. Measures to control treatment plant emissions will be incorporated into facility design, as described above. The new treatment plant will be required to obtain a Notice of Construction permit from the Northwest Air Pollution Control Agency and to implement best available control technology to reduce emissions.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Semiahmoo Bay is adjacent to the City of Blaine on the west. The populated areas of the City lie both northeast and southwest of Drayton Harbor, which connects to the bay via a narrow channel between downtown Blaine and Semiahmoo Spit. Dakota Creek and California Creek flow into Drayton Harbor from the east and south, respectively. A number of wetlands are found in the area, particularly to the south of Drayton Harbor and in the riparian areas of the two creeks.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

The new wastewater treatment plant will likely be constructed within 200 feet of Semiahmoo Bay and/or Drayton Harbor. In addition, repairs to the existing outfall will require work within the waters of Semiahmoo Bay. Details of this work will be developed in project-level environmental review to be completed during facility planning and design.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

It is not currently anticipated that fill or dredge material would be placed in or removed from surface water or wetlands in conjunction with development of projects under this plan.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

Portions of the sewer service area lie within the floodplains of Dakota and California Creeks.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

The City discharges treated wastewater effluent into Semiahmoo Bay under the terms of an NPDES municipal discharge permit with the Department of Ecology. Discharge in accordance with permit limits would continue under this General Sewer Plan; however, effluent quality would improve significantly under the plan as a result of enhanced treatment technology at the new water reclamation facility. Average annual flows through the treatment plant are expected to increase from 0.61 mgd in 2002 to 0.81 mgd in 2013 and 1.0 mgd in 2023.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No groundwater will be withdrawn or water discharged to groundwater. Temporary dewatering may be required during construction excavation in some areas, but it is not expected to affect overall groundwater quantity or quality.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Over time, the extension of sewer service to currently unsewered areas will eliminate the use of septic systems in those areas. Septic systems have been associated with contamination of groundwater and surface water; thus, groundwater quality is likely to improve as a result of plan implementation.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Stormwater running off areas disturbed during construction will be routed through erosion control facilities, as described under B.1(h) above. Any additional impervious surface at the new treatment facility would generate runoff; all runoff from the facility would be collected and disposed of in accordance with regulations in force at the time the facility is constructed. Estimates of runoff quantities and designs for stormwater management systems will be developed during treatment plant design and evaluated as part of environmental review for that project.

3) Could waste materials enter ground or surface waters? If so, generally describe.

There is a small possibility that a spill or release of fuel or oil from construction equipment could enter nearby streams or wetlands.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Compliance with the terms of the NPDES permit and development of the new water reclamation facility will improve water quality within the study area. All discharges of wastewater effluent and stormwater will comply with applicable regulatory requirements and specific conditions defined during permitting. Construction activities will implement BMPs to protect water quality, as described in B.1(h) above.

4. **Plants**

a. Check or circle types of vegetation found on the site:

——— deciduous tree: alder, maple, aspen, other

——— evergreen tree: fir, cedar, pine, other

——— shrubs

——— grass

——— pasture

——— crop or grain

——— wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

——— water plants: water lily, eelgrass, milfoil, other

——— other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

In general, construction of new facilities under this General Sewer Plan would take place within existing developed rights-of-way and/or City property. Minimal removal or alteration of vegetation is anticipated.

c. List threatened or endangered species known to be on or near the site.

No threatened or endangered plant species are known to exist in the service area.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

As noted above, the areas in which construction would occur generally are not vegetated. Landscaping and/or restoration measures for the WWTP and pipeline corridors will be developed on a site-specific basis as necessary during facility design.

5. **Animals**

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, other: typical Northwest birds and waterfowl
mammals: deer, bear, elk, beaver, other: raccoon, skunk, coyote, typical Northwest mammals
fish: bass, salmon, trout, herring, shellfish, other: typical Northwest saltwater and freshwater game and non-game fish

b. List any threatened or endangered species known to be on or near the site.

Federally listed threatened or endangered animal species that occur, or have the potential to occur, in the project area include bald eagle *(Haliaeetus leucocephalus)*, marbled murrelet *(Brachyramphus marmoratus marmoratus)*, and Steller's sea lion *(Eumetopius jubatus)*, all listed as threatened.

c. Is the site part of a migration route? If so, explain.

Yes, for anadromous fish and migratory waterfowl.

d. Proposed measures to preserve or enhance wildlife, if any:

Removal of existing vegetation will be minimal, and any disturbed areas would be revegetated. Any in-water construction will be limited to the in-water work windows established by resource agencies.

