Final

General Sewer Plan

Prepared for

City of Blaine, Washington

September 2004

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777 108th Ave. NE
Bellevue, WA 98404

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Prepared in compliance with the Washington Department of Ecology Requirements for General Sewer Plans, WAC 173-240-050.

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D Pump Curves
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Acronyms and Abbreviations

AACE	American Association of Cost Engineers
AC	asbestos cement
BBWSD	Birch Bay Water and Sewer District
BMC	Blaine Municipal Code
BOD_5	Biological Oxygen Demand (5-day)
CCTV	closed-circuit television
CERB	Community Economic Revitalization Board
cfs	cubic feet per second
CIP	capital improvement program
City	City of Blaine
CMMS	Computerized Maintenance Management System
CMOM	Capacity, Management, and Operations & Maintenance
CPES	CH2M HILL Parametric Cost Estimating System
CWAC	Citizen's Wastewater Advisory Committee
DHI	Danish Hydraulic Institute
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EDA	Economic Development Administration
EGL	energy grade line
EPA	U.S. Environmental Protection Agency
ERU	Equivalent Residence Unit
ESA	Endangered Species Act
FOG	fats, oils, and grease
fps	feet per second
ft^2	square feet
GASB	General Accounting Standards Board
GFF	General Facility Fee
GIS	Geographic Information System
GMA	Growth Management Act
gpd	gallons per day
gpm	gallons per minute
GVS & DD	Greater Vancouver Sewerage and Drainage District
H_2S	hydrogen sulfide
HGL	hydraulic grade line
hp	horsepower

I/I	infiltration/inflow
I-5	Interstate 5
LS	lift station
mgd	million gallons per day
mg/L	milligrams per liter
MHHW	mean higher high water
MHI	Mean Household Income
MLLW	mean lower low water
MOUSE	Modeling Urban Sewers
NEPA	National Environmental Policy Act
NOAA	National Oceanographic and Atmospheric Administration
NOC	Notice of Construction
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NSF	National Science Foundation
O&M	operation and maintenance
PCHB	Pollution Control Hearing Board
PLC	programmable logic controller
Pro2D	CH2M HILL's Professional Process Design
PWTF	Public Works Trust Fund
RBC	rotating biological contactor
RCP	reinforced concrete pipe
RDII	rainfall-derived infiltration and inflow
RUS	Rural Utility Service
RTU	remote telemetry unit
SEPA	State Environmental Policy Act
SERP	State Environmental Review Process
SHPO	State Historic Preservation Officer
SRB	sulfate reducing bacteria
SSO	sanitary sewer overflow
STAG	State and Tribal Assistance Grant
SWD	side water depth
TSS	total suspended solids
UGA	Urban Growth Area
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service

VCP	vitrified clay pipe
VFD	variable frequency drive
WAC	Washington Administrative Code
WRF	water reclamation facility
WWTP	wastewater treatment plant

CHAPTER 1

Introduction

The City of Blaine, Washington (City) is updating its General Sewer Plan (Sewer Plan) to provide a road map that can be used by City leadership and staff to implement required improvements to the existing City facilities. This Sewer Plan is intended to provide the City with a flexible tool that can be used to assist in the decision-making process for the various sewer service needs and objectives identified herein. This plan updates the City's previous sewer plan, which was completed in 1994, and addresses the wastewater conveyance and treatment needs for the City for the period from 2005 to 2025.

This Sewer Plan has been prepared in accordance with the requirements of Washington Administration Code 173-240-050, which is administered by the Washington State Department of Ecology (Ecology). Further information on the requirements of WAC 173-240-050 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, gravity sewer lines, force mains, and ten pump stations.

1.1.1 History of the Planning Process

The City of Blaine's existing wastewater treatment plant 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 treatment plant on the City's existing treatment plant 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 treatment plant upgrade.

Design documents for the new treatment plant were completed in 1999, Ecology approved them, and construction began in the spring of that year. 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 treatment plant site on Semiahmoo Spit is no longer considered a feasible long-term treatment site. The City has 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 evaluated alternatives for addressing capacity limitations and regulatory requirements. In 2000, the City conducted an

analysis of the existing capacity at the treatment plant 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 Blaine's wastewater flows to the Birch Bay Water and Sewer District's treatment facility 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 plant, a solution for future treatment needs to be found and implemented as soon as possible. In the meantime, the City must maintain compliance with regulations and permit requirements until the new solution is in place.

Blaine's collection system has also faced a number of challenges since completion of the previous General Sewer Plan. The City has completed a number of key collection system projects in support of the cleanup of Drayton Harbor – most notably, replacement of the underwater sewer line across the harbor mouth in 1996 and inspection and repair of the sewer line along Marine Drive in 2000-2001. However, a number of condition and capacity issues still exist within the system. Inflow and infiltration, which are significant in the older downtown section of Blaine, cause high flows in the collection system in the winter months. With portions of the sewer system over 50 years in age, improvements in conveyance are clearly needed in concert with additional treatment capacity.

The most pressing issue in Blaine's collection system is the potential for overflows at Lift Station No. 1, which handles all flows from east and central Blaine. 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 improvements have already prevented several wet-weather overflows, but they are insufficient to guarantee that there will be no future overflows. The temporary storage is too small for extreme storm events. Using this approach is very labor-intensive, and the rubber bladders are expected to have a service life of less than 10 years. The City determined that the preferred long-term solution to eliminate the overflows at Lift Station No. 1 would require providing storage to hold peak flows during heavy rainfall, then releasing them to be pumped to the treatment plant 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).

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. The harbor is listed on Ecology's 303(d) list of water quality-impaired water bodies, and the Drayton Harbor Shellfish Protection District has been formed to develop strategies for improving water quality in the harbor and tidal flats. There are many contributors to water quality issues in the harbor, including agricultural practices, failing septic systems, and stormwater runoff. As a point source, however, municipal wastewater discharges are often singled out in the public perception of coliform contamination.

Because of the financial impact of constructing new wastewater facilities and the difficulty of financing these improvements solely through rate increases, especially in a small community, the City is seeking sources of funding. In order to qualify for funding, the proposed improvements must be included in a comprehensive wastewater plan that provides reliable estimates of population and employment growth and wastewater flows and loads over a defined planning horizon. This General Sewer Plan is designed to lay the foundation for development of new treatment and conveyance facilities while allowing for approval and funding of critical interim actions to comply with regulations while decisions are being made on the WWTP site.

1.1.2 Sewer Plan Goals

The primary purpose of this General Sewer Plan is to serve as a comprehensive planning document that can be used by City staff to implement required improvements to address identified capacity, treatment, and operation and maintenance needs over the next 20 years. Specific goals of this Sewer Plan include:

- Comply with the requirements of WAC Chapter 173-240-050
- Prepare the plan to be consistent with all other applicable federal, state, and local regulations, policies, and planning requirements
- Present a clear and concise capital improvement program (CIP) and implementation strategy
- Identify planning-level construction costs for CIP facilities
- Provide recommendations for sewer system (O&M) improvements and improvements to design standards
- Develop a financing plan for the recommended improvements and assess potential impacts on utility rates

Studies leading to the preparation of this General Sewer Plan included:

- A review of existing planning data, mapping, utility system information, and other material pertaining to the study area
- A projection of anticipated population growth in the City's wastewater service basins for the next 20 years—based upon the City of Blaine's recently completed population growth allocations—and the resulting wastewater flows and loads
- An evaluation of existing sewer facilities to determine their current and future adequacy and a review of existing design criteria
- An evaluation of alternatives for future wastewater treatment

Based upon these analyses, a recommended program of improvements to the collection and treatment systems has been developed and is presented in Chapter 6 of this plan.

1.2 Regulatory Requirements

Wastewater system planning must address the regulations and requirements of many federal, state, and local regulatory agencies. This section summarizes applicable rules and regulations for this General Sewer Plan.

1.2.1 Federal Regulations

Sanitary Sewer Overflow Policy

A federal advisory committee made recommendations to the U.S. Environmental Protection Agency (EPA) in 1999 for policies regarding sanitary sewer overflows. The recommendations call for policies that would require sewer-system operators to do the following:

- Properly manage, operate and maintain all parts of collection systems under their control
- Provide adequate capacity to convey base and peak flows
- Take all feasible steps to stop and mitigate impacts of sanitary sewer overflows
- Notify parties with a reasonable potential for exposure to pollutants associated with sanitary sewer overflows
- Develop a sanitary sewer overflow management program and make a written summary of the program available to the public
- Develop an overflow response plan
- Develop a plan for system evaluation and capacity assurance
- Conduct an audit of the capacity, management, operation and maintenance program and submit a report on the audit
- Communicate with interested parties on a regular basis on implementation and performance of the capacity, management, operation and maintenance program.

The advisory committee also recommended a prohibition on municipal sanitary sewer discharges upstream of treatment facilities, with exceptions for circumstances that are exceptional, unintentional, temporary and caused by factors beyond the reasonable control of the system operator. Exceptions for severe natural conditions are likely to be site-specific. That is, even overflows resulting from very infrequent rainfall events may be prohibited if the discharge is to water-quality-sensitive areas, whereas more frequent overflows caused by rainfall may be allowed if it can be demonstrated that the discharge has negligible water-quality impact on the receiving water.

The recommended policy also requires 24-hour, follow-up, and annual reports of sewer system overflows, with notification to agencies, drinking water suppliers and other affected parties if there is potential to affect human health. The policy also would encourage system owners to update their collection, treatment and disposal infrastructure in a manner that prevents and eliminates sewer overflows, meets all regulatory requirements, and protects beneficial uses of waters to which they discharge.

New rules to implement these recommendations were issued but have been temporarily withdrawn for further review. The issued rules focused on expanded operation and maintenance efforts and are known as CMOM, which stands for "capacity, management, operation and maintenance." It is anticipated that the revised rules will be issued in some form in the near future.

Environmental Regulations

Key federal environmental regulations pertinent to this General Sewer 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 Act 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 Blaine 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 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 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. Wastewater treatment 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 following:
  - Affected environment and environmental consequences of a proposed project
  - Reasonable or practicable alternatives to the proposed project

– 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:

– Categorical exclusions
– Environmental assessments
– Environmental impact statements

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 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.

EPA Site Limitations

This General Sewer Plan includes an evaluation of potential locations for treatment of the City's future wastewater flows. Key EPA policies on site limitations pertinent to this evaluation are as follows:

- If facility improvement projects affect identified historical or archaeological sites, a more detailed evaluation of the site and potential impact of the project on the site may be required under the National Historic Preservation Act.
- The EPA will not fund treatment projects on environmentally sensitive lands such as floodplains or wetlands.
- It is the policy of the EPA and the Farmland Protection Policy Act (PL 97-98) to protect agricultural lands from "irreversible loss as an environmental or essential food production resource."

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 this 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 the Department of Ecology with an NPDES permit. This permit establishes the allowable quantity of discharge from a given of treatment facility 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:

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

Ecology uses the Orange Book design guidelines to review and approve reports, plans, and specifications. Design guidelines presented in Chapters 3 and 4 of this plan are generally based upon those in the Orange Book. Areas where the City of Blaine's design guidelines differ from Ecology's are noted in the text.

State Environmental Policy Act

The State Environmental Policy Act (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 projects under this plan.

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)

- Environmental impact statement or EIS (required when a project is determined likely to have significant impacts on the natural or built environment)

This General Sewer Plan is considered a "non-project" agency action and, as such, is subject to SEPA review. A SEPA environmental checklist on the plan is included as Appendix B. Individual capital projects under this plan will be subject to project-level SEPA review during the design phase in order to evaluate their potential impacts. This review will be done on a project-by-project basis and could range from categorical exemption to EIS, depending on the magnitude of impact involved.

State Environmental Review

A Memorandum of Understanding has been established between the U.S. Department of Agriculture Rural Development, the U.S. Department of Agriculture Forest Service, the Washington State Department of Ecology, the Washington State Office of Community Development, and the Washington State Public Works Board 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 that follows the guidelines of Rural Utility Service Bulletin 1794A-602. The report accomplishes the following:

- It establishes the purpose and need for the project.
- It presents alternatives to the proposed project.
- It evaluates the environmental effects of the proposed project and the alternatives considered.
- It assesses the significance of those environmental effects.
- It 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 treatment plant or on-site 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

Development within Blaine city limits is regulated by the City's Comprehensive Plan (last amended in 1999) and by zoning and development standards contained in the Blaine Municipal Code. In accordance with the requirements of the Washington State Growth Management Act, the City has identified Urban Growth Areas (UGAs) where urban levels of development will occur over the next 20 years. For land within their UGA, cities must prepare capital facilities plans to show how services and facilities will be financed and must adopt implementation regulations to carry out the plan's goals and policies. The City of Blaine Comprehensive Plan is consistent with state growth management goals and the Whatcom County Planning Policies adopted to guide the development of comprehensive plans within Whatcom County. This General Sewer Plan helps implement the Comprehensive Plan by providing a cohesive strategy to serve wastewater conveyance and treatment needs as the City develops.

The Utilities component of the Comprehensive Plan includes the following goal pertaining to wastewater service:

> *To provide efficient and affordable wastewater collection and treatment facilities which meet the needs of existing and future residents, protect the environment and water quality in Drayton Harbor and Semiahmoo Bay, and comply with state and federal requirements.*

Specific actions recommended in the Comprehensive Plan include development and implementation of a comprehensive program to repair or replace older sanitary sewer lines subject to infiltration and inflow; completion and implementation of a detailed financial plan to fund sewer system improvements; and adoption of an industrial pretreatment ordinance.

Regulations related to sewer service and capital project development within the City of Blaine 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 Sewer 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. Also documents the history of the City in terms of land use and wastewater development.

Chapter 3, Wastewater Collection System. Describes the existing sewer system components. Sewer system design criteria are presented and City standards that are more stringent than Ecology's are highlighted. Presents the development and results of the sewer system hydraulic model. Issues associated with the condition of the existing system are presented. An overview of a potential condition assessment process is also included.

Chapter 4, Wastewater Treatment Facility and Outfall. Presents an evaluation of the City's wastewater treatment facility and outfall, as well as describing future treatment alternatives.

Chapter 5, Operation and Maintenance. Describes the City's operation and maintenance practices, as well as ongoing maintenance issues.

Chapter 6, Improvement Program. Summarizes the system and facility improvements identified previously in this Sewer Plan. Provides a cost estimate (in 2004 dollars) and anticipated scheduling for those improvements.

Chapter 7, Financial Program. Presents an analysis of the City's current sewer funding and a discussion of alternative methods for financing CIP projects.

Chapter 8, Implementation. Presents the procedures, permits, and approvals necessary to implement the CIP. Includes a discussion of suggested policies and a description of upcoming CMOM requirements.

Chapter 9, Bibliography and References. Provides a list of resources used in the preparation of this report

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 two hours from Seattle. Blaine is the first city encountered coming south from 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 two 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 of Blaine. 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 ten lift stations. The existing sewer system is described in more detail in Section 3.1.

2.1 Land Use, Zoning, and Development Patterns

2.1.1 Land Use

The City of Blaine's Urban Growth Area 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 city limits. For analysis of existing and future land use, the City has divided the UGA into smaller planning units, which are briefly described below. It should be noted that, due to the differing requirements of land use planning and sewer system planning, these planning units do not exactly correspond with the sewer service basins described in Section 2.2.

Central Blaine is the original town site of Blaine, located northeast of Drayton Harbor. This area has a number of older homes and businesses built around the turn of the 20th century, as well as newer homes and businesses. In 2000, this area had a population of approximately 2,950 and included 836,000 square feet of commercial retail or office space, 236,000 square feet of manufacturing and warehouse space, two U.S./Canadian border crossings, a school complex, and a number of public facilities serving the City and the surrounding area.

N

0 1 2 3 4

Scale in Miles

Figure 2-1
City of Blaine
Vicinity Map

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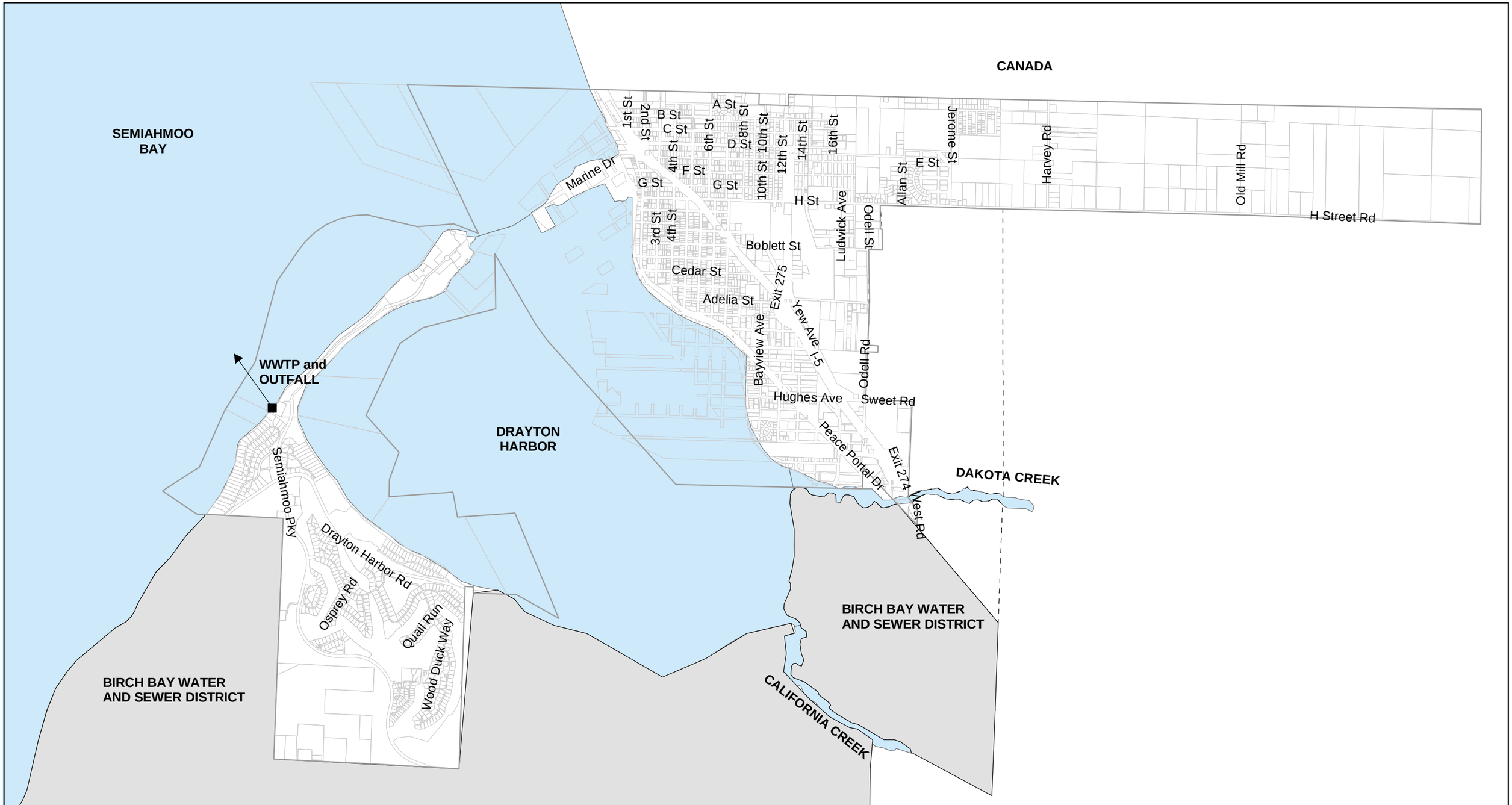
179597.SP.03.04_W052004065EA_Blaine Vicinity Map.ai_5/26/04_roy-dk



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

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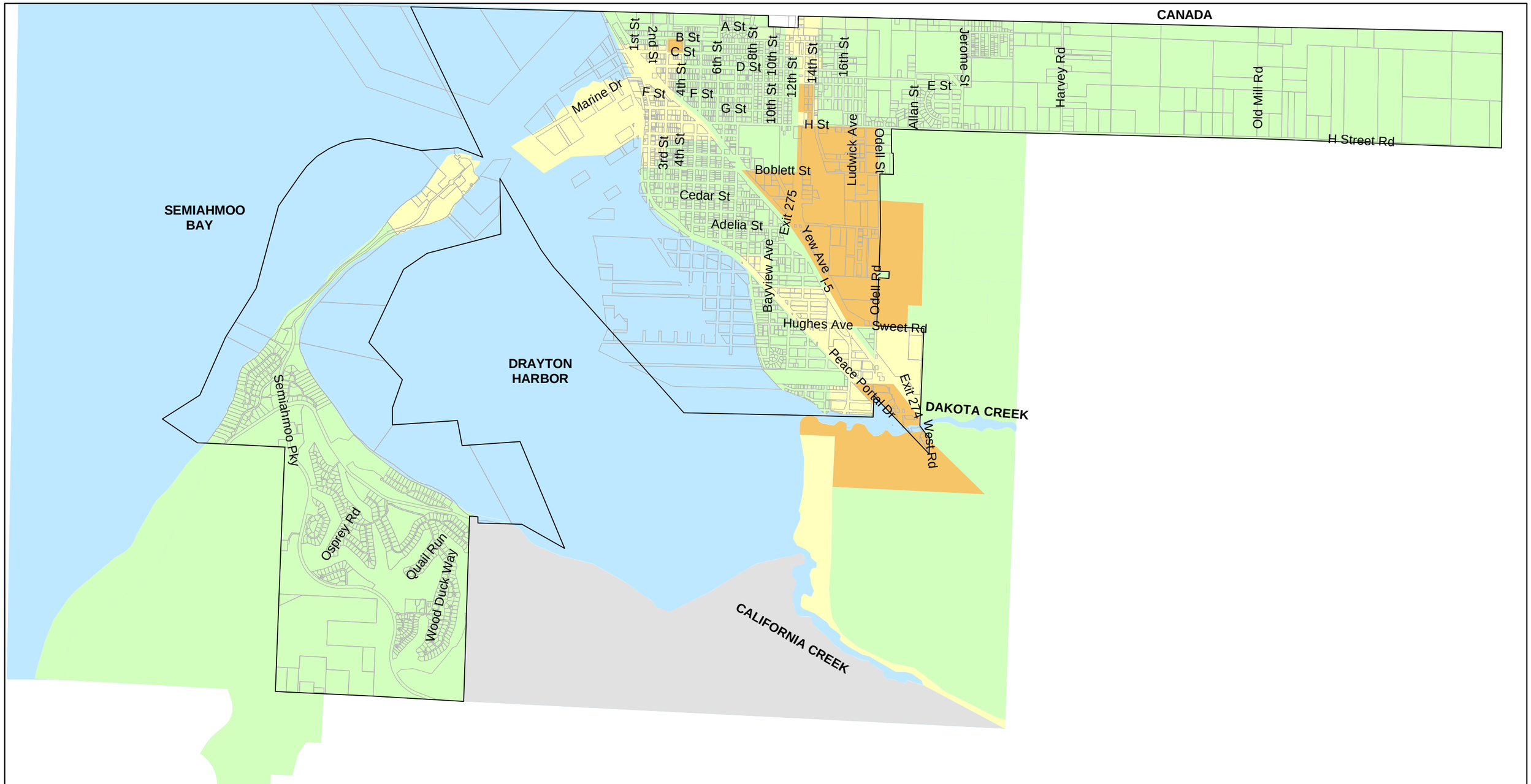


N

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

Semiahmoo lies across Drayton Harbor from Central Blaine. The Resort Semiahmoo site was annexed to the City in 1974 and has developed as a resort community that includes an 18-hole golf course, a country club, a 201-room hotel, a 300-slip boat harbor, and a residential neighborhood with a population of just over 500 in 2000.

East Blaine is an area of approximately 1,180 acres annexed to the City in 1996. At the time of the 1999 Comprehensive Plan, it had approximately 100 residences, located primarily on platted parcels in the western portion of the annexation area. These residences are served by city water, but rely on septic systems for sewer service. Approximately 500 undeveloped platted parcels are located in this area, and the remainder of the land is in 5- to 10-acre tracts or large parcels. A large portion of this area is identified as an aquifer recharge area, meaning that rainfall within the area percolates through the soil into the aquifers that supply drinking water to Blaine and Birch Bay.

The ***East Blaine UGA*** includes the area outside city limits east of Odell Road to the UGA boundary (west of Harvey Road) and south of H Street to I- 5. It includes approximately 1,000 acres and includes areas designated for residential and manufacturing development. In 2000, its population was 355. City water service is available in this area, but wastewater disposal is by individual septic tanks.

The ***Loomis UGA*** planning area lies east of Drayton Harbor and contains the area outside of city limits that is south of Dakota Creek and Interstate 5 and north of California Creek. It contains approximately 750 acres and is designated for a combination of residential, resort, and manufacturing uses under the Comprehensive Plan. In 2000, this area had a population of just over 100.

The ***South Drayton Harbor UGA*** is located south of Drayton Harbor and north of Lincoln Road, and includes land west from California Creek to the city limits at Semiahmoo. This area had a population of approximately 350 in 2000; it includes approximately 1,150 acres and is designated for residential development of up to four dwelling units per acre. Although this area is within the City of Blaine's UGA, land use is regulated by Whatcom County and sewer service is provided by the Birch Bay Water and Sewer District.

The ***West Semiahmoo UGA*** lies outside the incorporated area but within the UGA; it includes approximately 825 acres and is designated in the Comprehensive Plan for a combination of residential and resort development. As of 1999-2000, it included approximately 50 homes. It receives water service from Birch Bay Water and Sewer District, but sewer service is not currently available.

2.1.2 Zoning

Within the City of Blaine, there are 2,773 acres zoned for residential use, including 2,333 zoned for low-density residential use (up to 6 units per acre); 420 acres for medium-density residential use (up to 12 units per acre), and 20 acres for high-density residential use (over 12 units per acre). This comprises 79 percent of the total land within 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 2-1 provides a summary of acreage and allowable density for zoning categories within the City. Figure 2-3 shows the zoning designations within the City's service area.

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 are the Central Business zone, the Highway Commercial zones, the Planned Commercial zone, the R/O zone in Central Blaine, and the Marine Planned Recreation Zone located at the tip of Semiahmoo Spit.

TABLE 2-1
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	1182	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

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 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. Chapter 3 of this General Sewer Plan presents the City's estimates of population and employment growth and the resulting effects on wastewater flows and loads.

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 Blaine's wastewater treatment facility for secondary treatment and discharge into Semiahmoo Bay. The area currently served by the City's sewer system is shown on 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. The service area in Central Blaine is roughly bounded by Drayton Harbor on the west, the U.S.-Canada border on the north, Odell Road on the east, and Dakota Creek on the south. 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, for the East Blaine UGA and West Semiahmoo UGA, the City has not yet determined exactly how the sewer system will be implemented. 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 Blaine's.

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. Figure 2-4 shows the topography of the area.

2.3.2 Critical Areas

The identification and protection of critical areas is a key goal of the Growth Management Act. Critical areas are defined by the Growth Management Act as wetlands, frequently flooded areas, aquifer recharge areas, geologically hazardous areas, and fish and wildlife habitat conservation areas. Under the Growth Management Act, special consideration must be given to these designated areas. The City of Blaine'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 limits, and approximately 20 percent of land within the Blaine UGA, is classified as wetlands or buffer areas, as shown in Figure 2-5.

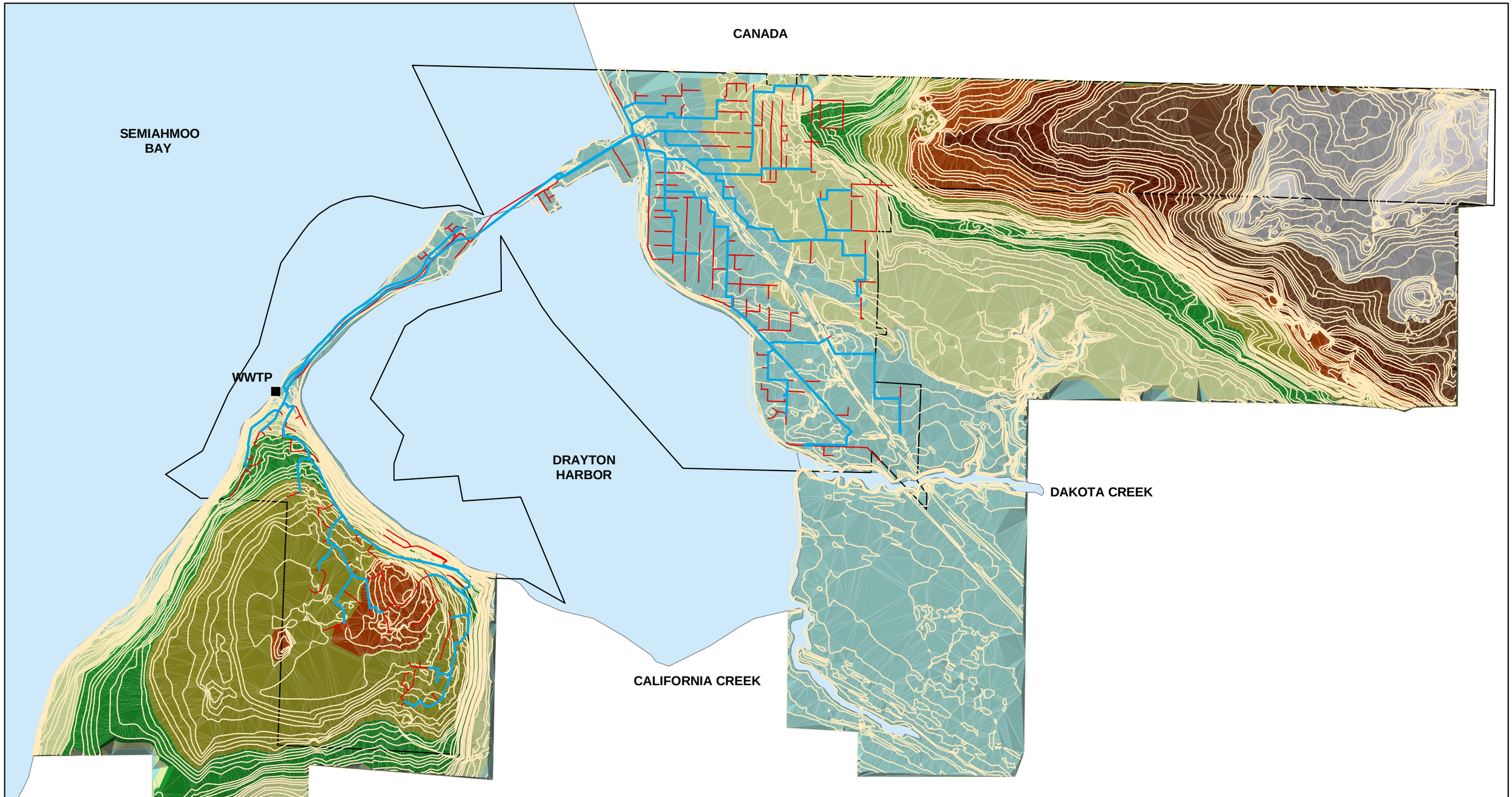
Other critical areas and natural resource lands within the service area are regulated by the City's Natural Resource Lands and Critical Areas Management regulations (Chapter 16.12 BMC). They include the following:

- The aquifer recharge area east of the city limits, which replenishes the groundwater supply serving the entire Blaine/Birch Bay area
- Potentially unstable slopes along the eastern and southern shorelines of Drayton Harbor
- Flood hazard areas along Dakota and California Creeks and portions of Semiahmoo Spit
- Sand and gravel resource areas in the vicinity of H Street and Valley View Road

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

2.3.3 Geology and Soils

The City's geology, like that in 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



N

SCALE

1 inch equals 2,500 feet

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

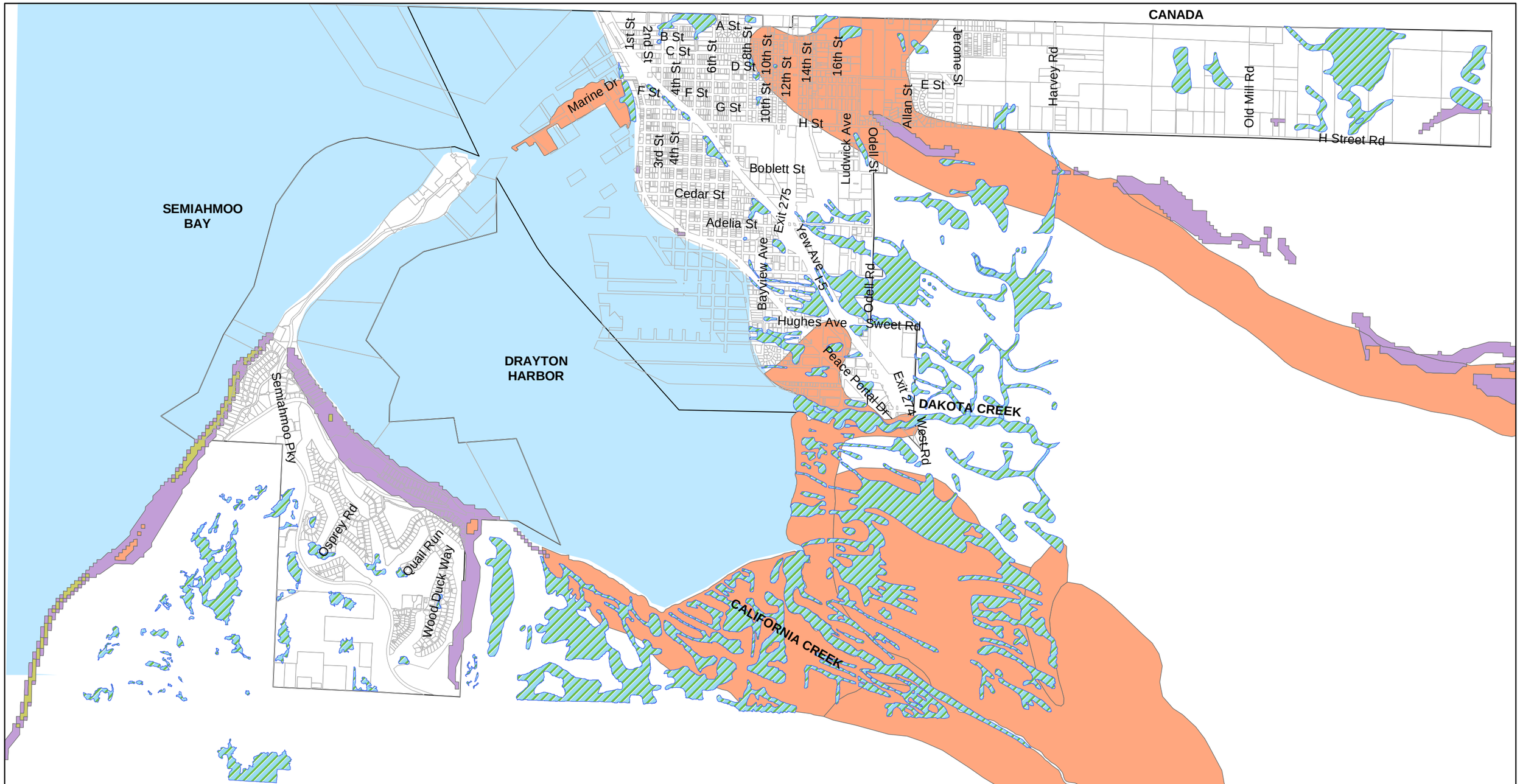
LEGEND

- City Limit
- Sewer Lines
- 5 ft contour lines
- Trunk Lines
- Wastewater Treatment Plant (WWTP)

CITY OF BLAINE, WASHINGTON

FIGURE 2-4
Topography Map

CH2MHILL



N

SCALE

1 inch equals 2,500 feet

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

LEGEND

City Limit

Wetland

< 15%

15%-35%

> 35%

CITY OF BLAINE, WASHINGTON

FIGURE 2-5
Steep Slopes and Wetland Areas Map

CH2MHILL

tides have changed the shape of once open and exposed Drayton Harbor by eroding the step 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 Blaine 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.

Climatological data for the Blaine area is shown in Table 2-2. 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 2-2
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

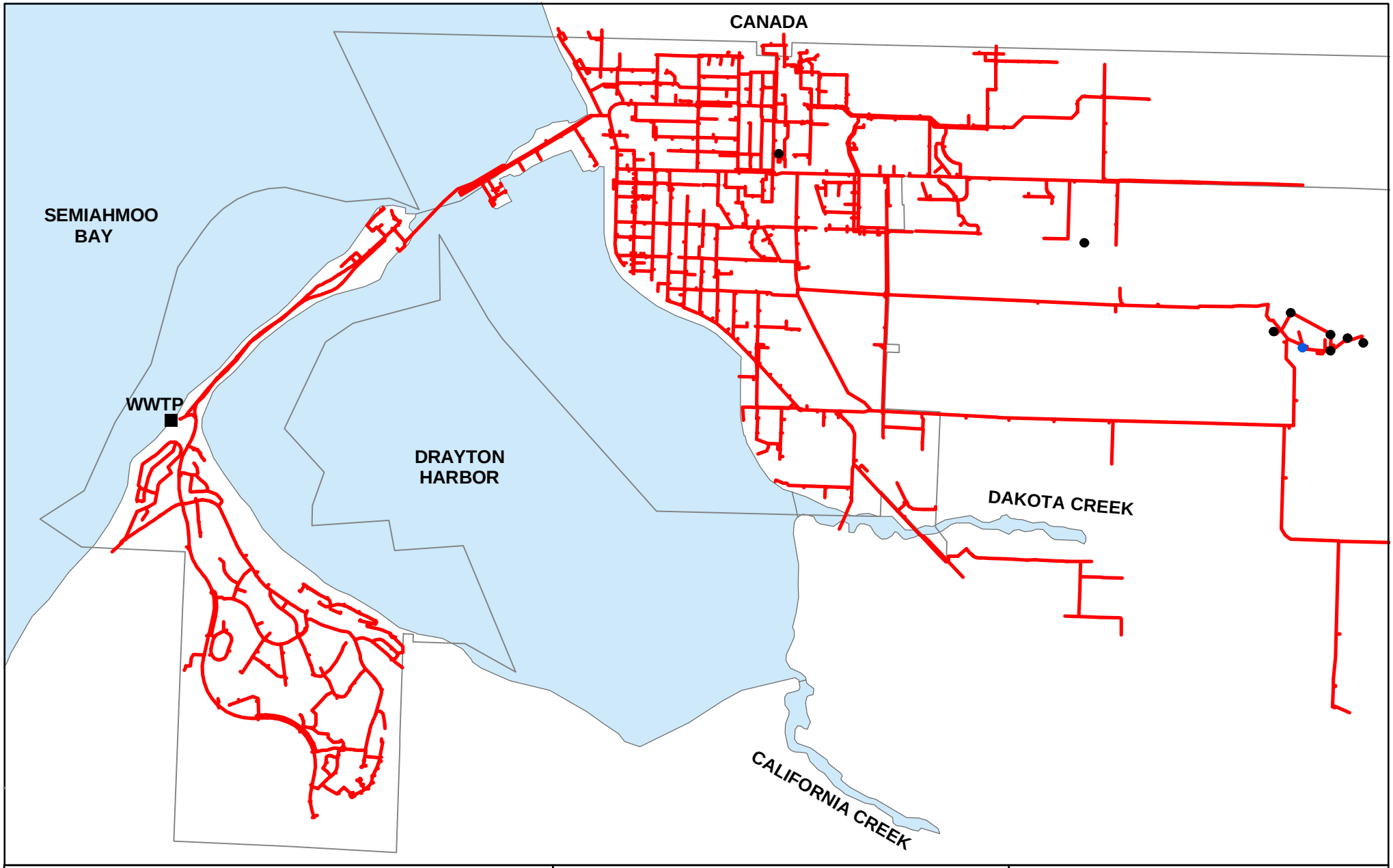
Significant water bodies in the City of Blaine and the Blaine UGA include Drayton Harbor, Semiahmoo Bay, Dakota Creek, and California Creek.

2.3.6 Water Supply

The City of Blaine owns and operates a municipal water system that provides domestic, commercial, industrial, and irrigation water to retail customers within the City and the greater Blaine area. The water distribution system is shown in Figure 2-6. 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 the Department of 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 a both a Groundwater Management Plan (1995) and a Wellhead Protection Plan (1996) which identify aquifer recharge areas and addresses 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.



N

SCALE

1 inch equals 3,000 feet

0 1,500 3,000 4,500 6,000 Feet

LEGEND

- Wastewater Treatment Plant (WWTP)
- City Limit
- Water Line
- Well
- Reservoir

CITY OF BLAINE, WASHINGTON

FIGURE 2-6
Water System

CH2MHILL

CHAPTER 3

Wastewater Collection System Evaluation

This chapter supersedes the September 2004 version of Chapter 3. To improve the accuracy of the hydraulic model and to assess the City's progress in reducing I/I, the City invested in obtaining additional flow monitoring data, which was conducted between October 2004 and January 2005. The model was recalibrated and the evaluation of the wastewater collection system was updated using the additional information.

The purpose of a wastewater collection system is to convey wastewater to locations where it can be treated and safely discharged. Collection systems in most cities have continued to evolve over time as they expand to accommodate growth and redevelopment, and as they are rehabilitated and upgraded due to deterioration with age. A hydraulic model of the City's collection system was developed to evaluate the adequacy and operational characteristics of the existing system and to evaluate the requirements of the system under future flow conditions as the City develops over time.

This chapter describes the City's existing collection system and design standards, presents the results of the collection system analysis, and recommends improvements to the collection system. Physical conditions associated with portions of the existing system have been identified based on available data and interviews and site visits with City maintenance staff. To assist the City in prioritizing the repair and replacement of collection system components, a recommended condition assessment program is also presented in this chapter.

3.1 Existing Collection System

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 ten lift stations. Figure 3-1 shows the locations of the major facilities.

3.1.1 Collection System History

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. The project included rehabilitation of approximately 16,000 feet of sanitary sewers, 57 manholes, and 249 service laterals. Approximately 13,000 feet of new storm sewers also were constructed, as well as 13 new storm sewer catchbasins. To reduce 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 the following additional improvements to further improve performance of the collection system:

- Replacement of the Drayton Harbor crossing force main from Lift Station 1 (1997)
- Replacement of 5,200 feet of leaky residential sewer pipe in North Blaine (1997)
- Pipe burst and sliplining of the gravity trunk sewer in Peace Portal Drive (1998)
- Dye-testing and smoke-testing, followed by elimination of 43 illicit connections to the sanitary collection system (1998)
- Piping changes at Lift Station 1 to allow emergency pump-around and use of a 60,000-gallon storage tank (1999)
- Replacement of pump access rails and discharge piping at Lift Station 1 (2000)
- Addition of four 50,000-gallon bladder tanks at Lift Station 1 for overflow storage (2000)
- Repair of Marine Drive/Blaine Marina sewers including joint repairs and manhole rehabilitation (2001)

3.1.2 Sewer Lines

Sewer pipes in the collection system range from 4 to 21 inches in diameter. The gravity sewer lines in Central Blaine generally convey flow north and west, following topography. All the wastewater from Central Blaine is collected at Lift Station 1 and pumped across the mouth of the harbor to the wastewater treatment plant (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. A summary of the sewer lines in the collection system is shown in Table 3-1. A summary table, including pipe size, slope, and capacity of all existing trunk sewers, is presented in Appendix C.

TABLE 3-1
Collection System Summary

Sewer Diameter (inches)	Sewer Length (feet)		
	Force Mains	Gravity Mains	Total System
4	1,490	1,820	3,310
6	5,740	3,440	9,180
8	8,270	141,440	149,710
10	9,880	15,820	25,700
12		2,530	2,530
15		5,330	5,330
18		1,150	1,150

TABLE 3-1
Collection System Summary

Sewer Diameter (inches)	Sewer Length (feet)		
	Force Mains	Gravity Mains	Total System
21		6,380	6,380
Unknown		2,720	2,720
Total Sewer Length	**25,380**	**180,630**	**206,010**

Wastewater Treatment Plant Outfall = 2,450 feet

3.1.3 Lift Stations

Each of the City's ten lift stations (LS) has two pumps. Table 3-2 lists key characteristics of each station. All of the stations have high-level alarms; two of the stations (LS 1 and LS 9) 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.

TABLE 3-2
Characteristics of Lift Stations in the City of Blaine

Lift Station Number	Lift Station Location	Capacity of Each Pump (gpm)	Motor Size of Each Pump (hp)	Force Main Diameter (inches)
1	Marine Drive	1,750	100	14 – under harbor 10 – along spit
3	Pipeline Road	150	6	4
4	Semiahmoo Marina	600	10 and 9.4	8
5	Peace Portal Drive	450	15	8
6	Dodd Street	330	5	6
7	Runge Avenue	200	7.5	6
8	Drayton Harbor	300	40	6
9	Knight/Heron Drive	80	3	4
10	Odell Road/ Hwy I-5	300	7.5	6
Troon	Semiahmoo Parkway	80	3.5	4

Lift Station 1 is the only station equipped with variable speed drives on its pumps. It is built on the site of the City's previous WWTP, which consisted of a circular primary clarifier and a digester. These facilities are no longer in use for treatment but are utilized to help prevent overflows during storm events by providing 60,000 gallons of storage capacity. The existing pump facilities at Lift Station 1 are generally in good condition after the recent repairs noted

above. Lift Station No. 2 was eliminated several years ago by extending the sewer directly to Lift Station 1.

Lift Stations 3, 5, 6, 7, and 10 collect wastewater from small areas of South Blaine and discharge their flows via short force mains into gravity sewers that ultimately flow to Lift Station 1.

Lift Station 4 serves Semiahmoo Spit and the hotel on the Spit. Its force main discharges directly to the WWTP. Lift Station 8 conveys flow from the southeast portion of Semiahmoo to the gravity system serving the remainder of Semiahmoo. Lift Station 9 is a small station that pumps wastewater from a residential area uphill to Lift Station 8. The Troon Lift Station is a private lift station that serves a golf course. This facility is owned by the Semiahmoo Resort but maintained by City staff.

3.1.4 Onsite Wastewater Disposal Systems

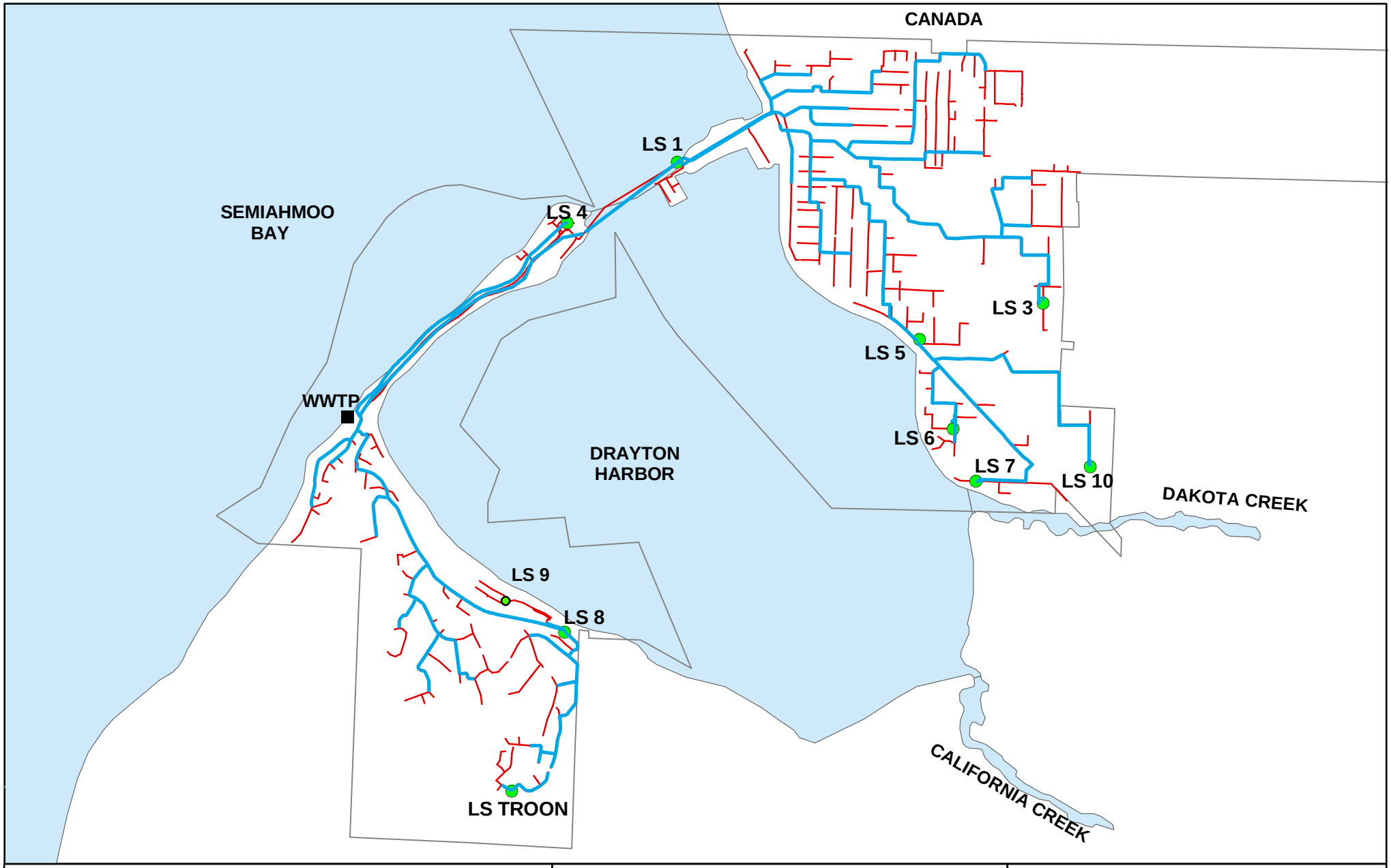
Onsite wastewater disposal systems (commonly known as septic systems) are used in portions of the Blaine service area that are outside the existing sewer collection system. The existing collection system covers Central Blaine from the Canadian border south to Dakota Creek and from the Puget Sound shoreline 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 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 Growth Management Act, 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 Blain UGA, new sewers are not currently included in the City's capital improvement program (CIP) as they would be done as development projects occur and most likely funded by the specific developer.

3.2 Existing System Conditions

This section describes the current condition of Blaine's collection system. Included in the discussion are a number of issues or conditions associated with existing facilities that were identified from public records or from information provided by City maintenance staff. The resolution or correction of some of these items will require developing new policies or adding new projects to the CIP.

3.2.1 Infiltration and Inflow

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.



N

SCALE

1 inch equals 3,000 feet

0 1,500 3,000 4,500 6,000 Feet

LEGEND

- Wastewater Treatment Plant (WWTP)
- City Limit
- Lift Station
- Trunk Line
- Sewer Lines

CITY OF BLAINE, WASHINGTON

FIGURE 3-1
Sewer System

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Figure 3-2 is a plot of wet-weather versus dry-weather flow recorded at the WWTP. The six months with the lowest wastewater flows each year, May through October, were compared to the six 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, it but has slightly increased since 2000, as shown on Figure 3-3.

3.2.1.1 Noted Areas of Infiltration/Inflow (I/I)

Figure 3-4 shows the northern and central residential locations with high I/I. In addition, this figure shows locations in the system that City of Blaine maintenance staff has identified as known I/I problem locations.

The flow monitoring data were analyzed to determine wet-weather characteristics during the peak storms in November 2004. The analysis yielded peak wet-weather flows, peaking factors (i.e., ratio of peak instantaneous flow to average base flow), and rainfall-dependent inflow/infiltration (RDI/I) volumes. Table 3-3 summarizes the November 2004 wet-weather characteristics of the sewer collection system.

TABLE 3-3
November 2004 Wet-weather Flow Monitoring Results

Location	November 1, 2004 Storm (3.03-inch Cumulative)		November 24, 2004 Storm (6.29-inch Cumulative)	
	Peak Monitor Flow (gpm)	Peaking Factors	Peak Monitor Flow (gpm)	Peaking Factors
1B/9B	1,902	2.6	1,966	2.7
1S	30	2.4	135	10.5
2B	316	5.2	417	6.8
2S	94	11.8	103	13.0
3B	206	4.3	509	10.6
5B	847	2.8	599	2.0
6B	263	8.3	884	27.7

Includes upstream subbasins.
Peaking factor is the ratio of peak flow to average dry-weather flow.