6. **Energy and natural resources**

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Construction equipment used for clearing and grading activities, trench excavation and backfilling, and delivery of construction materials will use fossil fuel energy. Lift Station 1 and the new WWTP will use electric power, with diesel-powered emergency backup units.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Energy consuming equipment (e.g. pumps and motors) at the lift stations and treatment facility will comply with all applicable energy efficiency requirements and codes to reduce power consumption.

7. **Environmental health**

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Implementation of the General Sewer Plan will improve environmental health by enhancing water quality in Semiahmoo Bay. The new WWTP and Lift Station 1 will use a number of chemicals typically employed at treatment facilities and pump stations to control odor and corrosion. Under federal and state law, these chemicals require

special storage and handling systems and disposal procedures that minimize risks to public health. Therefore, no additional risk of fire, spill, or explosion is expected from sewer plan implementation.

1) **Describe special emergency services that might be required.**

None are anticipated.

2) Proposed measures to reduce or control environmental health hazards, if any:

As noted above, implementation of the General Sewer Plan will improve environmental health in the Blaine area.

b. **Noise**

1) **What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?**

None.

2) **What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.**

Noise due to construction will be short-term. Noise from operation of the treatment facility and Lift Station 1 will be appropriately mitigated through project design measures to meet or exceed the requirements of applicable noise regulations.

3) **Proposed measures to reduce or control noise impacts, if any:**

See (2) above. Final design and mitigation measures will be determined during design-development and project-level review for specific projects.

8. **Land and shoreline use**

a. **What is the current use of the site and adjacent properties?**

Land use within the Blaine Urban Growth Area is primarily residential, with smaller amounts of commercial and industrial development as well as a significant amount of undeveloped land.

b. **Has the site been used for agriculture? If so, describe.**

Agriculture is not a significant land use within the City's service area.

c. **Describe any structures on the site.**

No structures are located in areas proposed for new sewer pipelines. A portion of the City's former WWTP is located at the site of Lift Station 1.

d. **Will any structures be demolished? If so, what?**

It has not yet been determined whether any structures will be demolished in order to construct the WWTP. Environmental review for the treatment plant project will include a discussion of any needed land use actions, including demolition, at the chosen site.

e. **What is the current zoning classification of the site?**

The Blaine sewer service area encompasses high- and low-density residential, commercial, undustrial, parks/open space, and public facilities zoning.

f. **What is the current comprehensive plan designation of the site?**

Comprehensive plan designations within the service area are consistent with zoning classifications (as described above).

g. **If applicable, what is the current shoreline master program designation of the site?**

Shorelines within the City's service area are under the jurisdiction of the Blaine and Whatcom County Shoreline Master Program. Designations include Urban, Rural, and Conservancy.

h. **Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.**

The City of Blaine has classified various environmentally sensitive areas within its jurisdiction, including wetlands, floodplains, geologic hazard areas, and aquifer recharge areas.

i. **Approximately how many people would reside or work in the completed project?**

Staffing requirements for the new WWTP have not been determined, but operation of the future wastewater collection and treatment system under this General Sewer Plan is not likely to result in a significant increase in employment.

j. **Approximately how many people would the completed project displace?**

None.

k. **Proposed measures to avoid or reduce displacement impacts, if any:**

None required.

l. **Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:**

The General Sewer Plan is designed to be consistent with the Blaine Comprehensive Plan and to facilitate the provision of urban services to residents and businesses within the UGA as required by the Growth Management Act.

9. **Housing**

a. **Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.**

None.

b. **Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.**

None.

c. **Proposed measures to reduce or control housing impacts, if any:**

None required.

10. **Aesthetics**

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Design and finish specifications have not been developed for projects proposed in the General Sewer Plan. This information will be developed during project design and will be subject to applicable requirements for environmental review.

b. What views in the immediate vicinity would be altered or obstructed?

Views affected by facility construction will depend on the specific sites chosen and the facilities' design.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Project-level environmental review will identify any potential aesthetic impacts and propose appropriate mitigation.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Lighting will be used at the new WWTP, but specific lighting types and the usage of lighting during operations have not been determined.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

Design of WWTP lighting will minimize or eliminate any such impacts.

c. What existing off-site sources of light or glare may affect your proposal?