The RDI/I into the system was quantified as the difference between dry and wet weather and is typically proportional to the total monitored area and the precipitation. To prioritize the subbasins into terms of RDI/I severity, upstream RDI/I was removed and the volume of RDI/I was divided by the volume of precipitation that fell on the monitored subbasins. By ranking the subbasins, the City can best allocate its resources to address I/I. The RDI/I is expressed as a "%r" (or return ratio). For example, a %r of 3.0 would indicate that 3.0 percent of the precipitation that fell over an area eventually made its way into the collection system as RDI/I. Table 3-4 summarizes the RDI/I "%r" return ratios for each subbasin.

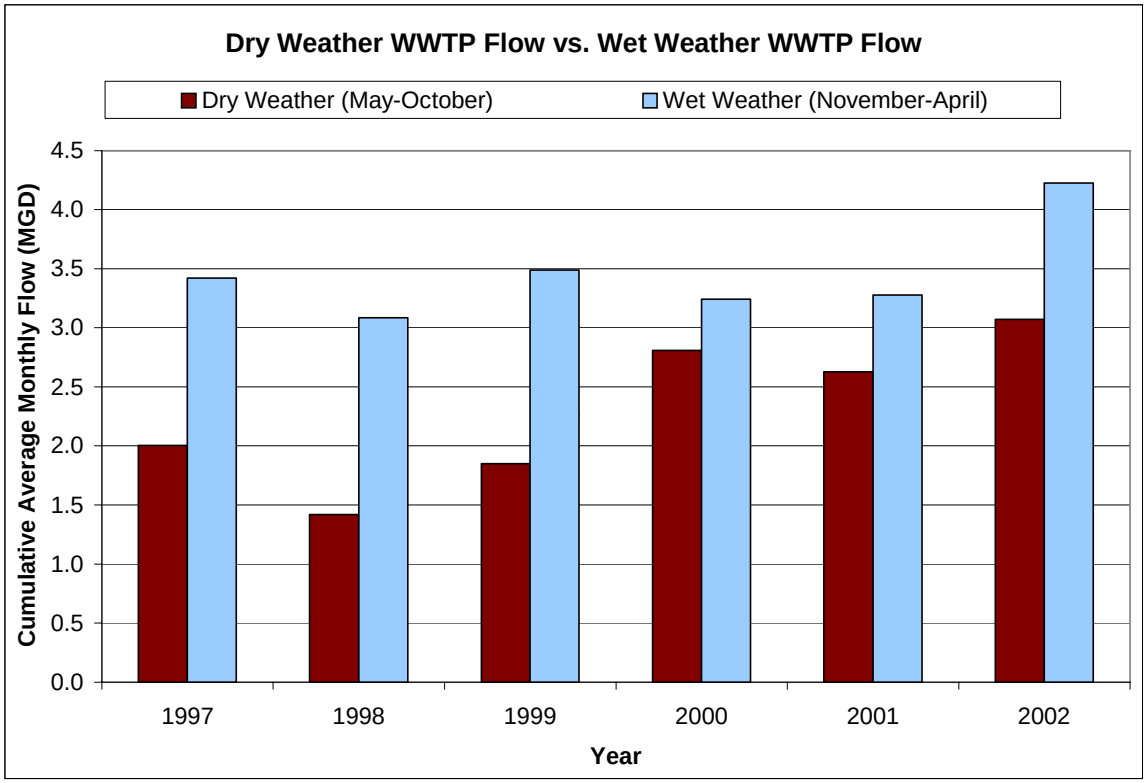


FIGURE 3-2
Wet Weather and Dry Weather Wastewater Treatment Plant (WWTP) Flow, 1997-2002

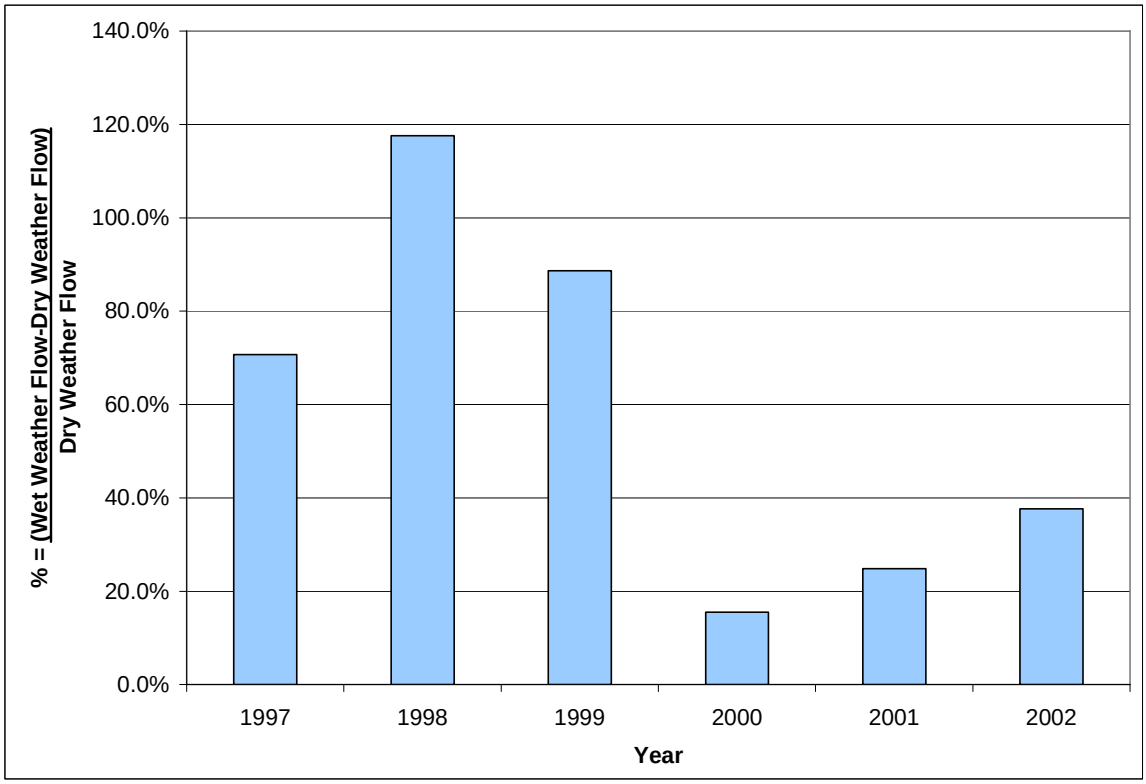


FIGURE 3-3
Wet Weather Flow as a Percentage of Dry Weather Flow

TABLE 3-4
Rainfall Dependent Inflow/Infiltration Results

Location	November 1, 2004 Storm (3.03-inch Cumulative)	November 24, 2004 Storm (6.29-inch Cumulative)
	%r (Ratio of RDI/I volume to Precipitation Volume)	%r (Ratio of RDI/I volume to Precipitation Volume)
1B/9B	**0.87%**	**1.31%**
1S	--	--
2B	**1.47%**	**2.79%**
2S	--	--
3B	0.35%	0.32%
5B	**2.44%**	**0.61%**
6B	0.46%	0.25%

Each subbasin's individual contribution (does not include upstream subbasins).

RDI/I will vary depending on antecedent soil conditions, distribution rainfall, flow monitoring anomalies, etc. The **bolded** values in Table 3-4 indicate those subbasins that exhibit the relative greatest contribution of RDI/I into the collection system given their area. Subbasins 1S and 2S are on the west side of town and in areas of more recent construction. As a result, a discernable RDI/I pattern could not be established, as would be expected with new construction. These subbasins have extremely high peaking factors; however, very little RDI/I volume is associated with these spikes in flow. The high peaking factors for subbasins 1S and 2S are a result of very small average dry-weather flow; as a result, any increase in flow because of rainfall is comparatively large.

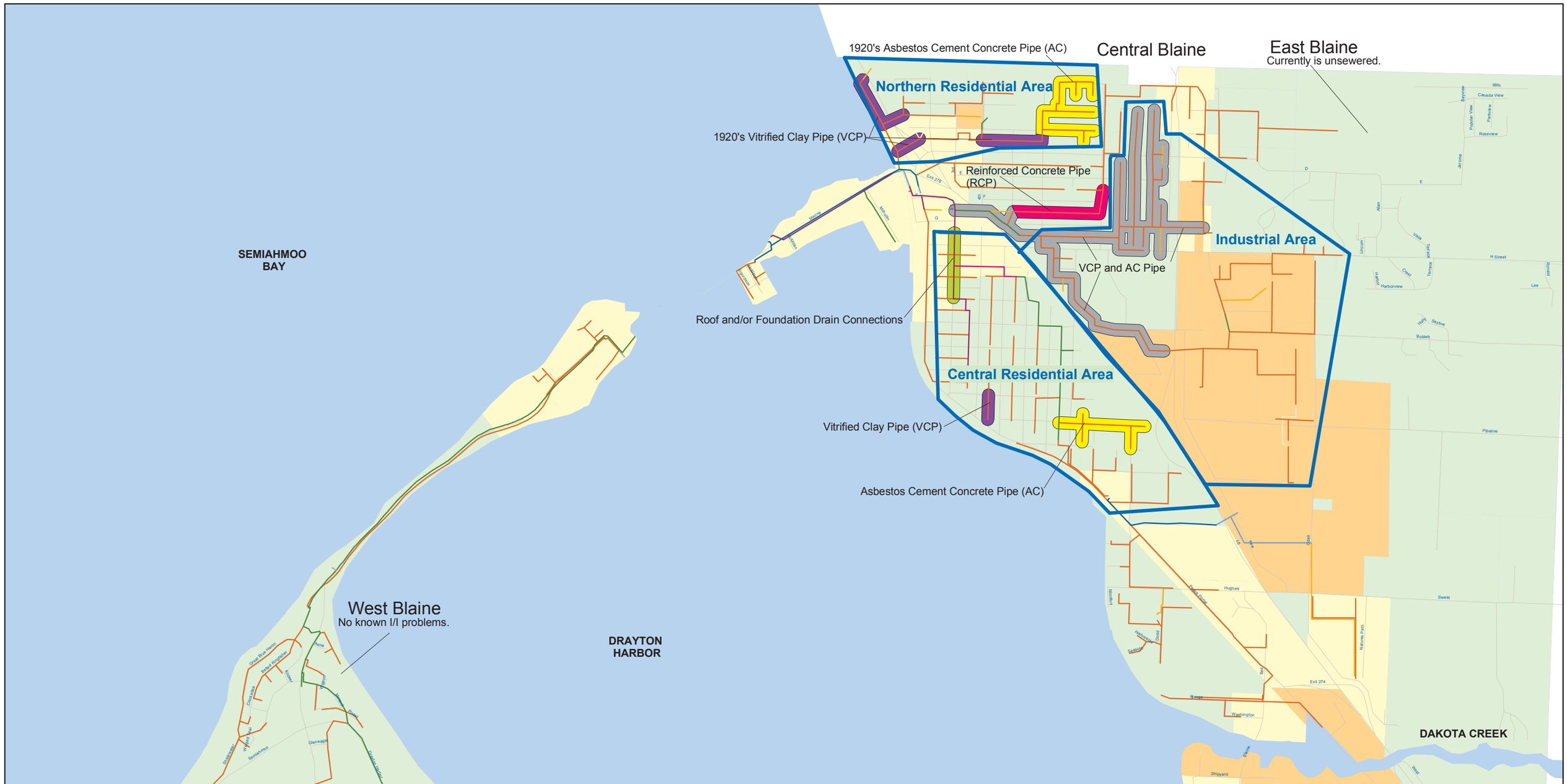
Installation logs and flow monitoring hydrographs are provided in Appendix W.

In interviews, City personnel agree with the findings of the November 2004 to January 2005 flow monitoring. Subbasin 5B (the downtown area) is a source of relatively significant RDI/I into the system. Similarly, subbasins 1B/9B in the near vicinity of LS1 along Marine Drive and Milhollin, and subbasin 2B (bounded by Interstate 5 to the west, D Street to the south, and 8th Street to the east) indicate areas that warrant further source-detection activities.

3.2.1.2 Efforts to Reduce I/I

Beginning in 2000, the City of Blaine 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 in these areas 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



N

SCALE

1 inch equals 1,500 feet

0 700 1,400 2,800 4,200 Feet

Legend

- Undesignated UGA
- Commercial
- Industrial
- Residential
- Asbestos Cement Concrete Pipe (AC)
- Reinforced Concrete Pipe (RCP)
- Roof and/or Foundation Drains
- Vitrified Clay Pipe (VCP)
- City Limits
- OLD AC and VCP Pipe

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Figure 3-4
Infiltration and Inflow Locations

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reduction in wet-weather flow percentage since 1998; approximately $2 million has been spent since the onset of this program. The program includes source detection activities (smoke testing, dye-water testing, closed-circuit television pipe inspection) and sewer system rehabilitation and repair. Further details of the City's I/I program are provided in the *Inflow & Infiltration Evaluation 2004 Annual Report* (Blaine, 2005).

3.2.2 Sanitary Sewer Overflow

Sanitary sewer overflow (SSO) is defined as the condition in which the wastewater level rises above the rim elevation of a manhole, when wastewater overflows into a basement, or when cross-connection contamination occurs because of high wastewater levels. No overflows are allowed within the City's system.

Two manholes on the east side of the Semiahmoo spit, near Lift Station 1, have had historic uncontrolled overflows and are still suspected SSO locations in the City of Blaine wastewater conveyance system. To address this potential occurrence, four vinyl-coated 50,000-gallon Terra Tanks® (bladder tanks) were installed in 2000 to provide the additional wastewater capacity for the Central Blaine area up to and including the 10-year, 24-hour design storm.

Since the installation of the bladder tanks, the City has not received public complaints reporting backups of wastewater into basements or other overflow areas in the conveyance system. However, during a major storm in October 2003, the City experienced a wastewater overflow from the three manholes along Marine Drive, near Lift Station 1. The bladders were deployed but were not sufficient to contain this major storm in spite of the use of tanker trucks to convey additional flow from the lift station site to the WWTP.

3.2.3 Odors

Odors are common in pump station wet wells. Foul air forms naturally in the wet well due to hydrogen sulfide generation, which causes the rotten egg smell commonly associated with wastewater. As more wastewater enters the wet well, the foul air is displaced from the wet well. Typically, odor control problems are more noticeable during the warm summer months.

Odor control at remote pump stations can be addressed by chemical addition or through collection and treatment of the foul air. There are currently no provisions for odor control through chemical injection or vapor treatment at any of the pump stations. However, the City has not received any odor complaints regarding the pump stations or collection system in the recent past. Pump station operational changes and, if necessary, chemical injection can be implemented to control odors.

3.3 Hydraulic Model

A hydraulic model representation of the collection system is used to predict the system's response to different flow conditions. A hydraulic model uses two different sets of data. One data set includes information about the comprehensive network of physical structures and appurtenances that conveys wastewater from all users in the sewer service area to the treatment facilities. The other data set consists of information about the wastewater flows that are being conveyed by the physical network.

Inputs to the model include the attributes of the physical system, such as elevations, dimensions, materials, and pumping rates, as well as the magnitude, pattern, and location of flow inputs. The model solves hydrodynamic equations to predict resulting flow rates, velocities, and water levels throughout the network. The results from the hydraulic analysis identify areas where flow exceeds the conveyance capacity of the existing facilities. In addition, the model can be modified to evaluate alternatives for increasing system capacity, managing excess flows, or planning for the effects of development.

3.3.1 Modeling Software

The Danish Hydraulic Institute (DHI) Water and Environment's Modeling Urban Sewers (MOUSE) software package was selected to analyze the City's sewer collection system. This state-of-the-art software meets the City's modeling objectives and the data are easily integrated with the City's current Geographical Image Service (GIS) and other data. MOUSE has been available commercially since 1970. It is currently used extensively around the world, with approximately 2,000 installations in more than 25 countries. Washington State users include King County Department of Natural Resources, City of Everett, City of Tacoma, and City of Auburn.

MOUSE software simulates flows in pipe networks. Its hydraulic equations are based on an implicit, finite-difference numerical solution of the governing flow equations (St. Venant). MOUSE provides efficient and accurate solutions in multiple-connected branched and looped pipe networks and can readily transition between subcritical and supercritical flow regimes. It simulates flow features such as backwater and surcharging.

In addition to its computational features, MOUSE has advanced capabilities for displaying and documenting simulation results. Results can be presented using color-coding and symbols in plan view, as well as with static and dynamic graphs and profiles. Results from MOUSE can be easily imported for use in the City's GIS.

3.3.2 Representation of Model Network

The existing physical system for the City includes pipes, manholes, pumps, hydraulic control structures, and force mains. The City maintains an inventory of its system on a GIS database, which was the main source of information used to develop the model network. The available system information was processed using GIS techniques, to give the best estimate of the network connectivity and to generate the input data for the hydraulic software.

Rather than modeling each individual pipe in the basin, a simplified model representing the trunk system was developed. The level of detail was sufficient to represent the conveyance of flows from contributing basins. The trunk system pipes were selected based on the following criteria:

- Diameter greater than eight (8) inches
- Primary conveyance pipe for a sewer basin
- Interconnection between basins
- Force main
- Network continuity
- Owned/maintained by the City

Table 3-5 provides a summary of pipe diameters and lengths in the collection system and in the trunk system. The trunk system is highlighted in the map of the collection system included as Figure 3-1. The trunk system model includes approximately 19 miles of pipe and 325 manholes. A triangulated network was created from the topographic contours (5-foot intervals) of the City. Where rim elevations were not available for the manholes, elevations derived from the triangulated network were used.

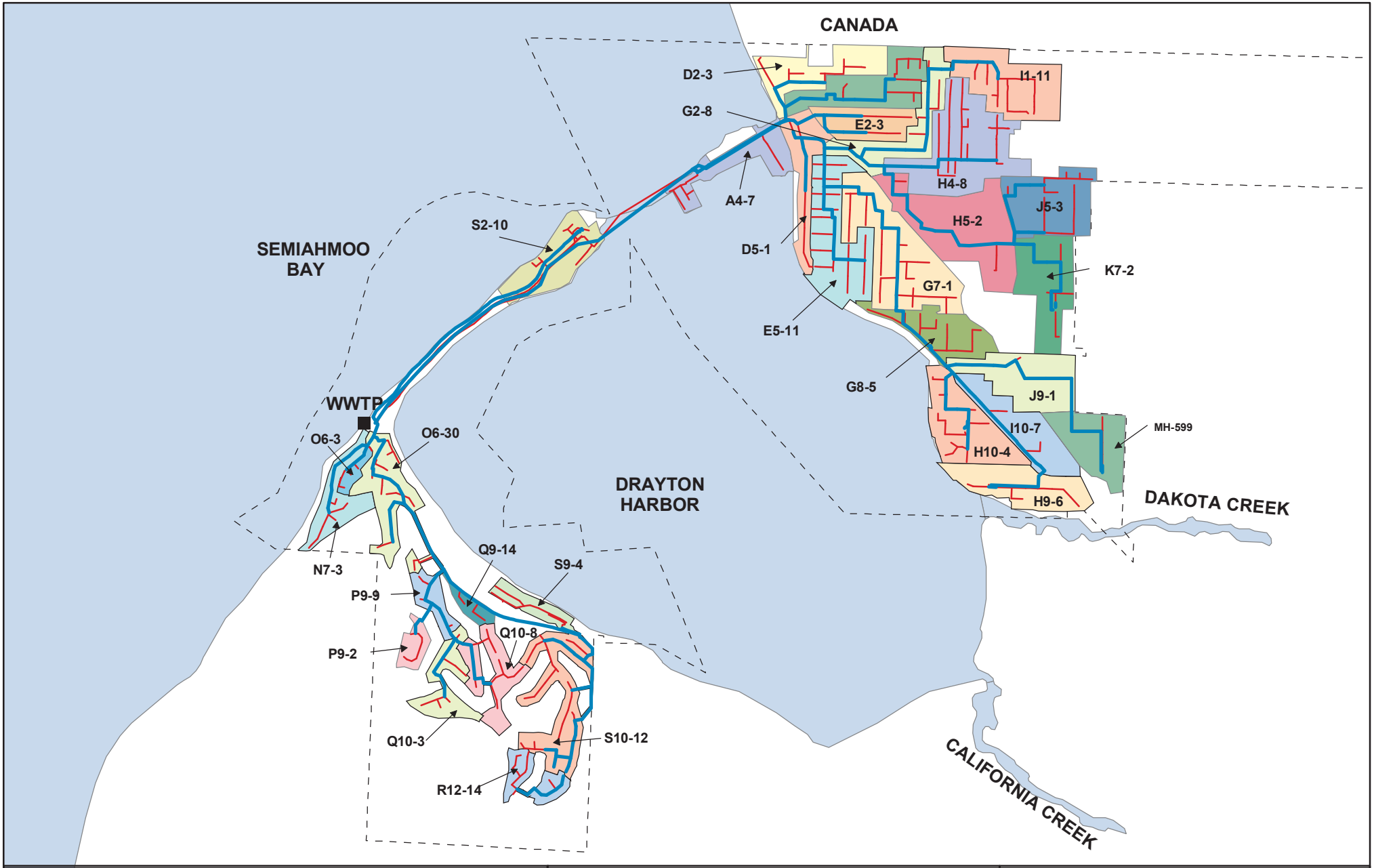
TABLE 3-5
Comparison of Trunk System Pipe Length with Total Collection System Length

	Sewer Length (feet)		
Diameter (inches)	**Trunk System (Included in Model)**	**Total System**	**Percent Modeled**
4	893	3,310	27%
6	5,736	9,180	62%
8	55,993	149,710	37%
10	23,553	25,700	92%
12	2,389	2,530	94%
15	4,782	5,330	90%
18	1,139	1,150	99%
21	5,800	6,380	91%
Unknown	5,800	2,720	0%
Total	**100,285**	**206,010**	**49%**

The model included nine of the ten lift stations. In East Blaine, Lift Stations 1, 3, 5, 6, 7, and 10 were modeled. In West Blaine, Lift Stations 4, 8, and Troon were modeled. Lift Station 9 was not included in the model because it only pumps flow to Lift Station 8, which was included in the model. Lift station pump curves, wet well dimensions, and start/stop elevation data were obtained from drawings provided City personnel and equipment vendors. Pump curves are presented in Appendix D.

One hydraulic control structure (weir) was included in the model. It is located where Marine Drive crosses the railroad (Manhole ID MH480 in the model, City ID D3-2). The weir dimensions used in the model were based on information provided by the City.

The sewer service area was divided into drainage basins as shown in Figure 3-5. These basins represent drainage areas where sewer flows are collected by a gravity main and conveyed to the trunk system. The flow input is based on the flow monitoring conducted from November 2004 through January 2005. The flow generated in each drainage basin was modeled and conveyed to the downstream trunk system. The system service areas were divided into 31 drainage basins, with 20 located in East Blaine and 11 located in West Blaine. The drainage basins are named for the manhole at which flow enters the modeled collection system.



N

SCALE

1 inch equals 3,000 feet

0 1,400 2,800 4,200 5,600 Feet

LEGEND

- Wastewater Treatment Plant (WWTP)
- Subbasin
- City Limit
- Trunk Line
- Sewer Lines

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FIGURE 3-5
Sewer System Modeling Subbasins

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3.3.3 Flow Input

Flow inputs are composed of a base flow component, which includes sanitary flow (i.e., residential, commercial/retail, and industrial wastewater) along with groundwater infiltration (which is more pronounced during the wet season) and a RDI/I component.

Existing base flows were estimated using available flow monitoring data. To determine future base flows, existing growth projections were reviewed and flows corresponding to the growth were approximated. Existing and future wastewater base flows were developed on an Equivalent Residential Unit (ERU) basis.

The RDI/I characteristics were identified from previous flow monitoring. Based on the relationship between precipitation and the resulting RDI/I, the response in RDI/I due to design storms could be determined for use in the model. The RDI/I component was used to predict current and future conveyance system deficiencies caused by capacity problems or prolonged surcharging.

3.3.3.1 Summary of Existing Flow Data Collection

Flows in a collection system are dynamic because of the natural variation inherent in sanitary wastewater flow service and the many ways in which storm water can potentially enter the system. Such fluctuations make it difficult to estimate the magnitude and duration of the flows occurring at specific points within a system; however, such estimates are crucial to the system evaluation. Flow monitoring data collected from November 2004 to January 2005, along with City of Blaine WWTP flow data were used to characterize flows in the existing system.

Available Flow Monitoring Data Review

From October 14, 2004, to January 19, 2005, eight flow meters and one rain gage were installed to simultaneously measure sewer flows and rainfall in the City of Blaine. The 2004-05 flow monitoring updated the flow monitoring data collected in 1999 that was used to construct the original model. Table 3-6 describes the locations of the flow meters. Figure 3-6 shows the flow meter and rain gage locations. The data-collection period for each flow meter and rain gage is shown on the table provided with Figure 3-6. The letter "B" denotes that the flow meter is located in East Blaine, and the letter "S" indicates that the flow meter is located in West Blaine.

The flow monitoring results were qualitatively reviewed to determine the validity of the data collected at each location. Data validation was performed using the following criteria:

- Total volume of flow at a meter location correlates to tributary area of the meter compared to other meters in the system.
- Known areas with high I/I rates should have higher base flows as compared to areas known to have low I/I.
- Dry-weather base flow is near the industry standard for daily wastewater generation of approximately 100 gallons per capita per day (Viessman and Hammer, 1993) for the estimated sewer basin population in 2005.
- Flows measured at downstream locations are generally greater than flows measured at upstream locations.
- Diurnal flow patterns at the flow meters are representative of land use in the basin.

- Increases in sewer flow correspond to rainfall.

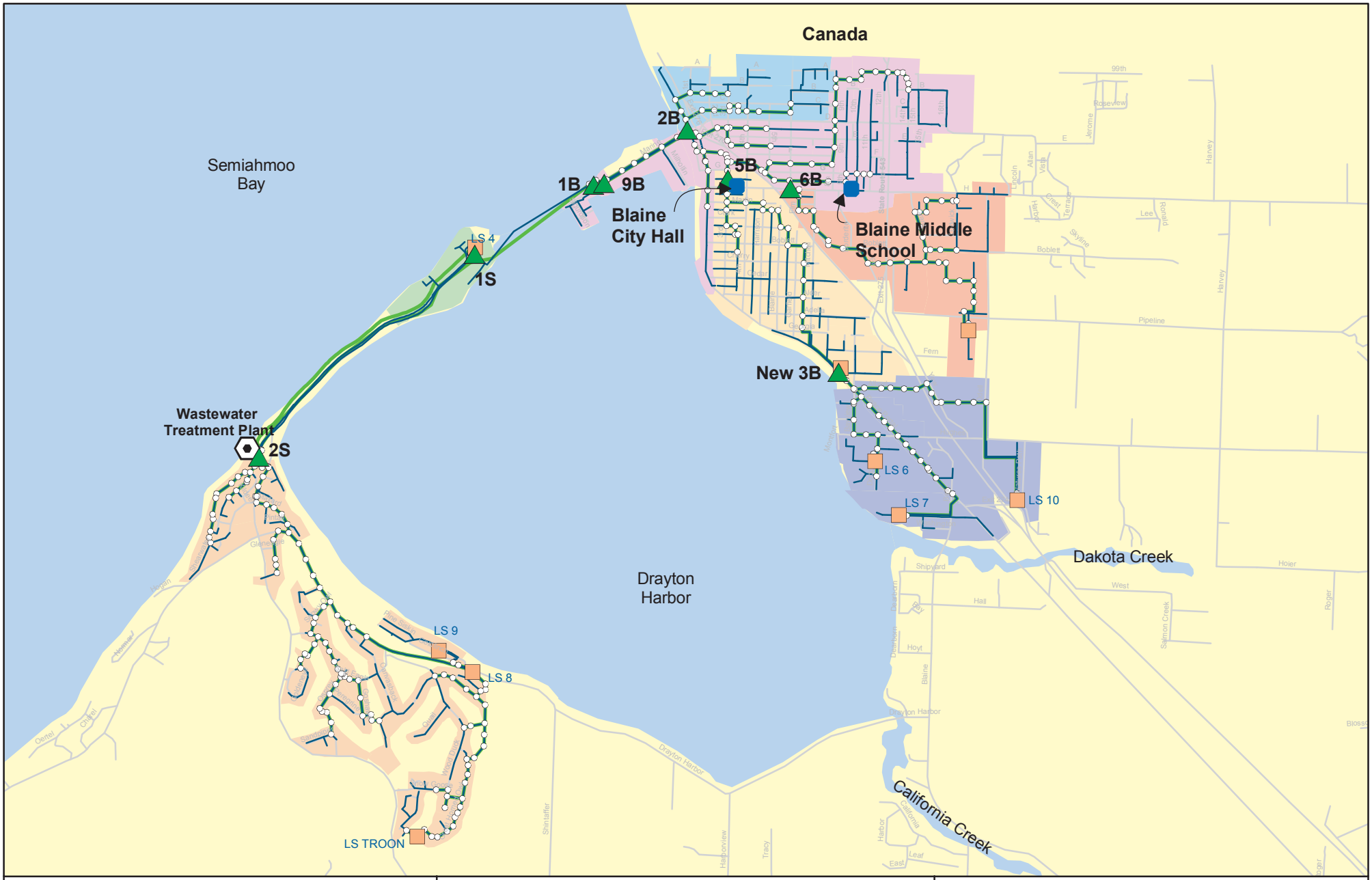
The results of the data validation for each meter location are summarized in Table 3-6. From this analysis, flow data from 1S, 2S, 2B, 6B, and 9B were selected to calibrate the hydraulic model and to develop flow parameters.

TABLE 3-6
Flow Monitoring and Rain Gage Sites (October 14, 2004, to January 19, 2005)

Flow meter	UGA	Location	Land Use	Validity of the Flow Monitoring Data	Subbasins
1B	Central Blaine	Upstream of LS #1: On Marine Dr.; 15-inch main	Commercial	This area has very low flows as it monitors a very small area.	A4-7
2B	Central Blaine	West of Peace Plaza near I-5 overpass at Marine Dr.; 8-inch main	Commercial/ Residential	Reasonable.	D2-3, D5-1
3B	Central Blaine	1666 Peace Portal Dr.; 18-inch main	Residential	Reasonable.	E2-3
5B	Central Blaine	Corner of 3rd St. and G St.; 21-inch main	Residential (some Commercial)	Reasonable; High I/I area per interviews with City operations staff.	G8-5, G7-1, E5-11
6B	Central Blaine	6th St between G St and H St—635 H St; 8-inch main	Industrial	Low flow—weir inserted to improve flow measurement	K7-2, H5-2, H4-8, J5-3
9B	Central Blaine	Upstream of LS#1: On Marine Dr.; 21-inch main	All	Data is inconclusive after 12/2/2004—poor calibration.	Downstream of meters 3B, 4B, and 5B
1S	Semiahmoo Spit	9565 Semiahmoo Pkwy. across from tennis court; 8-inch main	Commercial/Resort	Reasonable.	S2-B
2S*	West Blaine	Upstream of WWTP; 16-inch main	Residential	After 12/25/2004, the data is inconsistent due to a damaged sensor. A depth-flow relationship was applied.	O6-3, N7-3, O6-30
RG	Central Blaine	Roof of City Hall	Commercial/ Residential	November 24, December 5, and December 26 2004 storms were not measured. Data provided by Weatherbug rain gage located at Blaine Middle School.	P9-2, P9-9, Q10-3, Q10-8

* Area is a known summer-use area and flow monitoring data was obtained during the winter. Monitored flows reflect seasonal highs for I/I, but likely underestimate the flow contribution from individual residences.
UGA = Urban Growth Area
gpd = gallons per day

The flow monitoring data was also compared to flow measurements at the WWTP for the same period of record. Figure 3-7 shows the flows recorded at the WWTP compared to the accumulated measured flow at meter locations 1S, 2S, 2B, and 9B. Generally, Figure 3-7 shows good correlation between the WWTP and meter data. The flow hydrograph at the WWTP lags the hydrograph at the meter locations due to attenuation of peaks through the conveyance system.



0 1,250 2,500 5,000 Feet

Flow Monitor
Rain Gage
Existing Lift Stations
Trunk System Manholes
Sewer pipes
Trunk System Pipes

Sub-basins
1B9B
1S
2B
2S
3B
5B
6B

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Figure 3-6
November 2004 Flow Meter Rain Gage and Basin Locations

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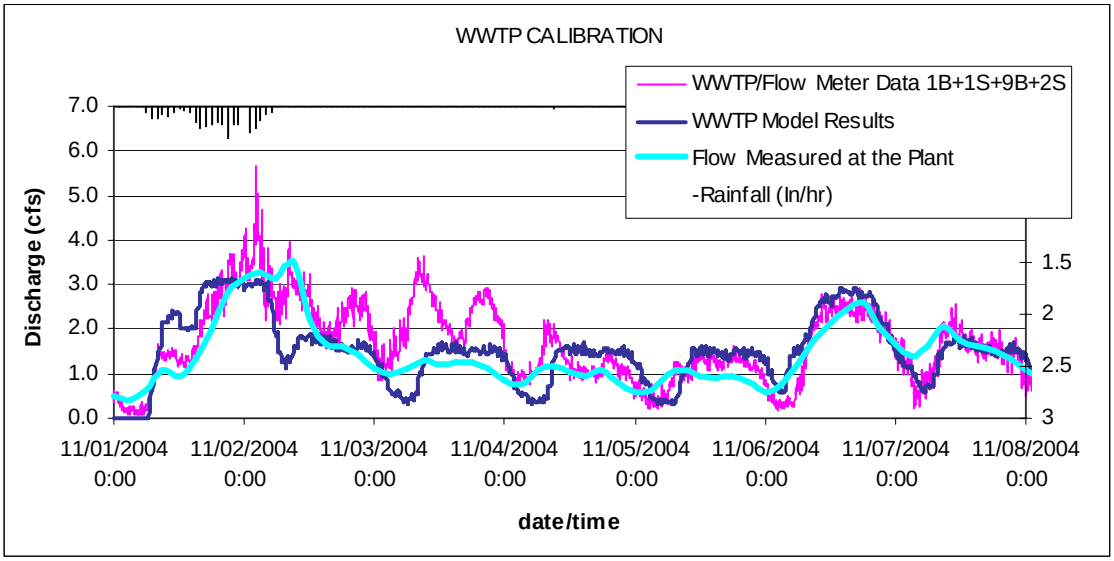


FIGURE 3-7
City of Blaine November 2004 Wastewater Treatment Plant Flow vs. Flow Monitoring Data

Average Sewer Flow

The average base flow was determined from flow monitoring data for an extended period of dry-weather flow (no rainfall). Table 3-7 shows the average base flow at the selected meter locations.

TABLE 3-7
October 2004 – January 2005 Flow Monitoring Results, Average Base Flow

Flow Meter	Average Base Flow (gpd)
1B/9B	1,052,900
1S	18,375
2B	88,000
2S	11,440
3B	69,100
5B	440,000
6B	46,000

3.3.3.2 Summary of Population Projections

Current Year 2005

The *City of Blaine Population Growth Allocations 2002-2022* report (Sehome, 2003) lists the projected population growth of the City of Blaine and the surrounding UGAs by percentage and total population. As of December 31, 2002, 3,956 people lived within Blaine's city limits,

while 5,012 lived in the City and the surrounding UGAs. The 2005 population was extrapolated from 2002 information using the 2002-2007-population growth rate.

Future Years 2015 and 2025

Growth projections from the *Population Growth Allocations* report were used to estimate future sewer flows. The study presented future population for years 2012 and 2022. The population growth rate from this report was used to forecast the population in years 2015 and 2025. Per the *Criteria for Sewer Works Design* (Ecology, 1998), the planning horizon for WWTP improvements and replacements is 20 years, which would be 2025 for purposes of this General Sewer Plan. An interim year (2015) was also chosen to evaluate potential phasing of conveyance system improvements that could be cost-effective. Table 3-8 shows the annual percent increase in population and Table 3-9 shows the projected future population.

TABLE 3-8
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 3-9
Existing and Projected Population* for the City of Blaine

Location	2005	2015	2025
Central Blaine	3,083	3,369	3,609
East Blaine	342	457	627
West Blaine	700	1,435	2,042
Total	4,125	5,261	6,280

* Year 2012 and 2022 population estimate taken from *City of Blaine Population Growth Allocations 2002-2022*; year 2015 and 2025 populations estimated using population growth estimates shown in Table 3-6.

City of Blaine Sewered Areas Population Projections

The population of the City of Blaine and the population served by the sewer system differ. Currently, the sewered areas are within the city limits. It is likely that parts of the East Blaine UGA will also be sewered between 2015 and 2025 (T. Galvin, personal communication, 2003). City staff also indicated that the East Blaine area will likely grow more quickly than the population report suggests and may reach the 2025 population estimate by 2015. From parcel and land use information and assuming full buildout, it was estimated that approximately 4,580 people will be living in the East Blaine UGA in 2025. It is assumed that the entire population in the East Blaine UGA will be sewered sometime between 2015 and 2025.

Table 3-10 shows the total future sewer flow projections, including the anticipated populations of areas to be served by sewers.

TABLE 3-10
Existing and Projected Population for the City of Blaine Sewered Areas

Location	2005	2015	2025	Growth 2005-2015	Growth 2015-2025
				%	%
Central Blaine	3,083	3,369	3,609	9%	7%
East Blaine	342	6,27	6,40	83%	2%
West Blaine	700	1,435	2,042	105%	42%
East Blaine UGA[1]	-	2,977	4,580	-	54%
Total	4,125	8,408 [2]	10,871	104%	29%

[1]UGA = Urban Growth Area

[2]Including service to currently (2005) developed parcels.

3.3.3.3 Flow Components to Accommodate Population Projections

Base Flow Component (Dry Weather)

Base flow is the predictable, consistent dry-weather flow in the collection basin that comprises sanitary flow and groundwater infiltration. Sanitary flow is the portion that contributes to the base flow from commercial/retail and residential sources. Groundwater infiltration tends to vary in different sections of a sewer collection system, depending on such characteristics as long-term soil moisture content, groundwater levels, and the relative depths of sewer pipes.

The base flow component was estimated using the average sewer flow, and unit diurnal curves were derived from available flow monitoring data. To generate flow inputs to the hydraulic model, the average sewer flow from a metered basin was distributed based on land use and contributing area, using the corresponding unit diurnal curve to represent the fluctuation during a day.

Unit Diurnal Curve

The flow rate varies during a 24-hour period according to the type of sewer connections that drain from a sewer basin. For example, residential areas generate more wastewater in the mornings and early evenings than in the early-morning hours, while an industrial entity might generate wastewater at a fairly constant rate over a 24-hour period.

Because most sewer connections in the City are residential, the diurnal patterns at many of the flow meter locations were similar. Four diurnal patterns were derived from the 2004-05 flow monitoring data: one representing the residential areas, another representing the combination commercial/residential areas, a third for the industrial area, and the fourth for the Semiahmoo Resort area. Figure 3-8 presents the unit diurnal curves that were used in the hydraulic model for these land uses.

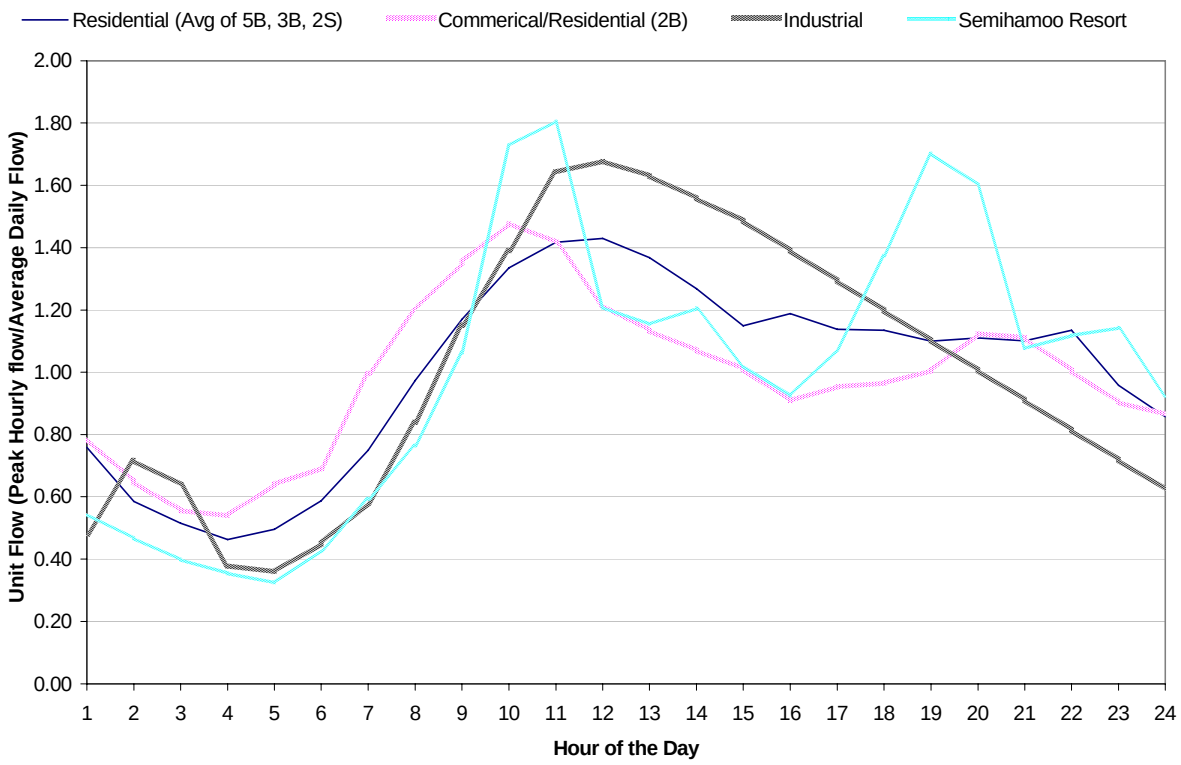


Figure 3-8
City of Blaine: Diurnal Flow Patterns

Equivalent Residential Units (ERUs)

The existing and future sewer flows in the City of Blaine are represented as ERUs. An ERU is defined as the average daily contribution of wastewater from a single-family residence. It is a unit of measure used to equate non-residential or multi-family residential wastewater contribution to a specific number of single-family residences. For example, if a system has sufficient physical capacity to convey flow equivalent to 100 ERUs, then that system would have the capability to meet the needs of 100 full-time single-family residences or any combination of residential, commercial/retail and industrial customers contributing flow equivalent to that of 100 single-family homes (100 ERUs). The volume of wastewater associated with an ERU is different for each utility's system. The ERU depends on demographics and wastewater generation patterns and may change over time due to I/I reduction measures.

The percentage of residential contribution to the City of Blaine's WWTP flow was approximated from water use data reported in City of Blaine Water System Growth Allocations (Sehome, 2003). The total number of water ERUs within the city limits of Blaine for different land-use types and the percentage each contributes the total are shown in Table 3-11.

TABLE 3-11

Water Service Area[1] ERUs and Percent of Total Flow Contribution, 2001

Land Use	Water ERUs[2]	Percent of Total ERUs
Single-family	1,743	62%
Multi-family	190	7%
Commercial/Retail	876	31%
Industrial	20	1%
Total	2,829	100%

Total Residential Use = 62% + 7% = 69%

[1] Water Service Area includes a portion of the Blaine UGA and areas outside the UGA. The water system and the sewer system have different service areas.

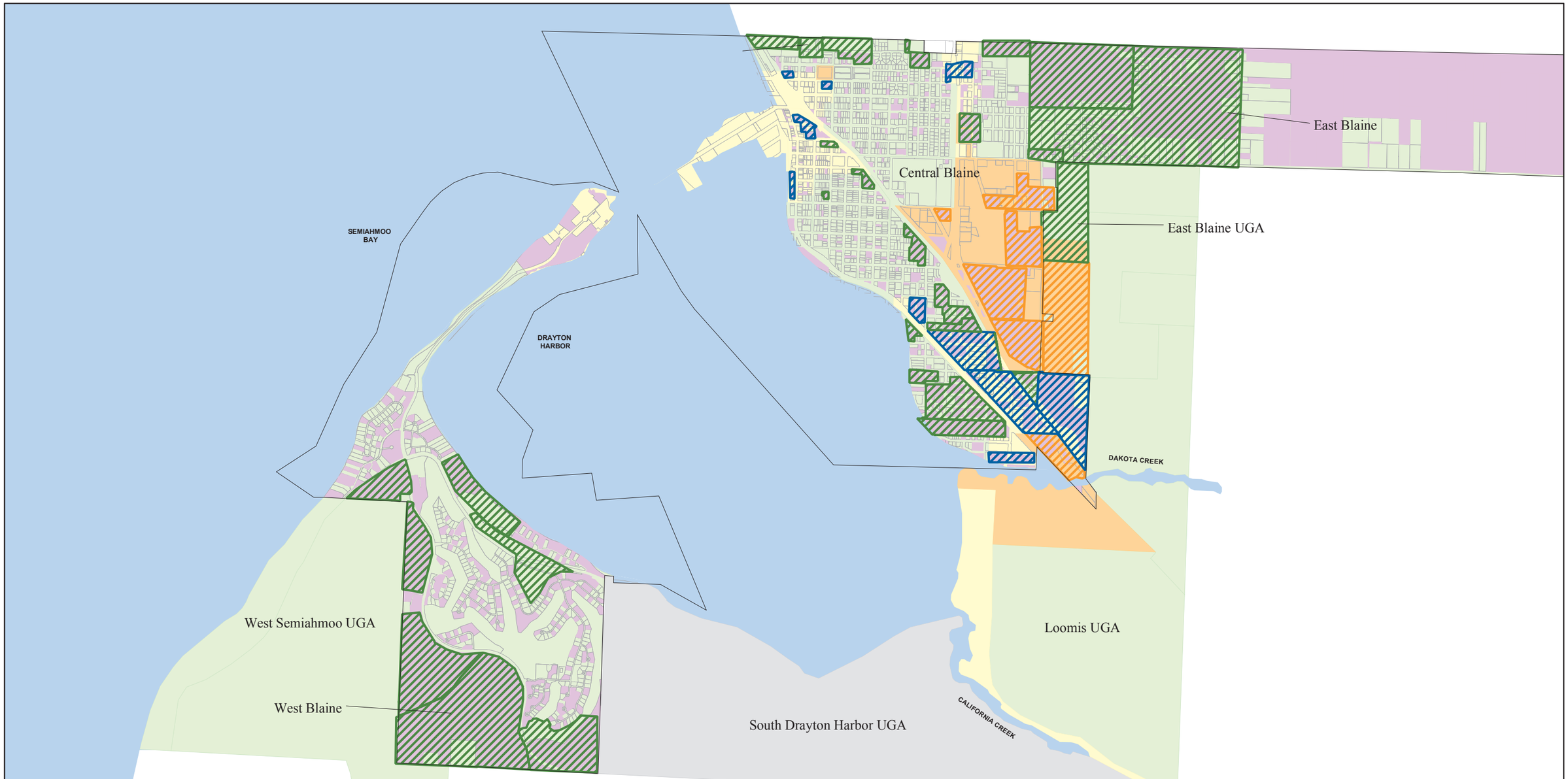
[2]Source: *City of Blaine Water System Growth Allocations (Sehome, 2003)*

Residential water use (single family and multifamily) is about 66 percent of the total water consumption in the City. For modeling purposes, it was assumed that the percentage of residential water use is comparable to the percentage of residential sewer flow. This percentage was applied to the total average base flow for the City of Blaine to obtain the sewer flow contribution from residential users. The residential sewer flow was divided by the 1999 population to obtain the sewer contribution per capita. This results in a residential contribution of approximately 73 gallons per capita per day. Since one ERU represents the contribution from a single-family residence and it is assumed that there are 2.5 people per residence, then one ERU is equal to 184 gallons per day per residence. This ERU value was used to represent flow data collected, existing flow, and future flow inputs to the model. It was assumed that typical single-family residential lots have a 5/8-inch meter (1 ERU), commercial/retail lots have a 1.5-inch meter (5 ERU), and industrial lots have a 3-inch meter (16 ERU).

Future Sewer Flows. The November 2004 to January 2005 flow was the basis for existing (2005) sewer flows. The ERUs and resulting 20-year projected flows developed below were added to the 2005 base condition, using the growth projections presented in Table 3-10.

The estimation of future sewer flows provides a tool to determine likely future problem areas in the existing collection system and the size of future system improvements. In addition, these flows provide a good approximation for the sizing of future WWTP enhancements.

To estimate future base flow, future average sewer flow was estimated based on projections for population, commercial/retail, and industrial growth. The estimated future flows are also presented in ERUs in this section. Future growth allocation within the City's collection system was determined based on information provided by City staff (Galvin, personal communication, 2003). Figure 3-9 shows how residential, commercial, and industrial growth was allocated in the City of Blaine.



N

SCALE

1 inch equals 2,500 feet

0 1,250 2,500 5,000 7,500 10,000 Feet

Legend

- Undesignated UGA
- Commercial
- Industrial
- Residential
- Vacant
- City Limits

FUTURE GROWTH ZONES

- Commercial
- Industrial
- Residential

CITY OF BLAINE, WASHINGTON

Figure 3-9
Future Growth Allocation

CH2MHILL

BLAINE WASHINGTON THE PEACE ARCH CITY

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The ERUs will be applied to future population growth and development to predict future residential sewer flows. To estimate future ERUs for residential areas, it was assumed that there are 2.5 people/residence in Central Blaine, East Blaine, and East Blaine UGA. Because West Semiahmoo is largely a retirement community, with seasonal fluctuations in population, it was assumed that there are 2.0 people/residence. Table 3-12 presents the total ERUs for City of Blaine, including residential, commercial/retail, and industrial growth, and associated flows for the user contribution. Existing flows were based on available flow meter data (2004-05) and future flows were calculated using the growth projections described in section 3.3.3.2. Table 3-13 presents existing and future flows per subbasin (shown in Figure 3-5), including I/I contributions.

TABLE 3-12
Future City of Blaine Total ERUs

Year	Total ERUs	Flow (gpd)[1]
Central Blaine, East Blaine, and East Blaine UGA		
2005	3,035	561,479
2015	4,854	898,043
2025	6,674	1,234,607
West Blaine		
2005	204	37,693
2015	282	52,165
2025	360	66,638
City of Blaine Totals		
2005	3,163	585,189
2015	5,098	943,217
2025	7,034	1,301,245

[1] Annual Average

Rainfall-Derived Infiltration and Inflow Component (Wet-Weather)

The RDI/I portion the total sewer flow is an estimate of the storm water that enters the collection system via surface inflow (e.g., through manhole covers), foundation drain connections, and/or storm drain connections. The magnitude and distribution of RDI/I entering a sewer collection system is approximated by using design storms, antecedent soil moisture condition, and rainfall data.

Design Storm Selection

Two design storms were used to simulate wet weather conditions in the City: the 5-year, 24-hour design storm and the 25-year, 24-hour design storm. The Natural Resource Conservation Service (NRCS) has developed several 24-hour storm hyetographs that are used throughout the country for surface runoff calculations. The City of Blaine is located in the coastal Pacific Northwest, and the NRCS Type 1A hyetograph best characterizes typical storm patterns for this region of the country.

The National Oceanographic and Atmospheric Administration (NOAA) has published total rainfall depth for storms for the 5-year, 24-hour design storm and the 25-year, 24-hour design storm (NOAA, 1973). Table 3-14 shows the cumulative rainfall depth for the City of Blaine reported by NOAA for these design storms. Figure 3-10 represents the design storms.

TABLE 3-13
Summary of Projected Flow per Subbasin (Average Base Flow)

Basin	Sub-basin	2005 Flow (gpd)	2015 Flow (gpd)	2025 Flow (gpd)
1B9B	A4-7	55,739	79,157	102,574
1B9B	D5-1	19,604	88,853	158,102
1B9B	E2-3	158,102	177,398	196,693
1B9B	G2-8	196,693	131,703	66,714
1B9B	H4-8	34,119	44,612	55,106
1B9B	H4-8	-	177,650	355,300
1B9B	H4-8			
1B9B	I1-11	55,106	134,901	214,695
1S	S2-10	8,235	17,037	25,840
2B	E2-1	66,714	50,416	34,119
2B	F2-2	8,513	32,126	55,739
2S	N7-3	4,618	6,392	8,166
2S	O6-3	3,868	2,542	1,215
2S	O6-30	9,504	6,933	4,363
2S	P9-2	4,363	4,116	3,868
2S	P9-9	1,215	2,200	3,184
2S	Q10-3	4,322	6,279	8,235
2S	Q10-8	-	2,161	4,322
2S	Q9-14	7,018	5,818	4,618
2S	S10-12	6,241	11,322	16,403
2S	S9-4	16,403	9,470	2,538
3B	H10-4	1,038	2,191	3,343
3B	I10-7	4,492	5,366	6,241
3B	I12-3	102,574	53,196	3,818
3B	J9-1	3,184	5,101	7,018
3B		23,209	12,124	1,038
4S	R12-14	2,538	6,021	9,504
5B	E5-11	16,153	17,879	19,604
5B	G7-1	8,873	12,513	16,153
5B	G8-5	3,343	6,108	8,873
5B	H11-5	3,818	4,155	4,492
6B	H5-2	214,695	111,604	8,513
6B	J4-6	8,166	8,747	9,327
6B	J5-10	18,655	13,991	9,327
6B	K7-2	25,840	24,525	23,209
Total		1,096,957	1,274,607	1,452,257

TABLE 3-14
Storm Characteristics

Design Storm	Maximum Intensity	Total Rainfall
5-year, 24-hour	0.55 inch/hour	2.5 inches
25-year, 24-hour	0.8 inch/hour	3.5 inches

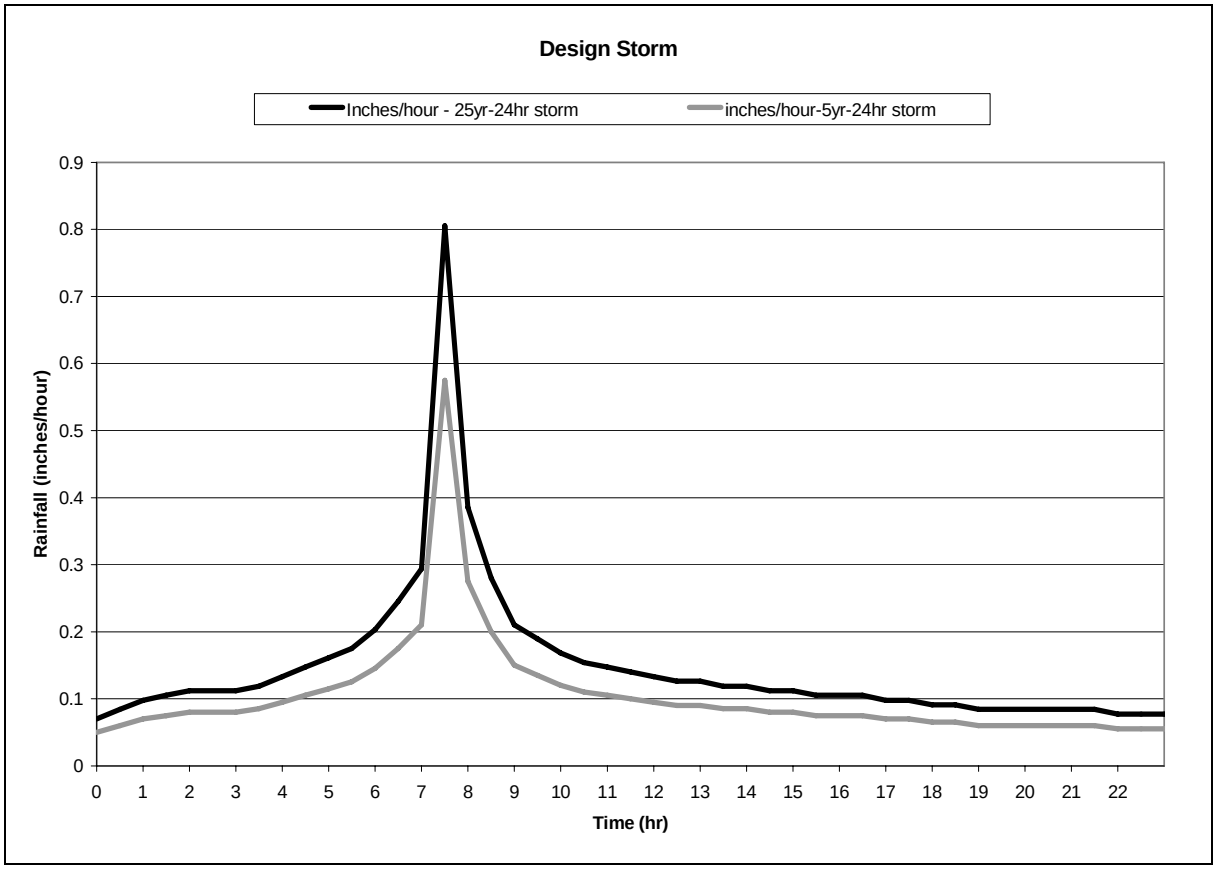


FIGURE 3-10
Design Storm

Antecedent Soil Moisture Condition. Antecedent soil moisture is defined as the moisture content of a soil before rainfall begins. This parameter controls the amount of rainfall that infiltrates into a soil and the amount of storm water runoff generated by a storm that may become RDI/I.

Rainfall Data. Rain gages were installed in the winter of 1999 and from November 2004 to January 2005 to estimate rainfall in the City of Blaine. For the winter 2004-05 precipitation data, the gages were located at City Hall and at the Blaine Middle School. For the winter 1999 data, one rain gage was located on the golf course in West Blaine, and the other was located at City Hall in East Blaine. The 2004-05 rainfall that best represents the City of Blaine was obtained from the Blaine Middle School rain gage.

Hydrological climate and, correspondingly, antecedent soil moisture conditions vary from year to year and season to season. The National Weather Service classifications describe the overall hydrological climate of the period for which flow data is collected. The three classifications are defined as follows:

- Average – Yearly cumulative rainfall falls within the band of one standard deviation
- Dry – Yearly cumulative rainfall falls below the band of one standard deviation
- Wet – Yearly cumulative rainfall falls above the band of one standard deviation

Overall, regional rainfall patterns for three water years of data were analyzed using statistics generated from the Blaine National Weather Service rainfall gage, Index No. 0729, Latitude 49º00′, Longitude 122º45′ (NOAA, 1999), for which long-term data were available. The rainfall data were analyzed by comparing the cumulative rainfall distribution to the data set average values. The results are presented in Figure 3-11. The data on this figure is shown by water year. The 3-year average monthly standard deviation (1999-2001) is also shown. Currently, NOAA does not publish a standard deviation for a longer period of rainfall record.

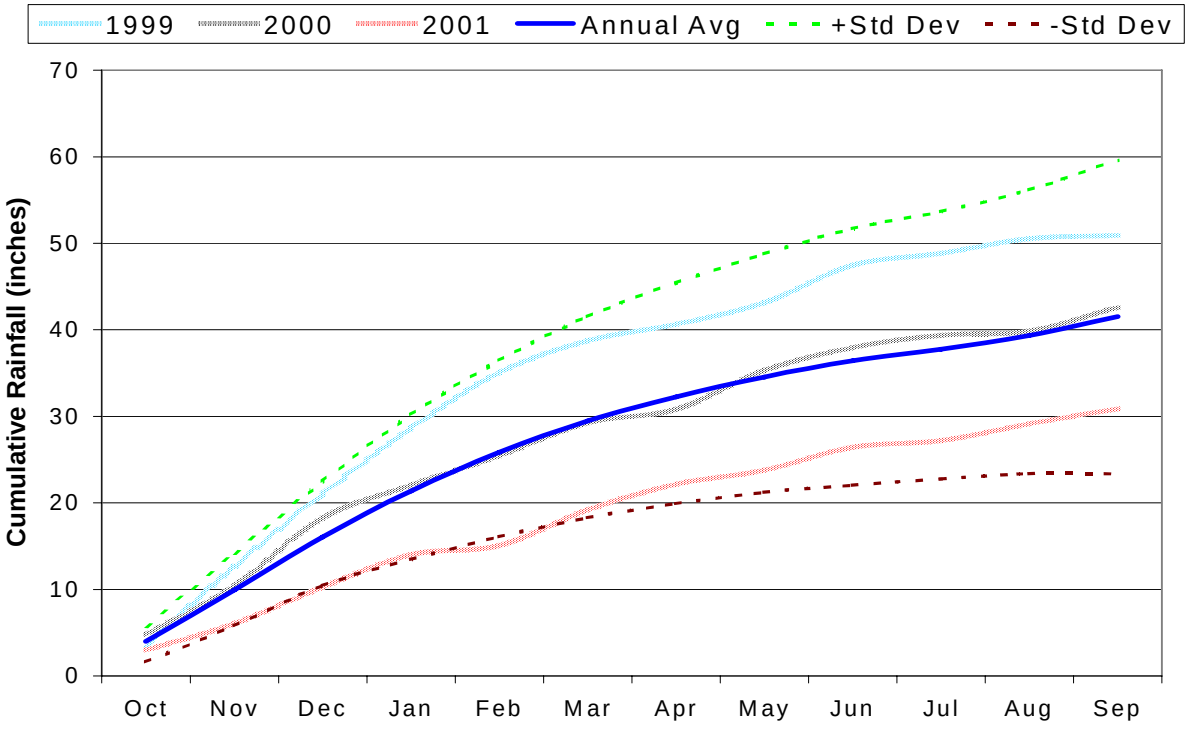


FIGURE 3-11
Cumulative Rainfall Compared to Historical Data (1999-2001 Water Years)

As shown in the graph, water years 1999, 2000, and 2001 are classified as "average". The highest soil moisture content, which results in high I/I, occurred in 1999. The peak base flow contribution observed during flow monitoring occurred in approximately mid-March 1999.

The hydraulic model of the Blaine sewer system was developed from the December 1999 flow monitoring data, which corresponds to the 2000 water year. Because this is an average rainfall

year, it is anticipated that the antecedent moisture conditions are representative of average conditions in the hydraulic model.

3.3.4 Model Calibration

Calibration consists of comparing model-predicted flows with field-measured flows. Accurate calibration is required in order to use the hydraulic model as an accurate predictive tool for identifying potential future improvements. The model parameters were calibrated for base flow (dry weather) and for a storm event (wet weather). The winter 2004-05 flow monitoring data was used calibration.

Successful calibration of a sewer collection system model depends on the quality and quantity of the monitoring data available for the system. The accuracy will vary proportionately with many factors, including the following:

- Number of flow monitoring locations in the system
- Extent of flow monitoring data
- Accuracy and consistency of flow monitoring data
- Number and magnitude of wet-weather events included in the flow monitoring record
- Spatial and temporal variability of rainfall across the collection system

3.3.4.1 Base Flow Calibration (Dry Weather)

To calibrate the base flow, the winter 2004-2005 monitoring data was analyzed and periods during which no rainfall occurred were identified. A representative 24-hour period (midnight-to-midnight) flow record was extracted from selected non-storm periods. The 24-hour flow record was then averaged to obtain a wet-season average, daily base flow volume at each monitoring location.

Table 3-15 presents the location and the average, daily base flow values obtained for each monitoring location in the collection system. The average base flow at the flow meter location was distributed upstream in selected manholes of the meter basin, using catchment areas and land use. Average base flow parameters were adjusted until the model agreed with the dry period sewer flow meter data.

3.3.4.2 RDI/I Calibration

To characterize RDI/I in the collection system, the flow monitoring data was analyzed for specific storm events. Typical wet-season base flow hydrographs were subtracted from the monitored total flow hydrographs to separate the RDI/I component. The storm event calibration was the wet-weather period of November 1 to November 9, 2004. This calibration stage involved adjusting the RDI/I parameters used for individual basins. RDI/I parameters include time of concentration, percentage of sewer area, and percentage of impervious area. These parameters were distributed in the subbasins contributing to each specific flow meter. The storm event used for verification of RDI/I parameters was the wet-weather period of January 16 to January 20, 2005.

TABLE 3-15
Wet Season Average Daily Base Flow at Monitoring Locations Updated to November 2004 to January 2005 Data

Monitoring ID	Location	Manhole Model ID/ City ID	Sewer Diameter (in)	Drainage Basin Area (acres)	Base Flow Estimate [a] (gpd)
1S	Semiahmoo Pkwy, north of Beachwalker Villas	MH665/ S2-10	10	51	18,375
2S	Semiahmoo Pkwy, north of Aerie Lane	MH153/ O6-12	10	325	11,440
2B	Intersection of Marine Dr. and railroad	MH561/ D3-1	15	112	88,000
3B	South of Intersection of D St. and Exit 276	MH460/ E2-3	8	36	69,100
5B	3rd St between Martin St. and H St.	MH493/ E4-3	21	528	440,000
6B	6th St, north of H St.	MH366/ F4-7	8	232	46,000
1B/9B	South of intersection of Marine Dr. and McMillan Ave.	MH298/A4-6/MH299/ B4-1	21	1220	1,052,900

[a] Base flow includes domestic and commercial wastewater plus typical wet-season groundwater infiltration.
gpd = gallons per day

3.3.5 Calibration Results

In general, model flow rates correlated well with the data from most of the monitoring locations. Figure 3-12 shows the result of the base flow calibration and the flow monitoring data. The model prediction closely follows the flow recorded by the flow meters. The fluctuation of the results during the day closely matches the peaks and the troughs of the flow meters. Figures 3-13 and 3-14 present discharge results of the model and sewer flow meter data for a representative meter in East Blaine and in West Blaine trunk system, respectively. A complete set of the discharge results is included in Appendix E.

The model satisfactorily predicts peak flows and the attenuation effect of the storms. Discrepancies were pronounced at a few locations, but these discrepancies were attributed to inconsistencies in the available meter data and uncertainties in the pump curves.

To verify the calibration, inflow records from the WWTP were compared with the model results. The November 2004 to January 2005 flows generated by rainfall were approximated using Blaine Middle School rain gage data. The base flows at the WWTP agree with the expected pattern and average; the predicted wet-weather response does not show expected wet peaks, following the pattern of the available rainfall data. Figures 3-15 and 3-16 show the dry-weather and wet-weather flows predicted by the model at the WWTP.

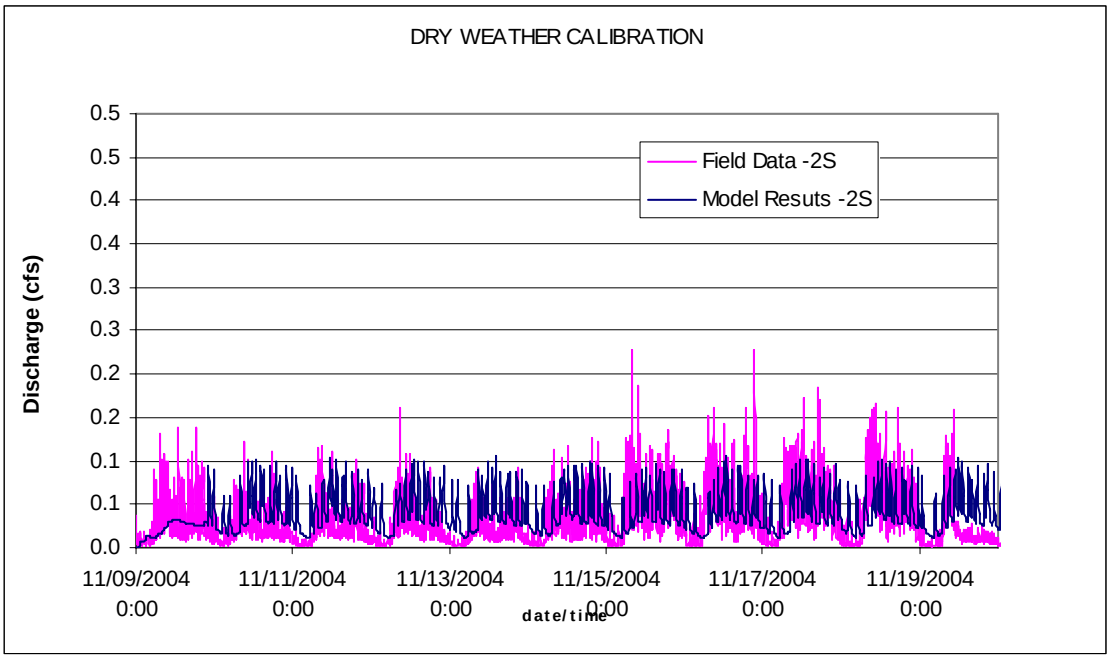


FIGURE 3-12
Base Flow Meter Data and Model Results – Meter 2S – West Blaine

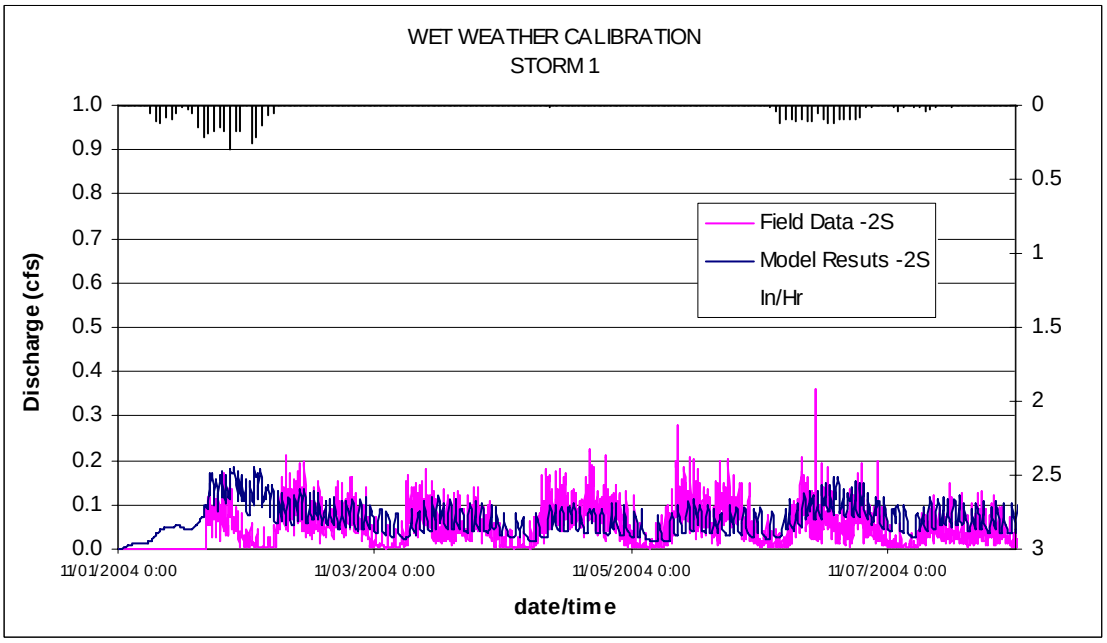


FIGURE 3-13
Wet-weather Meter Data and Model Results – Meter 2S – West Blaine

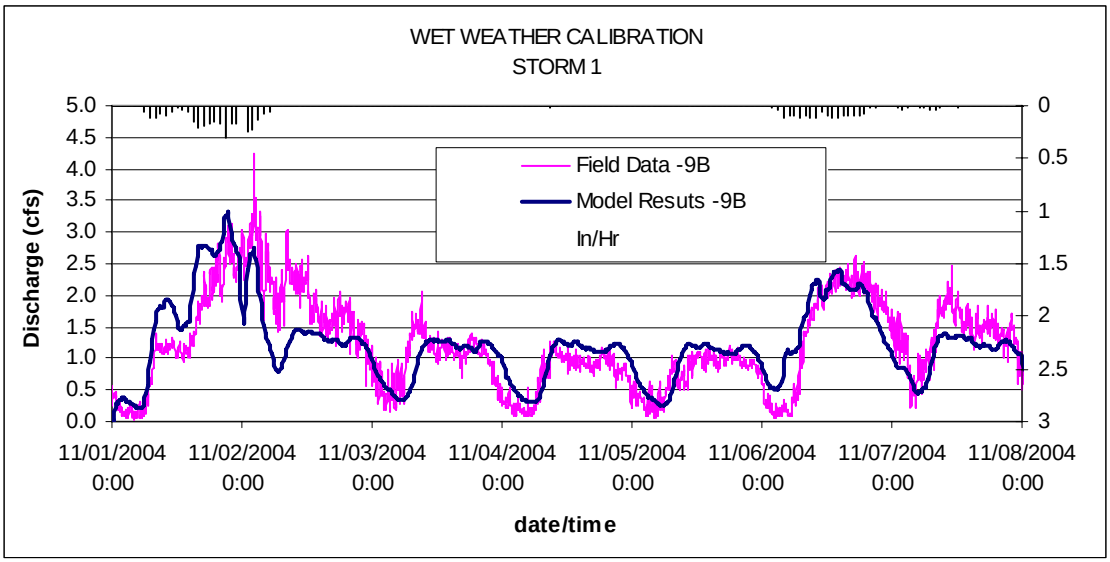


FIGURE 3-14
Wet-weather Meter Data and Model Results – Meter 9B – East Blaine

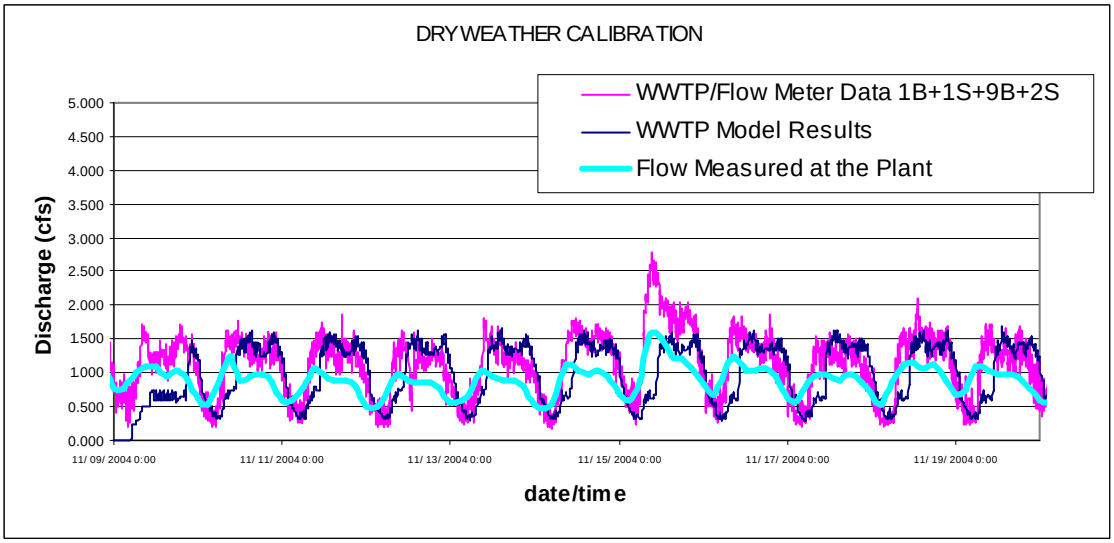


FIGURE 3-15
Base Flow Meter Data and Model Results – WWTP

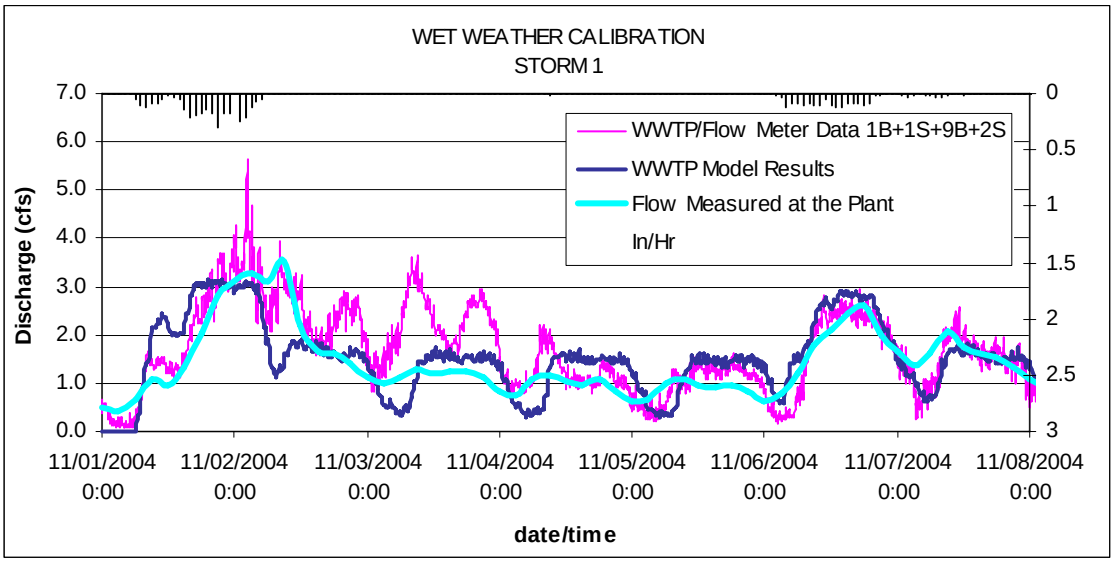


FIGURE 3-16
Wet-weather Meter Data and Model Results – WWTP

3.4 Collection System Analysis

The hydraulic model is a tool to help the City identify areas where the existing system may need to be replaced or expanded to convey the sewer flows to meet the City's standards. After hydraulic model construction and calibration, parameters in the model can be modified to simulate possible changes to the collection system. Corresponding responses of the collection system can then be predicted.

3.4.1 System Response Criteria

In order to identify capital improvement projects, criteria must be defined to identify where improvements are needed and the standards to which those improvements should be designed. Capital improvement projects for infrastructure can become necessary for one or more of the following reasons:

- The capacity of a facility is below defined criteria under existing or projected flow conditions.
- The condition of a facility meets one of the criteria shown in Table 3-16.

Table 3-16 summarizes the criteria that were used to determine when a capital improvement project is necessary. The recommended indicator parameters alone do not justify the development of a capital improvement project but are factors to be considered.

TABLE 3-16
Capital Improvement Project Deficiency Criteria Related To Hydraulic Capacity

Type of Criteria	Parameter	Criteria
Capacity-Related Criteria	Gravity Sewer Capacity	- Surcharging within 2 feet of the rim in areas without basements
		- Surcharging within 8 feet of the rim in areas with basements
		- Surcharge HGL elevation > 5 feet above the pipe crown
		- Surcharge duration > 30 minutes
	Sanitary Sewer Overflows	- Not permitted.
	Lift Station Capacity	- Standby pump up to and including the 5-year peak hourly design flow
		- Maximum lift station capacity at the 25-year peak hourly design flow
	Design Storms	- 25-Year, 24-hour rainfall event for the collection system
Condition-Related Criteria*	Pipe	- CCTV Inspection indicates excessive structural damage as determined by engineering staff
		- Inadequate or excessive flow velocities
	Lift Station	- Equipment failures resulting in overflows
	Manholes	- Loss of grout and/or joint sealing, interior corrosion
		- Cover/rim settlement
		- Ground subsidence
Condition-Related Indicator Parameters	Pipe Maintenance Frequency	- Preventative maintenance routine (e.g. jetting, hydrocutting) frequency due to pipe deterioration in excess of once every 3 years
	Facility Age	- Gravity sewers: 90 to 100 years old and pipes with high I/I
		- Force mains: 25 years
		- Pump stations (civil): 50 years
		- Pump Stations (mechanical and electrical equipment): 15 years

*Source: International Infrastructure Management Manual – Version 1.0

3.4.2 Results

A combination of storm and base flow data was used to assess the response of the existing system.

3.4.2.1 Base Flow Conditions

A main component of the base flow is the contribution from commercial and residential sources; therefore, the population growth will be reflected in an increase of this portion of the sewer flow. Base flow conditions for years 2015 and 2025 were estimated and compared to existing conditions. Base flow simulation provides information about system performance without considering effects of RDI/I. Figure 3-17 shows the response of the system with no

storm event upstream of Lift Station 1. This lift station receives the flow contribution from East Blaine.

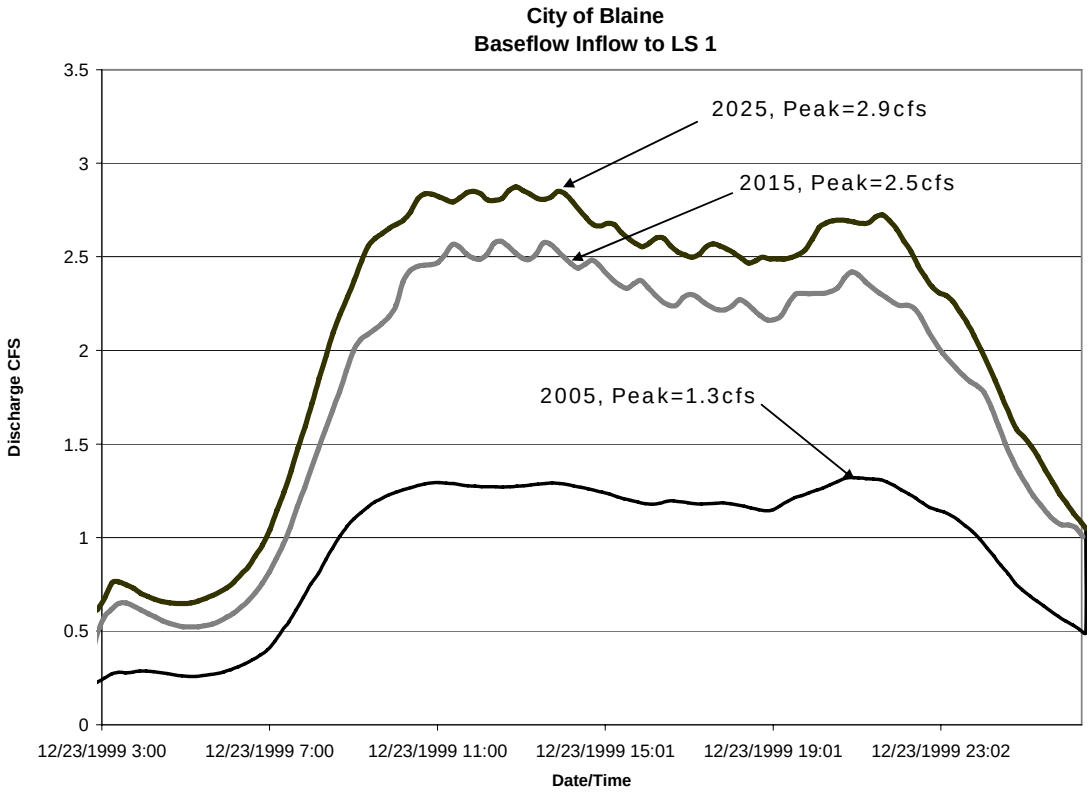


FIGURE 3-17
Base Flow Contribution at Lift Station 1

On average, the base flow is estimated to increase by 89 percent between 2005 and 2015, and by 117 percent between 2005 and 2025.

3.4.2.2 Storm Conditions

The 25-year, 24-hour storm was used to determine the location of conveyance deficiencies in the collection system and to size and determine the improvements required to meet the expected level of performance. The 5-year, 24-hour storm was used to determine the required firm pumping capacity (i.e., the capacity of the pump station with the largest pump out of service). Reduction of RDI/I as a result of the City's maintenance activities was not included in the analysis. Table 3-17 presents the scenarios that were used to determine the hydraulic deficiencies of the system.

TABLE 3-17
Modeled Scenarios

Scenario	Base Flow	Storm	Basis for Improvements?
1	2005	5-year, 24-hour	No
2	2005	25-year, 24-hour	No
3	2015	5-year, 24-hour	No
4	2015	25-year, 24-hour	No
5	2025	5-year, 24-hour	Yes for lift stations
6	2025	25-year, 24-hour	Yes for pipelines

3.4.2.3 Deficiency Categories

Based on the design criteria, the pipes identified as having deficiencies were grouped into the categories presented in Table 3-18.

TABLE 3-18
Categories of System Deficiencies

Category	Description
A	Sewer system overflow occurred during the simulation; pipe is exceeding 100 percent of its capacity.
B	Wastewater level is at less than 2 feet from the rim; pipe is exceeding 100 percent of its capacity.
C	Wastewater level is at less than 8 feet from the rim but more than 2 feet; therefore, the basements in the area will determine the priority of the improvements. Pipe is exceeding 100 percent of its capacity.
D	Pipe is exceeding 85 percent of its capacity; wastewater level does not present risks of SSOs.

3.4.2.4 Modeling Results

The design criteria described in Section 3.4.1 was used to identify pipes at or near capacity and the locations of SSOs for the existing trunk system, under 2005 base flow conditions during the 25-year, 24-hour storm. These results are presented in Figure 3-18.

To compare the effect of the increase in population, Figure 3-19 shows deficiencies under 2025 base flow conditions. Figure 3-20 shows the inlet hydrograph at Lift Station 1, for 2005 and 2025, during the 25-Year 24-hour design storm.

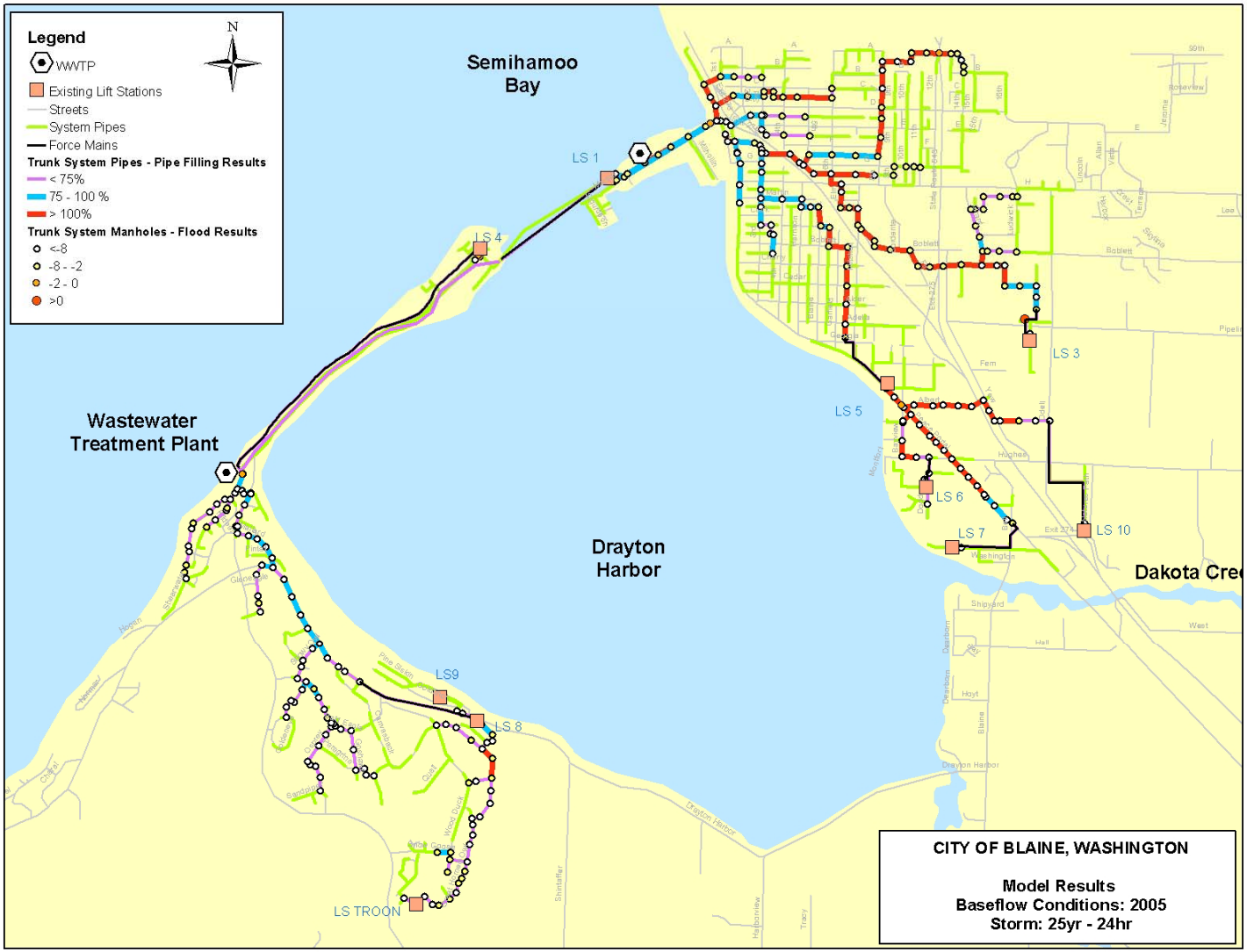


FIGURE 3-18
Pipes Exceeding 100 Percent of Capacity and Location of SSOs During the 2005 25-year, 24-hour Scenario

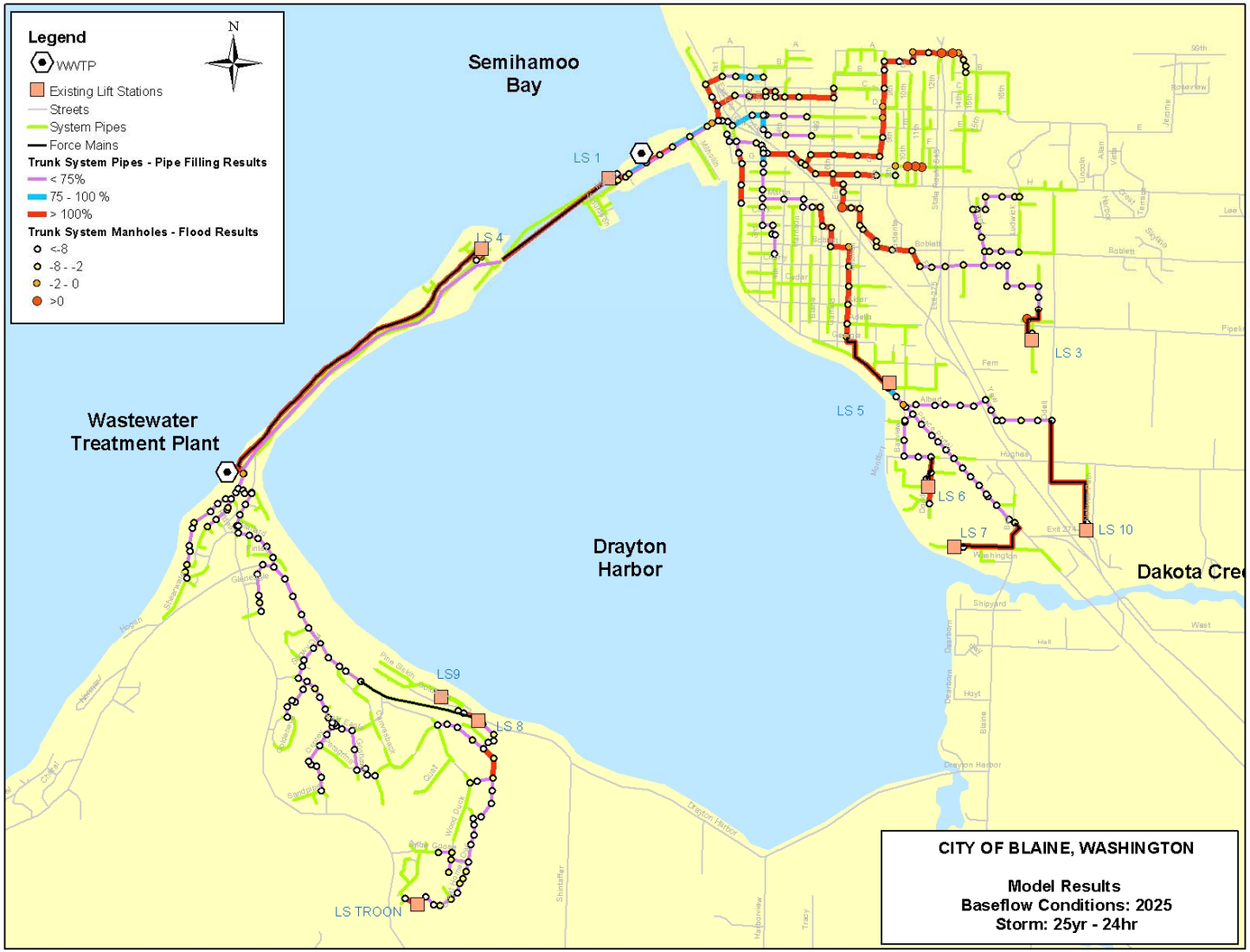


FIGURE 3-19
Pipes Exceeding 100 Percent of Capacity and Locations of SSOs During the 2025 25-year, 24-hour Scenario

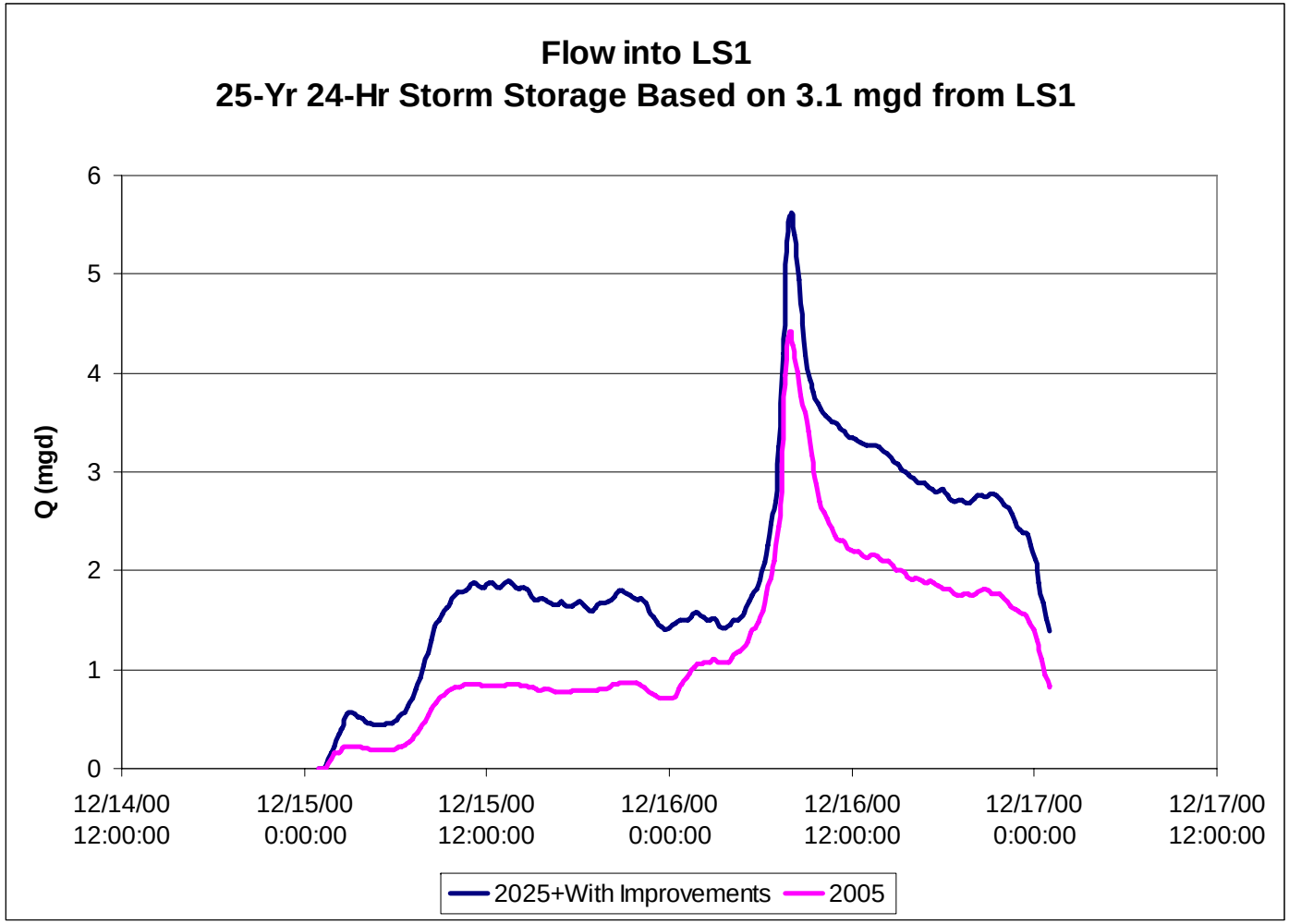


FIGURE 3-20
Inflow Hydrograph at Lift Station 1

3.5 Recommended Improvements

3.5.1 Proposed Conveyance Systems

In order for the City to provide sewer system to the East Blaine annexation area, proposed sewer extensions, and subbasins were developed to accommodate the existing development and predicted future growth. Development status and capacity information on each parcel was provided by the City in order to determine the appropriate way to sewer that area. Figure 3-21 and Table 3-19 summarize the proposed improvements required for providing sewer service to the East Blaine annexation area.

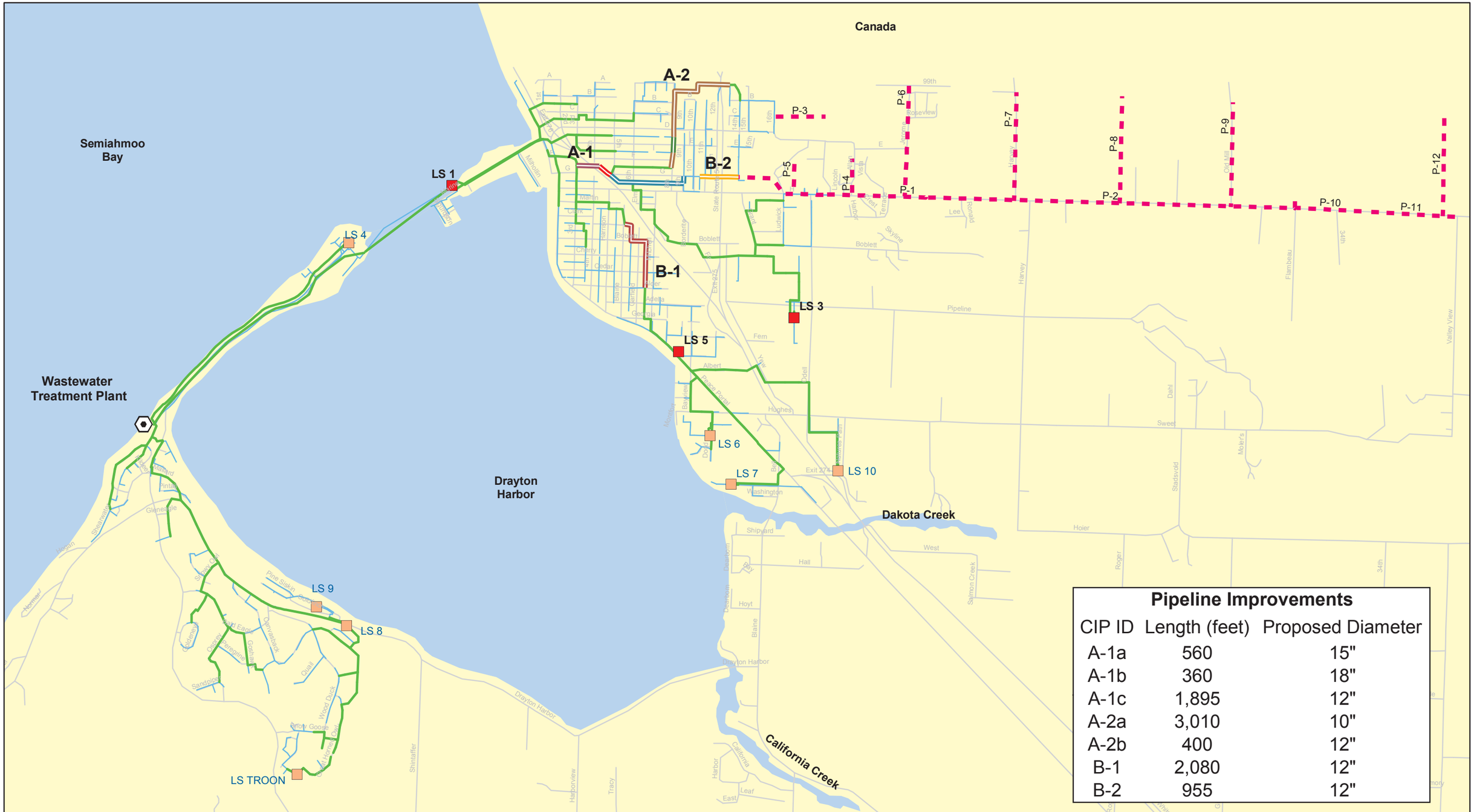
TABLE 3-19
Recommended Proposed Sewers

Pipe ID	Proposed Diameter (inches)	Length (feet)
P-1	8	2,545
P-2	8	9,299
P-3	6	1,304
P-4	6	894
P-5	6	857
P-6	6	2,722
P-7	6	2,665
P-8	6	2,627
P-9	6	2,571
P-10	6	1,623
P-11	6	2,239
P-12	6	2,496

3.5.2 Existing Conveyance Improvements

For the two design storms, the locations of conveyance deficiencies are almost the same. The principal difference is in the magnitude of the surcharge and pipe filling. The difference in peak flow between the 2005 5-year storm and the 2025 25-year storm is less than 15 percent; therefore, it is recommended to size the improvements to convey the 2025 25-year storm. This will reduce the risk of an SSO occurring without a significant increase in capital improvement projects. I/I control/reduction measures were not proposed as part of the recommended capital improvements.

Figure 3-21 shows the recommended capital improvements for each Type A, Type B, and Type C improvement; improvements are also summarized in Table 3-20. Appendix F includes figures that show the pipe profiles during the 2025 25-year storm



Pipeline Improvements		
CIP ID	Length (feet)	Proposed Diameter
A-1a	560	15"
A-1b	360	18"
A-1c	1,895	12"
A-2a	3,010	10"
A-2b	400	12"
B-1	2,080	12"
B-2	955	12"

N

0 1,200 2,400 4,800 Feet

WWTP
Existing Lift Station
Lift Station Improvements
Trunk System Pipe
System Pipe
Streets

Pipeline_improvement
A-1a
A-1b
A-1c
A-2a
A-2b
B-1
B-2

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Figure 3-21
Potential Conveyance Improvements

and effects of the proposed improvements. A complete summary of pipe size, slope, and capacity for all proposed sewers is presented in Appendix C.

TABLE 3-20
Recommended System Improvements Updated to the November 2004 to January 2005 Flow Monitoring Data

Improvement	Description
A-1	Replace existing 10-inch pipeline with a 15-inch pipeline between manholes E3-4 and E3-9 (approximately 560 feet). This includes 250-foot bore-and-jack I-5 undercrossing. The existing 10-inch pipeline should also be replaced by an 18-inch pipeline between manholes E3-9 and F4-1, parallel to I-5 (approximately 360 feet). The existing 8-inch pipeline should be replaced with a 12-inch pipeline between manholes F4-1and H4-2, between G Street and H Street (approximately 1,895 feet). This main line conveys wastewater from basin 6B, and downstream it collects wastewater from basin 4B. The wastewater level in these pipes exceeded the overflow criteria at the manholes, and the pipe capacity criteria were exceeded.
A-2	This main line conveys wastewater from basins 9B. Replace existing 8-inch pipeline with a 10-inch pipeline between manholes G3-4 and G3-5 and between manholes G2-8 and I1-5, along 8th Street and A Street (approximately 3,010 feet). Also replace existing 8-inch pipeline with a 12-inch pipeline between manholes G3-5 and G2-8, along 8th Street. The increased diameter in this section is due to a reduced slope. This project was also evaluated with 10 percent of the East Blaine flow being directed into this line. No change in the recommended diameter is needed. The wastewater level in these pipes exceeded the overflow criteria at the manholes and the pipe capacity criteria were exceeded.
B-1	The receiving main line from Lift Station 5, currently a 10-inch gravity line, should be replaced with a 12-inch pipeline between manholes F5-3 and G7-1, parallel to Garfield Avenue (approximately 2,080 feet). This main line conveys wastewater from basins 5B and 8B. The wastewater level in these pipes exceeded the overflow criteria at the manholes and the pipe capacity criteria were exceeded.
B-2	Replace existing 8-inch pipeline with a 12-inch pipeline between manholes H4-7 andI4-2 (connection point to service East Blaine) along G Street. (approximately 955 feet). In 2005, City constructed a 15-inch line from H4-2 to H4-7 to reflect impact of servicing East Blaine. The wastewater level in these pipes exceeded the overflow criteria at the manholes and the pipe capacity criteria were exceeded.