None known.

d. Proposed measures to reduce or control light and glare impacts, if any:

If appropriate, such measures will be developed as part of environmental review of the wastewater treatment facility.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

A number of parks exist within the City of Blaine. One of the potential WWTP sites is located in Marine Park, which is on the waterfront in downtown Blaine.

b. Would the proposed project displace any existing recreational uses? If so, describe.

If the WWTP were developed at the Marine Park site, it could displace up to 2.5 acres of passive recreational use.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

If required, such measures will be developed as part of project-level review for the WWTP/

13. **Historic and cultural preservation**

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

While the City contains a number of places of historic significance, none are located within areas proposed for improvements.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

None known.

c. Proposed measures to reduce or control impacts, if any:

None required.

14. **Transportation**

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

Construction of conveyance system improvements would take place within rights-of-way of a number of roadways, primarily within the downtown area. These include 9th, Mitchell, and G Streets and Peace Portal Drive. Lift Station 1 improvements and the new WWTP would be accessed via Marine Drive.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Not applicable.

c. How many parking spaces would the completed project have? How many would the project eliminate?

Parking would be provided at the new WWTP for employees and visitors. No parking would be displaced.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The potential WWTP sites are in the vicinity of the BNSF railroad line.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

The new WWTP would generate a small number of trips by employees, visitors, and suppliers and for periodic disposal of biosolids. Trip generation will be quantified during project-level environmental review.

g. Proposed measures to reduce or control transportation impacts, if any:

Where construction would cause temporary closures of traffic lanes, care would be taken to provide motorists and adjacent property owners in advance of the closures, maintain access to roads and businesses, provide for access by emergency vehicles, and provide signed detour routes if necessary. More specific mitigation measures will be developed as required during project-level environmental review.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

No.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Not applicable.

16. Utilities

a. **Circle utilities currently available at the site:** electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

c. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

All utilities listed above will be used for operation of the wastewater treatment plant and/or Lift Station 1.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: .....

Date Submitted: .....

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. **How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?**

Implementation of the proposed General Sewer Plan will allow future development to occur in the service area as envisioned in the Blaine Comprehensive Plan. Overall discharges to water from the WWTP would increase over current conditions as growth occurs, but the quality of the discharge would be improved. The risk of sanitary sewer overflows to surface waters would also be minimized by the proposed improvements to Lift Station 1 and the addition of capacity in several key conveyance lines. No significant increase would occur in emissions to air or in generation of noise. Some additional level of toxic or hazardous substances may be used or stored at the new WWTP, consistent with the added capacity; any such substances would be stored, handled, and disposed of in accordance with all applicable regulations for protection of human health and the environment.

Proposed measures to avoid or reduce such increases are:

The proposal represents a net environmental benefit and incorporates measures to minimize impacts. No additional measures are warranted.

2. **How would the proposal be likely to affect plants, animals, fish, or marine life?**

Please refer to Sections B.4 and B.5 of this checklist. The proposal would have positive effects on plants, animals, fish, and marine life by improving water quality and reducing sewage overflows.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Please refer to the responses to questions B.4(d) and B.5(d) in this checklist.

3. **How would the proposal be likely to deplete energy or natural resources?**

The proposed treatment plant and lift stations would use electricity on a regular basis.

Proposed measures to protect or conserve energy and natural resources are:

Energy efficiency will be a criterion in the selection of pumps and process equipment, and all such equipment will comply with applicable energy conservation codes and requirements. Please refer to Section B.6 of this checklist for additional information.

3. **How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?**

Please see the responses to questions in Sections B.3, B.8, and B.13. The proposal is not expected to result in significant impacts on environmentally sensitive areas, or to affect wilderness areas, wild and scenic rivers, or prime farmlands. An undeveloped portion of Marine Park could be used for WWTP construction, depending on the site and configuration chosen for the facility. The potential exists for any land-disturbing activity to encounter unidentified historic or cultural sites; however, all proposed projects would be located in previously disturbed areas. Endangered species and their habitat would benefit from the water quality improvements provided by plan implementation.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Please see the responses to questions in Sections B.3, B.8, and B.13. Any necessary mitigation measures will be identified during the environmental review conducted for projects prior to construction approvals.

5. **How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?**

Please see Section B.8 of this checklist. Implementation of the General Sewer Plan will support existing and planned land uses as envisioned in the Blaine Comprehensive Plan.

Proposed measures to avoid or reduce shoreline and land use impacts are:

The proposal is consistent with current planning for land and shoreline use. Site-specific impacts, if any, of individual projects on land or shoreline use will be evaluated and mitigation identified as necessary during project-level environmental review for those projects.