Additional conveyance improvements may be required for the wastewater treatment solutions, described in Chapter 4. These improvements may include, but are not limited to:

- Replacement of the 14-inch line under the harbor
- Replacement of the 10-inch line along Semiahmoo spit, from the harbor to the existing WWTP

3.5.3 Lift Station Improvements

Ecology requires that wastewater pump stations provide one redundant unit that matches the largest pump to handle the peak flow with the largest unit out of service. The model response shows that this requirement was not met for some of the pump stations during the 5-year, 24-hour storm. The total pumping capacity of the lift station must handle the peak flow during the 25-year, 24-hour storm.

There are two options to improve the pumping capacity: install an additional pump if the pump station facility has room available, or install new pumps with greater capacity. Table 3-21 summarizes the pump capacity deficiencies identified in the model.

TABLE 3-21
Trunk System Pump Station Existing and Required Capacity to meet the 5-year, 24-hour and the 25-year, 24-hour Storm

Lift Station Number	Existing Firm Capacity[1] (gpm)	Required Capacity to Meet 2005/5-year Storm (gpm)	Required Capacity to Meet 2025/25-year Storm (gpm)
1	1,750	3,020	3,900
5	450	500	550

[1] Firm capacity refers to pump station capacity with the largest pump out of service.
Source: Pump information was obtained from City personnel and equipment vendors.

For pump stations identified above to have insufficient discharge capacity, the replacement of the discharge line will likely improve the conveyance problem. Based on the model results, the alternatives to improve the conveyance deficiencies are as follows:

- Lift Station 1. The system curve for this force main and the existing pump curve are presented in Appendix D. If this line remains in service conveying wastewater across the harbor, improvements to increase the conveyance capacity of the discharge pipeline (the existing 10-inch line between the pump station and the existing treatment plant) require that the existing pipeline be replaced with approximately 7,000 feet of 14-inch pipeline.
- Lift Station 5. The system curve for this force main and the existing pump curve are presented in Appendix D. The existing capacity is nearly equal to the model results that used the existing pump curves. No improvements are recommended at this time; however, the lift station should be monitored for evidence of unacceptable surcharge.

3.6 Collection System Design Criteria

System design criteria and standards have been developed to ensure that a consistent minimum level of service is maintained throughout the collection system and to facilitate planning, design, and construction of collection system projects. Ecology has standards for the design and review of sewer facilities in the *Criteria for Sewage Works Design* (Ecology, 1998), commonly known as the "Orange Book."

In general, the collection system design standards address the sizing and siting of facilities, and the City of Blaine's standards are consistent with those of Ecology. The City has drafted some standards that are more stringent than those in the Ecology manual to ensure that facilities are tailored to the needs of the City. The existing City standards that differ from those of Ecology are summarized in Appendix G.

3.6.1 Design Criteria for Improvements

Capital improvement projects developed as part of this General Sewer Plan, and additional improvements made by the City, will conform to the standards of both the City and Ecology. In addition to the capacity criteria described in Table 3-16, the following recommended criteria and elements of sewer design should be incorporated into capital improvement projects.

3.6.1.1 Pipe Velocity Criteria

A minimum velocity of 2 feet per second must be achieved when the pipe is flowing full. This is recommended by both the City and Ecology for scouring velocities to inhibit solids deposition in gravity sewers. As a rule of thumb, velocities should not exceed 10 feet per second in gravity sewers to avoid causing damage to the sewer. For force mains, Ecology recommends that the velocity should range between 2 and 8 feet per second, and the optimum velocity is between 3.5 to 5 feet per second. Gravity sewers with a velocity below 2 feet per second or greater than 10 feet per second during the peak flow were identified. Force mains with a velocity less than 2 feet per second or greater than 8 feet per second during the peak flow were also identified.

3.6.1.2 Lift Station Pump Starts and Stops

Per Section C2-1.2.3 of the *Criteria for Sewage Works Design*, short periods of time between pump starts should be avoided. This typically happens during low flows and is dependent on wet well volume and pump and motor size. As a rule of thumb, pump starts should be limited to six starts per hour for motor sizes less than 10 horsepower, four starts per hour for motor sizes ranging from 10 to 75 horsepower, and one start per hour for motor sizes ranging from 100 to 200 horsepower. Since specific criteria are not noted by Ecology, capital improvement projects will not be developed for this reason alone. However, lift stations that exceed the recommended number of starts per hour will be identified.

3.6.1.3 Noise Control

Pumps, motors, and variable frequency drives (VFDs) produce significant levels of noise. However, emergency generators are generally the most significant source of noise at a pump station. Several methods of sound attenuation are available, including mufflers, insulation, and baffle walls. Ecology recommends hospital-grade silencing as the design standard.

3.6.1.4 Odor Control

In wastewater collection systems, there is a potential for dissolved oxygen (DO) to be depleted, resulting in septic wastewater. Under septic or anaerobic conditions, sulfate-reducing bacteria (SRB) can flourish, resulting in the accumulation of sulfides in the wastewater. One of the sulfide forms present is hydrogen sulfide (H_2S). When H_2S is released to the vapor phase, there is potential for both odor and corrosion. In gravity sewers with open channel flow, odorous air will tend to be conveyed downstream in the air space of the pipe above the wastewater flow. At a lift station, the odorous air can no longer be conveyed downstream, and the air will tend to be released at the lift station or at manholes upstream of the lift station. Several methods of odor control are available

and should be considered for some projects. These odor control methods include chemical addition, carbon scrubbers, and biotechnology. The appropriate technology will depend on the odor characteristics of the wastewater, distance to the nearest receptor, available space, and operator preference.

3.7 Sanitary Collection System Condition Assessment

One of the City's primary goals is the development of a program that will prioritize the repair and replacement of collection system components in a cost-effective manner. A means of accomplishing this is a system condition assessment, which provides information on the life expectancies of the various collection system components and a mechanism for maintaining the system components at operational standards to ensure reliability and prolonged life. A condition assessment would also allow the City to identify an annual level of funding for repair and replacement of system facilities. By conducting a condition assessment, the City can refine its maintenance program to extend the life of the system, thereby decreasing the required investment in repair and replacement of collection system components.

Some form or level of condition assessment is anticipated to be part of the upcoming Capacity, Management, Operation, and Maintenance (CMOM) program requirements. Condition assessment could also directly support the City's ability to file the General Accounting Standards Board (GASB) Statement 34 for existing general infrastructure assets, which is encouraged, but not required, for the City of Blaine.

The following sections contain an overview of the recommended condition assessment process.

3.7.1 System Component Rating System

The first step of a condition assessment is to develop a rating and condition description system that can be used for objective comparisons with similar system component types (assets such as pipelines, manholes, and pump stations) and that can be applied repeatedly. Provided below are examples of ratings and condition descriptions that are both objective and repeatable, and that will measure the condition of sewer pipes and manholes, as well as the mechanical and electrical assets of the sewer collection systems.

Table 3-22 contains an overview of a suitable rating system that the City could use to conduct a condition assessment of its collection system. During the assessment, a condition value from 0 to 5 is assigned to the pipeline or the facility. If the pipeline or facility is not observed, the value "6" is assigned. Detailed condition assessment forms for sewer collection systems, pump stations, and individual pumps are included in Appendix H.

TABLE 3-22
Asset Condition Rating System

Rank	Description of Condition
0	**Pipe, Manhole, or Facility Nonexistent**
1	**Very Good Condition** Only normal maintenance required
2	**Minor Defects Only** Minor maintenance required—5% of the asset needs maintenance.
3	**Backlog Maintenance Required to Return to Accepted Level of Service** Significant maintenance required—10 to 20% of the asset needs maintenance.
4	**Renewal Required** Significant renewal/upgrade—20 to 40% of the asset needs renewal.
5	**Asset Unserviceable** Over 50% of the asset requires replacement.

3.7.2 Condition Assessment Overview

To perform the condition assessment, the sewer collection system will be divided into two areas: sewer pipelines and pump stations.

The condition assessment team should comprise a condition assessment specialist, maintenance personnel, and a CCTV operator. Video footage will record the actual condition of the pipeline during the inspection. Digital photos will provide a visual reference on the condition assessment forms or records. The City currently has the beginnings of a library of CCTV information and plans to continue CCTV data collection.

The condition assessment team will use the condition assessment data entry form to assess the overall condition of each pipeline, manhole, and facility. In addition, the estimated repair/replacement cost needed to bring the system component back into an operable condition to ensure reliability and system integrity may be included with the form.

The results of the CCTV inspections, as listed on the data entry forms, will be used to add new projects to the City's list of repair and replacement projects. If a component is rated as a 5, it will immediately be added to a list of necessary projects. Components rated as 2, 3, or 4 will be scheduled for reassessment within an agreed-upon timeframe.

The City has already conducted a number of collection system video inspections. By using the condition assessment data entry form included in Appendix H, the results of those videos can be quantified, coordinated with GIS data, and filed to begin development of the condition assessment database for the collection system. Not all pipeline and manhole components can be rated during the initial condition assessment because of limited finances, staff, safety concerns, lack of accurate equipment identification information, or limited access to some areas. Therefore, further inspections will be required to ensure that all components are assessed for future CIPs. The

remainder of the collection system can be assessed as the City proceeds with its system-wide CCTV inspection program. A complete condition assessment of all the pipelines and manholes will provide information that will greatly reduce the utility's risk of failure in the collection system.

3.7.3 Methodology

A condition assessment is a necessary element of the City's maintenance program for minimizing risk. The following two methods describe alternative approaches to condition assessments:

- **Complete Condition Assessment of the Utility's Assets**—This method involves assessing conditions at all sewer pipes, manholes, catch basins, and pump stations in the sewer collection system. This kind of assessment would require extensive data collection from existing utility records, along with field verification of each individual asset and CCTV inspection of all sewer pipes.
- **Partial Condition Assessment of the Utility's Assets**—This method involves assessing conditions at all pump stations and 20 to 25 percent of the manholes, catch basins, and sewer pipes in the sewer collection system. This kind of partial assessment would involve field data collection and analysis of existing utility records. After collection and analysis of the information, the City would decide on the need for additional assessment of the remaining system. The City may choose to extrapolate results from the partial condition assessment to other portions of the system based on analysis of the results; however, the City should be aware that complete system assessments might be required. If extrapolations are made, information from the CCTV, smoke testing, and easement databases, along with the general sewer GIS layers, will be of value.

3.7.4 Risk Analysis Overview

A risk analysis is recommended to ensure that the events with the most impact on a utility or on a utility's assets are identified, thereby allowing a utility to determine its level of exposure to the risk and the actions necessary to minimize that risk.

To estimate the level of risk, the City needs to determine the consequences of failure for events, the probability of failure of the asset, and the probability of the event occurring. The probability of physical failure of a sewer component is related to the current condition of the asset, hence the importance of an accurate condition assessment. The probability of natural and external events is evaluated less easily but can be determined by expert opinion and computer modeling.

When all assets are analyzed for risk, the utility can determine the amount of risk it wishes to accept and the amount it wishes to minimize. Once the condition assessment has been completed, the City will apply risk assessment criteria to these results to determine what repairs or rehabilitation will be performed and findings documented.

CHAPTER 4

Wastewater Treatment Facility and Outfall

4.1 Introduction

The City of Blaine is at a critical decision point in planning for the future of its wastewater treatment system. The City's treatment plant 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 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 CWAC made up of community members, Native American tribal leaders, and key regulatory players.

This chapter begins by describing the City's existing wastewater treatment facilities, wastewater flows and loads, and discharge outfall, as well as the current NPDES permit for discharge of treated effluent into Semiahmoo Bay. The results of an evaluation of the existing WWTP are then presented, including options for optimizing treatment and providing capacity for growth until a new treatment solution can be implemented. This is followed by a description of the alternatives evaluation process used to identify the preferred new treatment solution. The chapter concludes with a discussion of the potential for using reclaimed treated wastewater effluent in Blaine and the surrounding area.

4.2 Existing Wastewater Treatment

4.2.1 Treatment Facilities

The Blaine WWTP is located on Semiahmoo Spit, west of Drayton Harbor. The facility was constructed in 1980 to provide wastewater treatment for the City of Blaine 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 facility 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 4-1 shows the site plan for the wastewater treatment facility. The process flow diagram for the facility is shown in Figure 4-2. Table 4-1 summarizes the unit processes and major equipment included within the Blaine WWTP.

TABLE 4-1
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-ft2 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.
Utility Building	This building houses the administration and laboratory equipment for the WWTP. The chlorine room is attached as well.

4.2.2 NPDES Permit

The current NPDES waste discharge permit for the City of Blaine (Permit No. WA-002264-1) became effective April 1, 2003 and will expire on June 1, 2007. The NPDES permit is included in Appendix I. Table 4-2 includes a summary of the effluent limitations for the Blaine WWTP.

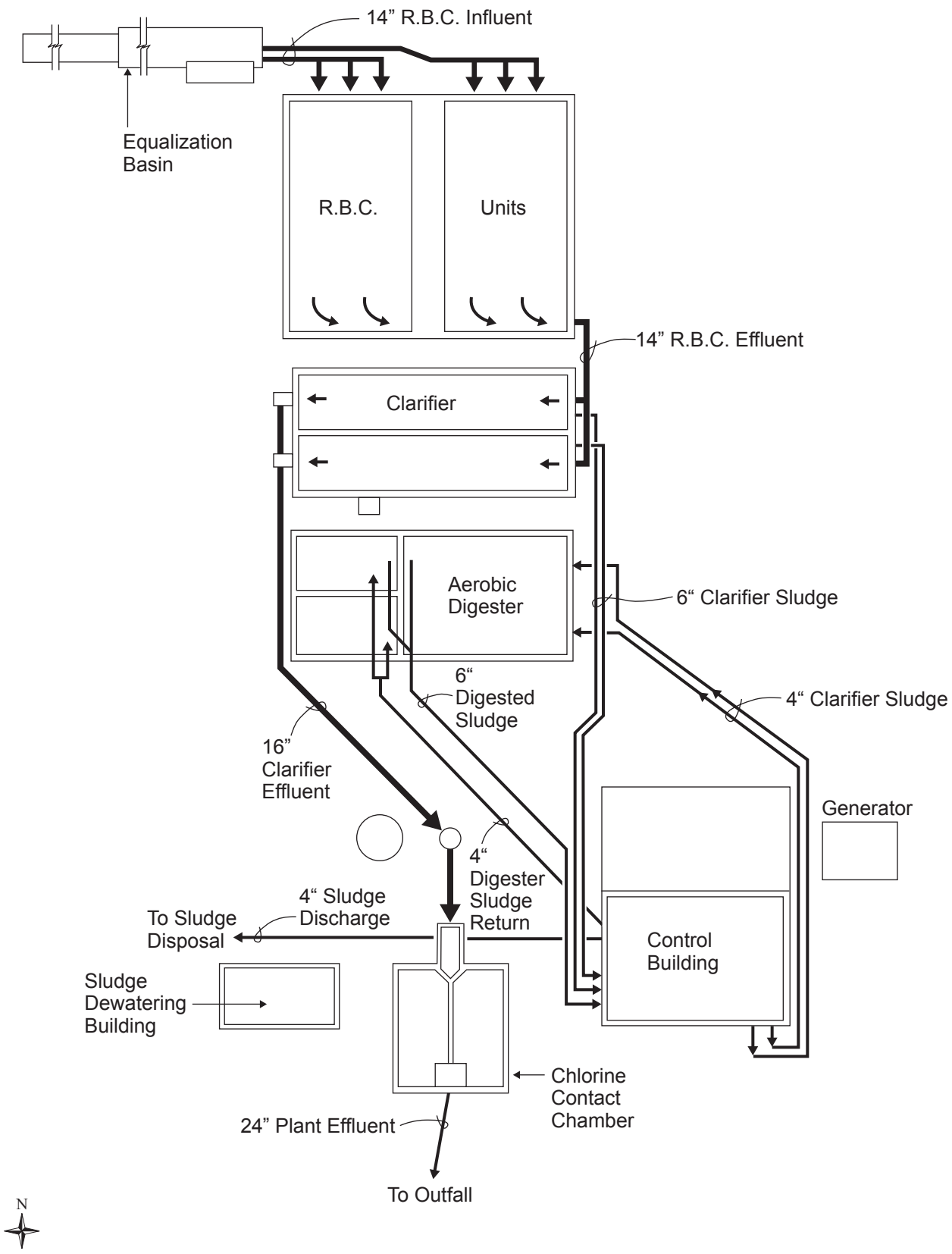

Figure 4-1
Blaine Wastewater Treatment Plant Plan

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179597.SP.03.04_W052004065EA_Blaine WWTF Plan.ai_5/26/03_roy-dk

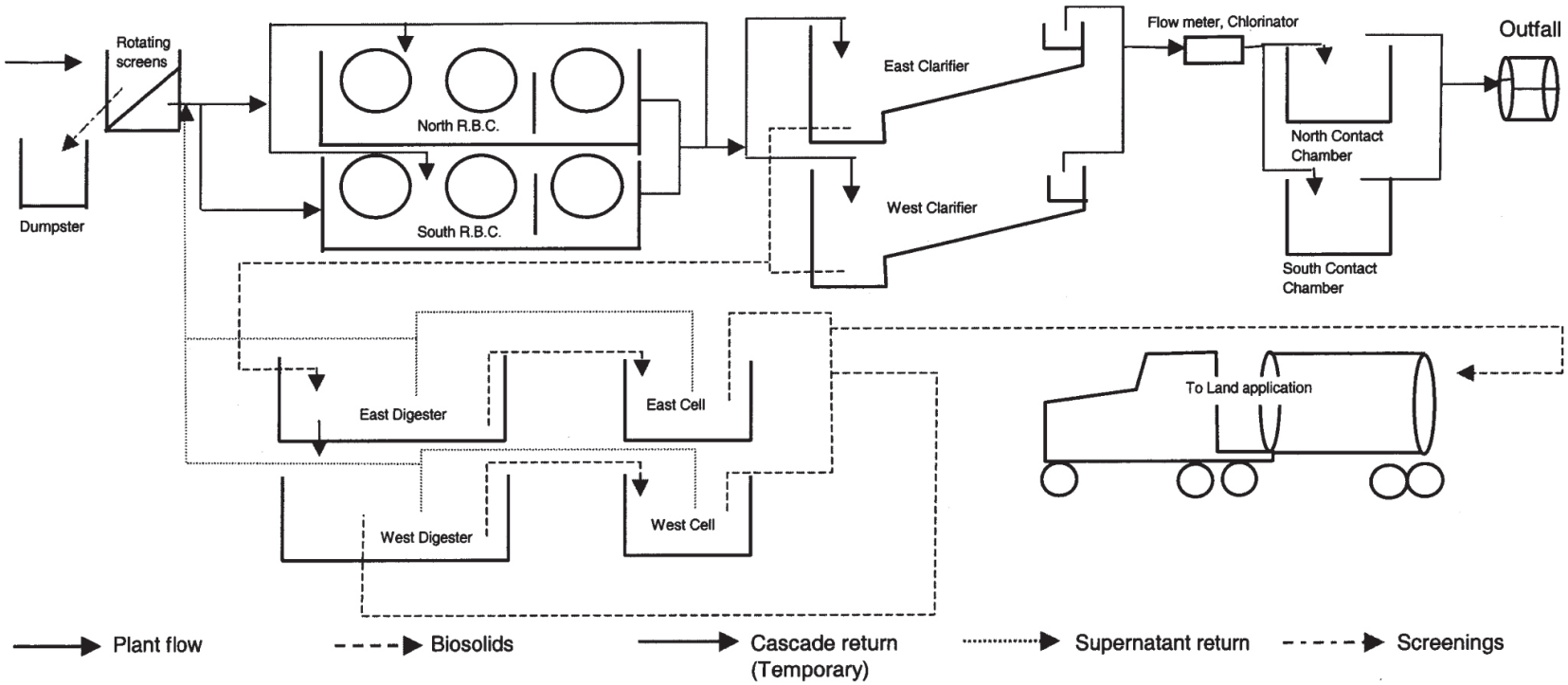

Figure 4-2
Blaine Wastewater Treatment Plant
Existing Process Flow Diagram

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179597.SP.03.04_W052004006SEA_Blaine WWTF Flow.ai_5/26/04_roy-dk

TABLE 4-2
Current NPDES Permit Effluent Limitations

Parameter	Average Monthly	Average Weekly (1)
Biochemical Oxygen Demand, 5 day (BOD_5)	200 lbs/day 30 mg/L	300 lbs/day 45 mg/L
Total Suspended Solids (TSS)	200 lbs/day 30 mg/L	300 lbs/day 45 mg/L
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)	2.3 lbs/day 0.35 mg/L	6.0 lbs/day 0.9 mg/L

1. The total residual chlorine limit is based on an average monthly and maximum daily value.

The NPDES permit includes a section on facility loading. The existing design criteria for the WWTP are as follows:

- Average flow for the maximum month: 0.8 million gallons per day (mgd)
- Biochemical oxygen demand, 5-day (BOD_5) loading for the maximum month: 2,088 pounds per day
- Total suspended solids (TSS) loading for the maximum month: 2,642 pounds per day

The Washington State Department of Ecology (Ecology) requires that wastewater utilities plan for maintaining adequate capacity at their treatment facilities. When the actual flow or wasteload reaches 85 percent of any one of the above design criteria for three consecutive months, or when projected increases in flow or loading would cause the plant to reach its capacity within five years, Ecology requires the preparation of a plan and schedule for continuing to maintain sufficient capacity at the facility to achieve the effluent limitations and other conditions of the NPDES permit. This General Sewer Plan is considered one aspect of this requirement. The Facility Plan for the new Marine Drive WRF that will be prepared this year is the next phase of this requirement.

4.2.3 Wastewater Flow and Loading

The existing influent flow and loads to the Blaine WWTP are listed in Table 4-3. The influent loads are from a 24-hour composite sample that is automatically collected in a single container from the headbox (not flow proportional) ahead of the rotating screens in the headworks building. The flow is measured by an 8-inch flowmeter assembly located between the secondary clarifier and chlorine contact chamber. Table 4-3 includes information based on a full year's data for 2002. The influent flow and loads to the facility have been increasing over the past five years. The data from 2002 are representative of the WWTP's current situation.

TABLE 4-3
Influent Flow and Load

Parameter	Average Annual (2002)	Maximum Month (2002)	Peak Instantaneous
Influent Flow (mgd)	0.61	0.85	2.4
BOD_5 (lbs/day)	1,253 (246 mg/L)	1,646 (232 mg/L)	--
TSS (lbs/day)	1,193 (235 mg/L)	1,530 (216 mg/L)	--

As the table indicates, the facility is at its design value of 0.8 mgd for influent flow based on the maximum month condition. The BOD_5 and TSS influent loads are both below the design values (78 percent and 58 percent of the design criteria, respectively). Table 4-4 includes effluent data from the WWTP for 2002.

TABLE 4-4
2002 Effluent Values

Parameter	Average Monthly (2002)
BOD_5 (1)	125 lbs/day 24.6 mg/L
TSS (1)	118 lbs/day 23.2 mg/L
Fecal Coliform Bacteria	45/100 mL
pH	6.6
Total Residual Chlorine (if water quality based) (2)	0.23 mg/L

1. The average monthly concentration is calculated using the average monthly flow of 0.61 MGD.
2. Total residual chlorine is based on an average monthly and maximum daily value.

As noted in the table, the WWTP is able to meet its effluent permit limitations. The facility recorded two permit violations in 2002, both for exceeding the design influent flow. In 2004, the WWTP received four permit violations: one for exceeding 0.8 Mgd average flow (January), two for TSS percent removal (January and April), and one for average monthly TSS effluent load (lbs/day) (January). The City of Blaine and Ecology entered into two settlement agreements with appeals brought before the Pollution Control Hearing Board (PCHB) regarding their new NPDES permit. The two settlements, one with the Nooksack Tribe (PCHB Nos. 03-060) and one with the Pointe On Semiahmoo Homeowner Association and Partnership For Responsible Development (PCHB Nos. 03-056), are included as Appendix J.

4.2.4 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 of Blaine's WWTP outfall is required in the City's NPDES discharge permit. In conjunction with this 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, the submerged length of exposed outfall pipe and diffuser was inspected by two CH2M HILL divers. The outfall inspection was conducted during a high slack tide, with a water surface elevation of about 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:

- Lack of observable discharge from the diffuser suggested that effluent may 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 (though this is very unlikely).
- 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. Recommendations for addressing the outfall issues are presented below in Section 4.3.

4.3 Wastewater Treatment Facility Evaluation

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

4.3.1 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 treatment facility. The hydraulic analysis begins at a water surface datum elevation at the downstream end of the facility. 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 4-3. 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.

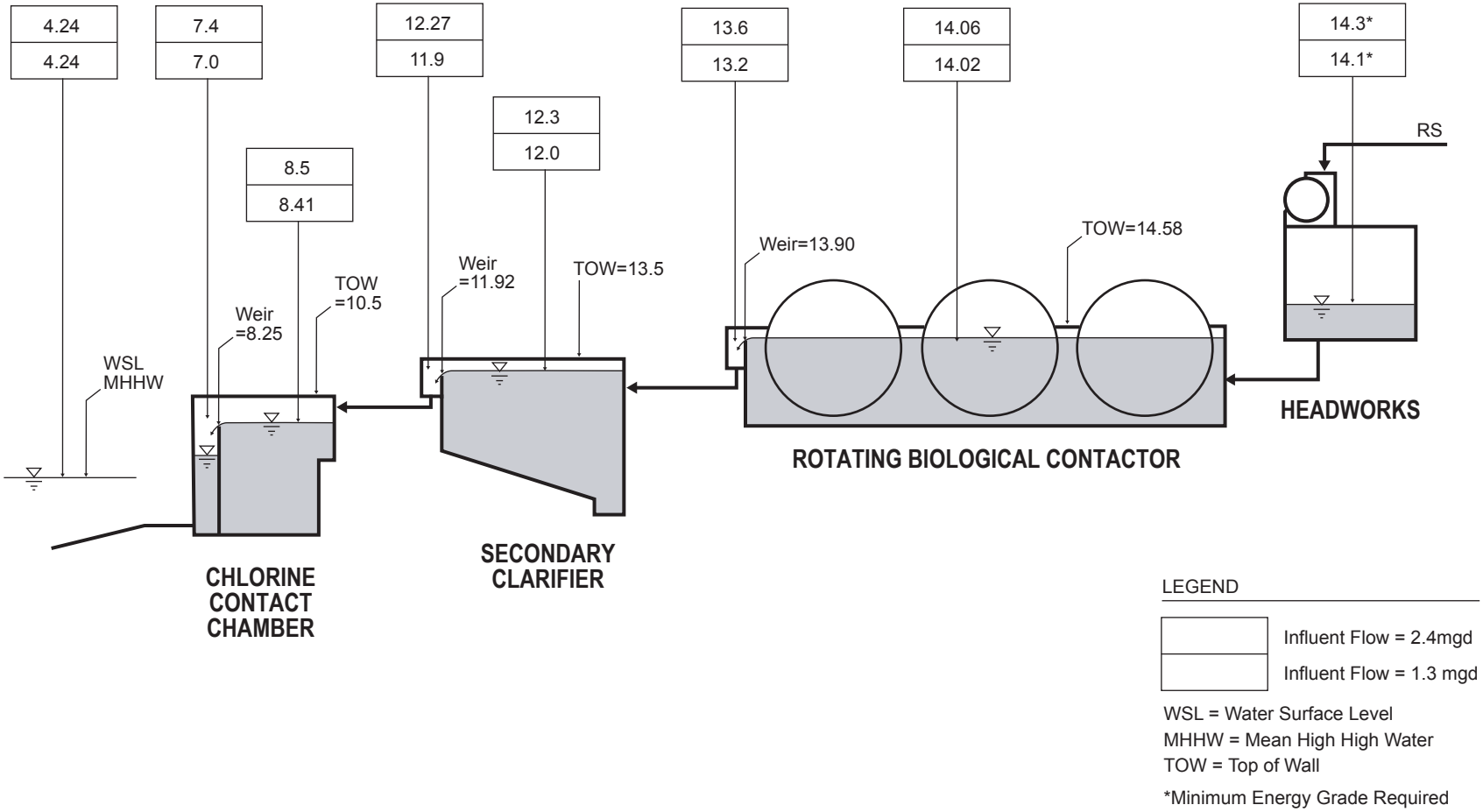
Peak Instantaneous Capacity

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 flow meter 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.

4.3.2 Process Unit Capacity Assessment

A treatment plant process simulation of the Blaine WWTP was conducted, which 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



LEGEND

	Influent Flow = 2.4mgd
	Influent Flow = 1.3 mgd

WSL = Water Surface Level
MHHW = Mean High High Water
TOW = Top of Wall

*Minimum Energy Grade Required

Figure 4-3
Blaine Wastewater Treatment Plant
Preliminary Hydraulic Profile

CH2MHILL

179597.SP.03.04_W052004006SEA_Blaine Prelim. Hydraulic Profile.ai_5/26/04_roy-dk

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 process analysis was conducted for maximum month values.

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 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.

4.3.3 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 (BOD and 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 biosolid 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 capacity of the WWTP is not limited by the aerobic digester.

The RBC unit process, as originally installed, and the secondary clarifiers limit the total capacity of the treatment facility. 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/1000-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, 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 have exceeded the limits on occasion. The shallow depth of the clarifiers (3.5-ft to 9-ft side water depth) appear 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 Table 4-3). The capacity of the aerobic digester to provide a Class B biosolid 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.

4.3.4 Short-Term Capacity Improvements

The on-site 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 process (i.e. going from a RBC to a SBC). The constructibility of such modifications is a major issue, since the existing facilities 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 on-site treatment alternatives to provide increased capacity or other improvements were investigated in 2000 (TetraTech/KCM, 2000) and as part of this preliminary planning process in this 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 is 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 deplete 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 have been completed. There are additional performance evaluations, however, that can be completed on site with minimal cost. It is recommended that the near-term capacity improvements involve initial optimization of the facility and further investigation of potential modifications to facilities as part of the facility planning effort for the new WWTP. The following testing and modifications are 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 STP. Package type systems can be evaluated and installed at the facility as required.
- **Aerobic Digesters.** The operational strategy for the aerobic digesters can be 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.

A prethickening step using an existing digester cell, or through the use of a pilot thickening system can be completed. This will verify the performance attained when using a prethickening operation. With a quantification of the capacity increase using a prethickening step, and economic analysis with the current practice can be completed prior to investing in a prethickening system. It may prove to be more cost effective to incur the additional disposal charges for not meeting the 38 percent volatile suspended solids reduction requirement at times.

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

4.3.5 Outfall Alternatives 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 will repair 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 will include replacement of approximately ten feet of pipe approximately 100 feet from the diffuser. It is recommended that once the repair is 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.

4.4 Future WWTP Expansion Alternatives

4.4.1 Background of Alternative Evaluation Process

When capacity expansion at the existing WWTP was halted because of the cultural resource discovery, the City began to plan for potential future treatment options. Several memoranda and reports were prepared describing treatment alternatives and their likely feasibility and costs. Key documents resulting from this initial analysis included:

- *Preliminary Alternatives Analysis: Wastewater Management Alternatives - City of Blaine* (Kennedy/Jenks Consultants, April 26, 2001)
- *Draft Feasibility Study: Northwest Whatcom County Regional Wastewater Management Program - Birch Bay Water and Sewer District and City of Blaine* (Kennedy/Jenks Consultants, April 27, 2001)

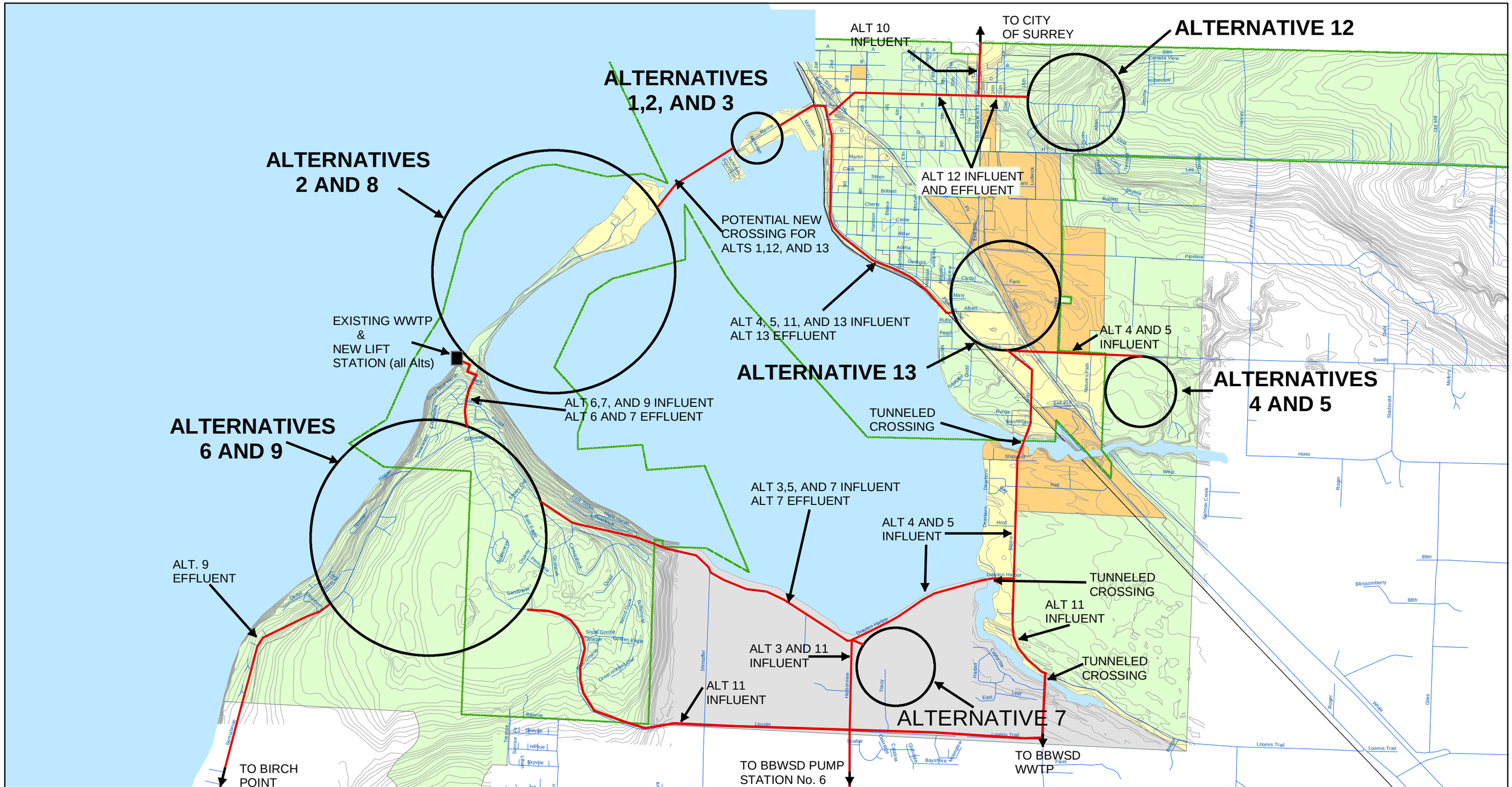
As a result of these evaluations, the City determined in 2001 that it would pursue a regional treatment option, which would involve conveying Blaine's wastewater south to the treatment facilities of the Birch Bay Water and Sewer District (BBWSD). Although not the lowest-cost option, this solution provided a number of benefits for both communities, including the opportunity for significant use of reclaimed water at industrial facilities located at Cherry Point. In addition, it was felt that a regional solution would have a high likelihood of obtaining funding directly from Congress as well as from other sources. However, issues arose with the agreement between the two agencies and funding did not materialize. Therefore, in 2002, the City decided to reopen the question of treatment alternatives in the context of an update to its General Sewer Plan.

The nine alternatives evaluated in 2001 for future wastewater treatment were used as a starting point for the General Sewer Plan alternative evaluation. These were augmented by four additional alternatives suggested by City staff and citizens, resulting in 13 alternatives that were carried into the initial analysis. The 13 alternatives are shown in Figure 4-4. A fourteenth alternative (a combination of two of the others) was suggested during the formal evaluation process at a meeting of the Blaine CWAC. An evaluation of each alternative was completed, using criteria and weighting factors developed by the CWAC.

Supporting the evaluation was technical information developed by CH2M HILL on each alternative, along with budgetary capital cost and annual cost opinions. The following section describes the alternative evaluation process.

4.4.2 Alternative Development

The evaluation of alternatives for Blaine'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.



N

SCALE

1 inch equals 2,500 feet

0 1,250 2,500 5,000 7,500 10,000 Feet

Legend

- City Limits
- 5 ft Contours
- Streets
- Railroads

LANDUSE

- Undesignated UGA
- Industrial
- Commercial
- Residential

CITY OF BLAINE, WASHINGTON

FIGURE 4-4
Wastewater Treatment Alternatives

CH2MHILL

BLAINE WASHINGTON — THE PEACE ARCH CITY

Development of the Citizen's Wastewater Advisory Committee

The Blaine 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. A list of CWAC members and the information prepared in support of the CWAC process is included in Appendix K. 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.

Evaluation Criteria and Weighting

The overall objective of the CWAC in making its recommendation was to "plan for an efficient, cost-effective wastewater treatment facility for the City of Blaine in a manner that provides for economic development, leverages progress already made, protects water quality, and is community-friendly." To accomplish this, the CWAC worked with staff and consultants to develop and apply an alternatives evaluation process that would reflect multiple community objectives, including:

- 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 constructibility, operability, reliability, and cost efficiency

Supporting these five fundamental objectives, or guiding principles, were a number of specific criteria or performance measures. Each performance measure was designed to help determine how well a particular alternative would support the overall objective. The CWAC formulated these objectives and criteria over the course of two meetings. To allow for

quantitative evaluation of options, numerical weights were developed for each criterion and each objective, allowing the evaluation to reflect which of the guiding principles were most important to the community. Overall, the values of committee members were very consistent, with the first objective (water quality) and the fifth objective (reliability and cost efficiency) receiving much higher weightings than the other objectives.

Detailed information on the criteria and weightings developed by the CWAC is included in Appendix K. The presentation materials developed by CH2M HILL for use by the CWAC are also included in this appendix.

Treatment Alternatives

Thirteen alternatives for the treatment of the City of Blaine's wastewater were initially developed for evaluation. As noted above, a fourteenth alternative was 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 the following topics, which were designed to correspond to the CWAC's objectives/guiding principles:

- Overview of the alternative
- Protection of the natural environment
- Protection and enhancement of community livability
- Growth and development requirements
- Constructibility, operability, reliability, and cost efficiency

The fact sheets for the initial 13 alternatives are included in Appendix L. (Alternative 14, which was a combination of alternatives 2 and 10, did not have a separate fact sheet prepared for it.) Table 4-5 includes a list and brief description of the treatment alternatives.

Cost Estimates for Treatment Alternatives

A major component for the evaluation of the treatment alternatives was cost efficiency. The capital costs and annual costs for each alternative were developed to assist in the evaluation process. CH2M HILL used 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 wastewater treatment facility. 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. Additional information from completed projects, EPA publications, and other sources were used to determine the cost for the natural treatment system.

Multiple assumptions were made at this conceptual level to determine the overall costs of the alternatives. To simplify the analysis, three technologies were identified for use as treatment alternatives: conventional activated sludge, membrane bioreactor, and natural treatment.

Conventional activated sludge is used as the treatment technology for the majority of the alternatives evaluated for Blaine. Because this is a typical treatment technology employed in

the industry, assuming its use for planning purposes allowed the evaluation to be based more on the criteria and weighting developed by the CWAC than on the technology itself. The evaluation of the actual technology to be used, if necessary, will be completed in future planning and design phases.

Several of the alternatives had specific site or operational issues that made it appropriate to consider the use of less conventional technologies at this stage of planning. Membrane bioreactor technology is assumed for Alternatives 2 and 4 because Alternative 2 offers high potential for reuse of treated effluent, and Alternative 4 requires a high-quality effluent for discharge into a freshwater stream. A natural treatment system with constructed wetlands was evaluated in Alternative 5 because it was included in one of the City's previous alternative analyses.

The technical information developed for each alternative to support the evaluation process is presented in a table, located in Appendix M. The total costs are also included in Table 4-5. The following topics are included in the appendix:

- Alternative description
- Treatment process (conventional activated sludge, membrane bioreactor, or natural treatment)
- Design flow rate
- Treatment costs (capital and annual)
- Land area required for treatment
- Treatment/outfall location (plant site, discharge point)
- Outfall capital costs, using the following assumptions:
  - $250,000 for refurbishing the existing outfall
  - $1,000,000 for a new freshwater outfall and diffuser
  - $2,000,000 for a new deep saltwater outfall and diffuser
- Conveyance costs (capital and annual)
- Total cost analysis (capital, annual, amortized debt payment, average annual O&M costs, total annual cost), developed as follows:
  - The total capital and annual costs associated with treatment, outfall, and conveyance
  - An amortized debt payment based on the total capital cost, assuming a life of 25 years and an interest rate of 3.5 percent
  - The average annual cost over the 25-year facility life, using a 2.5 percent inflation rate
  - The total annual cost (the sum of the amortized debt payment and inflated annual O&M cost), used for the cost-efficiency comparison

TABLE 4-5
Blaine Wastewater Management System Alternatives Analysis

	Alternative	Alternative Description	Capital*	Total Annual Cost
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.	$21,750,000	$2,296,436
	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.	$21,734,200	$2,760,023
	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.	$26,420,400	$3,099,006
Dakota Creek Alternatives	Alt. #4	Build one new membrane bioreactor plant with the plant effluent discharged to a shallow, freshwater outfall on Dakota Creek.	$36,206,000	$3,433,139
	Alt. #5	Build a treatment system along Dakota Creek utilizing a natural treatment system such as constructed wetlands.	$34,246,000	$2,658,388
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.	$24,033,000	$2,434,955
	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.	$27,115,000	$2,621,952
	Alt. #8	Build one new conventional plant on the Semiahmoo Spit and use the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	$19,960,000	$2,276,958
	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.	$25,783,000	$2,541,134
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	$18,336,000	$1,832,428
	Alt. #11	Separately pump East Blaine and West Blaine flow to Birch Bay for treatment in an expanded Birch Bay WWTP.	$32,319,000	$2,884,413

TABLE 4-5
Blaine Wastewater Management System Alternatives Analysis

	Alternative	Alternative Description	Capital*	Total Annual Cost
East Blaine Upland Alternatives	Alt. #12	Build one new conventional plant on the East Blaine uplands and use existing outfall.	$32,332,000	$2,938,488
	Alt. #13	Build one new conventional plant in the Blaine commercial/industrial area and use existing outfall.	$25,747,000	$2,538,950
Additional Alternatives	Alt. #14	Build one new WWTP in West Blaine uplands and convey East Blaine flow to Annacis Island.	$24,214,800	$2,721,980

*These capital costs are preliminary costs developed for comparative purposes. For more detailed cost on selected alternative, please refer to Chapter 6.

4.4.3 Alternatives Evaluation Process

The CWAC evaluated each alternative against the weighted objectives and criteria in three rounds over the course of two meetings. Numerical scores were used to assess how well each alternative met the objectives and criteria. The use of a computerized decision support tool helped to quickly calculate and display the results. In the first two rounds, committee members rated alternatives only against the five objectives and not against the more specific criteria. To allow values and benefits to be weighted separately from costs, the latter were separated from the rest of the criteria. This allowed a cost vs. benefit comparison of the alternatives to be depicted as a scatter plot, allowing CWAC members to determine readily which alternatives had the best ratio of benefit to cost.

The initial, objectives-only screening produced a "shortlist" of six alternatives: 2, 6, 7, 10, 13, and the new alternative 14. Primary reasons for the low rankings of the other alternatives included:

- The need to convey untreated wastewater across the mouth of Drayton Harbor and/or across creeks tributary to the harbor (applicable to Alternatives 1, 4, 5, 8, 9, and 12), which some committee members perceived as posing a threat to water quality
- The potential for discovering cultural resources on Semiahmoo Spit (Alternative 8)
- The high capital costs and the schedule implications of siting a new outfall (Alternatives 4, 5, and 8)
- The potential water quality issues associated with discharge into Dakota Creek and the difficulty of permitting such a discharge (Alternatives 4 and 5)
- The perceived political difficulty and high capital expense of a regional conveyance and treatment solution with the Birch Bay Water and Sewer District (Alternative 11)

In the final round of evaluation, CWAC members scored each short-listed alternative against all of the criteria. Cost was again held separate from benefit so that cost-benefit comparisons could be made. This evaluation resulted in three finalist alternatives:

Alternative 2 (one treatment plant at Marine Drive to serve East Blaine and a second treatment plant to serve West Blaine). The CWAC felt that this was the best "in-town" solution because it eliminated the raw-wastewater pipeline crossing of Drayton Harbor, made use of existing City infrastructure, and created the potential for use of high-quality reclaimed water at Semiahmoo.

Alternative 10 (both East and West Blaine wastewater flows pumped to the City of Surrey for treatment at GVRD's Annacis Island WWTP). This alternative had the lowest cost of any of the alternatives evaluated, and the fewest impacts within Blaine, although it would involve pumping of raw wastewater from West Blaine to East Blaine across Drayton Harbor.

Alternative 14 (East Blaine flows pumped to Surrey and West Blaine flows treated at a new West Blaine WWTP). This alternative had higher capital and annual costs than Alternative 10 because it would include both initial and recurring expenses for a new treatment plant. However, it included the benefits of eliminating the Drayton Harbor crossing and providing reclaimed water for use at Semiahmoo.

After identifying these three finalist alternatives, the CWAC presented them to City Council in early October 2003. The City also held a public meeting on October 8th 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 and is included as Appendix N.

4.4.4 CWAC Recommendations and Selection of Preferred Alternative

Based on the results of the analysis, the CWAC recommended Alternative 10 to the City Council, with consideration of potential future development of a small new WWTP to serve West Blaine. The CWAC determined that this alternative minimized both costs to ratepayers and impacts to City residents. Initial meetings with GVRD and the City of Surrey had indicated that Blaine could work directly with Surrey to develop new conveyance infrastructure that would benefit each city while minimizing expenditures for both. Several conditions on this alternative were recommended for advancement of the alternative to Council, including development of a long-term legal contract with protection against exchange rate fluctuation and assurance that sufficient capacity for growth would be available at the Annacis Island WWTP in the future.

The Council concurred with the CWAC's recommendation and directed staff to proceed with developing a memorandum of agreement that would lead to a sewer service contract with the City of Surrey. However, in early November 2003, the City received a letter from the Greater Vancouver Sewerage and Drainage District (GVS and DD) stating that:

> *…the legislation under which the Sewerage and Drainage District operates would not permit the City of Blaine to be connected to the GVS and DD system either directly or through a member municipality. The District is empowered to provide sewerage services only to its members and only to those areas within a defined Sewerage Area, and both these provisions would preclude the provision of service to an area outside of Canada. The District is not interested in pursuing amendments to this legislation, which in any event could not be in place within the time frame in which the City of Blaine wishes to select an option for meeting its needs.*

Based on this feedback, the City concluded that building a new WWTP on Marine Drive—the shortlisted alternative that did not involve conveyance to Canada—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 participants in the design charrette decided that a wastewater treatment facility could be sited on Marine Drive and remain consistent with the City's and Port's development plans for the area. They 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 their property. Given the Port's decision, on April 12, 2004, the

Blaine City Council unanimously approved the use of one of two City properties on Marine Drive for the location for the future wastewater treatment plant. These properties are a 2.5-acre parcel within Marine Park and the existing site of Lift Station 1 (shown in Chapter 6).

This final alternative is a combination of Alternatives 2 and 3. It includes one plant at Marine Drive that will serve East and Central Blaine, with a later 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 will continue to be treated at the existing WWTP. The Council did not choose at this time between the larger site in Marine Park or the Lift Station 1 site. Before this decision is made, further information will need to be obtained through a preliminary environmental investigation and a follow-up design charrette. These final decisions on the siting of the Marine Drive treatment plant and the alternative for future West Blaine treatment will be made during the facility planning process.

Based on the decision to provide treatment in two locations and the desire to optimize funding, the implementation of the proposed treatment facilities will be conducted using a multiple-phased approach. The first phase is to construct new wastewater equalization storage and upgrade the existing Lift Station No. 1 to provide hydraulic storage capacity for the winter wastewater peak flows, up to and including those associated with the 25-year design storm, with zero overflows into the adjacent Drayton Harbor. In addition, repairs will be made to the headworks treatment and control structures at the existing WWTP. The second phase of the project will be the construction of the new water reclamation facility (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.

For the Marine Drive 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 Marine Drive WRF. However, for purposes of this General Sewer Plan, alternative outfall locations are not being considered due to the length of time required for an outfall study and the critical timing required to construct and operate the new Marine Drive WRF. An alternative outfall would not be implemented prior to 2009.

The State Department of Health previously banned the shellfish harvest in Drayton Harbor, a shallow harbor south of downtown Blaine, due to high fecal coliform levels. The high coliform counts had also prompted the Department of Ecology to place the harbor and its tributary, Dakota Creek, on the state's list of "impaired" water bodies. In addition, the Department of Health has also closed a zone around the City's effluent outfall into Semiahmoo Bay to harvest as a precautionary measure. With the new WRF facility, 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 Marine Drive WRF. As part of the dilution modeling that will need to be conducted once a new wastewater treatment solution is in place, the shellfish closure zone surrounding the outfall should be re-evaluated.

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

4.5 Water Reclamation and Reuse

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. Reclaimed water can provide an alternative water resource for applications that would otherwise be limited by traditional water supplies. It is also a relatively drought-proof water supply because wastewater as a source is relatively consistent regardless of climatological conditions. 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 Re-use 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.

4.5.1 Potential Uses

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. The City conducted a feasibility study of reuse water for the golf course in 1992 (CH2M HILL Northwest, 1992) as one of the major potential uses for reuse water within the City of Blaine. 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 its new WRF on Marine Drive. Membrane technology planned for the new WRF will allow the City to produce reuse quality effluent. As part of the first phase of this project, lift station improvements and storage, the City is planning to install “purple” pipe that can be used at a later time to transport that reuse water to future customers.

CHAPTER 5

Operation and Maintenance

The City of Blaine maintains a full-time equivalent staff of approximately 5.3 to perform standard operation and maintenance for the treatment plant, the 39 miles of sewer lines, and the ten wastewater lift stations that make up the City's wastewater system. To protect the sewer utility's assets, the City has developed a program to enable the staff to be more effective and proactive in maintaining the sewer system. A description of the elements of the maintenance program and issues confronting the staff in operating and maintaining the sewer system are presented in the following sections.

5.1 Current Practices

The following sections describe the maintenance tasks identified by City of Blaine staff during interviews conducted as part of the preparation of this General Sewer Plan.

5.1.1 Collection System Jet Cleaning and Smoke Testing

To maintain sanitary sewer lines in good condition, the City established a jetting program in conjunction with a new smoke testing program. The program will include an annual cleaning schedule that addresses the entire collection system with frequency of cleaning based on past history of problems, condition assessment, and inspection results. The intent of the jetting program is to clean the entire sewer system every year. In addition to jetting, the City is conducting smoke tests during the summer to identify sources of stormwater inflow. Sewer system smoke testing is anticipated to provide a full assessment of the City's inflow issues. This inflow assessment, together with a hydraulic analysis and condition assessment, will help determine the most effective means of repair and/or rehabilitation, if necessary.

Currently, maintenance staff cleans the sewer collection system by jetting on a regular basis. Prior to 2002, the City's jet cleaning equipment was old, and sewer lines could only be jetted on an as-needed basis. With the new equipment purchased in 2002, the City is able to accomplish its goal of conducting regular scheduled jet cleaning in the fall and winter. Jet cleaning is conducted in sewers ranging from 4 to 21 inches in diameter. Known problem areas may require more frequent cleaning than one or two times per year. Maintenance staff have identified areas requiring the most frequent cleaning schedule, typically those sewer pipelines that have root intrusions or an accumulation of solids or grease, shown in Figure 5-1. Other measures may be required to decrease the cleaning frequency of these pipelines.

5.1.2 Sanitary Line Television Inspection

Closed circuit television (CCTV) inspection is done by sending a small television camera through the sewers and recording the inspection on videotape in addition to a written or digital log. Television inspection can identify pipeline defects, such as radial and longitudinal cracks in the pipe wall, separated joints, misaligned pipe connections, root intrusion, solids deposition, horizontal and vertical alignment changes, internal erosion and corrosion,

grease buildup, and sources of infiltration. Television inspection can also be used to assess the effectiveness of collection system jet cleaning and to determine when jet cleaning is needed. CCTV inspections should be done in conjunction with jet cleaning when possible to assess the pipe condition after cleaning and to determine the effectiveness of the cleaning procedures. Currently, television inspection is not performed on a routine basis, but rather is used to confirm suspected blockages or problems. A maintenance schedule should be established whereby sewer lines are inspected using CCTV once every five to ten years.

5.1.3 Lift Station Cleaning and Maintenance

This task involves cleaning and maintenance of the ten lift stations and the associated backup generators. The City conducts a daily check of each lift station to ensure that the pumps are operating properly and that an alarm has not been set off. Preventative maintenance and cleaning is performed on each lift station at least every three months (every two months during the winter). The pumps are removed annually for a complete overhaul. The City's lift system manual provides the basis for performing preventative maintenance, repairs, and replacement of working parts within the pumps.

5.1.4 Manhole Rehabilitation

Repairs to manholes include replacement of deteriorating steps, covers, and frames to ensure safe access. Other maintenance activities include patching holes in manhole walls and repairing other identified defects. Holes in manhole walls are potential locations of infiltration or exfiltration. Adjacent soil may also be carried into the manhole and the resulting void may collapse, causing surface settlement. The final step in the maintenance task is to seal the manhole to help prevent stormwater inflow. Manhole rehabilitation is performed on an as-needed basis when defects are identified. As part of the major sewer rehabilitation in 1992, a total of 57 manholes were rehabilitated.

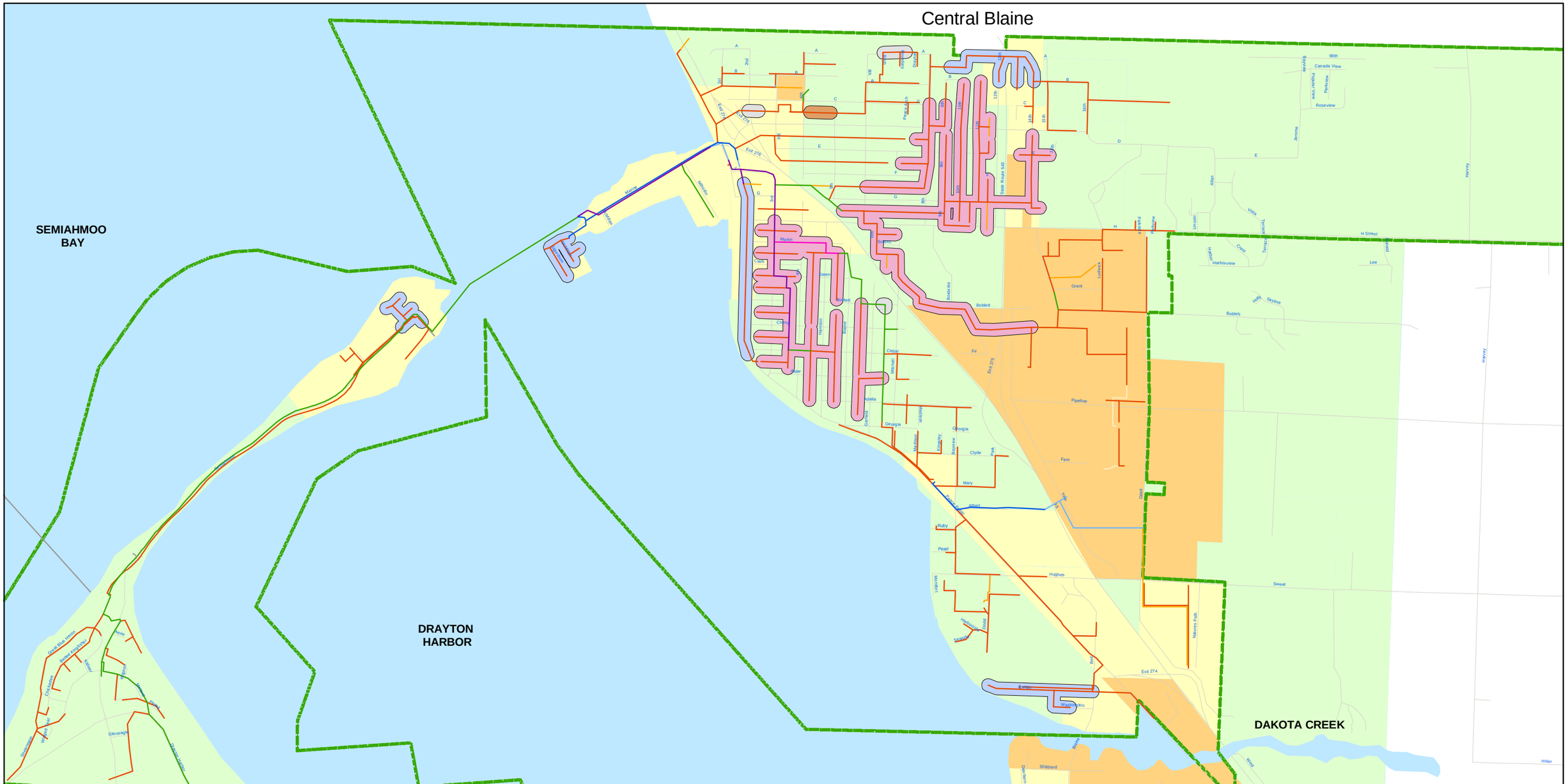
5.1.5 Customer Complaints

Maintenance staff performs field investigations to respond to customer complaints that are received by the maintenance manager. The desired response time is within 24 hours or sooner, depending on the nature of the complaint. If maintenance work is conducted to respond to the customer complaint, it is noted in the maintenance truck log.

5.1.6 Wastewater Treatment Plant

The wastewater treatment plant (WWTP) has an established operations and maintenance program. This program meets the requirements listed in the current NPDES permit. For each unit process, specific maintenance procedures are in place. (See Chapter 4 for a description of existing unit processes and major equipment at the WWTP.) The WWTP includes an Operations and Maintenance Manual on site for use by the plant staff, providing details of the existing maintenance program. This manual is updated as required when operations and maintenance procedures are modified.

Appendix O lists the maintenance activities included in the WWTP's program. In addition to the major equipment, the WWTP has an established maintenance program for the support systems at the facility, as well as specific controls and quality assurance programs for the laboratory. The buildings and grounds are maintained as required throughout the year.



N

SCALE

1 inch equals 1,500 feet

0 1,000 2,000 4,000 6,000 Feet

Legend

- Commercial
- Industrial
- Residential
- City Limits

Sewers Targeted For:

- Proactive Jetting
- Pipe Replacement

Sewer Problem areas:

- Grease
- Roots

CITY OF BLAINE, WASHINGTON

Figure 5-1
Recurring Maintenance Problems and Routines

CH2MHILL

5.2 Sewer System Issues

Current issues for the City's sewer system include lift station control, wastewater overflows, backup power, and accessibility. This section describes these issues and how they affect the operability and maintainability of the City's facilities.

5.2.1 Lift Station Control

Pumps in each lift station turn on and off automatically, depending on the level of wastewater in the wet well. The wastewater level is detected by the lift station control system, which uses sensors in the wet well. Currently, only Lift Stations 1, 5, 8, 9, and 10 have programmable logic controllers (PLCs) to control the level in the wet well. Only Lift Stations 1 and 9 have remote telemetry units (RTUs) that communicate with the control system at Lift Station 1 in the event of an alarm. The other lift stations (LS 3, LS 4, and LS 6) have an alarm on the outside of the building that can be seen and heardin case of failure. These alarms would be identified during the daily site visit or by phone calls from nearby residents.

5.2.2 Wastewater Overflows

The City does not typically experience wastewater overflows. However, due to the lack of capacity and/or storage at Lift Station 1, wastewater overflows occurred during one of the major storms in 2003, as described in Chapter 3. The City worked diligently and utilized every feasible measure, including the use of tanker trucks conveying wastewater from Lift Station 1 to the WWTP, to limit the amount of overflow to less than 30,000 gallons.

In 2000, the City installed four 50,000-gallon bladder tanks at Lift Station No. 1 for overflow storage. This has increased the capacity of storage at Lift Station 1; however, as discussed in Chapter 3, this storage is not enough to accommodate flows during unusually large rainfall events. Lack of storage is also a problem at Lift Station 5, which on occasion has overflowed into the basement bathroom of a restaurant nearby. The City has requested that the restaurant install a backflow prevention valve to prevent this from occurring again, but the restaurant had not installed the device at the time of this report. The facilities recommended as part of the Capital Improvements Plan will address the concern of storage in the collection system and at the lift stations.

5.2.3 Backup Power

Only three of the City's lift stations (No. 1, 3, and 4) have an on-site generator to provide backup power. The other lift stations have generator connections for the City's portable generator to provide backup power in case of an emergency. In the past, the portable generator was rotated between lift stations to prevent wastewater overflows. This is a very labor-intensive process. All new lift stations should be supplied with either local standby power or the capability to plug into a portable generator.

5.2.4 Accessibility

Accessibility to the various sewer facilities for maintenance by City staff is a policy issue that can be addressed by a combination of enforcing existing easements, obtaining new

easements, and abandoning certain facilities and replacing them with new facilities in the public right-of-way. The City has mapped existing easements; new easements are difficult to obtain due to the high cost of land. Maintaining existing easements is critical for inspection and maintenance of the system. Access to Lift Station 10, for example, is impaired due to the lack of easement for maintenance activities. All other lift stations are accessible.

5.2.5 Recordkeeping

Inspection, maintenance, and repair records are maintained only in hardcopy form in the maintenance truck and each lift station. The City does not keep a central file for public works records. Recommendations for recordkeeping improvements are presented below in section 5.5.1.

5.2.6 Wastewater Treatment Plant

The majority of the operation and maintenance issues at the WWTP result from the facility being at its capacity for treatment. With the facility at capacity, general maintenance listed in the established program is at times difficult, as unit processes cannot be removed from service without affecting treatment. The WWTP staff has done an admirable job in maintaining the major equipment at the site, but some units are past their useful life. As a result of some dated equipment and the capacity issues at the facility, odor control proves to be an issue at times. Some odor complaints have been logged with the City in the past when the odor control facility was out of service. Odor complaints also been attributed to operation of the aerobic digester.

5.3 Sewer System Programs

This section summarizes programs that will maximize the operation and maintenance aspects of the City's collection system. This includes routine O&M programs as well as emergency procedures.

5.3.1 Fats, Oils, and Grease

Many of the restaurants in the City do not have proper facilities to intercept fats, oils, and grease (FOG), and some restaurants that do have proper facilities may not maintain them regularly. In some cases where a business is plumbed for a grease interceptor, the restaurant's cleaning practice of using hot water to wash dishes may hamper the effectiveness of the interceptor. Due to the high temperature, the grease interceptor may not trap grease and, as the temperature cools, the grease coagulates and adheres to the inside of the sewers. Excessive grease accumulation has been documented in two locations in Central Blaine, between "C" and "D" streets.

The City has a Grease, Oil, and Sand Interceptors Sewer Ordinance (Blaine Municipal Code 13.08.350). Newly constructed food service users that generate FOG from an animal or vegetable origin will be required to have pretreatment facilities such as a grease interceptor. Existing establishments that produce organic-based FOG and do not have pretreatment facilities will be required to install a grease interceptor. Industrial or commercial users that generate petroleum- or mineral-based FOG will be required to have a pretreatment facility such as an oil/water separator. All pretreatment facilities will be installed, maintained, and

operated at the owner's expense. If lack of maintenance on the owner's part results in City staff having to perform maintenance or repair the sewer system, the owner will be subject to a penalty. A copy of the ordinance is included in Appendix P.

5.3.2 Inflow Reduction

Smoke testing has identified several illegal storm connections to the sanitary sewer system. These connections are believed to be a significant source of inflow, which can take up a significant portion of the sanitary sewer system capacity during peak wet weather flow.

Because of the impact of inflow on sewer system capacity, smoke testing was conducted to determine where the connections exist. It is likely that storm connections were made to the sanitary sewer system because there was no storm drainage system available at the time. The City is currently addressing the existence of illegal connections to the sewer system as part of their I/I reduction program.

5.3.3 Industrial Wastes

The City of Blaine has a pretreatment program that requires permits for all establishments producing industrial wastes, including commercial establishments processing food. A summary of the significant industrial and commercial dischargers is listed in Table 5-1.

The City recently conducted a study, included in Appendix Q, to identify and classify industrial and commercial users within the service area of the Blaine wastewater collection and treatment system. The study identified dischargers with high water usage and high loading parameters. A sampling program was then conducted for a representative group of these dischargers. The study found that the industrial/commercial flow represents only about six percent of the total flow to the WWTP while the industrial/commercial BOD loading represents about 43 percent of total WWTP loading during the testing period. Additional information on industrial dischargers, including available sampling information, is included in Appendix Q. Several of the business included in the study have since ceased operation.

5.3.4 Wastewater Spill Response Plan

In accordance with Ecology requirements that any significant wastewater overflow be reported within 24 hours, the City has developed a Wet Weather Emergency Plan. The Wet Weather Emergency Plan ensures that spills are documented, reported, and cleaned up in a consistent and responsible manner. The three primary steps to the City's plan are:

- Identify the cause of the overflow and collect the information necessary to determine a course of action.
- Contact the Public Works Director or the maintenance manager. The Public Works Director is responsible for contacting Ecology within 24 hours, if not sooner.
- Once the Public Works Director is contacted, the appropriate staff are contacted to assist in cleaning the spill in a safe manner.

Details on the wastewater spill response plan and utility and regulatory agency contact lists are provided in Appendix R.

TABLE 5-1
Summary of Industrial Dischargers

Business Name	Nature of Business	Address	Period of Operation	Included in Study
Anchor Inn Motel	Motel	250 Cedar	Year around	No
Bayside Motor Inn	Motel	340 Alder Street	Year around	No
Bella Marina	Restaurant	825 Peace Portal	Year around	No
Birch Point Vet clinic	Birch Point Vet clinic	1733 H Street	Year around	No
Blaine High School	Government/School	1055 H Street	Seasonal, due to school year-September though June	No
Blaine Middle School	Government/School	975 H Street	Seasonal, due to school year-September though June	No
Blaine Primary School	Government/School	820 Boblett	Seasonal, due to school year-September though June	No
Boundary Fish	Seafood Processing	Sigurdson Ave	Seasonal due to fishing season, fish processing waste not treated by the City	No
Burger King	Restaurant	1310 H Street	Year around	No
Café International	Restaurant	758 Peace Portal	Year around	No
Chuck's Drive In	Restaurant	1666 Peace Portal	Year around	No
Cost Cutter Market	Grocery store	1733 H Street	Year around	Yes
Dakota Fisheries	Seafood Processing	285 Marine Drive	Seasonal due to fishing season, fish processing waste not treated by the City	No
Dr. Allan	Medical	377 C Street	Year around	No
Dr. Chen, DDS	Medical	357 Martin Street	Year around	No
Dr. Rathe, DDS	Medical	341 C Street	Year around	No
Dr. Rooney, DDS	Medical	215 Marine Drive	Year around	No
Figaro's Pizza	Restaurant	429 Peace Portal	No longer in business	No
Golden Boy Foods	Peanut butter manufacture	Odell	No test or flow results- not yet in production	No
Justesens Industries	Fire screen manufacture	1090 Yew Ave.	Year around	Yes
La Bonne Maison	Restaurant	1830 Peace Portal	Year around	No
Little Ceasars Pizza	Restaurant	1733 H Street	Year around	No
Motel International	Motel	780 Peace Portal	Year around	No

TABLE 5-1
Summary of Industrial Dischargers

Business Name	Nature of Business	Address	Period of Operation	Included in Study
Natures Path Foods	Cereal manufacture	2220 Natures Path Way	Weekly variation due to product run	Yes
Nicki's	Restaurant	1700 Peace Portal	Year around	No
Northwest Podiatrics	Manufacture of Foot othopedia	1091 Fir Avenue	Year around	Yes
Northwood Motel	Motel	288 D Street	Low flow in winter months	No
Oceanbay Chinese	Restaurant	1210 3rd Street	Year around	No
Paso del Norte	Restaurant	289 2nd Street	Year around	Yes
Pizza Factory	Restaurant	738 Peace Portal	Year around	No
Rite-Aid	retail/drug store	1733 H Street	Year around	No
Sea-K Fish	Fish House	225 Sigurdson Ave.	Seasonal due to fishing season, fish processing waste not treated by the City	No
Semiahmoo Country Club	Resort/restaurant	8720 Semiahmoo Pkwy	Year around	No
Semiahmoo Hotel	Resort/restaurant	9565 Semiahmoo Pkwy	Year around	Yes
Stafholt	Adult care home	456 C Street	Year around	Yes
Star Fish	Seafood Processing	205 Marine Drive	Seasonal due to fishing season, fish processing waste not treated by City	No
Subway	Restaurant	429 Peace Portal	Year around	No
Totally Chocolate	Manufacture chocolate products	1855 Pipeline	Highest months Oct.-Jan, with flow peaking in November and December	Yes
Texaco	Gas Station/carwash	1503 H Street	Year around	No
Truffles by the Sea	Restaurant	442 Peace Portal	Year around	No
Washington Carwash	Carwash	388 Martin Street	Busiest in Spring and Summer	No
Werger's Place	Motel	4th Street 1368	Year around	No
Westview Motel	Motel	1300 Peace Portal	Year around	No

5.4 Staffing Needs

As previously mentioned, the City of Blaine Public Works Department currently employs the equivalent of 5.3 full-time staff members to oversee the WWTP, 39 miles of sewer line, and ten lift stations. Table 5-2 presents a summary of these positions. In addition, the City hires contractors to perform some of the preventative maintenance on the collection system, such as the CCTV inspection and grease removal. The current staffing appears to be adequate to meet the performance levels described in this chapter. Once the Sanitary Sewer Overflow (SSO) Rule or CMOM regulation goes into effect, staffing should be reevaluated in light of the requirements for the final regulation.

TABLE 5-2
WWTP and Collection System Operations and Maintenance Staff

Position	Full-Time Equivalent (FTE)
Collection System Manager	0.3
Collection System Operators	2
WWTP Manager	1
WWTP operators	1.2
Laboratory	0.5
Pretreatment Inspector	0.3
Total	**5.3**

5.5 Recommended Improvements

Recommendations for potential programs and/or projects to address the issues highlighted above are presented in the following sections.

5.5.1 Operation and Maintenance Programs

Computerized Maintenance Management System. The City would benefit greatly from a simple Computerized Maintenance Management System (CMMS) that would allow staff to generate work orders, track maintenance activities, and create reports to aid in staffing and budgeting. This would help the City prioritize and schedule preventative maintenance activities and document responsive activities. The system would be used by the entire Maintenance staff, from team leaders to team members.

CCTV Database. This program would compile and organize results of the CCTV inspection of the sewer lines. In conjunction with the condition assessment described in Chapter 3, a condition rating can be assigned to each sewer line, as well as an estimate of remaining life. Logging subsequent CCTV inspections of the same sewer lines can help determine the rate of deterioration. This information should be incorporated into the GIS collection system map. Having information in GIS format will aid the prioritization of sewer rehabilitation.

Catalog of Smoke Testing Results. Cataloging the results of previously conducted smoke testing will provide a database that can be accessed and used to analyze identified I/I sources and determine future testing and/or remediation projects. This information can also be incorporated into the GIS system.

Increased Enforcement of Grease Interceptor Ordinance. Enforcement of the grease interceptor ordinance for areas continually blocked with grease would reduce the required maintenance of those sewer lines located downstream of the users currently discharging excessive grease.

Strengthening of Pretreatment Program. Increased monitoring and enforcement of permit conditions for the industrial dischargers would increase the capacity, and subsequent useful life, of the WWTP for BOD loading. Given the time required to construct a new treatment plant, this is critical to the continued operation of the existing WWTP.

5.5.2 Collection System Improvements

Recommendations for improvements to the collection system are intended to continue the proactive approach that the City currently uses to maintain the system.

Annual Pipeline Rehabilitation / Replacement Program. The City currently conducts regular rehabilitation of the collection system. This practice should be continued. Based on the results of CMMS implementation, the frequency of replacement and rehabilitation may need to be adjusted.

Telemetry Improvements. Upgrading existing telemetry systems or installing new telemetry systems are recommended for all lift stations. As part of the Lift Station 1 project, the outdated central master system should be replaced with new industry standard, open-architecture products. The next step would be to transition existing remote facility control systems to communicate with the new central master system and replace remote facility control systems as needed. In addition, the communications system would need to be upgraded to accommodate the telemetry improvements. A telemetry system would allow the City to reduce the amount of labor spent on visual checks of lift stations and improve the City's response time in the event of lift station failure.

5.5.3 WWTP Improvements

The recommendations include interim operational strategies to improve the WWTP capacity, minimizing capital costs. With these improvements implemented, the overall capacity of the WWTP may be improved. With an increase in capacity, it will be easier for the WWTP staff to implement their existing maintenance program. Selected unit processes may be removed from service, allowing for maintenance on equipment.

Specific equipment and support components have been identified as requiring additional maintenance. The wet scrubber located within the headworks facility is in need of repair. It is recommended that the City investigate a retrofit for the existing wet scrubber, but replacement may prove to be more cost-effective. The wet scrubber currently is in use, and is helpful in reducing the odors at the site. The headworks building structure itself is in need of repair, as the concrete has been corroded away in areas.

The WWTP has experienced high algae growth within the clarifier effluent channels at times. By covering the channels, this growth subsided and the resulting effluent TSS dropped. It is recommended that this practice continue as required. Permanent launder covers may be warranted if algae growth proves to be an ongoing problem. An increase in

the duration of cleaning the clarifier weirs and launders may be warranted. The addition of chlorine to the wash water may also improve the effectiveness of the cleaning process.

The City has been proactive in reducing these odors by providing temporary covers over the digester basins. Permanent covers may be warranted if this practice continues to minimize the odors generated.

CHAPTER 6

Improvement Program

This Chapter supersedes the September 2004 version of Chapter 6, and incorporates the impact to the General Sewer Plan of the following:

- *MOUSE hydraulic model updated with the November 2004 to January 2005 flow monitoring data*
- *Reconfigured connection to the 2005 system to service East Blaine from intersection of H Street and Ludwick Ave Northwest to intersection of G Street and 14th Street*
- *Updated treatment improvement project costs*

In previous Chapters of this General Sewer Plan, analyses of the City's existing sewer system and the operation and maintenance of that system were presented. These analyses identified projects and programs required to continue providing quality sewer service to the City's ratepayers. This Chapter presents a summary of the improvements developed in Chapters 3, 4, and 5, along with their estimated costs and a schedule for each project identified.

6.1 Capital Cost Estimate Development

Cost estimates for projects in the Capital Improvements Program (CIP) are considered to be Class 5 estimates, based on standards established by the American Association of Cost Engineers (AACE). Class 5 estimates are described as generally being prepared on very limited information and subsequently have wide accuracy ranges. The typical accuracy range for this cost estimate class is from –20 percent to –50 percent on the low side and from +30 percent to +100 percent on the high side. Class 5 estimates are prepared for any number of strategic business planning purposes, including but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, project location studies, evaluation of resource needs and budgeting, long-range capital planning, etc. Supporting documentation for all capital improvement items is included in Appendix S.

These project costs are developed for guidance in project evaluation from information available at the time of preparation. They 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 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.

The pipeline unit costs were developed from a combination of recent bids on construction projects, vendor quotes, cost curves, scale-up and scale-down factors, and size and cost comparisons with similar projects. These estimates reflect the costs for typical sewer system

construction conditions, but should be adjusted for extraordinary costs, such as street undercrossing, deep or difficult trenching, and similar items. Unique items and repair technologies that do not have bid tabulation documentation were priced individually by the consultant using quotations and detailed cost breakdowns. After each project was estimated, the unit costs used were evaluated specific to the quantity and conditions of the project and, where necessary, the costs were adjusted accordingly.

Pump station costs were developed on a case-by-case basis according to the work required. Costs were developed using appropriate material costs, crews, and production rates from cost references, vendor input and estimator judgement.

The capital costs and annual costs for the new treatment plant projects were developed by the consultant 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 wastewater treatment facility. 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.

Where pipeline and pump station projects could not be defined in sufficient detail to quantify all costs, a miscellaneous allowance was included to account for details known to exist, but that cannot currently be quantified. This allowance was applied as a percentage based on estimator experience and judgement. Additional costs were added for each improvement program that include:

- 30 percent contingency (for unknowns not yet identified at this level of engineering), applied to base costs
- 8.2 percent sales tax
- 30 percent allied costs as an allowance for engineering, legal, inspection, and City administrative expenses
- 5 percent environmental mitigation
- 5 percent easements and right-of-way acquisition

6.2 Capital Improvement Projects

The capital improvements are organized into the following four categories:

- Treatment facilities
- Collection systems
- Lift stations
- Programs

The following sections provide brief descriptions of each project or group of projects and identify the projects with the letter and number designation listed in the CIP presented in Table 6-1. Table 6-1 also shows the distribution of projects that have been identified for implementation over the next five years and those that are slated to occur in 2011 and beyond. Figure 6-1 provides a schematic of each capital project within the City's sewer service area.

TABLE 6-1
Capital Improvement Program—2005 Update

	Project	Finance Source	2005	2006	2007	2008	2009	2010	2011-2025	Total
Treatment Improvements										
T1	Construct new wastewater equalization storage, improvements to Marine Drive, and upgrade the Existing LS 1.	PWTF Loan TIB Grant	$450,000	$3,500,000						$3,950,000
T2	Construct new Water Reclamation Facility on Marine Drive location, including influent and effluent pumping. New WRF would continue to use the existing outfall.	City PWTF Loan Rural Development Centennial Loan	$300,000	$1,500,000	$10,500,000	$10,000,000				$22,300,000
T3	Construct new wastewater treatment facility for West Blaine or convey to Birch Bay.	PWTF Loan Centennial Loan						$500,000	$4,012,000	$4,512,000
Collection System Improvements										
A-1a	Replace existing 10-inch pipeline with a 15-inch pipeline between manholes E3-4 and E3-9 (approximately 560 ft). Includes 250-ft bore-and-jack Interstate-5 undercrossing.	Developer-funded		$466,000						$466,000
A-1b	Replace existing 10-inch pipeline with an 18-inch pipeline between manholes E3-9 and F4-1, parallel to I-5 (approximately 360 ft).	Developer-funded			$155,000					$155,000
A-1c	Replace existing 8-inch pipeline with a 12-inch pipeline between manholes F4-1and H4-2, between G Street and H Street (approximately 1,895 ft).	Developer-funded			$668,000					$668,000
A-2a	Replace existing 8-inch pipeline with a 10-inch pipeline between manholes G3-4 and G3-5 and between manholes G2-8 and I1-5, along 8th Street and A Street (approximately 3,010 ft).						$1,050,000			$1,050,000
A-2b	Replace existing 8-inch pipeline with a 12-inch pipeline between manholes G3-5 and G2-8, along 8th Street (approximately 400 ft).						$154,000			$154,000
B-1	Replace existing 10-inch pipeline with a 12-inch pipeline between manholes F5-3 and G7-1, parallel to Garfield Avenue (approximately 2,080 ft).					$765,000				$765,000
B-2	Replace existing 8-inch pipeline with a 12-inch pipeline between manholes H4-7 and I4-2 (connection point to service East Blaine) along G Street. (approximately 955 ft). In 2005, City constructed a 15-inch line from H4-2 to H4-7 to reflect impact of servicing East Blaine.				$339,000					$339,000
P-1&2	Proposed sewer main extension along H Street	Developer-funded				$2,400,000				$2,400,000
P-3	Proposed sewer sub-main extension								$200,000	$200,000
P-4	Proposed sewer sub-main extension								$140,000	$140,000
P-5	Proposed sewer sub-main extension								$130,000	$130,000
P-6	Proposed sewer sub-main extension along Jerome Street								$400,000	$400,000
P-7	Proposed sewer sub-main extension along Harvey Road								$390,000	$390,000
P-8	Proposed sewer sub-main extension								$390,000	$390,000
P-9	Proposed sewer sub-main extension along Old Mill Road								$380,000	$380,000
P-10&11	Proposed sewer main extension along H Street	Developer-funded				$570,000				$570,000

	Project	Finance Source	2005	2006	2007	2008	2009	2010	2011-2025	Total
Lift Station Improvements										
LS-1	Upgrade firm capacity to 3,020 gpm and total capacity to 3,900 gpm (costs included in Project T-1 previous page).									$0
General Programs										
G-1	Annual pipeline rehabilitation, replacement and I/I program, including backyard sewer replacement.	City	$50,000	$50,000						$100,000
	Total		**$800,000**	**$5,516,000**	**$11,662,000**	**$13,735,000**	**$1,204,000**	**$500,000**	**$6,042,000**	**$39,459,000**

N

SCALE

1 inch equals 2,500 feet

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

Legend

- Lift Station Improvements
- WWTP
- Existing Lift Stations
- Trunk System Manholes
- Trunk System Pipes
- System Pipes
- Streets

Conveyance Improvements

- A
- B
- C
- P

CITY OF BLAINE, WASHINGTON

Figure 6-1
Capital Improvement Program

CH2MHILL

6.2.1 Treatment Facilities (T)

A significant portion of the City's capital improvement program for the next six years is dedicated to building new wastewater treatment facilities. As described in Chapter 4, the City must build new wastewater treatment capacity to replace the existing treatment plant. Once the General Sewer Plan is completed in 2004, the specific scope for this work can be developed.

The first phase of a new wastewater treatment solution for the City is the construction of equalization storage capacity near the current Lift Station 1 site and improvements to the existing lift station (Project T1), which will help the City continue to avoid overflows until a new treatment plant is designed, permitted, and constructed. This project will immediately reduce the loading at the existing plant and allow the City to operate within its NPDES permit limits. It will also provide 400,000 gallons of equalization storage, enabling the future Water Reclamation Facility to function efficiently. As described in Chapter 4, it is currently anticipated that the City will build a new water reclamation facility (WRF) on its property on Marine Drive as the second phase in its treatment program. This facility (Project T2) will serve all of central and east Blaine and will improve the water quality in Drayton Harbor by eliminating wastewater overflows and significantly improving the effluent to reuse quality. The third phase of treatment (Project T3) will provide treatment for West Blaine, either through a satellite plant, expansion of the Marine Drive WRF, or through conveyance to the Birch Bay Water and Sewer District's treatment facility.

6.2.2 Collection Systems

Several recommended proposed sewer extensions and existing collection system improvements were discussed in Chapter 3. These improvements have been prioritized according to their environmental health benefits, impact on the community, and populations served and are listed in order of priority in Table 6-1. A majority of these projects will be constructed after the new treatment plant is built. The projects that will be implemented in the next five years are discussed below. To verify the nature of system deficiencies and the size of the recommended improvements, flow monitoring was conducted during the winter of 2004-2005.

Project A-1a involves replacement of the 10-inch gravity line with 15-inch pipeline along Boblett Street, Fir Avenue, and Elm Avenue, paralleling Interstate 5. A 14-inch line would be adequate for conveyance; however, if the City is going to upgrade the line, an increase of two pipe sizes is recommended to allow for future increases in flow. The wastewater level in these pipes exceeded the overflow criteria in current conditions (as described in Chapter 3) at the manholes, and the pipe capacity criteria were exceeded.

In 2006, improvements will be made on the truck route to Canada that runs through the City. As part of this project, the sewer underneath the road will be replaced. This will complete a portion of Project B-1, which is a replacement of the 8-inch gravity line with 12-inch pipeline. The remainder of the project will be completed sometime after 2010. The wastewater level in these pipes exceeded the overflow criteria at the manholes during current conditions, although there was no surcharge observed. The pipe capacity criteria were also exceeded.

Project B-2 requires replacement of the 8-inch gravity line with 12-inch pipeline. This main line conveys wastewater from a commercial and residential zone that includes the border crossing facility. In 2008, the Federal Border Crossing Facility will be expanded. Project B-2 should be completed by this time in order to ensure that there is adequate capacity in the collection system.

Projects P-1&2 and P-10&11 allow for future sewer service to be provided to the East Blaine annexation area. These provide extend a sewer main along H Street to serve the entire area. It is anticipated that the remainder of the proposed sewers will not occur before 2010.

6.2.3 Lift Stations (LS)

Ecology requires that wastewater pump stations provide one redundant unit that matches the largest pump to handle the peak flow with the largest unit out of service. Modeling done for the project indicated that this requirement was not met for Lift Stations 1, 3, and 5 during the 5-year, 24-hour storm. According to Department of Ecology standards, the total pumping capacity of the lift station must handle the peak flow during the 25-year, 24-hour storm.

There are two options to improve the pumping capacity: install an additional pump if the pump station facility has room available, or install new pumps with greater capacity. Table 6-2 summarizes the pump capacity deficiencies identified in the model.

TABLE 6-2
Recommended Lift Station Improvements—Updated to November 2004 Flow monitoring

Lift Station Number	Existing Firm Capacity (gpm)	Required Capacity to Meet 2003/5-year Storm (gpm)	Required Capacity to Meet 2023/25-year Storm (gpm)
1	1,750	3,000	3,100
5	450	900	510

Another way to deal wit the lack of capacity of a lift station is to install storage capacity to reduce the amount of pumping capacity required. Construction of equalization storage capacity near the current Lift Station 1 site (Project T1) will also provide 400,000 gallons of equalization storage. This will eliminate the need to further increase the capacity of Lift Station 1 and the need to replace the line from Lift Station 1 to the existing WWTP.

6.2.4 General Programs (G)

Project G-1 is the City's current annual pipeline rehabilitation, replacement, and I/I program, which will continue to be implemented at a cost of $50,000 per year in 2005 and 2006. This program is also used for the annual replacement of one "backyard sewer" each year. These are considered to be planning-level estimates; this funding level may be adjusted in the future once condition assessment/risk analysis data has become available and again at the completion of the condition assessment process. In addition, Project G-1 provides the base funding mechanism for many of the City's ongoing sewer system improvements.

In addition to the CIP improvements, the City has several projects that it will undertake this year. the City will also repair the damaged effluent outfall identified during an October 2003 underwater examination, as a condition of its May 5, 2004 settlement to appeals brought

before the Pollution Control Hearings Board. This work will include replacement of approximately 10 feet of pipe approximately 100 feet from the diffuser. The City has applied for the required permits and will begin construction once the Army Corps of Engineers permit is issued. This project will improve water quality by allowing the outfall to operate as designed, providing increased dilution by forcing the effluent to flow through the diffuser. This will help mitigate the current shellfish closure area associated with the outfall.

The City has budgeted for rehabilitation of the existing badly deteriorated headworks facility at the WWTP. This project will include repair of the access door and epoxy repairs to the inside of this concrete structure. This will improve reliability and extend the life of the facility until the new WRF is constructed. These repairs will improve water quality by helping prevent flows from bypassing the headworks, which has resulted in past NPDES permit violations and overflows.

LS-9 is a developer project to upgrade Lift Station 9, which has been included in a new development in the Semiahmoo area of Blaine to be completed in 2004. The existing lift station is undersized to handle the loads planned with the new development. New pumps and controls (including telemetry) will be installed with this upgrade. This will provide adequate conveyance capacity for this area and prevent wastewater overflows.

LS-5 includes the installation of a controller and telemetry on Lift Station 5 to provide improved reliability for this major facility, which serves a growing commercial and industrial area. It is anticipated that this work will be performed by City staff. This improvement will provide adequate conveyance capacity for this area and prevent wastewater overflows.

In 2003, the City retained a corrosion control engineering firm to evaluate the effectiveness and proper operation of the cathodic protection system protecting the water and sewer pipes that run under the mouth of Drayton Harbor. It was recommended that an additional 400-foot-deep anode well and new rectifier be installed on Semiahmoo Spit. The design is complete, and construction will take place in fall 2004. This project will ensure that the ductile iron pipe is adequately protected from corrosion so that there are no wastewater leaks from these critical pipes, which convey about 80 percent of the City's untreated wastewater under the mouth of Drayton Harbor.

6.3 Capital Improvement Program Summary

The CIP presented in Table 6-1 is based on the information currently available. As the City implements the recommendations, the cost and timing of projects may be revised. The three elements that are most likely to affect the costs and schedule of projects in the CIP table are:

- Detailed cost estimate of treatment facilities
- Condition assessment, particularly of the pump stations

Once these activities are completed or under way, the City can reassess the priority and timing of the projects in the CIP.

CHAPTER 7

Financial Program

This Chapter supersedes the September 2004 version of Chapter 7.

7.1 Introduction

This Chapter addresses the financial condition of the City of Blaine's sewer utility and the City's capacity to pay for the new wastewater treatment facility, as well as the additional capital improvements identified in Chapter 6. Beginning with a review of the past five years' financial history, this Chapter evaluates the City's current financial condition as well as the revenue sources available to pay for the City's capital needs.

The building blocks of the financial plan are the projections of costs (both operations and maintenance, and capital) that the City will incur during the six year planning period (fiscal year 2005 through fiscal year 2010) and the revenues, under existing rates, which the City expects to generate during the same period. The financial plan is based on a set of overall assumptions related to customer growth, inflation, and other factors, as well as the specific phasing of the City's capital improvement programs.

The financial plan for the sewer system, in the form of projected sources and uses of funds for the sewer operating fund, is presented in Appendix T. Each component of the financial plan is discussed in more detail below.

7.2 Past and Present Financial Status

7.2.1 Sewer Utility Historical Financial Performance: Past Five Years

Table 7-1 presents a financial summary of the Blaine sewer utility's operating revenues and expenditures from 1998 through 2002. The City's finance department provided the revenue and expenditure data for the sewer system. Total revenues have ranged from a low of about $1.5 million in 2002 to a high of $2.0 million in 1998. The majority of revenues come from payments for regular sewer service. Other sources of revenue include interest on investments and miscellaneous revenues. As shown, the City's total operating revenue has declined since 1998, with a decrease in both wastewater service charge revenue and interest revenue.

Total operating expenses, which include personnel, materials, supplies, depreciation, and bad debt expense, have ranged from a low of approximately $1.6 million in 1998 to a high of $2.0 million in 2001. The largest annual expenses are for the treatment plant and debt service, primarily from the expansion of the existing WWTP that was stopped in 1999. The sewer utility has shown an unstable financial position in recent years, with expenses exceeding revenues.

TABLE 7-1
Sewer System Revenue and Expense Summary, 1998 – 2002

Year Ending	1998	1999	2000	2001	2002
Beginning Working Capital	**761,575**	**1,149,896**	**1,048,799**	**723,351**	**389,955**
Revenue					
Operating Revenue	1,258,087	1,364,860	1,400,662	1,402,028	1,409,544
Interest	33,762	39,638	45,223	54,023	20,858
ULID & Miscellaneous	256,022	159,495	145,083	190,016	100,142
DOE Grant			9,000	11,000	
Non-Revenue/Transfers	463,145	-		53,500	(23,353)
Total Operating Revenue	2,011,015	1,563,992	1,599,968	1,710,568	1,507,190
Operating Expenses					
Administration Expense	73,118	84,888	55,240	46,354	52,663
Depreciation (Non-cash Item)	291,138	212,621	303,436	315,972	310,281
Collections	107,336	121,968	125,558	191,429	187,249
Treatment Plant	257,851	253,091	328,685	347,703	398,884
Debt Service	475,946	547,208	664,994	652,364	378,336
Capital Expense	29,969	43,402	28,299	35,419	10,851
Operating Transfers Out	387,335	401,910	419,203	454,723	506,734
Total Operating Expenses	1,622,694	1,665,089	1,925,416	2,043,964	1,844,997
Operating Income	**388,321**	**(101,097)**	**(325,448)**	**(333,396)**	**(337,807)**
Ending Working Capital	**1,149,896**	**1,048,799**	**723,351**	**389,955**	**52,148**

In addition, the City has several funds set aside to pay for specific improvements to specific areas of the sewer system and for debt and bond reserve.

7.2.2 Existing Rate Structure

Table 7-2 presents the current sewer rate structure for the City. The sewer rates have not been increased since January 2000. However, 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.

TABLE 7-2
Current Sewer Rate Structure for the City of Blaine

Customer Class / Meter Size	Monthly Rate	Volume Allowance (ccf)	Commodity Charge ($/ccf)
Residential (single family)	$39.78	N/A	
Residential, Senior Discount	$30.56	N/A	
Multi-family Unit	$36.53	N/A	
Commercial I (average strength)			
¾”	$39.78	3	$5.88
1”	$99.41	7	$5.88
1.5”	$198.84	15	$5.88
2”	$318.12	24	$5.88
3”	$636.25	48	$5.88
4”	$994.15	75	$5.88
6”	$1,988.26	150	$5.88
8”	$3,181.22	240	$5.88
Commercial II (high strength)			
¾”	$51.19	3	$8.30
1”	$127.99	7	$8.30
1.5”	$255.98	15	$8.30
2”	$409.57	24	$8.30
3”	$819.14	48	$8.30
4”	$1,279.90	75	$8.30
6”	$2,559.79	150	$8.30
8”	$4,095.65	240	$8.30
Marinas			
Per pumpout station	$51.19	3	$8.30

7.3 Projected Revenue Requirements

The costs in this Sewer Plan that are to be funded from annual revenues are referred to as "revenue requirements" for rate-making purposes. Revenue requirements are composed of:

- Debt service expenditures
- Operation and maintenance (O&M) costs
- Annual capital improvement projects funded by rates and reserves
- Transfers to the City's general and other funds for indirect and direct services provided to the utility

Revenue requirements were projected based on data provided by the City, including historical fund performance from 1998 – 2002, fund projections for 2005-2010, a capital project list for 2004, and the CIP developed in Chapter 6. The following general assumptions were used in developing this Sewer Plan:

- Customer growth will occur at an average rate of 2.5 percent annually, with 72 percent of that growth occurring in West Blaine and 28 percent in Central and East Blaine. Commercial customer growth will occur at 1.0 percent annually.
- O&M costs will continue to increase at annual rates of 3 percent, based on historical trends and system growth.
- The City would increase sewer rates over a period of years in order to reach at least 1.5 percent of the mean household income (MHI) in time to qualify for hardship loans and grants from Ecology's funding programs for construction.
- A significant portion (75 percent) of the General Facility Fee (GFF) collected would be allocated to the three wastewater treatment phases
- The GFF charges would be increased at least equal to the rate increases and implemented as soon as possible following the rate study that will be conducted in 2004.
- Interest rate on investments is 3.5 percent.
- Capital costs will increase at an annual rate of 3 percent to account for inflation.

7.3.1 Operation and Maintenance Costs

O&M costs include all costs associated with operating and maintaining the sewer system, including personnel, materials, and services costs. The actual O&M costs for the sewer system for 2002 are shown in Table 7-1. Total personnel, materials, and services costs were approximately $640,000 for administration, treatment plant, and collection systems. As shown in Appendix T, this portion of O&M costs (including personnel services, materials, and services) is projected to remain consistent at $640,000 in 2010 for planning purposes in this General Sewer Plan. The O&M cost of the collection system should decrease due to minimized O&M associated with improved collection systems. For the treatment plants, O&M costs may increase slightly; however, the detailed O&M costs will be developed during the Facility Plan. It is assumed that the current revenue at current rate and customer base can continue to fund utility operations and that revenue increases associated with growth in the customer base will fund growth in operational expenses.

7.3.2 Capital Costs

Capital outlays for projects and equipment totaled approximately $650,000 in 2002. Future capital outlay expenditures are based on improvements recommended in this General

Sewer Plan, along with the City's existing capital project list. The two groups of projects represent approximately $33.5 million (in 2004 dollars) in capital improvements over the next six years. The projects are necessary to provide wastewater treatment for the City of Blaine, 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 7-3 summarizes the capital improvement plan for the sewer system over the next six years, in 2004 dollars. As shown in Appendix T, the projected capital improvements will be paid for by a combination of funding programs and current and future revenues. In order to fund the new wastewater solution, annual debt service is estimated to be a maximum of approximately $1.1 million per year. In 2010, the total annual debt service payment, including new and existing debt, will be approximately $1.6 million.

In order to afford a new wastewater treatment plant, 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. Table 7-4 shows the funding strategy for the new wastewater treatment facilities, including the Lift Station 1 (LS1) equalization storage project, the Marine Drive WRF, and wastewater treatment for West Blaine. Figure 7-1 shows anticipated funding sources for the wastewater treatment portion of the CIP.

In addition to the new wastewater treatment facilities, the City must continue to upgrade and maintain its collection system. Several of the CIP projects for the collection system can be phased in at a later date, but a few priority projects will also need to be completed in the next five years. The City will have to continue to rely on established funding programs for these projects. The funding strategy for the non-treatment CIP projects to be completed in the next five years is shown in Table 7-5.

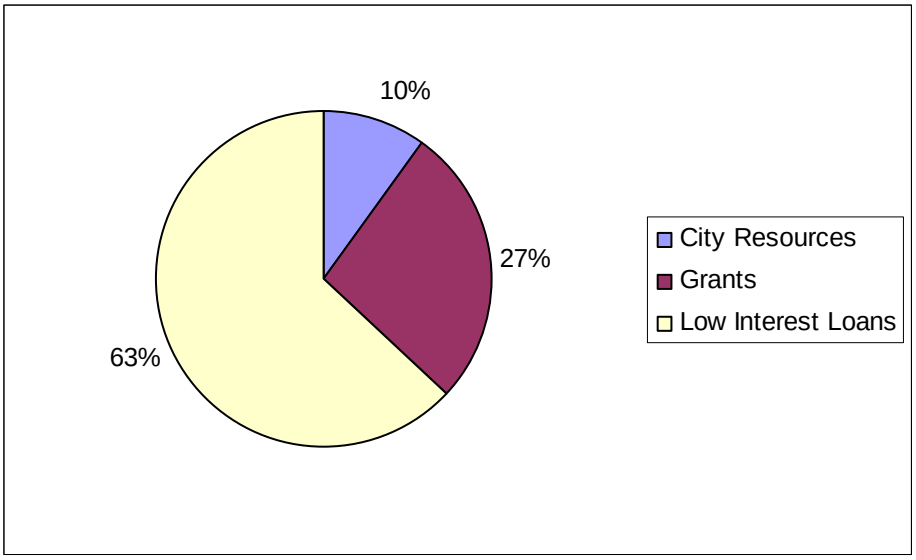


FIGURE 7-1
Summary of Funding for Wastewater Treatment Portion of CIP

TABLE 7-3
Capital Improvement Program

	Project Description	2005	2006	2007	2008	2009	2010	Total
CIP								
T1	Construct new wastewater equalization storage.	$450,000	$3,500,000					$3,950,000
T2	Construct new Water Reclamation Facility on Marine Drive location.	$300,000	$1,500,000	$10,500,000	$10,000,000			$22,300,000
T3	Construct new wastewater treatment facility for West Blaine or convey to Birch Bay						$500,000	$500,000
A-1a	Replace existing 10-inch pipeline with a 15-inch (560 ft)		$466,000					$466,000
A-1b	Replace existing 10-inch pipeline with a 18-inch parallel to I-5 (360 ft)			$155,000				$155,000
A-1c	Replace existing 8-inch pipeline with a 12-inch between G Street and H Street (1,895 ft)			$668,000				$668,000
A-2a	Replace existing 8-inch pipeline with a 10-inch along 8th Street and A Street (3,010 ft)					$1,050,000		$1,050,000
A-2b	Replace existing 8-inch pipeline with a 12-inch along 8th Street (400 ft)					$154,000		$154,000
B-1	Replace existing 10-inch pipeline with a 12-inch parallel to Garfield Avenue (2,080 ft)				$765,000			$765,000
B-2	Replace existing 8-inch pipeline with a 12-inch along G Street (955 ft)			$339,000				$339,000
P-1 & P-2	Proposed sewer main extension along H Street				$2,400,000			$2,400,000
P-10 & P-11	Proposed sewer main extension along H Street				$570,000			$570,000

TABLE 7-3
Capital Improvement Program

	Project Description	2005	2006	2007	2008	2009	2010	Total
CIP								
T1	Construct new wastewater equalization storage.	$450,000	$3,500,000					$3,950,000
G-1	Annual pipeline rehabilitation, replacement and I/I program, including backyard sewer replacement.	$50,000	$50,000					$100,000
	Subtotal	$800,000	$5,516,000	$11,662,000	$13,735,000	$1,204,000	$500,000	$33,417,000
City Project List								
T5	Interim WWTP Improvements	$100,000						$100,000
LS-5	Install Controller and Telemetry on Lift Station 5	$15,000						$15,000
	Subtotal	$115,000	$0	$0	$0	$0	$0	$115,000
	Total	**$915,000**	**$5,516,000**	**$11,662,000**	**$13,735,000**	**$1,204,000**	**$500,000**	**$33,532,000**
	City Funded	**$915,000**	**$5,050,000**	**$10,839,000**	**$10,765,000**	**$1,204,000**	**$500,000**	**$29,273,000**

TABLE 7-4
Funding Strategy for the City of Blaine Wastewater Treatment Solution

Revenue Sources	T1 - Equalization Storage	T2 Design	T2 Construction	T3 Design	T3 Construction	Total Cost
Estimated Cost	$3,950,000	$1,500,000	$20,500,000	$500,000	$4,012,000	$30,462,000
Timeframe	5/05 - 12/06	1/05 - 12/06	3/07 - 6/08	2010	3/11 - 4/12	
City Resources						
Sewer Capital Facilities Fund		$500,000	$2,500,000		$12,000	$3,012,000
Grants						
Rural Development Grant	$700,000					$700,000
Centennial Clean Water			$2,500,000		$2,000,000	$4,500,000
TIB Grant	$500,000					$500,000
Direct Federal Appropriations (STAG)			$2,000,000			$2,000,000
Rural Sales Tax			$500,000			$500,000
Total Grants	**$1,200,000**	**$0**	**$5,000,000**	**$0**	**$2,000,000**	**$8,200,000**
Loans						
Rural Development Loan*	$3,500,000*					$3,500,000*
PWTF Pre-Construction (15% City Match)		$1,000,000		$500,000		$1,500,000
PWTF Construction (15% City Match)	$2,750,000		$10,000,000			$12,750,000
Centennial Clean-water			$2,500,000		$2,000,000	$4,500,000
Rural Sales Tax			$500,000			$500,000
Total Low Interest Loans	**$2,750,000**	**$1,000,000**	**$13,000,000**	**$500,000**	**$2,000,000**	**$19,250,000**
Total Revenues for Project	**$3,950,000**	**$1,500,000**	**$20,500,000**	**$500,000**	**$4,012,000**	**$30,462,000**
Annual Debt Service						
PWTF Pre-Construction (0.5%)	$0	($203,010)	$0	($101,505)	$0	($304,515)
PWTF Construction (0.5%)	($144,833)	$0	($526,665)	$0	$0	($671,498)
Centennial	$0	$0	($125,000)	$0	($100,000)	($225,000)
Rural Sales Tax	$0	$0	($32,074)$	$0	$0	($32,074)
Total	**($144,833)**	**($203,010)**	**($683,738)**	**($101,505)**	**($100,000)**	**($1,233,087)**

*Rural Development Loan will be paid off by PWTF loan

TABLE 7-5
Funding Strategy for the City of Blaine Collection System CIP

Revenue Sources			A-1a	A-1b	A-1c	A-2a	A-2b	B-1	B-2	P-1&2	P-10&11	Total Cost
Estimated Cost			$466,000	$155,000	$668,000	$1,050,000	$154,000	$765,000	$339,000	$2,400,000	$570,000	$6,567,000
Duration			2006	2007	2007	2009	2009	2008	2007			
City Resources												
Sewer Capital Facilities Fund							$154,000	$100,000	$100,000			$354,000
Grants/Paid by Others												
CERB Grant						$300,000						$300,000
Paid by Others			$466,000	$155,000	$668,000			$45,000	$69,000	$2,400,000	$570,000	$4,373,000
Total Grants			**$466,000**	**$155,000**	**$668,000**	**$300,000**	**$0**	**$45,000**	**$69,000**	**$2,400,000**	**$570,000**	**$4,673,000**
Loans												
Rural Sales Tax	20	2.5%						$620,000	$170,000			$790,000
CERB Loan	20	3.0%				$750,000						$750,000
Total Loans			**$0**	**$0**	**$0**	**$750,000**	**$0**	**$620,000**	**$170,000**	**$0**	**$0**	**$1,540,000**
Total Revenues for Project			**$466,000**	**$155,000**	**$668,000**	**$1,050,000**	**$154,000**	**$765,000**	**$339,000**			**$3,597,000**
Annual Debt Service												
Rural Sales Tax	20	2.5%						($39,771)	($10,905)			($50,676)
CERB Loan	20	3.0%				($50,412)						($50,412)
Total			**$0**	**$0**	**$0**	**($50,412)**	**$0**	**($39,771)**	**($10,905)**	**$0**	**$0**	**($101,088)**

7.4 Revenues

The City must rely predominantly on sewer rates and GFFs to fund the debt service for the projected CIP costs over the next six years. GFFs are revenue the City gets 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. As shown in Appendix T, additional revenues based on existing rates are estimated to be only $210,000 in 2004. This estimate is based on the City's existing rate schedule and the current number of units by customer class generated from the City's billing system. As the system grows, additional sewer sales revenues may increase to approximately $725,000 by 2009.