6. **How would the proposal be likely to increase demands on transportation or public services and utilities?**

Please see Sections B.14, B.15, and B.16 of this checklist. The proposed General Sewer Plan would meet increased demands for sewer service from planned land uses.

Proposed measures to reduce or respond to such demand(s) are:

Not applicable.

7. **Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.**

The proposal would be implemented consistent with all applicable local, state, and federal laws and requirements for protection of the environment.

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
OFFICE OF FOOD SAFETY & SHELLFISH PROGRAMS
7171 Cleanwater Lane, Bldg. 4 • PO Box 47824 • Olympia, Washington 98504-7824
(360) 236-3330 • TDD Relay Services 1-800-833-6388

February 17, 2005

Steve Banham
Public Works Director
City of Blaine
1200 Yew Avenue
Blaine, Washington 98230

Dear Mr. Banham:

The Office of Food Safety and Shellfish Programs of the Washington Department of Health (DOH) is glad to provide comment on the City of Blaine's draft facility plan for an upgraded wastewater treatment plant (WWTP). In particular we are responding to the potential benefit that a membrane bioreactor (MBR) may have on the shellfish closure zone for the Blaine WWTP. As you are aware, our program is responsible for establishing the size of shellfish closure zone around WWTP outfalls. No shellfish are to be harvested within these closure zones.

The existing WWTP outfall has been recently repaired, extends over 2000 feet offshore into Semiahmoo Bay, and has the capacity for future increases in average effluent flow. We believe that this outfall is an important resource in dispersing Blaine's WWTP effluent if a marine water discharge in the general area of Drayton Harbor is the only viable disposal option.

The existing shellfish closure zone for the Blaine WWTP extends a great distance in all directions from the end of the outfall. This closure zone is extensive because of inherent limitations in Blaine's WWTP treatment process. An upgraded WWTP could shrink the size of the shellfish closure zone, allowing intertidal shellfish harvesting along portions of the outside of Semiahmoo Spit. Regardless of WWTP configuration, we encourage the installation of reliable disinfection system at WWTPs near shellfish areas, with automatic alarm system signals connected continuously to plant staff, and with strong disinfection capacity.

Our program has conducted a preliminary assessment of membrane bioreactors (MBRs), focusing primarily on the removal of pathogenic viruses. In particular, we have studied the performance of the Kubota MBR technology, since it was tested under the California Title 22 requirements for its ability to meet reclaimed water standards. To my knowledge, no other MBR technology or system has completed testing for these stringent standards. Among other parameters, these tests assessed the removals of bacteria, in addition to MS2 and coliphage

viruses, under various flows and filter conditions. Due to the small pore size of MBRs, pathogenic bacteria, Giardia, Cryptosporidium are filtered out unless there is a problem with this treatment system. There is also a significant reduction in levels of viruses that pass into the effluent. Our program encourages municipalities to reduce and/or eliminate the discharge of pathogenic viruses into waters near shellfish growing areas.

A preliminary assessment of the shellfish closure zone for the Blaine WWTP using virus reduction efficiencies achieved by the Kubota MBR indicates that the resulting shellfish closure zone is relatively small and would shrink the size of the existing shellfish closure zone around the Blaine WWTP outfall. This closure zone does not appear to impact intertidal area near the existing WWTP outfall. The preliminary assessment assumed a future maximum monthly design flow of 1.5 million gallons per day, upset conditions in the WWTP, and adverse receiving water conditions.

Our program intends to stay in communication with the City of Blaine and their consultant regarding the type of WWTP system (or vendor of MBR) that is selected for the WWTP upgrade. The capacity of the selected system or technology to reduce viruses in the Blaine WWTP effluent will be an important consideration in assessing the resulting size of shellfish closure zone.

We are currently reviewing the results of a technical review by FDA specialists on the size of shellfish closure zones at WWTPs that use MBRs. We will provide your office a more complete response on Blaine's future WWTP shellfish closure zone after further discussions with FDA staff on their review.

Thank you for your consideration of this general assessment. If you have any questions, please contact me at (360) 236-3321 or at frank.meriwether@doh.wa.gov.

Sincerely,

Frank Meriwether
Environmental Engineer

cc: Alan Chapman, Lummi Indian Nation
Gary Mac Williams, Nooksack Tribe
Mike McHugh, Tulalip Tribes
Paul Williams, Suquamish Tribe
Kim Zabel-Lincoln, DOH