Non-rate revenues, including interest income and miscellaneous charges, were approximately $50,000 for the sewer system in 2002. Interest income is projected to fluctuate from year to year depending on the available working capital at the beginning of each year and the annual increase (or decrease) in operating income. Miscellaneous income was projected to remain relatively constant over the study period.

7.5 Rate Impacts

As discussed previously, this analysis assumes that the City will rely significantly on state and federal funding programs to fund its capital projects. The debt service associated with this funding strategy is estimated to total almost $23 million. To repay the debt, and to pay for the additional capital and operating expenses forecast over the study period, the City will have to increase sewer rates in the future. Appendix T shows the proposed financial plan to pay for the debt service the City will incur. The City will conduct a comprehensive wastewater utility rate study in 2004 to analyze the impacts on customers' rates of implementing the CIP and determine the exact rate impacts. In order to fund the new wastewater treatment plants, which will cost over $30 million for a City with less than 5,000 people, the City will have to raise sewer rates by approximately 28 percent over the next five years. At that level of increase, the City's rates will meet the Ecology's criteria for hardship: 1.5 percent of Blaine's MHI of $36,900. Blaine's current sewer rates are already far above the statewide average of $26.13.

7.6 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.

7.6.1 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 utility improvements set forth in this General Sewer Plan 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 towards 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.

- **Community Economic Revitalization Board (CERB).** Managed by the Department of Community Trade and Economic Development, this program provides grants and loans to fund public facilities that result in specific private-sector development. Eligible projects include water, sewer, roads, and bridges.

- **Community Development Block Grant Program.** This federal government program is administered by the State Department of Community Trade and Economic Development, and provides grants and loans for infrastructure improvements, including water projects, for business development that creates or retains jobs for low- and moderate-income residents.

- **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.

7.6.2 Federal Capital Funding Sources

There are multiple Federal agencies through which wastewater projects can be funded, including the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA). Some communities have found creative ways to get funding through other agencies, such as overviewed in Table 7-6. Ideally, when a new project is seeking to gain federal approval, it should try to adhere to the established process by seeking authorization and followed by looking for an appropriation. One rarely runs into political trouble by following the rules. However, because needs sometimes arise outside of the authorization schedule or authorization efforts are unsuccessful, the project is important to a key Member on the Appropriations Committee or a time-critical need can be identified, an attempt is made to seek money before a project is authorized. In any event, these are complicated decisions that should be judged on an individual basis.

TABLE 7-6
Summary of Potential Federal Funding Sources

Organization	Program(s)
U.S. Department of Agriculture (USDA)	Conservation Reserve Program
	Environmental Quality Incentives Program
	Rural Utility Service (RUS) Water and Waste Systems
	Watershed Protection and Flood Prevention Program
	Wildlife Habitat Incentives Program
U.S. Army Corps of Engineers	Water Resources Development Act
	Section 503 Watershed Management, Restoration, and Development
	Section 1135 Project Modifications for the Improvement of the Environment
	Aquatic Ecosystem Restoration
	Flood Hazard Mitigation
U.S. Department of Commerce/Economic Development Administration (EDA)	Grants for Public Works and Economic Development
U.S. Department of Commerce/NOAA	Coastal Zone Management Awards
	Sea Grant Program
U.S. Environmental Protection Agency (EPA)	CWSRF Capitalization Grants
	Environmental Programs and Management
	State and Tribal Assistance Grants
	Watershed Assistance Grant (WAG)
	Sustainable Development Challenge Grants
	Wetlands Program Development Grants
U.S. Department of Housing and Urban Development (HUD)	Community Development Block Grants
	Wetlands Reserve Program
	Watershed Projects
	Land and Water Conservation Fund Grants
U.S. Department of the Interior/FWS	Coastal Program
EPA, USDA and National Science Foundation(NSF)	HUD Grant (for construction of wastewater treatment facilities)

Of these programs, the State and Tribal Assistance Grant (STAG) and USDA RUS wastewater loan programs are the most promising for Blaine.

- **USDA Rural Utilities Services, 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 population 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 of Blaine because the debt service portion of the average annual user cost would exceed 1.0 percent of the 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 with regular meeting with the USDA. This project is helping to push the process along towards 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 Rural Utility Service loan as quickly as possible.

- **State and Tribal Assistance Grant (STAG)**. Funding for projects, such as a new wastewater treatment plant 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 Blaine 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 treatment plant site to meet archaeological and/or historical requirements. Funding may also be secured in direct appropriations through EPA or other grant administering agencies, such as the USDA, for innovative technology, innovative application of wastewater treatment technologies, or for projects that will demonstrate wastewater treatment approaches that other communities similar to Blaine might also use.

  Obtaining direct appropriations is a very competitive process. Arguments to win congressional support for an appropriation will involve demonstrating that Blaine is maximizing its local resources and has secured other available sources before reaching out for direct appropriations. Federal agencies will rarely include requests for direct appropriations in their budgets, but can become an ally when ask to comment on the technical aspects of a project or the need for projects. EPA is the most likely candidate for "funneling" direct appropriations, but other granting agencies should not be excluded in developing of funding strategies.

The appropriations process is shown in Table 7-7. It is important to begin very early in the cycle. As a general rule, after the committee and on the floor, there is very little chance for funding.

TABLE 7-7
Sample Appropriations Cycle Calendar

Process	Timing
Committee starts legwork	January to February
President submits budget	February
Federal agencies begin submitting funding priorities up through the Executive Branch budget hierarchy	Fall
the President's budget submitted to Congress	Early February
Congressional Appropriations Committee staffs are evaluating priorities from the legislative perspective, culminating with hearings on specific topics	January to March
House and Senate Appropriations Committees move legislation	April to June
House and Senate Conference Committees reconcile differences	July to September

While there is no set time to begin working the annual appropriations process, the general rule is the earlier the better. A good target window to begin familiarizing local Congressional offices with projects, is late Fall through mid-Winter and certainly no later than February. At that point, most offices have already determined where they intend to focus their clout. Of course, there are always a few exceptions to the rule, but those who respect the calendar usually fare better. Moreover, many projects work over several funding cycles before receiving money. In other words, good timing does not translate to success.

Soliciting local congressional support is key to success and preparation is central to securing local Congressional support. Projects should be fairly vetted through prickly local political concerns. Moreover, project descriptions, costs, benefits and support should be plainly and briefly presented in non-technical format with helpful graphs, pictures or maps, in a report or brochure-like format. Congressional staff work on a broad spectrum of issues for their bosses. If the Members of Congress and staff cannot understand and explain a project, the chances are that the sales job to the relevant Committees will be less than optimal. Congressional staffers work collaboratively to share information and build consensus with their bosses. Most importantly, the project's proponents – in Washington and at home – have the responsibility to follow through not just with the Congressional sponsor, but also with key committee Members and staff. All sides of the funding process, not just the home front, must be covered to have an opportunity for success.

7.6.3 User Charges as Capital Funding Source

Rates paid by customers for sewer service are the primary source of funding for all City sewer utility activities. Rate revenues can be used both to pay for debt service or directly to fund capital projects. The chief advantage of rates as a financing mechanism is their stability

and low cost (no interest expense is incurred). However, relying primarily on rates for capital funding can cause high near-term rate increases.

7.6.4 General Facility Fee

GFFs are sources of funding typically used by utilities to support capital needs. GFFs are imposed on new customers connecting to the system as a condition of service. Typically, the basis for the GFF is the capital cost the utility will or has incurred to provide the sewer system. The underlying premise of the GFF is that growth (i.e., future customers) will pay for growth-related costs that would not have been necessary in the absence of customer base growth. The GFF is critical to the City's ability to pay debt service to the new WRF and other capital projects. The City will use approximately 75 percent of the GFF for the new wastewater treatment facilities (Phases 1, 2, and 3), and the remaining 25 percent for the other capital projects.

7.7 Conclusion

The CIP presented in Chapter 6, particularly the new wastewater treatment facilities, places extreme financial stresses on the City's sewer utility and will require significant additional sources of funds to pay for the improvements. The City should aggressively pursue PWTF loans, Ecology grants and loans, other government programs (such as CERB), and direct congressional appropriation through the State and Tribal Assistance Grant (STAG) or other programs. Though the competition for state and federal grants or low interest loans is very high, the City should begin applying for funds. The City should also begin a practice of updating its sewer rates on a consistent basis. The next full utility rate analysis will be conducted in the summer of 2004 and will incorporate the anticipated construction costs associated with the capital projects discussed in this chapter and described in detail in Chapter 6.

CHAPTER 8

Implementation

This Chapter presents the steps needed to adopt the City's General Sewer Plan, along with items required to implement this plan's recommendations and descriptions of upcoming or potential regulations that could affect the City's operation and maintenance of the sewer system.

8.1 Sewer Plan Adoption

A key element of implementing the General Sewer Plan is proper compliance with state and local requirements governing adoption of such documents. The General Sewer Plan will be reviewed by City staff and then submitted to Ecology for review. Following receipt of comments from affected agencies and completion of the final environmental determination, the General Sewer Plan will be adopted by the City Council. The final environmental determination and Ecology approval will serve as additional support and endorsement of the General Sewer Plan and its recommended improvements. An overall schedule for the implementation of the three phases of the wastewater treatment program for the City of Blaine is included in Appendix U.

8.2 Environmental Checklist and Permits

The State Environmental Policy Act (SEPA) of 1971, Chapter 43.21 RCW, requires that all sewer system plans be accompanied by the appropriate environmental document. A SEPA checklist was completed for the Sewer Plan and is provided in Appendix B. The SEPA checklist addresses the CIP on a planning level—that is, as a nonproject action. Each individual CIP project will undergo subsequent project-specific environmental review as design and engineering are completed. Individual projects will also require permits from the City, and possibly from county, state, and federal regulatory agencies.

8.3 Issues Involving City Policies

To effectively implement the recommended improvements presented in this sewer plan, the City may want to consider revisions of certain policies. Potential revisions are summarized below.

8.3.1 Increased Enforcement of Grease Interceptor Ordinance

Enforcement of the grease interceptor ordinance for areas continually blocked with grease would reduce the required maintenance of those sewer lines located downstream of the users currently discharging excessive grease.

8.3.2 Strengthening of Pretreatment Program

Increased monitoring and enforcement of permit conditions for the City's industrial dischargers would increase the capacity, and subsequent useful life, of the WWTP for BOD

loading. Given the time required to construct a new treatment plant, this is critical to the continued operation of the existing WWTP.

8.3.3 Accessibility and Easements

Accessibility to the various sewer facilities for maintenance by City staff is a policy issue that can be addressed by a combination of enforcing existing easements, obtaining new easements, and abandoning certain facilities and replacing them with new facilities in the public right-of-way. The City has mapped existing easements; new easements are difficult to obtain due to the high cost of land. Maintaining existing easements is critical for inspection and maintenance of the system.

8.4 Construction Standards

Contract documents for all projects constructed within the City shall be prepared based on the most current edition of the City's draft Engineering Standards as presented in Appendix G, Ecology's *Criteria for Sewage Works Design* (1998), and the most current edition of the Washington State Department of Transportation's standard specifications.

8.5 Proposed Sanitary Sewer Overflow Rule

NPDES permits enforce the Clean Water Act on WWTPs. These permits regulate discharges from POTWs, but this does not address discharges in the collection system prior to the treatment works. EPA is proposing the Sanitary Sewer Overflow (SSO) Rule to provide regulations that extend coverage of the NPDES permit to collection systems.

The goal of the proposed SSO Rule is to reduce or eliminate overflows in the collection system. The proposed rule currently includes three proposed standard permit conditions, which are as follows:

1. CMOM program (see Appendix V)
2. SSO prohibition (however, the SSO rule would provide a framework for raising a defense for unavoidable SSOs).
3. Reporting, public notification, and recordkeeping

As introduced in Chapter 2, the CMOM program is part of a regulatory mandate that will focus on the collection system to promote the reduction or elimination of SSO. As the owner and operator of a municipal collection system, the City will be required to comply with the SSO Rule when it is promulgated. The timing of promulgation of the SSO Rule is currently under review. As part of compliance with the proposed regulation, municipalities will be responsible for preparing certain documentation, including:

- Written summary of CMOM program
- Overflow emergency response plan
- Program audit report

Further detail on each of these required documents is provided below. It is worth noting that the overflow emergency response plan and the program audit report are not required from utilities that meet the requirement of average daily sewer flow of less than 2.5 mgd,

unless there is an SSO occurrence. Thus, the City of Blaine would not be subject to these requirements until its flows increased to this level.

8.5.1 Written Summary of the CMOM Program

EPA is proposing that municipal collection systems be required to develop a written summary of their CMOM programs and to make this document available upon request. The primary purpose of the CMOM program summary is to:

- Define the goals and organizational process of collection system management
- Demonstrate to the permitting agency that the hydraulic capacity of the collection system is defined and SSO locations are identified
- Demonstrate to the permitting agency what steps are necessary to eliminate or reduce the identified SSO locations based on reasonable design criteria
- Demonstrate to the permitting agency that the physical condition of the collection system infrastructure is known and that an approach addressing deficiencies (i.e., CIP) is defined
- Demonstrate appropriate monitoring, reporting, and public notification processes and provide an emergency response plan

The program summary will basically provide an overview of the management practices for the collection system agency and summarize major implementation activities. The summary may incorporate other documents by reference. Many items listed in the CMOM program summary requirements are included in this General Sewer Plan. A more detailed outline of the CMOM program summary is presented in Appendix V.

8.5.2 Overflow Emergency Response Plan

An overflow emergency response plan provides a standardized course of action for sewer collection system personnel to follow in the event of an SSO. The plan must describe the utility's planned options for response, remediation, and notification measures under different SSO scenarios. EPA believes that an up-to-date overflow emergency response plan is necessary to ensure that a municipality is adequately prepared to respond to SSO events. EPA anticipates that under the CMOM proposal, overflow emergency response plans would identify procedures for a wide range of potential system failures. It should be noted that under the SSO Rule, reporting of all overflows will be required. This includes overflows to water bodies, overflow that do not flow into water bodies, and basement backups.

The minimum items expected to be in an overflow emergency response plan are listed in Appendix V. While the City does have portions of an emergency response plan pertaining to wastewater spills that would meet EPA requirements, there are additional materials required, as indicated in the list in Appendix V. A guidebook is available that assists utilities in developing plans entitled *Preparing Sewer Overflow Response Plans: A Guidebook for Local Governments* (APWA, 1999).

8.5.3 Program Audit Report

EPA's position is that ongoing assessment of the CMOM program and performance of the collection system is critical to the success of the program. Performing periodic comprehen-

sive audits of the program provides the mechanism for the program assessment. EPA is proposing that utilities with average daily flow of over 2.5 mgd conduct comprehensive audits of their programs at least once every 5 years. The audit would include:

- Interviews with facility managers
- Field inspection of equipment and other resources
- Interviews with field personnel and first-level supervisors and observation of field crews
- Review of pertinent records and information management systems

Based on an evaluation of information from these sources, the utility would be required to develop an audit report. At a minimum, the audit report would address:

- The findings of the audit, including deficiencies
- Documentation of steps taken to respond to each finding in the report, including steps taken to correct each deficiency
- A schedule for additional steps to respond to findings of the report

CHAPTER 9

Bibliography and References

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Appendix A

General Sewer Plan Checklist

Appendix A
General Sewer Plan Checklist

WAC 173-240-050 Requirements	Included?	Section	Specific Table, Figure, or Appendix
(a) The purpose and need for the proposed plan.	Yes	1.1.2	
(b) A discussion of who will own, operate, and maintain the systems.	Yes	1.1	
(c) The existing and proposed service boundaries.	Yes	2.2.1	Figure 2-2
(d) Layout map including the following:			
(i) Boundaries. The boundary lines of the municipality or special district to be sewered, including a vicinity map;	Yes	2.2.1	Figure 2-2
(ii) Existing sewers. The location, size, slope, capacity, direction of flow of all existing trunk sewers, and the boundaries of the areas served by each;	Yes	3.1.2	Oversized Map, Appendix C, Figure 3-6
(iii) Proposed sewers. The location, size, slope, capacity, direction of flow of all proposed trunk sewers, and the boundaries of the areas to be served by each;	Yes	3.5.1	Oversized Map, Appendix C, Figure 3-26, Table 3-17
(iv) Existing and proposed pump stations and force mains. The location of all existing and proposed pumping stations and force mains, designated to distinguish between those existing and proposed;	Yes	3.1.3 3.5.2	Figure 3-1, Figure 3-26, Table 3-2, Table 3-18
(v) Topography and elevations. Topography showing pertinent ground elevations and surface drainage must be included, as well as proposed and existing streets;	Yes	2.3.1	Figure 2-4
(vi) Streams, lakes, and other bodies of water. The location and direction of flow of major streams, the high and low elevations of water surfaces at sewer outlets, and controlled overflows, if any. All existing and potential discharge locations should be noted; and	Yes	2.3.5 3.2.2	Figure 2-2, Section 3.2.2 for discussion of historical uncontrolled overflows.
(vii) Water systems. The location of wells or other sources of water supply, water storage reservoirs and treatment plants, and water transmission facilities.	Yes	2.3.6	Figure 2-6
(e) The population trend as indicated by available records, and the estimated future population for the stated design period. Briefly describe the method used to determine future population trends and the concurrence of any applicable local or regional planning agencies.	Yes	3.3.3.2	Table 3-6, Table 3-7, Table 3-8
(f) Any existing domestic or industrial wastewater facilities within twenty miles of the general plan area and within the same topographical drainage basin containing the general plan area.	Yes	1	Figure 2-1
(g) A discussion of any infiltration and inflow problems and a discussion of actions that will alleviate these problems in the future.	Yes	3.2.1	Figure 3-5
(h) A statement regarding provisions for treatment and discussion of the adequacy of the treatment.	Yes	4.3	
(i) List of all establishments producing industrial wastewater, the quantity of wastewater and periods of production, and the character of the industrial wastewater insofar as it may affect the sewer system or treatment plant. Consideration must be given to future industrial expansion.	Yes	5.3.3	Table 5-1, Appendix Q

Appendix A
General Sewer Plan Checklist

WAC 173-240-050 Requirements	Included?	Section	Specific Table, Figure, or Appendix
(j) Discussion of the location of all existing private and public wells, or other sources of water supply, and distribution structures as they are related to both existing and proposed domestic wastewater treatment facilities.	Yes	2.3.6	Figure 2-6
(k) Discussion of the various alternatives evaluated, and a determination of the alternative chosen, if applicable.	Yes	4	Section 4.4, Table 4-7
(l) A discussion, including a table, that shows the cost per service in terms of both debt service and operation and maintenance costs, of all facilities (existing and proposed) during the planning period.	Yes	7	Appendix T
(m) A statement regarding compliance with any adopted water quality management plan under the Federal Water Pollution Control Act as amended.	Yes	8	
(n) A statement regarding compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA), if applicable.	Yes		Appendix B

Appendix B

SEPA Checklist

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, <u>rolling</u>, 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: .....

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

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.

Appendix C

Summary of Existing and Proposed Truck Sewers

Appendix C
Proposed Pipe Diameter and Capacity
2025 25Yr-24Hr
This appendix supersedes the September 2004 version of Appendix C.

CIP	FROMNODE	TONODE	DIAMETER (Inch)	LENGTH (ft)	SLOPE (ft/ft)	Capacity (gpm)	Qmax (gpm)	% Capacity
A1	MH364	MH363	12	385	0.0104	1589	1124	71%
A1	MH365	MH364	12	366	0.0109	1630	1123	69%
A1	MH366	MH365	12	494	0.0162	1982	1121	57%
A1	MH367	MH475	12	255	0.0118	1689	1310	78%
A1	MH475	MH368	16	99	0.0000	0	2013	--
A1	MH368	MH369	16	261	0.0038	2063	2017	98%
A1	MH366	MH367	12	346	0.0145	1874	1325	71%
A1	MH369	MH346	14	481	0.0104	2361	2033	86%
A1	MH346	MH485	14	74	0.0136	2697	2034	75%
A2	MH323	MH320	10	181	0.0000	0	530	--
A2	MH403	MH374	10	214	0.0093	925	533	58%
A2	MH373	MH372	10	381	0.0053	693	736	106%
A2	MH323	MH321	10	268	0.0037	585	528	90%
A2	MH321	MH322	10	292	0.0034	560	521	93%
A2	MH374	MH375	10	268	0.0000	0	532	--
A2	MH375	MH320	10	309	0.0065	769	531	69%
A2	MH322	MH376	10	180	0.0056	713	516	72%
A2	MH376	MH405	10	360	0.0028	504	504	100%
A2	MH405	MH430	10	378	0.0026	492	510	104%
A2	MH430	MH448	10	213	0.0047	656	518	79%
A2	MH448	MH373	12	378	0.0026	802	744	93%
B1	MH554	MH565	10	261	0.0038	592	473	80%
B1	MH542	MH551	12	373	0.0027	807	816	101%
B1	MH551	MH554	10	402	0.0025	478	448	94%
B1	MH531	MH542	12	384	0.0052	1124	789	70%
B1	MH521	MH522	12	165	0.0061	1214	754	62%
B1	MH522	MH528	12	377	0.0026	802	758	95%
B1	MH528	MH527	12	376	0.0027	803	760	95%
B1	MH527	MH531	12	382	0.0026	798	758	95%
B2	MH441	MH440	12	234	0.0043	1017	1126	111%
B2	MH440	MH439	12	157	0.0064	1245	1127	91%
B2	MH439	MH435	12	137	0.0073	1333	1129	85%

Appendix D

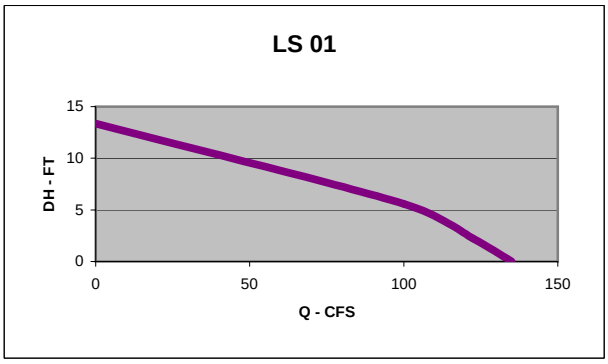
Pump Curves

Appendix D

CITY OF BLAINE, WA SEWER SYSTEM
LIFT STATION INFORMATION - PUMP CURVES

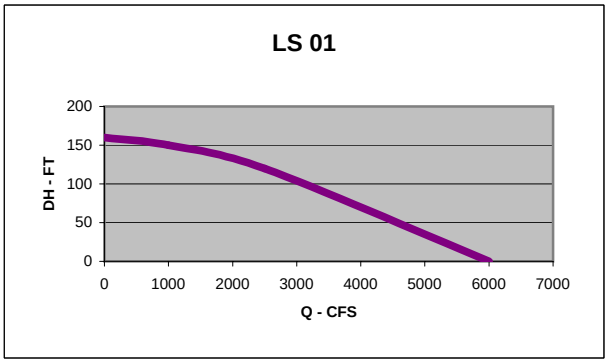
DRY
LS 01 @2PUMPS

DH (FT)		Q (GMP)
135	0	0
122.5	2.228009	1000
100	5.570023	2500
0	13.36805	6000



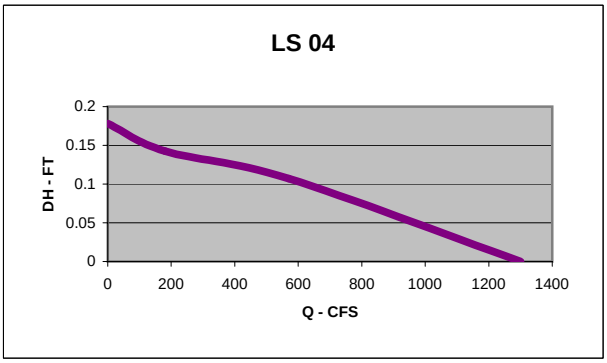
WET
LS 01 @2PUMPS

DH (FT)		Q (GMP)
160	0	0
150	2.228009	1000
120	5.570023	2500
0	13.36805	6000



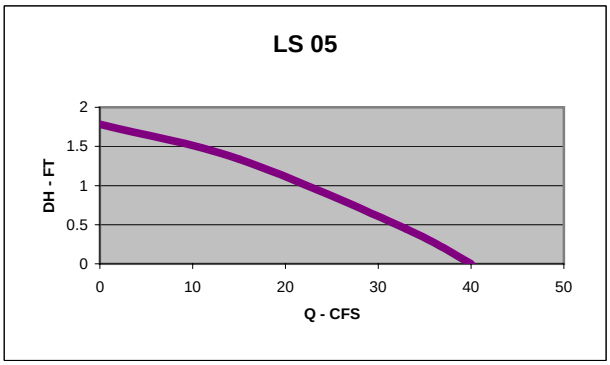
LS 04 @2PUMPS

DH (FT)		Q (GMP)
0	0.178241	80
180	0.142593	64
570	0.106944	48
1300	0	0



LS 05 @2PUMPS

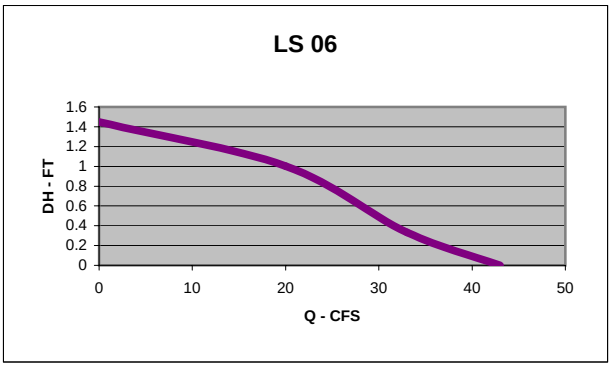
DH (FT)		Q (GMP)
40	0	0
33	0.445602	200
15	1.336805	600
0	1.782407	800



Appendix D

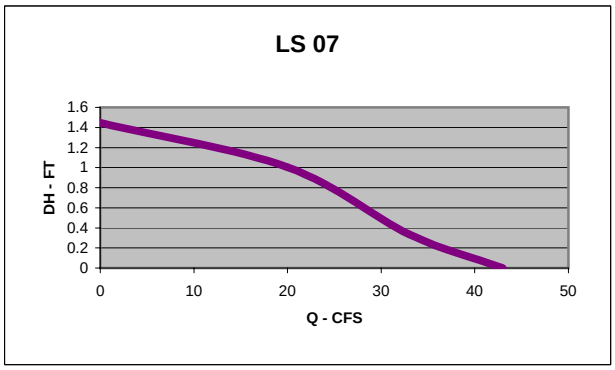
LS 06 @2PUMPS

DH (FT)		Q (GMP)
43	0	0
33	0.334201	150
20	1.002604	450
0	1.448206	650



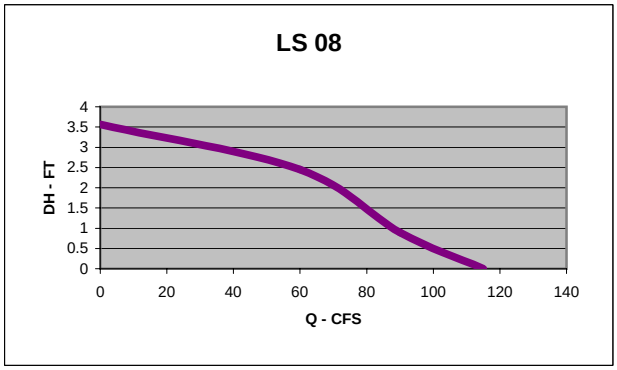
LS 07 @2PUMPS

DH (FT)		Q (GMP)
43	0	0
33	0.334201	150
20	1.002604	450
0	1.448206	650



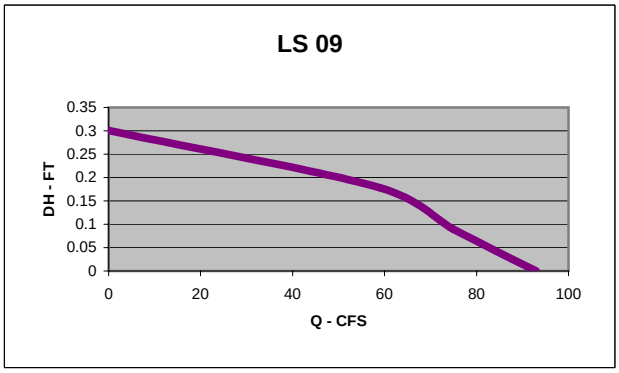
LS 08@2PUMPS

DH (FT)		Q (GMP)
115	0	0
90	0.891204	400
60	2.45081	1100
0	3.564814	1600



LS 09 @2PUMPS

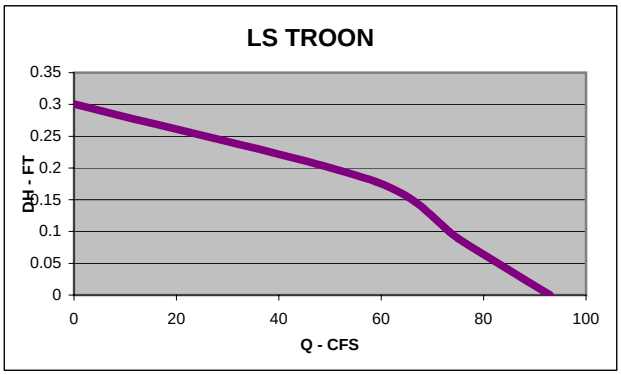
DH (FT)		Q (GMP)
93	0	0
75	0.08912	40
59	0.178241	80
0	0.300781	135



Appendix D

LS TROON@2PUMPS

DH (FT)		Q (GMP)
93	0	0
75	0.08912	40
59	0.178241	80
0	0.300781	135



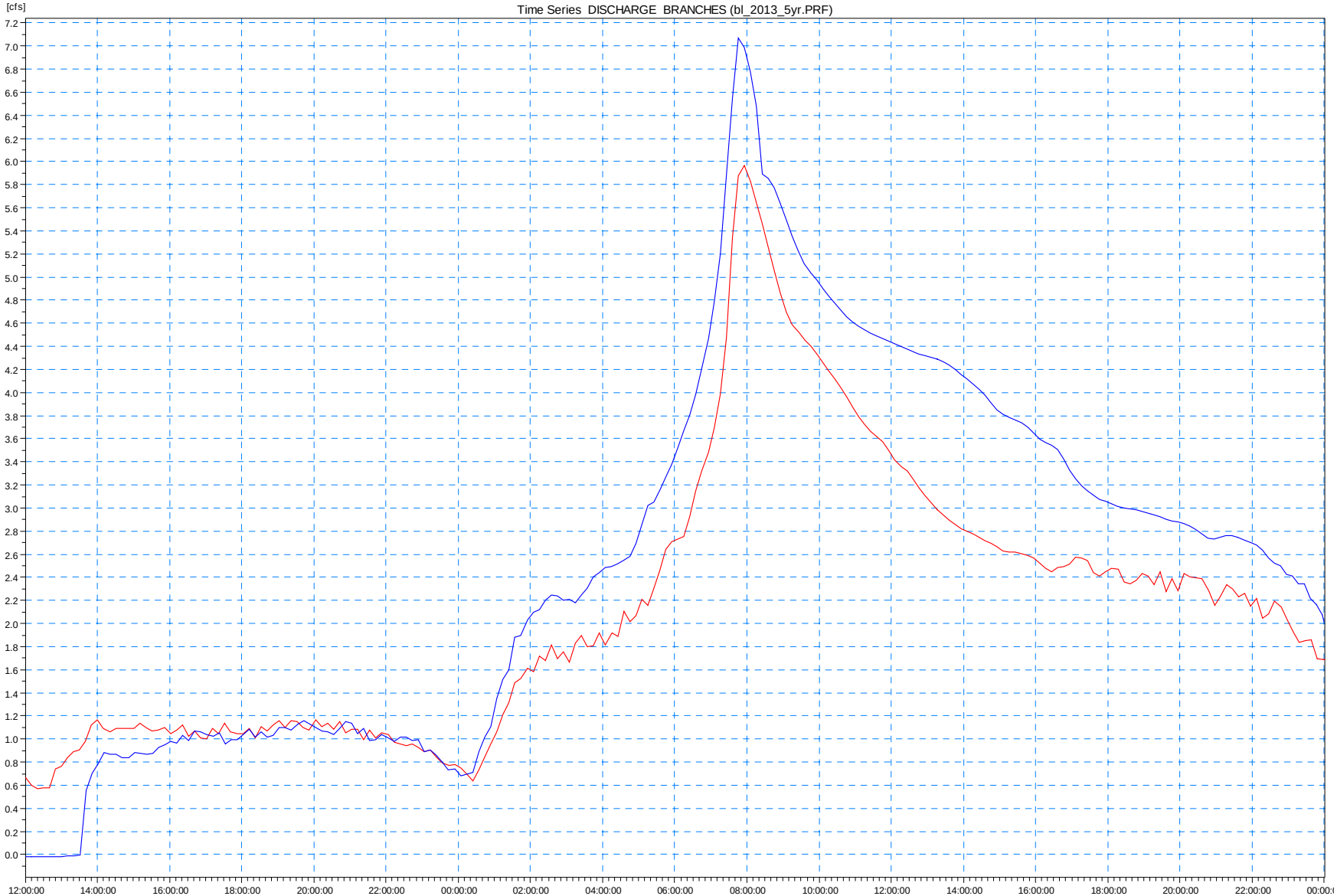
Appendix E

Discharge Results

2013: 5 YEAR VS. 25 YEAR STORM (EAST)

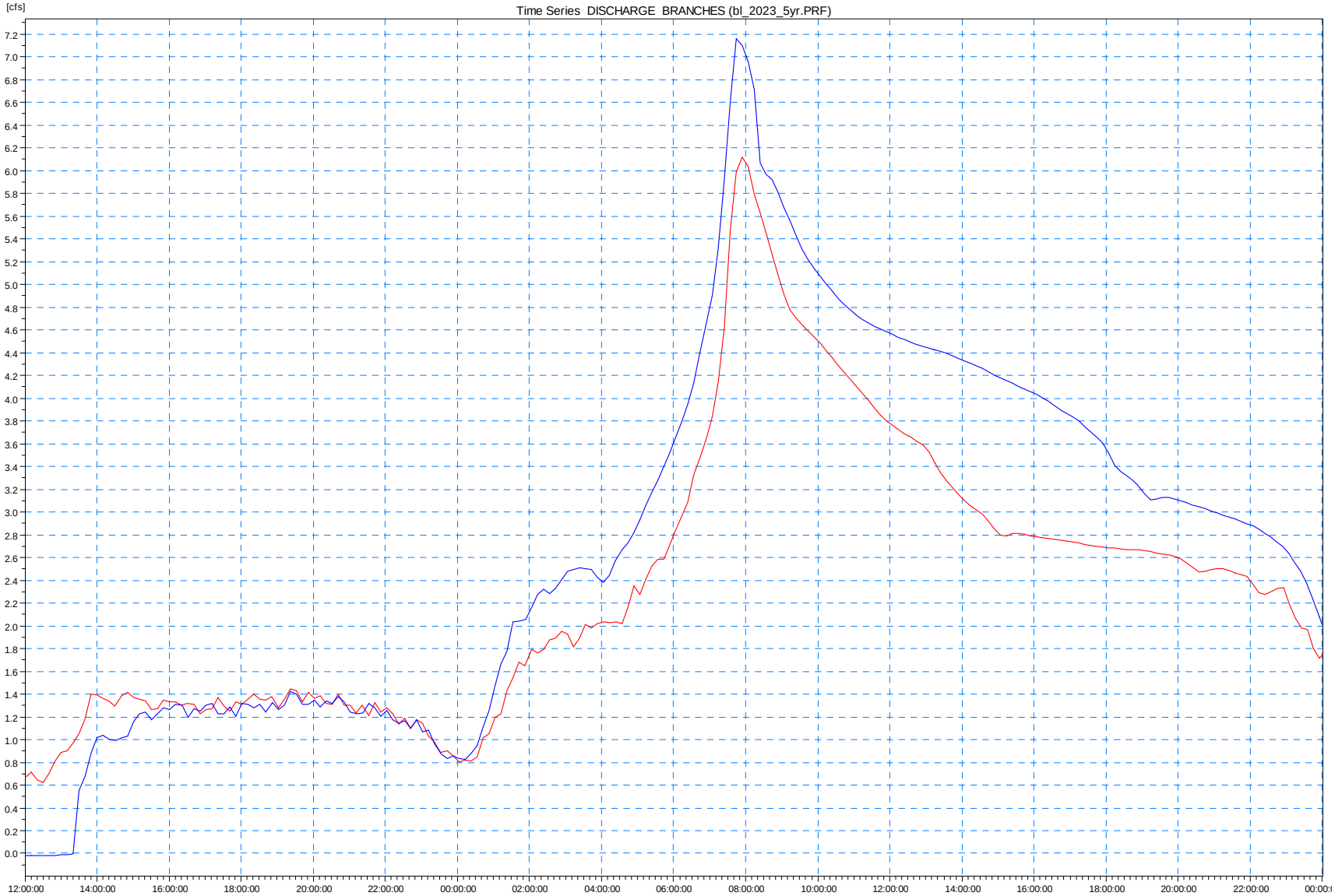
Red = 5 Year

Blue = 25 Year



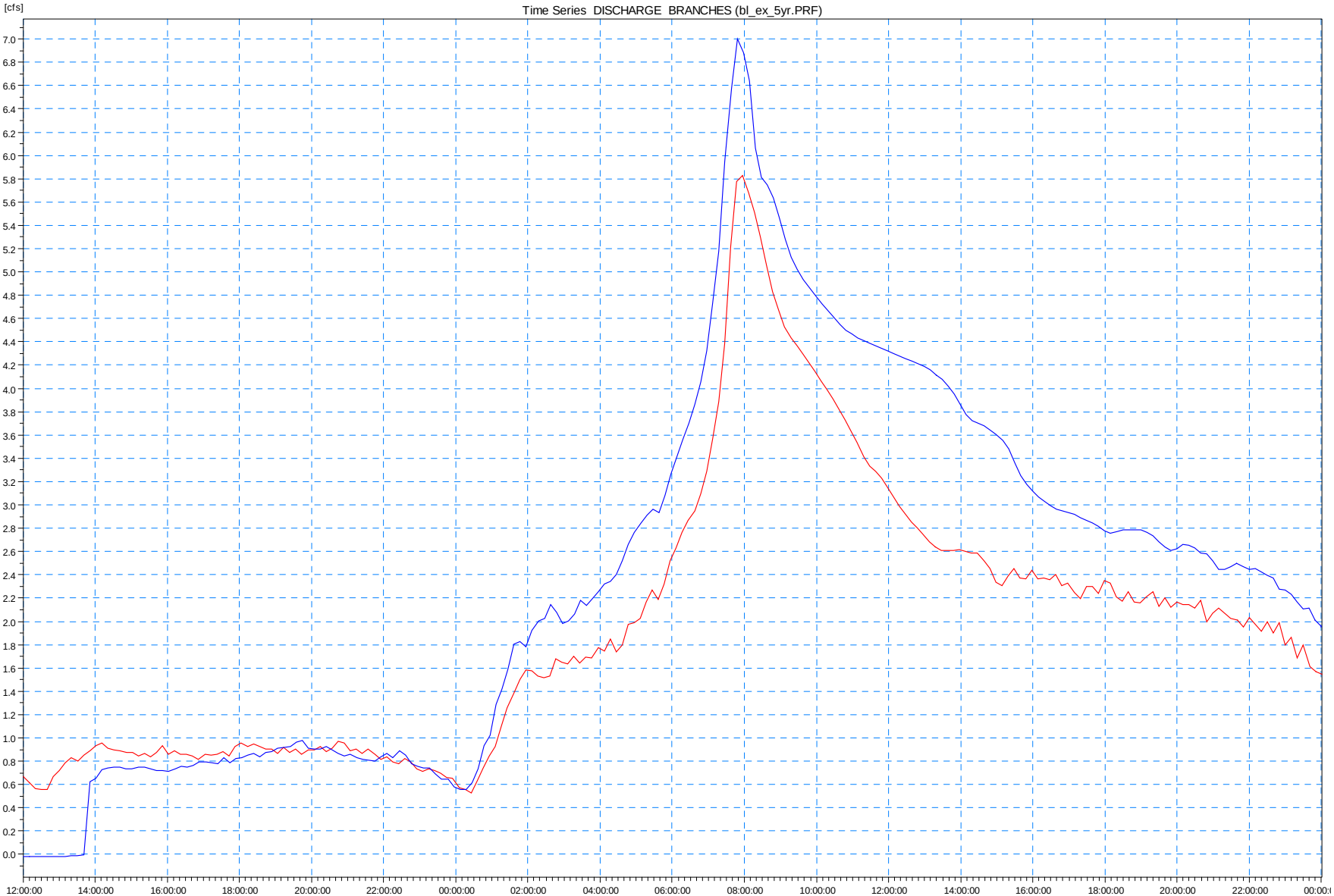
2023: 5 YEAR VS. 25 YEAR STORM (EAST)

Red = 5 Year
Blue = 25 Year



EXISTING 5 YEAR VS. 25 YEAR STORM (EAST)

Red = 5 Year
Blue = 25 Year



Appendix F

Pipe Profile During Storms for A and B Improvements

Appendix F

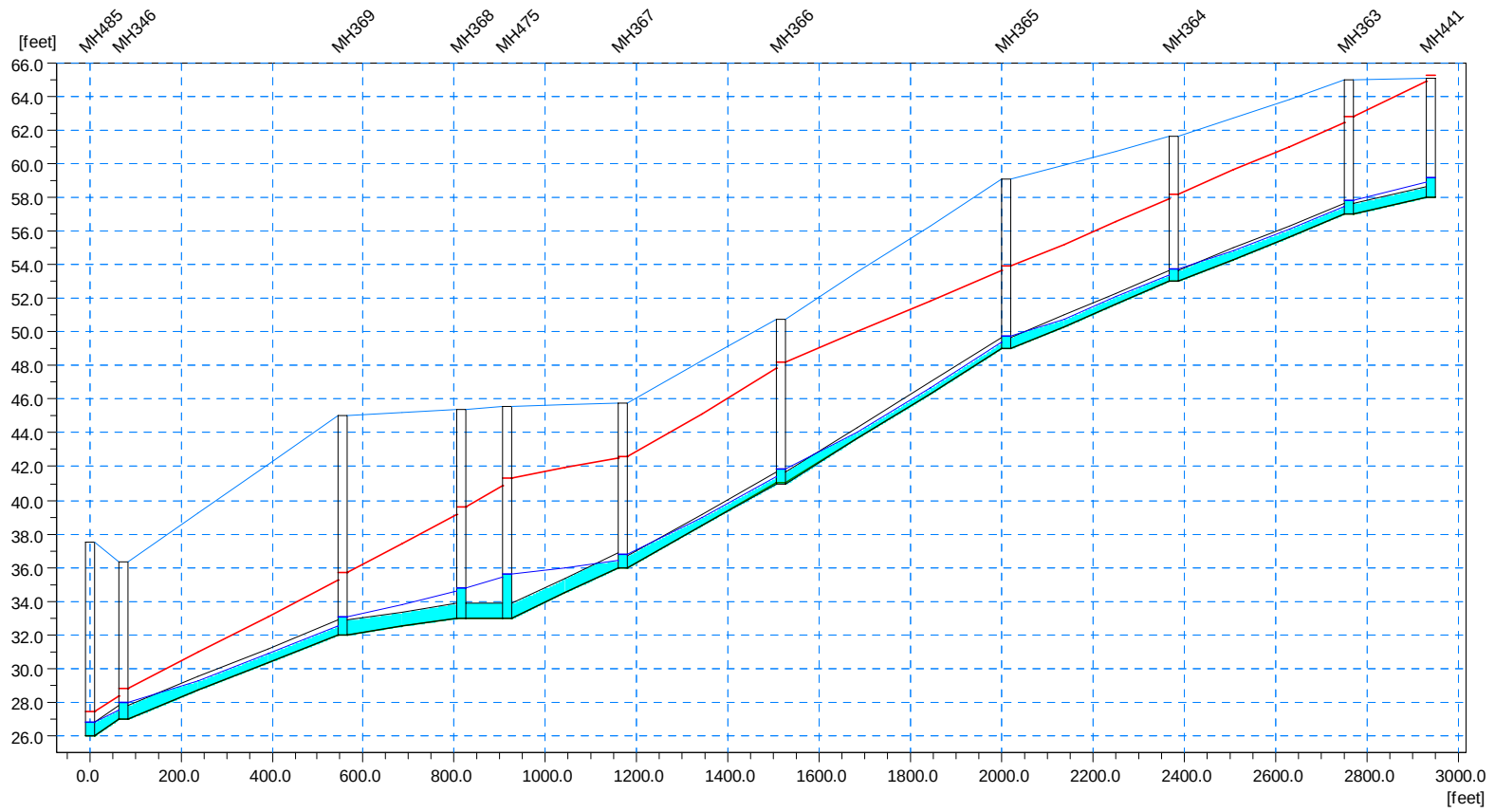
Profile A-1 without improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F

WATER LEVEL BRANCHES - 15-12-2000 10:40:55 DEF_2025_25Yr_eastbl_NoImprov.PRF

Discharge		1.651	1.651	1.652	1.043	1.043	-0.909	-0.909	-0.909	0.910	cfs



Diameter		0.83	0.83	0.83	0.83	0.67	0.67	0.67	0.67	0.67	[m]

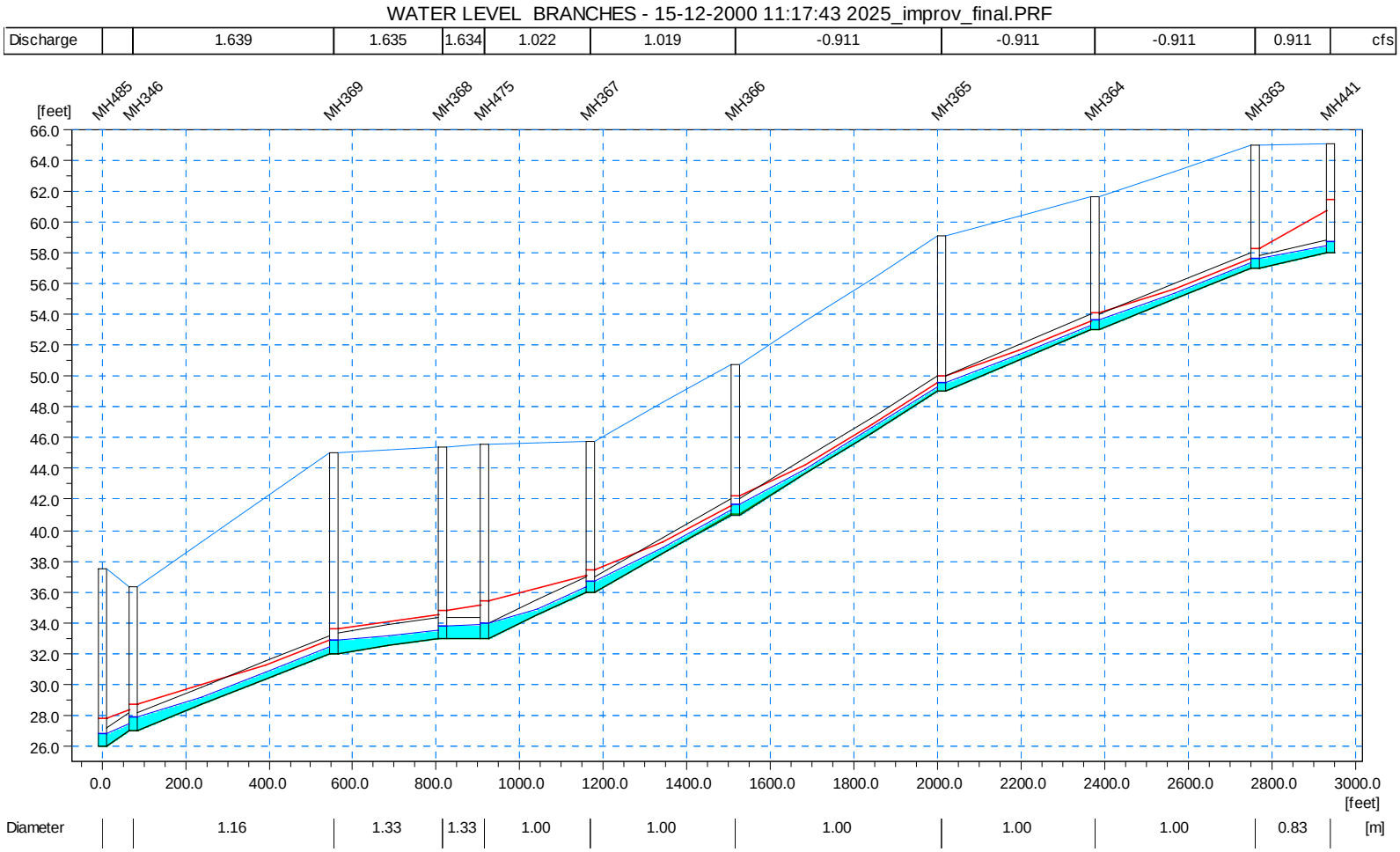
053200015

Appendix F

Profile A-1 with improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F



Appendix F

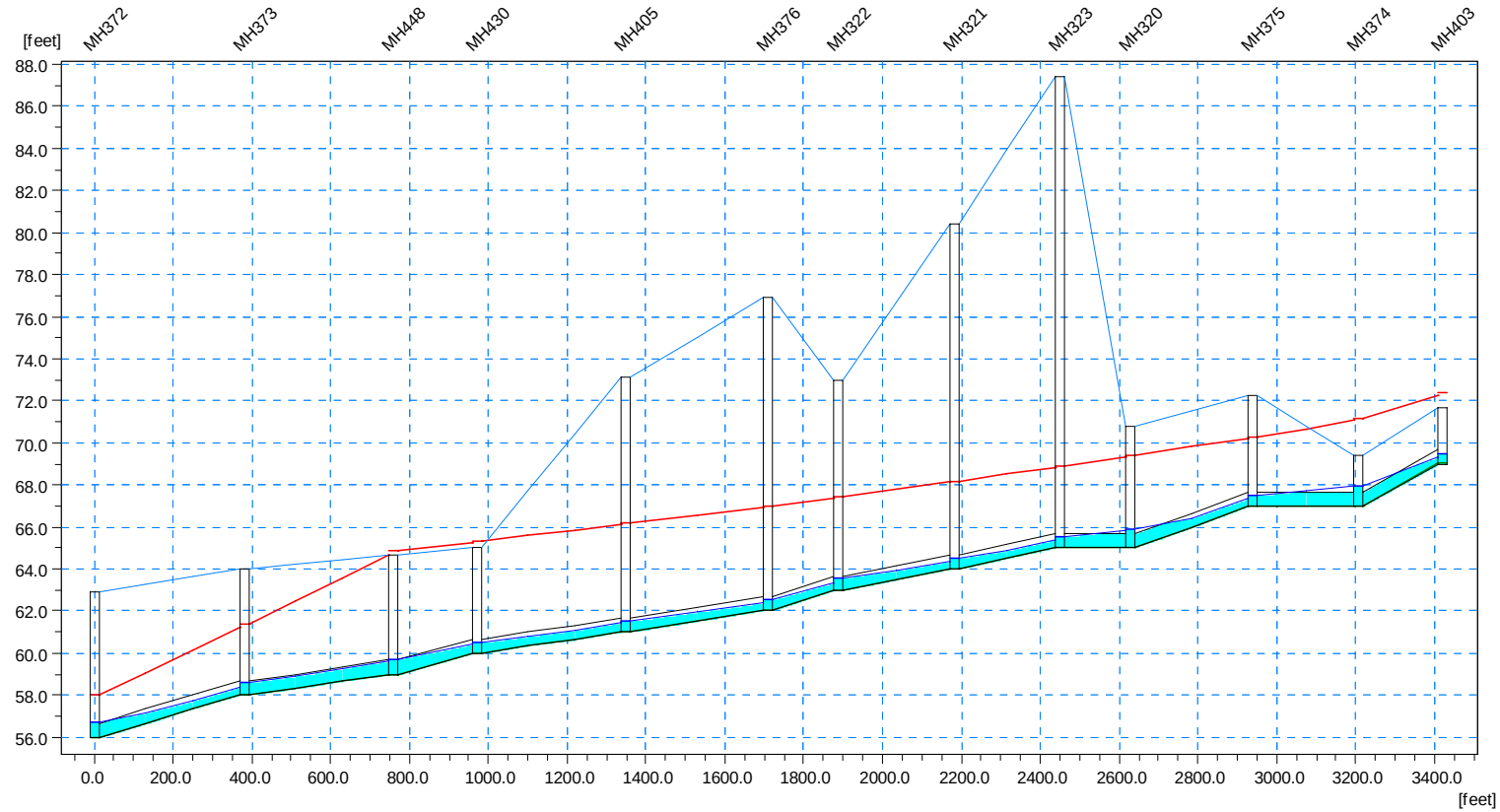
Profile A-2 without improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F

WATER LEVEL BRANCHES - 15-12-2000 20:56:25 DEF_2025_25Yr_eastbl_NoImprov.PRF

Discharge	0.612	0.613	0.468	0.468	0.467	0.466	0.466	0.465	-0.465	0.464	0.464	0.464	cfs



Diameter	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	[m]

Appendix F

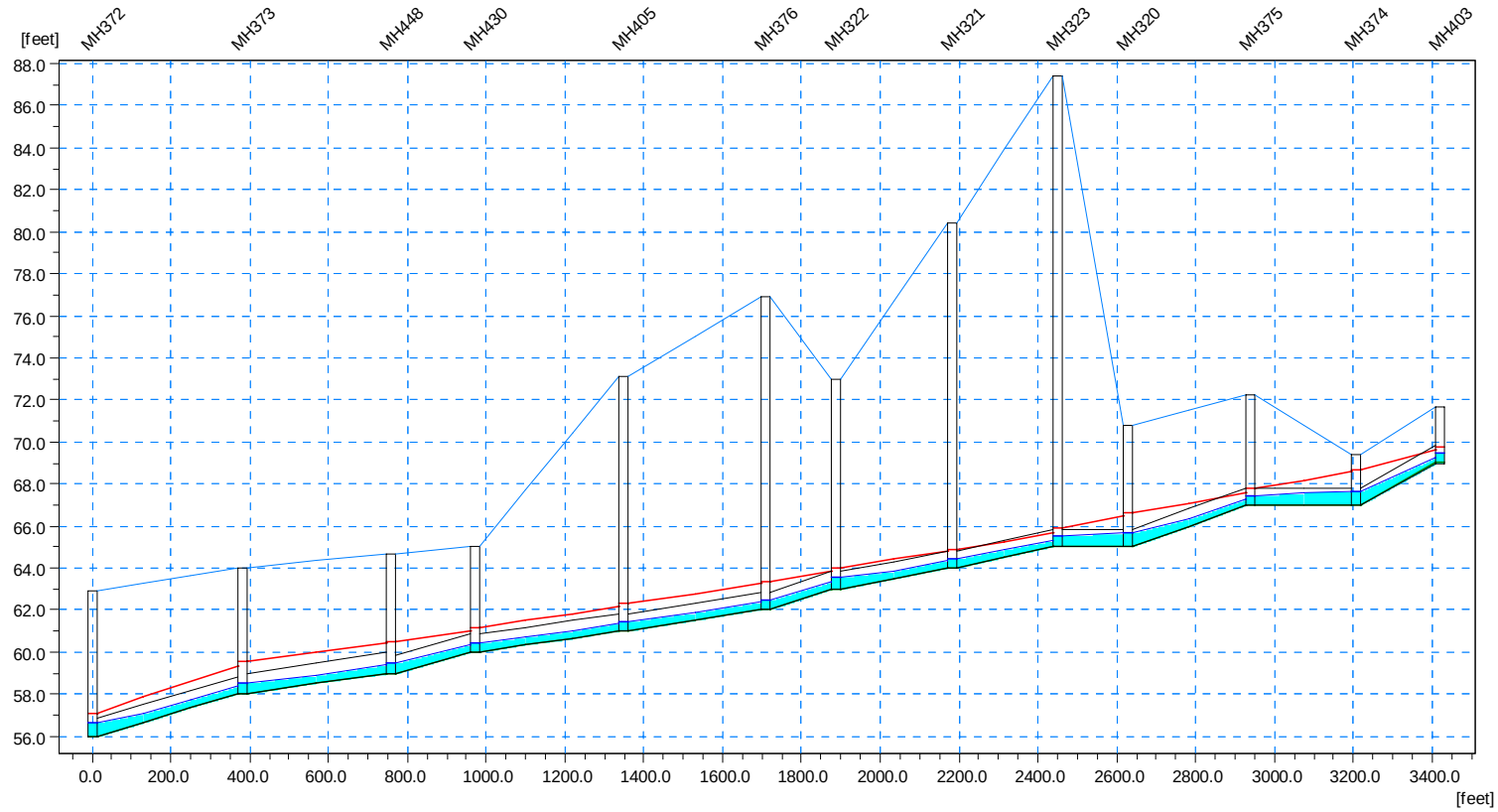
Profile A-2 with improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F

WATER LEVEL BRANCHES - 15-12-2000 10:57:37 2025_improv_final.PRF

Discharge	0.614	0.613	0.469	0.468	0.467	0.466	0.465	0.465	-0.464	0.463	0.463	0.462	cfs



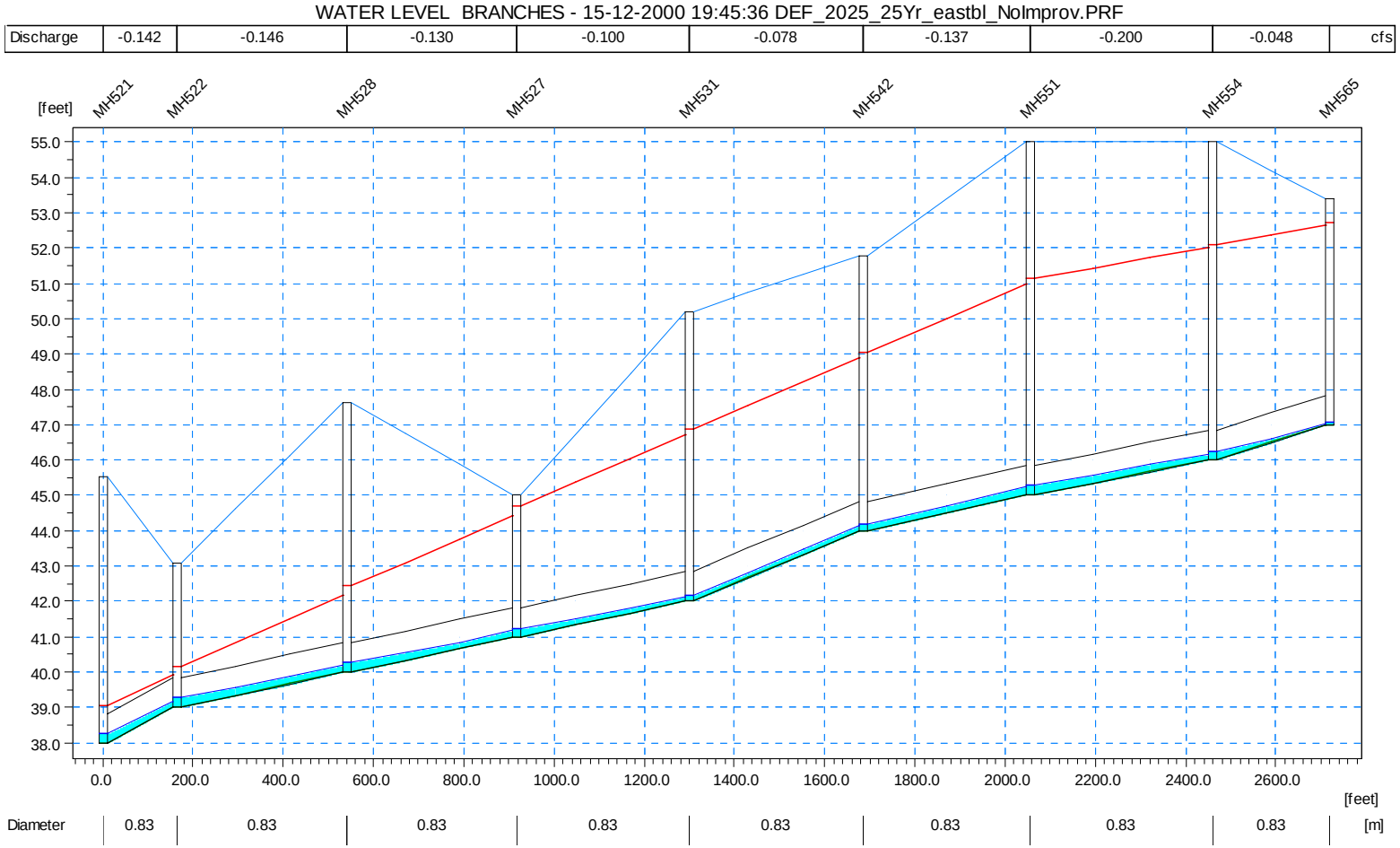
Diameter	0.83	1.00	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	[m]

Appendix F

Profile B-1 without improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F



Appendix F

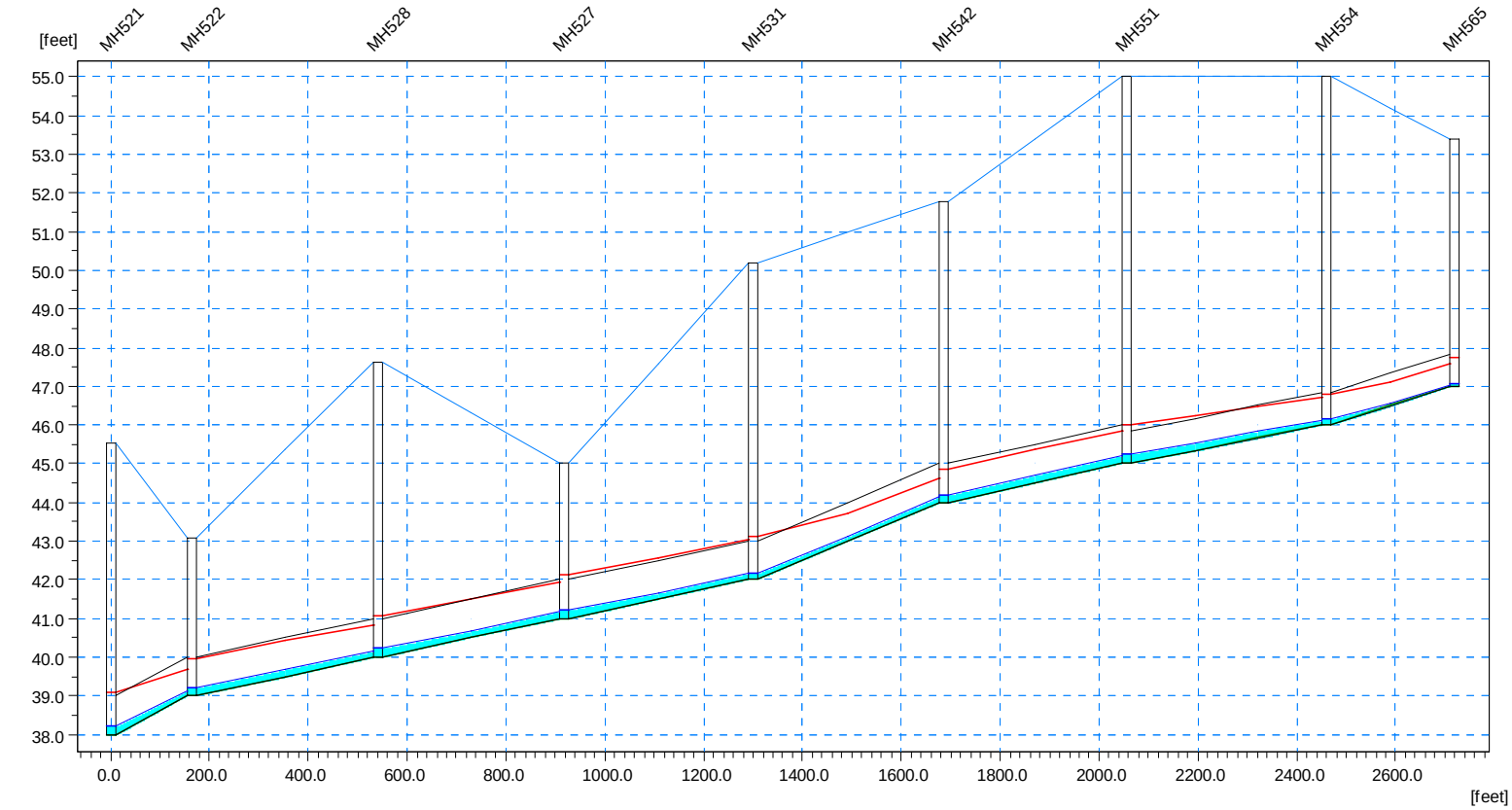
Profile B-1 with improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F

WATER LEVEL BRANCHES - 15-12-2000 11:07:39 2025_improv_final.PRF

Discharge	-0.106	-0.113	-0.122	-0.108	-0.099	-0.152	-0.132	-0.023	cfs



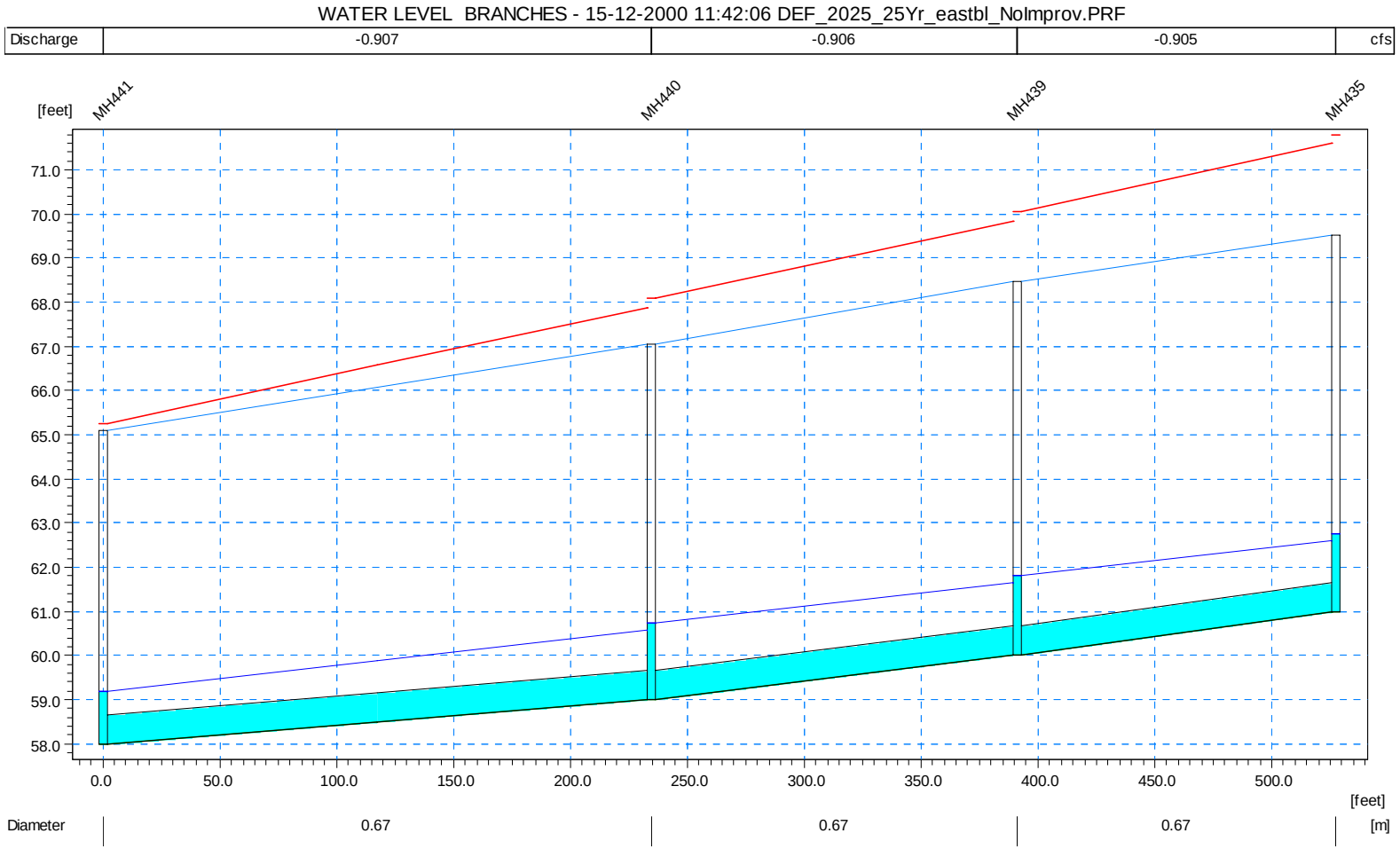
Diameter	1.00	1.00	1.00	1.00	1.00	1.00	0.83	0.83	[m]

Appendix F

Profile B-2 without improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F

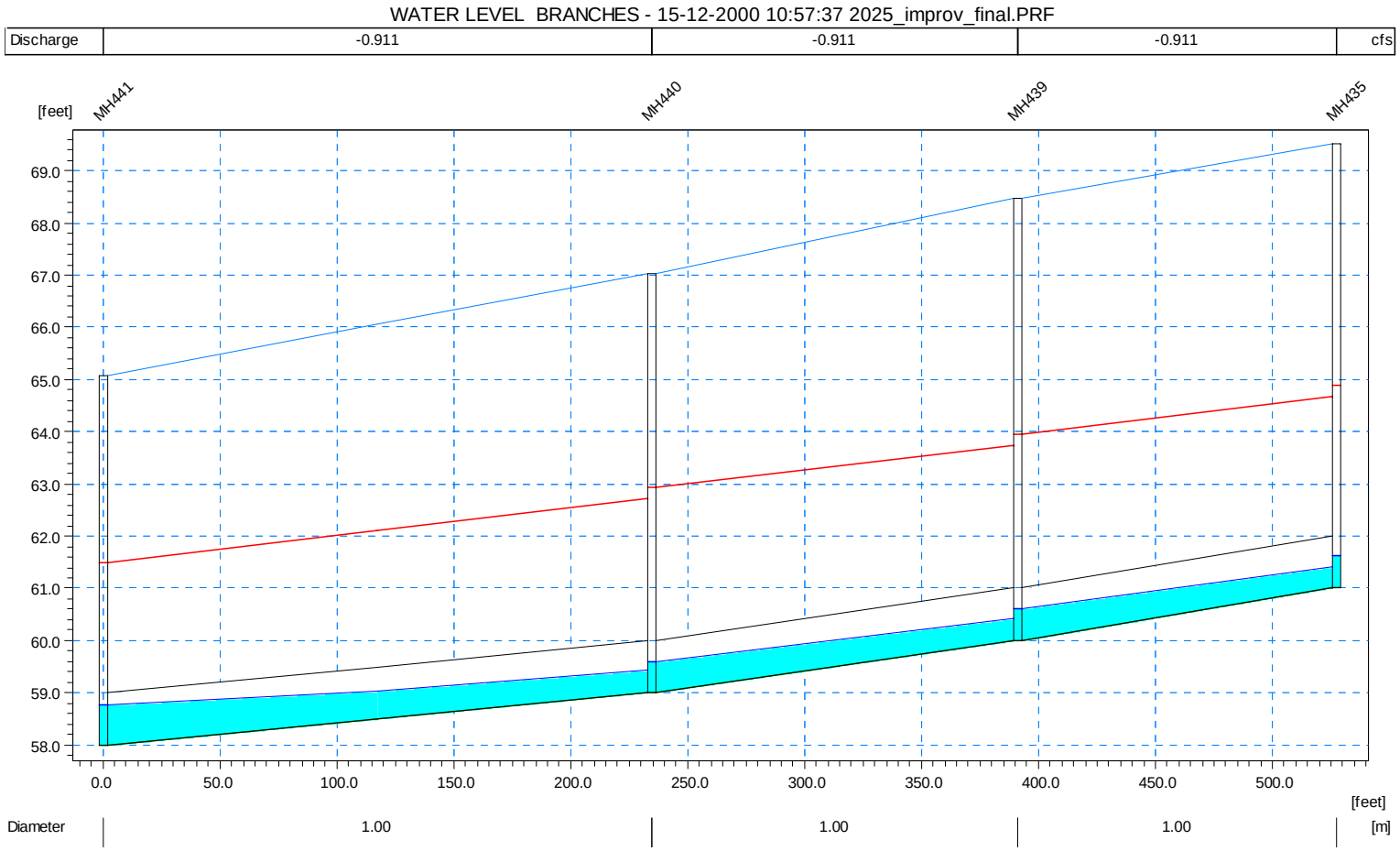


Appendix F

Profile B-2 with improvements

25yr-24hr Storm – Year 2025

Supersedes the September 2004 version of Appendix F



Appendix G

City Engineering Standards

APPENDIX G

The following table is a list of many of the City's design standards that are more stringent than the Department of Ecology's design standards as listed in the Criteria for Sewage Works Design ("Orange Book").

TABLE G-1
City Design Standards more stringent than those required by Ecology

Design Standards	Washington State Department of Ecology's Criteria for Sewage Works Design	City of Blaine Design Standards
Design Report	Section G1 4.1.3 lists general engineering requirements including those for engineering reports, facility plans and construction plans.	Section 7.03.020 addresses design standards for lift stations. This includes a design report listing several characteristics about the lift station including items such as pump data, motor data, controls, telemetry, etc…
Lift Station Construction Plans	Section G1 4.2.2, subsection C lists the required content for lift station construction plans.	Section 7.03.020 list additional requirements for lift station construction plans including a list of materials with quantity and manufacturer, and schematics related to telemetry and electrical supply. Reference is also made to Chapter 3 of the City's standard which lists general requirements for all construction plans.
Side Sewer Marking	N/A	Section 7.01.050 requires the location of all side sewers to be marked with a PVC pipe extending 2 feet above finish grade to allow for future depth measurement.
Side Sewer Minimum Diameter	N/A	Section 7.02.030 notes that side sewer diameters shall not be less than 6-inches.
Gravity Sewer Design	Section C1-3.3 notes that sewer flow design criteria shall be determined from a combination of per capita flows, and a peaking factor. Provisions are also made for approved alternative methods.	Section 7.02.020 lists per capita rates of not less than 100 gallons per day. Additionally, laterals and submain sewers, when flowing full, should be designed to carry no less than 400 gallons per capita per day of sewage. Provisions are also made in this section for the use of alternative per capita rates as approved by the Department of Public Works.
Depth	Section C1-4.2 requires a minimum sewer depth of 3 feet.	Section 7.02.030 notes a <u>typical</u> depth of 5 feet to provide sewer service by gravity, facilitate maintenance activities, and comply with vertical clearance requirements between sewers and water mains. Actual depth will be determined by existing collection system characteristics.

TABLE G-1
City Design Standards more stringent than those required by Ecology

Design Standards	Washington State Department of Ecology's Criteria for Sewage Works Design	City of Blaine Design Standards
Pipe Material	Section C1-4.8 lists several types of suitable pipe material.	Section 7.02.030 lists PVC with rubber gaskets as the pipe material for gravity sewers. Exceptions can be made for conditions which may warrant a heavier class or type of pipe. Section 7.04.030 lists PVC C900 and ductile iron as the approved pipe materials for forcemains.
Slope	Section C1-4.4 lists minimum slopes based on pipe diameter.	Section 7.02.030 lists the same slope requirements as the Orange Book, however a provision is made to allow decreased slopes where the depth of flow will be at least 0.3 times the diameter during the design average flow.
Connection to the existing system	N/A	Section 7.02.040 addresses requirements for connecting to the existing collection system including when circumstances where manhole installation will be required. Requirements are also listed for side sewer connection taps to the sewer main.
Gravity Sewer cleaning prior to testing	N/A	Section 7.02.080 requires pipes to be cleaned with a high pressure water jet or water pressure inconjunction with a rubber ball prior to pipe testing.
Gravity Sewer Testing	Section C1-5.1 requires a method of leakage testing using either air or water.	Section 7.02.080 requires a low pressure air test per Washington State Department of Transportation / American Public Works Association (WSDOT/APWA) standards for gravity sewers.
Gravity Sewer TV Inspection	Section C1-5.2 recommends a television camera inspection prior to placing a sewer in service. Reinspection of at least 50 percent of the pipe after 10 months of service is also recommended.	Section 7.02.080 allows the Public Works Director to require the contractor to conduct a television inspection after the air test has been successfully completed and before pavement restoration is performed. Requirements for television inspection are listed in this section. In addition, any taps to existing sewers will require television inspection.
Manhole Testing	Section C1-6.9 notes that infiltration or exfiltration testing for at least 3 hours should be performed. Provisions are also made for vacuum method testing.	Section 7.02.080 notes that a water test may be required for manholes. Water testing procedures are listed in this section.
Drop connections	Section C1-6.2 allows for inside drop connections provided that clearance for minimum inner diameters of manholes are maintained.	Section 7.02.050 does not allow for inside drop connections unless approved by the City Engineer.

TABLE G-1
City Design Standards more stringent than those required by Ecology

Design Standards	Washington State Department of Ecology's Criteria for Sewage Works Design	City of Blaine Design Standards
Manhole Diameter	Section C1-6.3 lists a minimum manhole diameter of 48-inches. In cases where an incoming pipe is larger than 24-inches, then the minimum manhole diameter is 54-inches.	Section 7.02.050 lists manhole diameters based on number of connecting pipes, diameter of pipes, and the angle between the pipes.
Eccentric Manhole Placement	N/A	Section 7.02.050 requires that eccentric manhole cone sections, be offset so as not to be located in the tire track of a traveled lane.
Forcemain Pressure Test	Section C2-3.7 requires that forcemains be hydrostatically tested at a minimum pressure of 50 percent above the design working pressure.	Section 7.04.110 will be tested with a hydrostatic pressure of 200 pounds for at least 4 hours.
Air/Vacuum Valves	Section C2-3.3 lists circumstances requiring the placement of air/vacuum valves.	Section 7.04.060 requires that air/vacuum valves: be located inside standard 48-inch diameter manholes or comparable utility vault, be fitted with an activated carbon canister, have vehicular access.
Blow-Off Valve	Section C2-3.4 recommends blow-off valves at low points of forcemains.	Section 7.04.070 requires provisions be made to temporarily remove the forcemain from service. If a valved tee (blow-off) at the low point of the forcemain is used, then a manhole is required to be set over the valved tee.
Forcemain Termination	Section C2-3.5 recommends a smooth transition from pressure flow to gravity flow. Protective coatings are also recommended for receiving manholes	Section 7.04.090 requires a control method such as chemical addition at the pump station or reaeration near the terminus to limit hydrogen sulfide odors. At a minimum, the manhole at the terminus and the first manhole downstream of the terrminus is required to be lined for corrosion protection.
Surge Protection	Section C2-3.9 recommends that pipe pressure tests and thrust restraint be based on maximum transient conditions with a margin of safety.	Section 7.04.050 notes that PVC is subject to failure under cyclic surge pressures. The forcemain (and surge tank if needed) shall be constructed to minimize rapid velocity changes.

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

City of Blaine, Department of Public Works, *Existing Sanitary Sewer Standards*.

Appendix H

Condition Assessment Data Entry Forms

Wastewater Collection Condition Assessment Data Entry Form

ID No.: _____

Type of Inspection: Visual ☐ CCTV ☐

Length Inspected: Upstream end: _____ m Downstream end: _____ m

Material: _____

CONDITION RANKING: 1 = best; 5 = failed

Manhole	
Steps	_____
Cracking	_____
Invert Erosion	_____
H_2S/Corrosion	_____
Drop	_____

Pipeline	
Cracking	_____
Joint Displacement	_____
H_2S/Corrosion	_____
Sags	_____
Taps	_____
Debris/Settlement	_____
Root Penetration	_____

Comments:

Inspected by: _____

Date: _____ Year: _____

Time: _____

Inspection Criteria for Pipeline		**Ranking**				
		1	**2**	**3**	**4**	**5**
Pipe Cracking	Single Pattern	Best	Fine	Apparent	Extensive	Failed
Joint Displacement		None	Appearing	Open, no infiltration	Open, with infiltration	Failed
Invert Erosion		None	Shallow scour	Apparent	Deep scour, not broken	Broken through
Sags		None	Slight sag	Obvious sag	Major sag	Excessive sag
Taps		None	Minor intrusion	Obvious intrusion	Major intrusion	Failed
Debris/Settlement		None	Siting apparent	Some Blockage, flow not retarded	Blockage, flow retarded	Totally blocked
Upstream Structure		Excellent	Slight blemishes	Obvious blemishes	Major blemishes	Failed. Poor, indicating neglect
Root Penetration		None		Medium		Neglected/ blocked

Pump Condition Assessment Form

Date_____ Assessor_____

Asset ID_____ Asset Type_____

Asset Description_____

Facility_____ Process Area_____

Operating Amps_____ Run Hours_____

Estimated Remaining Life

- ☐ <12 Months
- ☐ 1-2 Years
- ☐ 3-5 Years
- ☐ 6-10 Years
- ☐ 11-20 Years
- ☐ >20 years

	Yes	NO	N/A
Oil Ok at Inspection	☐	☐	☐
Operating at Inspection	☐	☐	☐
All Safety Equipment Present	☐	☐	☐
No Unusual Smell or Heat	☐	☐	☐
No Pump Cavitation	☐	☐	☐
No Excessive Vibration	☐	☐	☐
No Excessive Noise	☐	☐	☐

	Volts	Amps	Insulation
Line 1			
Line 2			
Line 3			

	Point 1	Point 2	Point 3	Point 4
Vibration				

Pump Condition Assessment Form

Date_____ Assessor_____

Asset ID_____ Asset Type_____

Asset Description_____

Facility_____ Process Area_____

	Rating					
(1) Overall Rating	0	1	2	3	4	5
(2) Corrosion Rating	0	1	2	3	4	5
(3) Motor Rating	0	1	2	3	4	5
(4) Bearing Rating	0	1	2	3	4	5
(5) Oil Seal Rating	0	1	2	3	4	5
(6) Electrical Rating	0	1	2	3	4	5
(7) Wear Ring Rating	0	1	2	3	4	5
(8) Structural Rating	0	1	2	3	4	5
(9) Pipe Alignment Rating	0	1	2	3	4	5
(10) Check Valve Rating	0	1	2	3	4	5
(11) Isolation Valves Rating	0	1	2	3	4	5
(12) Volt Rating	0	1	2	3	4	5
(13) Amp Rating	0	1	2	3	4	5
(14) Insulation Rating	0	1	2	3	4	5
(15) Vibration Rating	0	1	2	3	4	5

COMMENTS

Pump Station Condition Assessment Form

Date_____ Assessor_____

Asset ID_____ Asset Type_____

Asset Description_____

Facility_____ Process Area_____

Estimated Remaining Life				
	☐	<12 Months	☐	1-2 Years
	☐	3-5 Years	☐	6-10 Years
	☐	11-20 Years	☐	>20 years

	Yes	NO	N/A
Auto Shutdown Alarms Active	☐	☐	☐
Telemetry Monitoring Active	☐	☐	☐
Operating at Inspection	☐	☐	☐
All Safety Equipment Present	☐	☐	☐
No Unusual Smell or Heat	☐	☐	☐
No Pump Cavitation	☐	☐	☐
No Excessive Vibration	☐	☐	☐
No Excessive Noise	☐	☐	☐
No Missing Equipment	☐	☐	☐

COMMENTS

Pump Station Condition Assessment Form

Date_____ Assessor_____

Asset ID_____ Asset Type_____

Asset Description_____

Facility_____ Process Area_____

	Rating					
(1) Overall Rating	0	1	2	3	4	5
(2) Corrosion Rating	0	1	2	3	4	5
(3) Guide Rail Rating	0	1	2	3	4	5
(4) Lifting Equipment Rating	0	1	2	3	4	5
(5) Cover and Lid Rating	0	1	2	3	4	5
(6) Electrical Rating	0	1	2	3	4	5
(7) Security Rating	0	1	2	3	4	5
(8) Structural Rating	0	1	2	3	4	5
(9) Safety Rating	0	1	2	3	4	5
(10) Accessibility Rating	0	1	2	3	4	5
(11) Telemetry Rating	0	1	2	3	4	5

COMMENTS

Appendix I

NPDES Permit

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

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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.

Appendix J

PCHB Settlement Agreements

POLLUTION CONTROL HEARINGS BOARD
STATE OF WASHINGTON

NOOKSACK INDIAN TRIBE, Petitioners, v. CITY OF BLAINE and WASHINGTON STATE DEPARTMENT OF ECOLOGY, Respondents.	)	Case Nos. 03-060 STIPULATION AND AGREED ORDER OF DISMISSAL

Appellant Nooksack Indian Tribe ("Tribe" or "Appellant"), a federally recognized Indian tribe, by and through its representative Thomas P. Schlosser, and the Department of Ecology ("Ecology") by and through its representative Joan Marchioro of the Washington State Attorney General's Office, and the City of Blaine ("Blaine" or "City"), a municipality of the State of Washington, by and through its representative, Jonathan K. Sitkin of Chmelik Sitkin and Davis P.S., (collectively referred to herein as "Respondents") agree and stipulate to the entry of this Stipulation and Agreed Order of Dismissal in the form attached, as follows:

I. STIPULATION OF FACTS

1. The City operates the Blaine Wastewater Treatment Plant which has an outfall pipe that discharges into Semiahmoo Bay pursuant to National Pollution Discharge Elimination System ("NPDES") Permit No. WA-002264-1;

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2. The Blaine Wastewater Treatment Plant provides essential services for the residents of Blaine and surrounding communities, and the continued operation of the facility at increased capacity is necessary for the continued growth of the community;

3. The City is committed to operating the Blaine Wastewater Treatment Plant in full compliance with state and federal environmental standards and laws;

4. The Appellant filed an administrative appeal of the issuance of Permit No.WA-002264-1 with the Pollution Control Hearings Board ("PCHB");

5. The Nooksack Indian Tribe is the political successor in interest to certain tribes, bands, and groups of Indians who were parties to the Treaty of Point Elliot of January 22, 1855 (12 Stat. 927) and has a treaty protected right to take fish species in the Nooksack River and adjacent waters, including the marine waters of Puget Sound as provided in *U.S. v. Washington*, 459 F. Supp. 1020, 1041 (W.D. Wash. 1975);

6. The waters and resources of Drayton Harbor and Semiahmoo Bay serve many important ceremonial, subsistence, and commercial needs of the Tribe;

7. Drayton Harbor has been listed as the shellfish growing area with the highest fecal coliform pollution impact in Puget Sound by the Department of Health in its 2002 Annual Inventory of Commercial and Recreational Shellfish Areas, is listed as a 303(d) impaired water body due to elevated fecal coliform, and has been listed as a priority water body for water cleanup planning;

8. The shellfish harvest in Drayton Harbor has been closed by the Washington State Department of Health since 1999 due to the existence of fecal coliform at levels that exceed state water quality and health standards; and

9. The City and the Tribe are committed to ensuring the cleanup of Drayton Harbor and the restoration of the shellfish beds in Drayton Harbor that are of importance to

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the Tribe, its members, and the people of Washington through the reduction of fecal coliform found in Drayton Harbor;

10. The Tribe filed its appeal of the Permit with the PCHB on or about April 11, 2003.

II. STIPULATION

The parties wish to avoid the time and cost of further litigation of this matter and, therefore, without admitting guilt or liability or the accuracy of the facts set forth above, stipulate and agree as follows:

1. Within ninety (90) days of the PCHB's entry of this Order, the City shall submit to Ecology for review and approval an updated General Sewer Plan ("Plan"). A copy of the Plan shall also be submitted to the Tribe for comment. The Plan shall meet the requirements of WAC 173-240-050 by clearly identifying the preferred location and secondary treatment technology for replacement of the existing plant. The Plan shall also include an implementation schedule containing reasonable milestones for completion of a facility plan, environmental review, design, and construction of a replacement treatment plant.

2. The implementation schedule shall, at a minimum, include specific milestones for: (1) improvements to the wastewater conveyance system in the vicinity of Lift Station No. 1 identified in the Plan as necessary to prevent wastewater bypasses (overflows) into Drayton Harbor, and (2) other interim improvements to the system required to operate the plant in compliance with the NPDES Permit. The City shall use best efforts to implement these improvements in a timely manner and as soon as reasonably possible after receipt of approval of the Plan from Ecology. Regardless of any other terms of this

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settlement, plant replacement and interim improvements shall be implemented in a manner consistent with the 2000 Settlement Agreement between the City and the Lummi Nation.

3. The City shall comply with the dates set forth in the implementation schedule unless it has been relieved of compliance by Ecology. If it appears that the City will miss a milestone, it shall immediately inform both Ecology and the Tribe in writing, setting forth the reasons for the inability to meet the milestone. Ecology may concur that the City is justified in missing the milestone and set a new date, or it may use its enforcement authority to require compliance and/or penalize the City for noncompliance.

4. As part of the Plan, the City shall consider and review the following possible improvements for testing and treating wastewater: (1) Secondary Clarifier Improvements, including, but not limited to, modifications to influent flow distribution, the installation of internal baffles, and the optimization of the polymer feed systems; (2) prolonged Chlorine Chamber contact time that exceed Washington Department of Ecology standards; and (3) split stream alternatives for treating a portion of influent wastewater.

5. The City shall expedite repairs to the damaged effluent outfall identified during an October 2003 underwater examination. The City shall use best efforts to apply for all necessary permits to repair the outfall in a timely manner. These permits may and are anticipated to include the following: US Army Corps of Engineers Section 10/404 Permit, Washington Department of Fish & Wildlife Hydraulic Project Approval, Washington State Ecology Approval (possibly 401 certification), Washington State Department of Natural Resources Aquatic Resources Use Authorization Notification and City of Blaine Shorelines Exemption. The City shall make reasonable good faith efforts to complete repairs to the damaged effluent outfall identified during an October 2003 underwater examination within ninety (90) days of receiving required permits. The City shall make

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itself reasonably available to Tribe for status reports or updates concerning said repairs to the outfall line. Immediately upon the submission of any written status reports and updates concerning the above referenced repair to the Department of Ecology, the City shall submit a copy of such report or update to the Tribe.

6. The City will participate with the Tribe and the State Department of Health to identify prospective long-term and short-term solutions to mitigate the current shellfish closure area associated with the outfall. To help facilitate this effort, the City, in addition to the sampling required by the NPDES Permit, will continue to take monthly samples of effluent fecal coliform counts before chlorine disinfection (before contact chamber) and report this information to the State Department of Health for use in updating its CORMIX model, until such time as the State Department of Health determines that such testing is no longer necessary. For these purposes, "participate" shall mean exchange of information and regular communication with each other and the State Department of Health with regard to such shellfish and fecal coliform monitoring activities, including sampling activities.

7. The City shall promptly notify Ecology, the Tribe, and the State Department of Health in writing of any sewer overflows into Drayton Harbor.

8. In consideration of these stipulations, the Appellant agrees to dismiss its appeal with prejudice.

9. Nothing herein shall be construed to alter, limit, or otherwise affect the right of the Tribe to provide comments objecting to the Plan and/ or seek an appeal of Ecology's approval thereof consistent with RCW 34.05 and RCW 43.21B *et seq.*

10. To the extent that any aspect of this Stipulation is determined to be in conflict with any subsequent ruling or order of a court of competent jurisdiction of the

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Pollution Control Hearings Board ("Subsequent Order"), the terms and provisions of this Stipulation that are in conflict with a Subsequent Order shall be of no further force or effect, and all terms and provisions of this Stipulation that are not in conflict with a Subsequent Order shall remain in full force and effect.

11. The undersigned representatives for Ecology, the City, and the Tribe certify that they are fully authorized by the party whom they represent to enter into the terms and conditions of this Stipulation and Agreed Order of Dismissal and legally to bind such party thereto.

IN WITNESS WHEREOF, the parties agree to the provisions set forth herein as evidenced by the signatures of their authorized representatives below:

NOOKSACK INDIAN TRIBE:

By_____
Title: _____
Date: _____

_____
Thomas P. Schlosser
Attorneys for Tribe
Date: _____

CITY OF BLAINE:

By_____
Title: _____
Date: _____

_____
Jonathan K. Sitkin
Attorney for City
Date: _____

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THE DEPARTMENT OF ECOLOGY:

By_____
Title: _____
Date: _____

_____
Joan Marchioro
Attorney for Department of Ecology
Date: _____

III. AGREED ORDER OF DISMISSAL

Having reviewed the foregoing Stipulation and the file and pleadings herein, and it appearing that the parties have reached an agreement;

IT IS HEREBY ORDERED that the foregoing Stipulation is entered as an Order of this Board, and these appeals are hereby DISMISSED with prejudice and without costs or attorney's fees.

DATED this _____ day of _____, 2004.

POLLUTION CONTROL HEARINGS BOARD

_____
PHYLLIS K. MACLEOD, Presiding
Administrative Appeals Judge

_____
KALEEN COTTINGHAM, Member

_____
ROBERT V. JENSEN, Member

CHMELIK SITKIN & DAVIS P.S.
ATTORNEYS AT LAW
1500 Railroad Avenue Bellingham, Washington 98225
phone 360.671.1796 • fax 360.671.3781

Approved as to form; notice of presentation waived:

CHRISTINE O. GREGOIRE
Attorney General

_____
Joan M. Marchioro, WSBA # 19250
Assistant Attorney General
Attorneys for Respondent
Washington State Department of Ecology

Approved as to form; notice of presentation waived:

_____
Jonathan K. Sitkin, WSBA # 17604
CHMELIK SITKIN AND DAVIS P.S.
Attorneys for Respondent,
City of Blaine

Approved as to form; notice of presentation waived:

_____
Thomas P. Schlosser, WSBA #06276
Attorney for Appellant, Nooksack Indian Tribe

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POLLUTION CONTROL HEARINGS BOARD
STATE OF WASHINGTON

POINTE ON SEMIAHMOO HOMEOWNERS ASSOCIATION; AND PARTNERSHIP FOR RESPONSIBLE DEVELOPMENT;	)	PCHB NOS. 03-056
Petitioners,	)	**STIPULATION AND AGREED ORDER OF DISMISSAL**
vs.	)	
DEPARTMENT OF ECOLOGY and CITY OF BLAINE,	)	
Respondents.	)	

Petitioners Pointe on Semiahmoo Homeowners Association ("Homeowners") and Partnership for Responsible Development's ("PRD"), collectively referred to herein as the "Petitioners", by and through their representative David Mann, of Gendler and Mann, LLP; and Respondent, the Department of Ecology ("Ecology") by and through its representative Joan Marchioro of the Washington State Attorney General's Office; and Respondent, the City of Blaine ("Blaine" or "City"), a municipality of the State of Washington, by and through its representative, Jonathan K. Sitkin of Chmelik Sitkin & Davis, P.S., (collectively referred to herein as "Respondents"), agree and stipulate to the entry of this Stipulation and Agreed Order of Dismissal in the form attached, as follows:

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I. STIPULATION OF FACTS

1. The City operates the Blaine Wastewater Treatment Plant which has an outfall pipe that discharges into Semiahmoo Bay pursuant to National Pollution Discharge Elimination System ("NPDES") Permit No. WA-002264-1;

2. The Blaine Wastewater Treatment Plant provides essential services for the residents of Blaine and surrounding communities, and the continued operation of the facility at increased capacity is necessary for the continued growth of the community;

3. The City is committed to operating the Blaine Wastewater Treatment Plant in full compliance with State and Federal environmental standards and laws;

4. The Petitioner filed an administrative appeal of the issuance of Permit No.WA-002264-1 with the Pollution Control Hearings Board ("PCHB");

5. The Petitioners filed their appeal of the Permit with the PCHB (PCHB NOS. 03-056) on or about April 9, 2003.

II. STIPULATION

The parties wish to avoid the time and cost of further litigation of this matter and, therefore, without admitting guilt or liability or the accuracy of the facts set forth above, stipulate and agree as follows:

1. Within ninety (90) days of the PCHB's entry of this Order, the City shall submit to Ecology for review and approval an updated General Sewer Plan ("Plan"). A copy of the Plan shall also be submitted to the Pointe on Semiahmoo Homeowners Association ("Homeowners") and to Partnership for Responsible Development's ("PRD") for comment at the following address: 1424 Fourth Ave, Suite 1015, Seattle, WA, 98101, or such other location as Homeowners and/or PRD may elect in writing. Notice of change

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of address by Homeowners or PRD shall be delivered to the Public Works Director for the City of Blaine. The Plan shall meet the requirements of WAC 173-240-050 by clearly identifying the preferred location and secondary treatment technology for replacement of the existing plant. The Plan shall also include an implementation schedule containing reasonable milestones for completion of a facility plan, environmental review, design, and construction of a replacement treatment plant.

2. The implementation schedule shall, at a minimum, include specific milestones for: (1) improvements to the wastewater conveyance system in the vicinity of Lift Station No. 1 identified in the Plan as necessary to prevent wastewater bypasses (overflows) into Drayton Harbor, and (2) other interim improvements to the system required to operate the plant in compliance with the NPDES Permit. The City shall use best efforts to implement these improvements in a timely manner and as soon as reasonably possible after receipt of approval of the Plan from Ecology. Regardless of any other terms of this settlement, plant replacement and interim improvements shall be implemented in a manner consistent with the 2000 Settlement Agreement between the City and the Lummi Nation.

3. The City shall comply with the dates set forth in the implementation schedule unless it has been relieved of compliance by Ecology. If it appears that the City will miss a milestone, it shall immediately inform Ecology in writing, setting forth the reasons for the inability to meet the milestone. Ecology may concur that the City is justified in missing the milestone and set a new date, or it may use its enforcement authority to require compliance and/or penalize the City for noncompliance.

4. As part of the Plan, the City shall consider and review the following possible improvements for testing and treating wastewater: (1) Secondary Clarifier Improvements, including, but not limited to, modifications to influent flow distribution, the installation of

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internal baffles, and the optimization of the polymer feed systems; (2) prolonged Chlorine Chamber contact time that exceed Washington Department of Ecology standards; and (3) split stream alternatives for treating a portion of influent wastewater.

5. The City shall expedite repairs to the damaged effluent outfall identified during an October 2003 underwater examination. The City shall use best efforts to apply for all necessary permits to repair the outfall in a timely manner. These permits may and are anticipated to include the following: US Army Corps of Engineers Section 10/404 Permit, Washington Department of Fish & Wildlife Hydraulic Project Approval, Washington State Ecology Approval (possibly 401 certification), Washington State Department of Natural Resources Aquatic Resources Use Authorization Notification and City of Blaine Shorelines Exemption. The City shall make reasonable good faith efforts to complete repairs to the damaged effluent outfall identified during an October 2003 underwater examination within ninety (90) days of receiving required permits.

6. The City will participate with the State Department of Health to identify prospective long-term and short-term solutions to mitigate the current shellfish closure area associated with the outfall. To help facilitate this effort, the City, in addition to the sampling required by the NPDES Permit, will continue to take monthly samples of effluent fecal coliform counts before chlorine disinfection (before contact chamber) and report this information to the State Department of Health for use in updating its CORMIX model, until such time as the State Department of Health determines that such testing is no longer necessary. For these purposes, “participate” shall mean exchange of information and regular communication with the State Department of Health with regard to such shellfish and fecal coliform monitoring activities, including sampling activities.

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7. The City shall promptly notify Ecology and the State Department of Health in writing of any sewer overflows into Drayton Harbor.

8. In consideration of these stipulations, the Appellants (Petitioners, Homeowners and PRD) hereby agree to dismiss its appeal with prejudice.

9. Nothing herein shall be construed to alter, limit, or otherwise affect the any right, if any such right exists, of the Petitioners to provide comments objecting to the Plan and/or seek an appeal of Ecology's approval thereof consistent with RCW 34.05 and RCW 43.21B *et seq.*

10. The undersigned representatives for Ecology, the City, and the Petitioners certify that they are fully authorized by the party whom they represent to enter into the terms and conditions of this Stipulation and Agreed Order of Dismissal and legally to bind such party thereto.

IN WITNESS WHEREOF, the parties agree to the provisions set forth herein as evidenced by the signatures of their authorized representatives below:

POINTE ON SEMIAHMOO HOMEOWNERS ASSOCIATION ("HOMEOWNERS"); PARTNERSHIP FOR RESPONSIBLE DEVELOPMENT ("PRD"):

For Homeowners:

_____
By_____
Title: _____
Date: _____

For PRD:

_____
By_____
Title: _____
Date: _____

Representative for Homeowners and PRD:

_____
David Mann
Gendler & Mann, LPP
Attorneys for Petitioners
Date: _____

CHMELIK SITKIN & DAVIS P.S.
ATTORNEYS AT LAW
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CITY OF BLAINE:

_____	_____
By: Gary Tomsic	Jonathan K. Sitkin
Title: City Manager	Chmelik Sitkin & Davis P.S.
Date: _____	Attorneys for City
	Date: _____

THE DEPARTMENT OF ECOLOGY:

_____	_____
By_____	Joan Marchioro
Title: _____	Attorney for Department of Ecology
Date: _____	Date: _____

III. AGREED ORDER OF DISMISSAL

Having reviewed the foregoing Stipulation and the file and pleadings herein, and it appearing that the parties have reached an agreement;

IT IS HEREBY ORDERED that the foregoing Stipulation is entered as an Order of this Board, and these appeals are hereby DISMISSED with prejudice and without costs or attorney's fees.

DATED this _____ day of _____, 2004.

POLLUTION CONTROL HEARINGS BOARD

_____
PHYLLIS K. MACLEOD, Presiding
Administrative Appeals Judge

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Washington State Department of Ecology

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Jonathan K. Sitkin, WSBA # 17604
CHMELIK SITKIN AND DAVIS P.S.
Attorneys for Respondent,
City of Blaine

Approved as to form; notice of presentation waived:

David S. Mann, WSBA #21068
Attorney for Petitioners, Pointe on Semiahmoo Homeowners Association; Partnership for Responsible Development

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Appendix K

Public Involvement

How community values are being weighed and rated by CWAC

(Summary of CWAC Decisions on September 15, 2003)

Decision Scope

The CWAC recommendation must plan for an efficient, cost-effective wastewater treatment future for the City of Blaine in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly. The decision must be made through an alternatives evaluation process that reflects multiple community objectives to do the following.

Objectives
City of Blaine Wastewater Management System

MINIMIZE COSTS

- Minimize project cost and rate impacts

MAXIMIZE BENEFITS

Safeguard Marine Waters
- Minimize habitat disturbance for fish and wildlife
- Minimize overflows along Marine Drive
- Maximize effluent quality

36 points

Enhance Community Livability
- Maximize benefits for recreational, educational, and/or other public purposes
- Minimize adverse aesthetic impacts (blend into location, pleasing design)
- Minimize impacts to highly valued land uses
- Minimize adverse impacts to the surroundings (employs odor control and noise mitigation technologies
- Site and technology to be employed creates no differential in the impact of the plant between parts of the community

18 points

Meet Non-Tech Objectives
- Recycle treated effluent to recreational areas
- Maximize beneficial use of process by-products
- Balance issues of natural environment, social environment, and the economy (sustainable development)
- Restore the existing site as quickly as possible

11 points

Meet Growth Requirements
- Maximize opportunity for staged solution approach
- Provide seamless transition between old and new systems
- Provide opportunity for future expansion

20 points

Provide Implementable Schedule
- Minimize operating and maintenance requirements
- Minimize construction impacts on ecosystem
- Use proven technologies

15 points

Revised at the September 15th CWAC meeting to separate costs from benefits.

100 Total Benefit Points

What alternatives have been considered?

Alternatives are not listed in any priority ranking. There is no priority intended by the numbers.

Initial Alternatives

Marine Drive Alternatives

Alt. #1
Build one new plant in central Blaine on Marine Drive. Pump untreated West Blaine flow through a pipeline under the harbor entrance to the new plant and pump treated flow to the existing outfall at the site of the present wastewater treatment plant (WWTP).

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.

Alt. #3
Build one new WWTP in Central Blaine on Marine Drive, with the plant effluent being discharged through the existing outfall. Untreated West Blaine flow would be conveyed to the Birch Bay WSD WWTP for discharge.

Dakota Creek Alternatives

Alt. #4
Build one new membrane bioreactor plant with the plant effluent discharged to a shallow, freshwater outfall on Dakota Creek.

Alt. #5
Build a treatment system along one of the creeks using a more natural treatment system such as constructed wetlands, etc.

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.

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.

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.

Alt. #9
Build one new conventional plant on the West Blaine uplands and use a new deep, saltwater outfall from Birch Point. Pump untreated East Blaine flow to the new treatment plant.

Conveyance to Others Alternatives

Alt. #10
Build new lift station and force main to City of Surrey and convey Blaine wastewater to Greater Vancouver Regional District (GVRD) Annacis Island plant from new lift station in Central Blaine. Pump untreated West Blaine flow to new lift station.

Alt. #11
Separately pump East Blaine and West Blaine flow to Birch Bay for treatment in an expanded Birch Bay WWTP.

East Blaine Upland Alternatives

Alt. #12
Build one new conventional plant on the East Blaine uplands. Pump untreated West Blaine flow to Lift Station 1 and convey East and West Blaine flows to new WWTP through a new force main. Effluent would flow back across Drayton Harbor crossing for discharge at existing outfall.

Alt. #13
Build one new conventional plant in the commercial/industrial area. Pump untreated West Blaine flow to Lift Station 1 and convey East and West Blaine flows to new WWTP through a new force main. Effluent would flow back across Drayton Harbor crossing for discharge at existing outfall.

New Alternative

Alt. #14
Build one new membrane plant in the West Blaine uplands and use the existing outfall for effluent discharge. Convey untreated East Blaine flows via City of Surrey, B.C. conveyance system to GVRD's Annacis Island Treatment

Narrowed Listing

ALT 2

CWAC alternatives evaluation on September 15th narrowed the alternatives to four, but added one new alternative

ALT 6

ALT 7

ALT 10

ALT 14

Next Steps

CWAC will meet on September 24th to narrow the alternatives and begin to assign priority rating	CWAC presentation to the City Council, October 6th 5:30p.m.	Community Open House, October 8th 6–8p.m.	CWAC recommends and reviews results of Council Meeting and Open House. New meeting to be scheduled if needed.
?			
?			?
?			

179597.sp.03.04_CityofBlaine_W092003003SEA • Blaine Handout - New • 9/24/03 • mm

You Are Invited To A Community Open House

on the

City of Blaine's Wastewater Management System

October 8th, 2003

6:00 – 8:00 P.M.

New Fire Station – 9408 Odell Road

Making the right choice to address Blaine's wastewater needs.

CITY OF Blaine

Planning for the future
Providing for development
Leveraging progress already made
Protecting our water quality
Safeguarding our future

Sponsored by the Citizens' Wastewater Committee

Bonnie Onyon
Brad O'Neill
Dave Fakkema
Frank Bresnan
Geoff Menzies
Jan Hrutfiord
Jeff Green
Jim Jorgensen
Ken Raithel
Mark Henderson
Pam Christianson
Trevor Hoskins

September/October 2003

What work has already been done?

What is the process?

What considerations should guide the analysis?

What are the alternatives?

How should alternatives be rated?

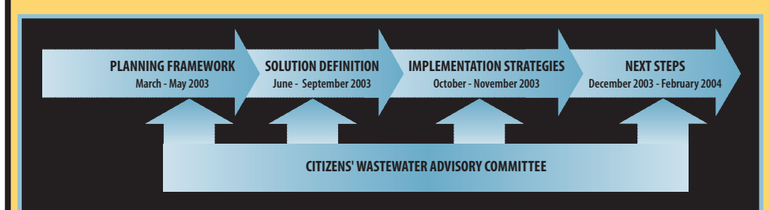
What's next?

CH2MHILL

The City of Blaine is currently evaluating options for a new wastewater treatment system. The City of Blaine's Citizens' Wastewater Advisory Committee (CWAC) wants you to be informed about their work on a recommendation to the City Council about wastewater system needs.

The CWAC is working hard to recommend a solution that best meets community needs and values.

CWAC will recommend to the City Council a preferred alternative for a future wastewater management system alternative. The CWAC may also recommend a priority rating for several alternatives. To make this recommendation, the CWAC followed a deliberative decision process that involved developing an evaluation framework to identify objectives and evaluation criteria.



The CWAC needs your input to complete its work and make a recommendation to the City Council.

If you have questions, please contact Steve Banham, Public Works Director, at 360-322-8820. All information about this project is posted on the City's website at:

www.cityofblaine.com

What have we done? Where are we going?

Meetings #1 - #2

STEP 1 **FORM & CHARTER CWAC, CONDUCT VISIONING EXERCISE TOUR**

The City of Blaine Citizens' Wastewater Advisory Committee's (CWAC) charge is to provide guidance to the Blaine City Council on future wastewater treatment.

STEP 2 **DEFINE PROJECT VISION**

The CWAC recommendation must plan an efficient, cost-effective wastewater treatment future for the City of Blaine in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly. The decision must be made through an alternatives evaluation process that reflects multiple community objectives.

Meeting #3

STEP 3 **ESTABLISH GUIDING PRINCIPLES**

Specific objectives and criteria (guiding principles) must be prepared and validated to weigh options and alternatives.

Meetings #4 - #5

STEP 4 **RATE GUIDING PRINCIPLES/WEIGH OBJECTIVES**

STEP 5 **BEGIN DISCUSSION OF ALTERNATIVES**

Community Open House — We are here

Meetings #6 - #7

STEP 6 **MAKE RECOMMENDATION TO CITY COUNCIL, PROVIDE RATIONALE FOR RECOMMENDATION**

What have we done? Where are we going?

Meetings #1 - #2

STEP 1 **FORM & CHARTER CWAC, CONDUCT VISIONING EXERCISE TOUR**

The City of Blaine Citizens' Wastewater Advisory Committee's (CWAC) charge is to provide guidance to the Blaine City Council on future wastewater treatment.

STEP 2 **DEFINE PROJECT VISION**

The decison to be made throught CWAC recomendation must plan an efficient, cost-effective wastewater treatment future for the City of Blaine in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly. The decision must be made through an alternatives evaluation process that reflects multiple community objectives.

Meeting #3

STEP 3 **ESTABLISH OBJECTIVES AND CRITERIA (GUIDING PRINCIPLES)**

Specific objectives and criteria (guiding principles) must be prepared and validated to weigh options and alternatives.

Meetings #4 - #5

STEP 4 **RATE GUIDING PRINCIPLES/WEIGH OBJECTIVES**

STEP 5 **BEGIN DISCUSSION OF ALTERNATIVES**

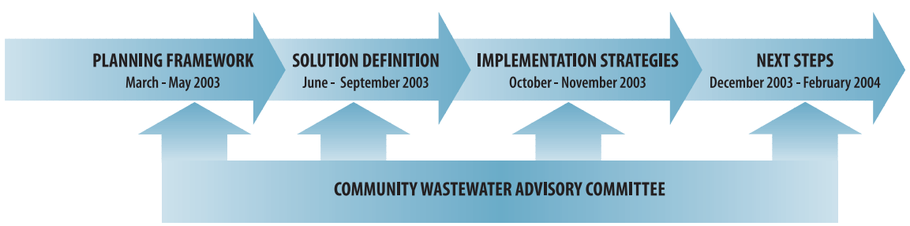
We are here

Meetings #6 - #7

STEP6 **MAKE RECOMMENDATION TO CITY COUNCIL/PROVIDE RATIONALE FOR RECOMMENDATION**

The City-Council-appointed Citizens' Wastewater Advisory Committee (CWAC) will recommend to the City Council a preferred wastewater management system alternative. The CWAC may recommend a priority rating for several alternatives. to make this recommendation, The CWAC followed a deliberative decision process that involved developing an evaluation framework to identify objectives and evaluation criteria.

The CWAC needs your input to complete its work and make a recommendation to the City Council.



Community Wastewater Management System

Help us make the right choice to address Blaine's wastewater needs.

CITY OF Blaine

Planning for the future
Providing for development
Leveraging progress already made
Protecting our water quality
Safeguarding our future

The City of Blaine's Citizens' Wastewater Advisory Committee (CWAC) wants you to be informed about their work to make a recommendation to the City Council on wastewater system needs.

The CWAC is working hard to recommend a solution that best meets community needs and values.

If you have questions, please contact Steve Banham, Public Works Director at 360-332-8820.All information about this project is posted on the City's website *www.cityofblaine.com*

August/September 2003

Inside

What work has already been done?

What is the process?

What considerations should guide the analysis?

How should alternatives be rated?

Who is serving on the Citizens' Wastewater Advisory Committee?

Bonnie Onyon
Brad O'Neill
Dave Fakkema
Frank Bresnan
Geoff Menzies
Jan Hrutfiord
Jeff Green
Jim Jorgensen
Ken Raithel
Mark Henderson
Pam Christianson
Trevor Hoskins

CH2MHILL

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How community values are being weighed and rated by CWAC

Objectives Rating & Weighting (Summary of CWAC Decisions on July 23, 2003)

Working Toward Our Water Quality Vision for the Future

Decision Scope

The decision to be made through CWAC recommendation must plan for an efficient, cost-effective wastewater treatment future for the City of Blaine in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly. The decision must be made through an alternatives evaluation process that reflects multiple community objectives to:

Fundamental Objectives (Why the Decision Is Important)

Criteria/Guiding Principles (Performance Measures)

Safeguard the Beneficial Uses of Marine Waters to Support Fish, Wildlife, and Shellfish Harvest	Protect and Enhance Community Livability	Meets Other Nontechnical Community Objectives	Meets Growth and Development Requirements in a Timely Fashion	Ensures Highest Constructibility, Operability, Reliability, and Cost-Efficiency
Minimizes habitat disturbance for fish and wildlife	Maximizes benefits for recreational, educational, and/or other public purposes	Recycles treated effluent to recreational areas	Maximizes opportunity for staged solution approach	Minimizes operating and maintenance requirements
Minimizes overflows along Maring Drive	Minimizes adverse aesthetic impacts (blends into location, pleasing design)	Maximizes beneficial use of process byproducts	Provides seamless transition between old and new systems	Minimizes construction impacts on ecosystem
Maximizes effluent quality	Minimizes impacts to highly valued land uses	Balances issues of natural environment, social environment, and the economy (sustainable development)	Provides opportunity for future expansion	Utilizes proven technologies
	Minimizes adverse impacts to the surroundings (employs odor control and noise mitigation technologies)	Restores the existing site as quickly as possible		Minimizes project cost and rate impacts
	The site and technology to be employed creates no differential in the impact of the plant between parts of the community			
31 points	**15 points**	**9 points**	**18 points**	**27 points**

This draft objective hierarchy organizes the objectives and criteria. The next task for the CWAC will be to determine how well each alternative performs against these criteria, narrow the alternatives to three, select a preferred alternative and make a recommendation to city council.

CH2MHILL

Working Toward Our Water Quality Vision for the Future

Objectives Rating & Weighting Worksheet

Decision Scope

The decision to be made must plan for an efficient, cost-effective wastewater treatment future for the City of Blaine in a manner that provides for development, leverages progress already made, protects water quality and is community friendly. The decision must be made through an alternatives evaluation process that reflects multiple community objectives to:

Fundamental Objectives (Why the Decision Is Important)

Criteria/Guiding Principles (Performance Measures)

Assign Weights (A Subjective Exercise Based on Values of the CWAC)

Protect the Natural Environment	Protect and Enhance Community Liveability	Meets Other Non-Technical Community Objectives	Meets Growth and Development Requirements in a Timely Fashion	Ensures Highest Constructibility, Operability, Reliability and Cost-Efficiency
Eliminates the force main as a conveyance system of untreated sewage under a waterbody	Maximizes benefits for recreational, educational and/or other public purposes	Recycles treated effluent to recreational areas	Maximizes opportunity for staged solution approach	Minimizes operating and maintenance requirements
Maximizes compatibility with shellfish harvest	Minimizes adverse aesthetic impacts (blends into location, pleasing design)	Maximizes beneficial use of process byproducts	Provides seamless transition between old and new systems	Minimizes construction impacts on ecosystem
Minimizes habitat disturbance for fish and wildlife	Minimizes impacts to highly valued land uses	Balances issues of natural environment, social environment and the economy (sustainable development)	Provides opportunity for future expansion	Utilizes proven technologies
Minimizes overflows along Maring Drive	Minimizes adverse impacts to the surroundings (emplys odor control and noise mitigation technologies)	Restores the existing site as quickly as possible		Minimizes project cost and rate impacts
Maximizes effluent quality	The site and technology to be employed creates no differential in the impact of the plant between parts of the community			
Safeguards the waters of Drayton Harbor				
points	points	points	points	points

We will use the results of the Decision Tool (Applying Rates & Weights) to determine the overall measure of performance of the alternatives

CH2MHILL

W072003002PDX 179597.SP.06.02 7/21/2003 kk

Helpful Information For Thinking About and Ensuring the Validity of the Structured Decision Process

The Objectives Hierarchy

1. Do the objectives include all the important aspects of the decision to be made?
2. Do the objectives represent the essential reasons for the community's interest in the issue?
3. Can the objectives and criteria be used to differentiate between alternatives?
4. Are the objectives well defined, understandable, and inclusive?
5. Are the objectives non-redundant to avoid double counting a value?
6. Are the objectives independent so performance of alternatives against different objectives are measures independently?

Criteria/Guiding Principles (Performance Measures)

Are the ratings accurate?

Weighting the Objectives

The process of weighting reflects that objectives may be more, less, or of equal importance. Lesser weighted objectives still factor in the decision.

Working Toward Our Water Quality Vision for the Future

CH2MHILL

W07200300 2PDX 179597 SP06.02 7/21/2003 kk

CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward Our Water Quality Vision for the Future

MEETING ROADMAP

Meeting #1 - #2

STEP 1 **FORM & CHARTER CWAC, CONDUCT VISIONING EXERCISE TOUR**

The City of Blaine Citizen's Wastewater Advisory Committee's (CWAC) charge is to provide guidance to the Blaine City Council on future wastewater treatment.

Meeting #3

DRAFT

STEP 2 **DEFINE PROJECT VISION**

The City of Blaine's Wastewater System Planning Vision is to plan for the future in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly.

STEP 3 **ESTABLISH OBJECTIVES AND CRITERIA (GUIDING PRINCIPLES)**

Specific objectives and criteria (guiding principles) must be prepared and validated to later weigh options and alternatives.

Meeting #4 - #5

STEP 4 **DETERMINE HOW WELL EACH ALTERNATIVE AND/OR TECHNOLOGY PERFORMS AGAINST THE OBJECTIVES AND CRITERIA/WEIGHT OBJECTIVES**

Meeting #6

STEP 5 **MAKE RECOMMENDATION TO CITY COUNCIL/PROVIDE RATIONALE FOR RECOMMENDATION**

The CWAC report will identify the objectives more or less important to determine which alternative most strongly manifests the committee's values.

CH2MHILL

W072003002PDX 179597.SP.06.02 7/7/2003 kk

CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward Our Water Quality Vision for the Future

MEETING ROADMAP

Define Project Vision

The City of Blaine's Wastewater System Planning Vision is to plan for the future in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly.

W072003002PDX 179597.SP.06.02 7/7/2003 kk

CH2MHILL

CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward Our Water Quality Vision for the Future

Objectives Drafted July 8, 2003 and revised by CWAC input July 17, 2003

(Subject to Change at the July 23, 2003 CWAC Meeting)

OBJECTIVES

- Protect the Natural Environment
- Protect and Enhance Community Liveability
- Meets Other Non-Technical Community Objectives
- Meets Growth and Development Requirements in a Timely Fashion
- Ensures Highest Constructibility, Operability, Reliability and Cost-Efficiency

CRITERIA (there is no prioritization intended or implied in the following listing)

Protect the Natural Environment

- Eliminates the force main as a conveyance system of untreated sewage under a waterbody
- Maximizes compatibility with shellfish harvest
- Minimizes habitat disturbance for fish and wildlife
- Minimizes overflows along Maring Drive
- Maximizes effluent quality
- Safeguards the waters of Drayton Harbor

Protect and Enhance Community Liveability

- Maximizes benefits for recreational, educational and/or other public purposes
- Minimizes adverse aesthetic impacts (blends into location, pleasing design)
- Minimizes impacts to highly valued land uses
- Minimizes adverse impacts to the surroundings (emplys odor control and noise mitigation technologies)
- The site and technology to be employed creates no differential in the impact of the plant between parts of the community

Meets Other Non-Technical Community Objectives

- Recycles treated effluent to recreational areas
- Maximizes beneficial use of process byproducts
- Balances issues of natural environment, social environment and the economy (sustainable development)
- Restores the existing site as quickly as possible

Meets Growth and Development Requirements in a Timely Fashion

- Maximizes opportunity for staged solution approach
- Provides seamless transition between old and new systems
- Provides opportunity for future expansion

Ensures Highest Constructibility, Operability, Reliability and Cost-Efficiency

- Minimizes operating and maintenance requirements
- Minimizes construction impacts on ecosystem
- Utilizes proven technologies
- Minimizes project cost and rate impacts

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CITY OF *Blaine*

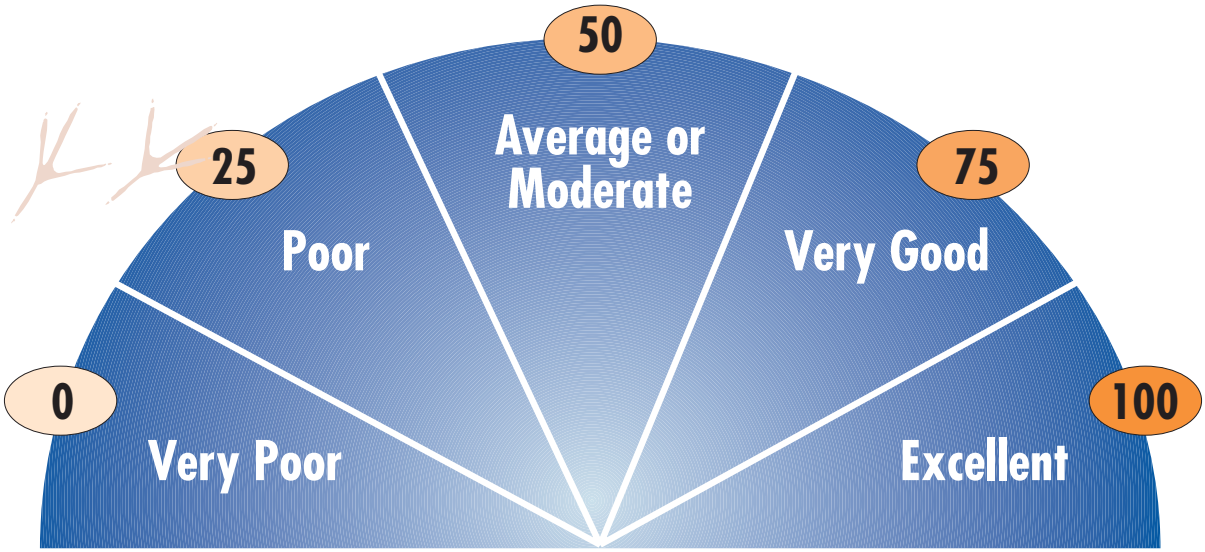
Citizen's Wastewater Advisory Committee (CWAC)

Working Toward Our Water Quality Vision for the Future

MEETING ROADMAP

Rating the Alternatives Based on the Objectives and Criteria (Guiding Principles) (Meetings 4 & 5)

- **Think about a 0 to 100 scale in this context**
- **We will use this scale to rate the performance of each alternative based on the underlying criteria**
  - provide pros and cons from the professional experience of project engineers
  - consider CWAC input/discussion
  - CWAC will provide an overall rating which characterizes these results using the scale- from poor to excellent



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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward Our Water Quality Vision for the Future

MEETING ROADMAP

Weighing Objectives: Determining the Relative Importance of Objectives and Criteria

Some of the objectives in your objectives hierarchy may be more or less important than others- based on your values.

Obviously different people faced with the same problem have different values and, therefore, a different sense about what is most important.

Weights are assigned to objectives to reflect this fact. It is important to note that this process should not be interpreted as some things are important while others are not. Rather, the process reflects that all objectives are important to the decision, but some objectives may be more, less, or equally important to others.

This step helps ensure that the process is aligned with community values. It will determine the performance of each alternative, factoring in criteria scores and weighing of each objective.

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward Our Water Quality Vision for the Future

MEETING ROADMAP

Recommendation to City Council

This approach produces a valid decision process that explains the objectives, rating and weighing process and is based on the good intentions of the CWAC.

The information will be accurate, complete and explainable.

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

The Purpose and Charge of the Blaine Citizens Wastewater Advisory Committee

Adopted by the Committee on May 28, 2003

The purpose and charge of the Blaine Citizen's Wastewater Advisory Committee (CWAC) is to provide guidance to the Blaine City Council on future wastewater treatment for the City of Blaine. Specifically, the Committee will work to fulfill this purpose by:

- Providing ongoing communication and input for the duration of the project
- Assisting in outreach for the siting project to ensure that stakeholders in Blaine have the information and opportunity to participate in the siting project
- Ranking in order of preference, preferred treatment solutions (including siting considerations) that represent the best interests of the City of Blaine given the Committee'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, such as trails, landscape design, interpretative and other visual concepts (especially those facilities located in Blaine)
- Serving as an advocate for the project and the process in external communications and organizations

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Site Evaluation Feedback - SITE 1

This site evaluation continues the exploration that was initiated on May 28, 2003. The critical thinking generated by the tour will allow the CWAC to review and refine the possibilities.

What opportunities did you see to change the overall image of the site?

☐ Positive ☐ Negative

How would you characterize the overall opportunities for a wastewater treatment facility on the site?

☐ Positive ☐ Negative

What other opportunities did you perceive? Please record your ideas regarding the issues and/or the character of the area.

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Site Evaluation Feedback - SITE 1 (continued)

This site evaluation continues the exploration that was initiated on May 28, 2003. The critical thinking generated by the tour will allow the CWAC to review and refine the possibilities.

What aspects of the plants you saw in "Good Neighbors: The New Face of Wastewater Treatment" could be included, adapted, or enhanced?

Are there aspects of the City of Blaine's social, cultural, and historical connections that tie the site to the community that could be enhanced/dimished if a facility were to be sited at this location?

What visions/goals do you have for the City of Blaine that will be fulfilled/enhanced at this site? Could a wastewater treatment facility be compatible with these visions/goals?

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Site Evaluation Feedback - SITE 2

This site evaluation continues the exploration that was initiated on May 28, 2003. The critical thinking generated by the tour will allow the CWAC to review and refine the possibilities.

What opportunities did you see to change the overall image of the site?

☐ Positive ☐ Negative

How would you characterize the overall opportunities for a wastewater treatment facility on the site?

☐ Positive ☐ Negative

What other opportunities did you perceive? Please record your ideas regarding the issues and/or the character of the area.

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Site Evaluation Feedback - SITE 2 (continued)

This site evaluation continues the exploration that was initiated on May 28, 2003. The critical thinking generated by the tour will allow the CWAC to review and refine the possibilities.

What aspects of the plants you saw in "Good Neighbors: The New Face of Wastewater Treatment" could be included, adapted, or enhanced?

Are there aspects of the City of Blaine's social, cultural, and historical connections that tie the site to the community that could be enhanced/dimished if a facility were to be sited at this location?

What visions/goals do you have for the City of Blaine that will be fulfilled/enhanced at this site? Could a wastewater treatment facility be compatible with these visions/goals?

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Site Evaluation Feedback - SITE 3

This site evaluation continues the exploration that was initiated on May 28, 2003. The critical thinking generated by the tour will allow the CWAC to review and refine the possibilities.

What opportunities did you see to change the overall image of the site?

☐ Positive ☐ Negative

How would you characterize the overall opportunities for a wastewater treatment facility on the site?

☐ Positive ☐ Negative

What other opportunities did you perceive? Please record your ideas regarding the issues and/or the character of the area.

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Site Evaluation Feedback - SITE 3 (continued)

This site evaluation continues the exploration that was initiated on May 28, 2003. The critical thinking generated by the tour will allow the CWAC to review and refine the possibilities.

What aspects of the plants you saw in "Good Neighbors: The New Face of Wastewater Treatment" could be included, adapted, or enhanced?

Are there aspects of the City of Blaine's social, cultural, and historical connections that tie the site to the community that could be enhanced/dimished if a facility were to be sited at this location?

What visions/goals do you have for the City of Blaine that will be fulfilled/enhanced at this site? Could a wastewater treatment facility be compatible with these visions/goals?

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

Preparation for Meeting No. 3

STEP 1 **FORM CWAC**

The City of Blaine Citizen's Wastewater Advisory Committee's (CWAC) charge is to provide guidance to the Blaine City Council on future wastewater treatment.

STEP 2 **DEFINE PROJECT VISION**

DRAFT

The City of Blaine's Wastewater System Planning Vision is to plan for the future in a manner that provides for development, leverages progress already made, protects water quality, and is community friendly.

STEP 3 **ESTABLISH OBJECTIVES AND GUIDING PRINCIPLES**

Specific objectives and guiding principles must be prepared and validated to weigh options and alternatives.

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CITY OF *Blaine*

Citizen's Wastewater Advisory Committee (CWAC)

Working Toward the Water Quality Vision for the Future

The following steps have been determined to assist the CWAC in making a recommendation.

1. Develop Vision
2. Identify Objectives
3. Refine Objectives with Criteria
4. Determine how well each alternative and/or technology performs against the criteria
5. Determine the relative importance of the objectives and criteria
6. Compare the alternatives based on the objectives and criteria
7. Make a recommendation

For the next meeting, please identify the objectives that you think the project vision should achieve. The objectives will be discussed at our July 8 meeting.

- Provide Water Quality Benefit (DRAFT)
- Protect the Natural Environment (DRAFT)
- Protect and Enhance the Historic and Cultural Environment (DRAFT)
- Ensure Constructability and Operability (DRAFT)
- Minimize Rate Impacts/ Project Cost (DRAFT)

Please provide your ideas for project objectives in the spaces below. Use the draft ideas above as a guide but do not be constrained by the draft ideas.

Please email a list of your objectives to Bev Kittel at bkittel@ca.blaine.wa.us by July 2, 2003.
If you like the objectives above, please let us know.

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Blaine

Blaine Citizens Advisory Committee Purpose and Charge

The purpose and charge of the Blaine Wastewater Treatment Plant Citizens Advisory Committee is to provide guidance to the Blaine City Council on wastewater treatment for the City of Blaine. Specifically, the Committee will work to fulfill this purpose by:

- Providing ongoing communication and input for the duration of the project
- Assisting in outreach for the siting project to ensure that stakeholders in Blaine have the information and opportunity to participate in the siting project

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Blaine

- Ranking in order of preference, preferred treatment plant locations that represent the best interests of the City of Blaine given the Committee's assessment of community values and guiding principles for site location

- 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, such as trails, landscape design, interpretative and other visual concepts (especially those facilities located in Blaine)

- Serving as an advocate for the project and the process in external communications and organizations

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Blaine

The Committee will work to accomplish this mission by:

- Providing ongoing communication and input for the duration of the project
- Recommending an aesthetically pleasing, community-friendly project that supports community values such as trails, landscape considerations, and interpretative facilities (for example as reuse garden, education center, water features, wetlands, and other visual concepts).
- Ranking in order of preference, preferred treatment plant locations that represent the best interests of the City of Blaine

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Blaine

Roles and Responsibilities

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Blaine

To effectively implement the Project, Citizens Advisory Committee members agree that the project must integrate different backgrounds, perspectives, and expertise.

Comittee members agree to:

- Participate in the four meetings/workshops to provide input and recommendations
- Recognize each other's expertise as a resource
  - Speak one at a time
  - Be courteous
  - Ask questions to seek to understand
- Respect that each person's perspective is valid for them and hence for the group
- Recognize that differences of opinion need to be understood, not argued
- Give unconditional respect to others, staff, consultants

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Blaine

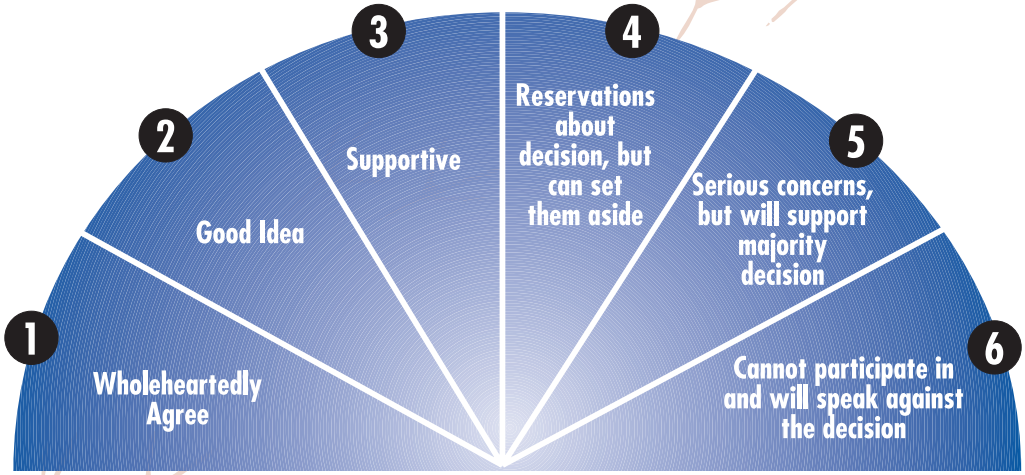
The role of the facilitators is to support the group to think together in our search for innovative, community-based solutions by:

- Providing ideas and images to stimulate discussion
- Encouraging full participation
- Cultivating shared understandings of the best future for the City
- Helping the group stick to a schedule and produce a result
- Building a supportable recommendation

Blaine

How Will Recommendations Be Made and Conflicts Be Resolved?

- Voting
- Minority/Majority Reports
- Consensus—or aim for consensus by moving toward general agreement through a process of working together



The Citizens Advisory Committee agrees that once recommendations are made, they will be shared and supported. The Citizens Advisory Committee agrees to make the best possible recommendation given each committee member's evaluation of the information and community values.

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CWAC Members
Bonnie Onyon
Frank Bresnan
Pam Christianson
Dave Fakkema
Jeff Green
Mark Henderson
Jan Hrutfiord
Jim Jorgensen
Geoff Menzies
Brad O'Neill
Ken Raithel
Gary Tomsic
Trevor Hoskins

Appendix L

Fact Sheets for Wastewater Treatment Alternatives

DRAFT Fact Sheet: Alternative 13 (WWTP in Blaine Commercial/Industrial Area)

Overview of Alternative

Wastewater from both East and West Blaine would be treated at a new WWTP in the commercial/industrial area of the City.

Site Location

The new WWTP would be located in the general area east of Peace Portal Drive, west of City limits, south of Pipeline Road, and north of Dakota Creek.

Site Size (approximate)

Total land area for the new WWTP would be approximately 6 to 10 acres, depending on land availability.

General Treatment Technology Attributes and Assumptions

The new treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use conventional activated sludge technology. The mix of commercial, industrial, and residential land uses in the vicinity means that odor control would be required.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1. From here, it would be pumped along Marine Drive and Peace Portal Drive to the new WWTP. Influent wastewater from West Blaine would be pumped from a new pump station at the site of the existing WWTP to the end of Semiahmoo Spit and across Drayton Harbor through the existing submarine pipeline. At Lift Station 1, the West Blaine flow would be combined with the East Blaine flow in the new Peace Portal Drive force main. Treated effluent from the new WWTP would be pumped to the existing outfall for discharge. The effluent pipeline route would be the same as the influent pipeline route. A new pipeline to carry effluent across Drayton Harbor may be required if existing abandoned water pipelines across the harbor mouth are not suitable for reuse.

Conveyance Requirements

- Improvements to Lift Station 1 (including capacity expansion and development of equalization storage)
- New lift station at site of existing WWTP
- New pipeline from existing WWTP to Lift Station 1
- New force main from Lift Station 1 to new WWTP

- New effluent pipeline from new WWTP to existing outfall (potentially including a new submarine crossing of Drayton Harbor mouth)

Timeline for Implementation

How long would this alternative take to be planned, approved, permitted, and built?

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year (2004)
- Design and permitting: 18 months (2005-06)
- Construction and startup: 18 months (2006-07)
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years; a significant schedule variable would be the potential need for a new Drayton Harbor pipeline crossing, which could add up to a year to the schedule

Protection of the Natural Environment

Discharge Location

This alternative would use the existing outfall to discharge into Semiahmoo Bay.

Effluent Water Quality

The new activated sludge plant would produce an effluent that would meet or exceed the City's current NPDES permit standards.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use to carry untreated sewage from East Blaine, as it does currently. Construction of a second pipeline to carry treated effluent may also be needed unless existing abandoned pipelines beneath the harbor mouth can be reused.

Other Environmental/Permitting Considerations

- This area of Blaine includes several Class 2 and extensive Class 3 wetlands. Final site identification and facility layout would avoid wetlands to the greatest extent possible.
- Much of the siting area is located within the aquifer recharge zone for the City's drinking water supply. This would necessitate that the WWTP be designed and built with adequate containment and spill control measures to prevent any potential for wastewater to enter the drinking water supply.

- Influent and effluent pipelines along Peace Portal Drive would pass next to Class 3 wetlands in up to four areas. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands could occur.
- Although it does not change operations from existing conditions, continued use of the line across Drayton Harbor for conveyance of sewage may be perceived by permitting agencies and concerned citizens as a potential threat to water quality in the harbor should the line develop leaks in the future.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses in the site area include commercial and industrial development, residential development, and vacant land.

Comprehensive Plan/Zoning Designation

Land east of I-5 in the site area is zoned for manufacturing; between I-5 and Peace Portal Drive, most land is designated for commercial use. West of Peace Portal Drive, this area is zoned for low-density residential development.

Potential Amenities and/or Benefits

A WWTP site in this location would be fairly centrally located and accessible. It could be developed with a multipurpose community facility or with interpretive displays on water quality.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Secondary effluent from the treatment plant could be used for industrial cooling if potential users in the vicinity of the site are identified.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. Onsite solutions such as composting probably may not be feasible because of the site's location within a relatively developed area, but digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it involves a single new plant, this alternative does not offer potential for phasing. However, permanent storage for peak flows could be constructed at the current site of Lift Station 1 at any time prior to WWTP construction to alleviate peak flow conditions at the existing WWTP.

Opportunity for Future Expansion

The potential for expansion at this location depends primarily on how large a site the City is able to acquire. Expansion beyond 20 years would require enough space to maintain an adequate buffer from residential uses even after the facility was enlarged. Because flows beyond 20 years are not known, it is difficult to predict what an optimum site size would be to allow for expansion, but an area of 10 to 20 acres would be desirable.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States.

Operation and Maintenance Complexity

Conventional activated sludge facilities are relatively easy to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plant, other funding sources could also be applicable, such as funding for reclaimed water system development.

DRAFT Fact Sheet: Alternative 12 (East Blaine WWTP)

Overview of Alternative

Wastewater from both East and West Blaine would be treated at a new WWTP located in East Blaine.

Site Location

The new WWTP would be located in the approximate area east of 14th Street, north of H Street, and south of the Canadian border.

Site Size (approximate)

Total land area for the new WWTP would be approximately 6 to 10 acres, depending on land availability.

General Treatment Technology Attributes and Assumptions

The new treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use conventional activated sludge technology. Although the area in which the plant would be located is now relatively isolated, the prospect of future development in East Blaine makes it advisable to include a significant level of odor control.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1. From here, it would be pumped east to the new WWTP, generally following the D Street right-of-way east to the site. Influent wastewater from West Blaine would be pumped from a new pump station at the site of the existing WWTP to the end of Semiahmoo Spit and across Drayton Harbor through the existing submarine pipeline. At Lift Station 1, the West Blaine flow would be combined with the East Blaine flow in the new D Street force main. Treated effluent from the new WWTP would flow by gravity to the existing outfall for discharge. The effluent pipeline route would be the same as the influent pipeline route. A new pipeline to carry effluent across Drayton Harbor may be required if existing abandoned water pipelines across the harbor mouth are not suitable for reuse.

Conveyance Requirements

- Improvements to Lift Station 1 (including capacity expansion and development of equalization storage)
- New lift station at site of existing WWTP
- New pipeline from existing WWTP to Lift Station 1
- New force main from Lift Station 1 to new WWTP

- New effluent pipeline from new WWTP to existing outfall (potentially including a new submarine crossing of Drayton Harbor mouth)

Timeline for Implementation

How long would this alternative take to be planned, approved, permitted, and built?

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year (2004)
- Design and permitting: 18 months (2005-06)
- Construction and startup: 18 months (2006-07)
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years; a significant schedule variable would be the potential need for a new Drayton Harbor pipeline crossing, which could add up to a year to the schedule

Protection of the Natural Environment

Discharge Location

This alternative would use the existing outfall to discharge into Semiahmoo Bay.

Effluent Water Quality

The new activated sludge plant would produce an effluent that would meet or exceed the City's current NPDES permit standards.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use to carry untreated sewage from East Blaine, as it does currently. Construction of a second pipeline to carry treated effluent may also be needed unless existing abandoned pipelines beneath the harbor mouth can be reused.

Other Environmental/Permitting Considerations

- Environmental impacts of this alternative would include clearing of land for construction of the new WWTP. The general siting area does not include any land classified as fish and wildlife habitat area, though it does contain several Class 3 wetlands. Final site identification and facility layout would avoid wetlands to the greatest extent possible.
- Much of the siting area is located within the aquifer recharge zone for the City's drinking water supply. This would necessitate that the WWTP be designed and built

with adequate containment and spill control measures to prevent any potential for wastewater to enter the drinking water supply.

- Influent and effluent pipelines along D Street would pass next to Class 3 wetlands in three areas between 8th and 10th Streets. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands could occur.
- Although it does not change operations from existing conditions, continued use of the line across Drayton Harbor for conveyance of sewage may be perceived by permitting agencies and concerned citizens as a potential threat to water quality in the harbor should the line develop leaks in the future.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses in the site area include vacant land, low-density residential development, a former gravel mine, and Lincoln Park.

Comprehensive Plan/Zoning Designation

The East Blaine area is zoned PR (Planned Residential).

Potential Amenities and/or Benefits

A site in this location is relatively distant from existing population centers and/or unique natural or manmade features, and thus would likely be less suited to the development of amenities than some of the other alternatives.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Secondary effluent from the treatment plant could be used for agricultural application and/or industrial cooling if potential users in the vicinity of the site are identified.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. There may be room at the site for composting of biosolids for reuse; alternatively, digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it involves a single new plant, this alternative does not offer potential for phasing. However, permanent storage for peak flows could be constructed at the current site of Lift Station 1 at any time prior to WWTP construction to alleviate peak flow conditions at the existing WWTP.

Opportunity for Future Expansion

Because of its location in a relatively undeveloped area, an East Blaine WWTP could be expanded to accommodate future flows if a parcel of suitable size (10-20 acres) were acquired.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States.

Operation and Maintenance Complexity

Conventional activated sludge facilities are relatively easy to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plant, other funding sources could also be applicable, such as funding for reclaimed water system development.

DRAFT Fact Sheet: Alternative 11 (All Blaine Flows to BBWSD)

Overview of Alternative

Wastewater from East Blaine and wastewater from West Blaine would be conveyed separately for treatment at the Birch Bay Water and Sewer District (BBWSD) WWTP.

Site Location

The BBWSD treatment plant is located in Birch Bay, south of Terrell Road and east of Point Whitehorn Road.

Site Size (approximate)

Small amounts of land (0.5 to 1 acre) may be needed for construction of a new lift station along Blaine Road and one south of Drayton Harbor.

General Treatment Technology Attributes and Assumptions

The BBWSD's existing treatment facility uses an activated sludge treatment process and has a current capacity of 1.3 mgd. Maximum monthly average flows from the Blaine are estimated at 1.7 mgd in 2033; this would necessitate capacity improvements at the BBWSD treatment facility. Improvements would include modification of the headworks; conversion of two secondary clarifiers to primary clarifiers; construction of new oxidation ditches and secondary clarifiers; expansion of the UV disinfection system; and other modifications to pipes, valves, and electrical systems to accommodate the new flows.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1, which would be rebuilt with equalization storage, new pumps, and a mechanical bar screen system with odor control. This wastewater would then be pumped through a new force main along Peace Portal Drive to Blaine Road, then south on Blaine Road to Grandview Road, west on Grandview Road until about ½ mile west of Jackson Road, then cross-country to the BBWSD treatment plant.

Influent wastewater from West Blaine would flow to a pump station at the site of the City's existing WWTP, then be conveyed through a new force main east and south along Semiahmoo Parkway to Lincoln Road. The force main would then run east along Lincoln Road to join the line from Lift Station 1 at the intersection of Lincoln and Blaine Roads. A new lift station would be built at this location.

Several components of this alternative would build upon the City's required improvements to provide regional benefit, as follows:

1. Development of new sewer facilities to serve development in south Drayton Harbor, including conveyance along Drayton Harbor Road and a new South Drayton Harbor

pump station and force main to BBWSD Pump Station No. 6. This area is within the Blaine Urban Growth Area but within the BBWSD sewer service area.

2. Modifications to two BBWSD pump stations (Pump Station No. 6 and the Blaine Road pump station) to enhance service to the Birch Bay beach area.
3. A new recycled water conveyance line from the BBWSD treatment facility to the Cherry Point industrial area. This line would be co-located with the southern portion of the new Blaine conveyance line to the BBWSD facility.

These three components were part of the regional solution evaluated in 2001, although costs of the recycled water line were not included in the total cost of that solution. They are included in this alternative for consistency. It may be possible for Blaine to develop a lower-cost, "Blaine-only" solution by eliminating these elements of Alternative 11.

Conveyance Requirements

- Improvements to Lift Station 1 (headworks, equalization storage, new pumps)
- New pump station at existing WWTP site
- New force main from Lift Station 1 to BBWSD treatment facility
- New lift station along Blaine Road
- New force main from existing WWTP site to Lincoln Road/Blaine Road intersection
- New force main and lift station to serve south Drayton Harbor area
- Improvements to two BBWSD pump stations
- New line to convey reclaimed water from BBWSD treatment facility to Cherry Point industrial area

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): 6 months (completion assumed in mid-2004)
- Facility planning: Up to 1 year
- Design and permitting: 12-18 months
- Construction and startup: 12-18 months for conveyance to BBWSD and construction of improvements at BBWSD treatment facility
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): 3.5-4.5 years. The major uncertainty in the schedule is the time required to negotiate an agreement between the City and BBWSD for treatment of flows at the BBWSD facility.

Protection of the Natural Environment

Discharge Location

This alternative would use the BBWSD's existing outfall at Point Whitehorn.

Effluent Water Quality

The BBWSD treatment plant is a conventional activated sludge facility that produces a quality of effluent consistent with NPDES permit requirements.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would be removed from use. The new force main from Lift Station 1 to the BBWSD treatment facility would cross Dakota, California, and Terrell Creeks.

Other Environmental/Permitting Considerations

- The conveyance line from West Blaine to BBWSD Pump Station 6 would require construction along the shoreline on Drayton Harbor Road and would pass next to or cross Class 2 wetlands in at least six locations along Drayton Harbor Road and Harbor View Drive. The conveyance line from Lift Station 1 to the BBWSD treatment plant would also pass next to or cross wetlands in numerous locations. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands and/or sedimentation into nearshore areas of Drayton Harbor could occur. Construction would also cause temporary disruption of habitat, particularly for shorebirds in Drayton Harbor.
- In addition to wetland crossings, the force main carrying untreated wastewater from West Blaine would cross Dakota and California Creeks, as well as both Terrell Creek and one of its tributaries. To minimize impacts on the creeks, these crossings would probably be tunneled beneath the streambeds. Although highly unlikely, potential impacts could include malfunction of tunneling equipment during construction (which would necessitate excavation of the streambed) or leakage of the line during operation.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land in the vicinity of the BBWSD treatment facility is relatively undeveloped. The plant site is large and includes room for expansion and buffering.

Comprehensive Plan/Zoning Designation

The BBWSD treatment facility is zoned R5A, which is a rural designation allowing a maximum of one dwelling unit per 5 acres.

Potential Amenities and/or Benefits

The improved Lift Station 1 could be developed to include amenities such as a shoreline viewing area and/or other features consistent with planning for Marine Park.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Effluent reuse for Blaine wastewater is possible with conveyance to the BBWSD. The District has identified an industrial user that could have a high demand (up to 6 mgd) for treated wastewater. Although the City would not directly produce or provide the effluent for reuse, it would be assisting in reducing regional demand for potable water. Provision for design and construction of reuse facilities has not been included in this alternative.

Potential for Beneficial Use of Process Byproducts

The BBWSD currently processes its solids in an aerobic digester. The solids are then land-applied locally under separate contracts for hauling and land application. This practice would continue if West Blaine wastewater were treated by BBWSD.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it includes two separate conveyance from East and West Blaine, this alternative could be phased, with either the conveyance line from West Blaine to BBWSD or the portion from East Blaine to BBWSD completed first (potentially as soon as 2005). The East Blaine-to-BBWSD line may be easier to construct first because improvements to Lift Station 1 have already been designed; this would allow earlier elimination of the Drayton Harbor crossing. Sending a portion of the flows to BBWSD while the balance of the new conveyance was being constructed would free up capacity at the existing WWTP and allow NPDES permit requirements to be met consistently.

Opportunity for Future Expansion

The BBWSD facility is not significantly constrained by land area and could be expanded beyond the 20-year planning period to meet additional demand.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs around the United States.

Operation and Maintenance Complexity

Conventional activated sludge systems are relatively simple to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable—e.g., funding for reclaimed water system development, amenities at the Lift Station 1 site, etc.

DRAFT Fact Sheet: Alternative 10 (All Blaine Flows to GVRD)

Overview of Alternative

Wastewater from East Blaine and wastewater from West Blaine would be conveyed to the City of Surrey, B.C. conveyance system for treatment at the Greater Vancouver Regional District (GVRD) Annacis Island WWTP.

Site Location

The Annacis Island treatment plant is located on Annacis Island in the Fraser River, south of New Westminster and north of Delta.

Site Size (approximate)

No additional land within Blaine would be needed for construction of conveyance or treatment improvements

General Treatment Technology Attributes and Assumptions

The Annacis Island WWTP uses an activated sludge secondary treatment process. Its current average flow (as of 2001) is 455 million liters per day, or approximately 120 mgd. The capacity of the treatment facility is sufficient that no expansion would be required to accommodate flows from Blaine.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1, which would be rebuilt with equalization storage, new pumps, and a mechanical bar screen system with odor control. Influent wastewater from West Blaine would flow through the existing collection system to the site of the existing WWTP, where a new pump station would pump the wastewater across Drayton Harbor to Lift Station 1 through the existing submarine pipeline. The combined wastewater from both East and West Blaine would then be pumped through a new force main to the City of Surrey's collection system. Within the City, the new line would run east from Lift Station 1 on Marine Drive and D Street, turning north to cross the border on the truck route. The route after this point has not yet been determined.

Discussions are currently underway with the City of Surrey to determine the best connection point for Blaine's flows. Preliminary indications are that the length of the new force main on the Canadian side of the border could be either 5 miles or 10 miles; however, there may be opportunities to partner with Surrey to reduce the conveyance distance. Additional information will be available at CWAC Meeting #6. Treated effluent from the Annacis Island plant would be discharged through the facility's existing outfall into the Fraser River.

Conveyance Requirements

- Improvements to Lift Station 1 (headworks, equalization storage, new pumps)
- New pump station at existing WWTP site
- New force main from Lift Station 1 to City of Surrey

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Up to 2 to 4 years
- Facility planning: 1 year
- Design and permitting: 18-24 months
- Construction and startup: 12-18 months
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Up to 6 years. The major uncertainty in the schedule is the time required to negotiate an agreement between the City of Blaine and the City of Surrey for conveyance of flows to GVRD. Similar negotiations between the City of Sumas and the Fraser Valley Regional District took about 4 years. The timeline for permitting of the Canadian portion of the pipeline is also not currently known.

Protection of the Natural Environment

Discharge Location

This alternative would use the existing Annacis Island outfall into the Fraser River.

Effluent Water Quality

The Annacis Island treatment plant produces a secondary effluent with maximum permitted limits of 45 milligrams per liter total suspended solids and 45 milligrams per liter. These limits are approximately 50 percent higher than Blaine's existing secondary effluent limits.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use, with flow in the opposite direction from existing conditions. The new force main may cross water bodies, depending upon the final route determined in conjunction with Surrey.

Other Environmental/Permitting Considerations

- The portion of the conveyance line within Blaine as currently envisioned would not have significant environmental impacts. Environmental and permitting issues along the Canadian side of the conveyance route are not now known, but will be determined

when information has been received from the City of Surrey on the preferred route and connection location.

Protection and Enhancement of Community Livability

Surrounding Land Uses

No land uses within the Blaine area would be affected by treatment facilities in this alternative.

Comprehensive Plan/Zoning Designation

No land uses within the Blaine area would be affected by treatment facilities in this alternative.

Potential Amenities and/or Benefits

The improved Lift Station 1 could be developed to include amenities such as a shoreline viewing area and/or other features consistent with planning for Marine Park.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Effluent reuse does not currently occur at the Annacis Island WWTP.

Potential for Beneficial Use of Process Byproducts

GVRD currently has a policy of recycling its biosolids for beneficial uses.

Restoration of Existing Site

The existing treatment plant would remain in use until between 2008 and 2010.

Growth and Development Requirements

Potential for Phased/Staged Development

This alternative does not offer the potential for phasing.

Opportunity for Future Expansion

The Annacis Island facility has enough capacity to meet demand beyond the 20-year planning period. However, the City of Surrey is experiencing significant growth, and is likely to require additional conveyance capacity within this time frame. Ideally if this is selected as the long-term solution, flexibility could be incorporated into the service agreement between Blaine, Surrey, and GVRD to allow for reserving additional conveyance capacity as needed into the future, based upon 5-year updates to the General Sewer Plan.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology.

Operation and Maintenance Complexity

Conventional activated sludge systems are relatively simple to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed; would vary subject to fluctuations in U.S.-Canadian currency exchange rates.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable—e.g., funding for reclaimed water system development, amenities at the Lift Station 1 site, etc.

DRAFT Fact Sheet: Alternative 9 (West Blaine Uplands WWTP with Birch Point Outfall)

Overview of Alternative

Wastewater from both East and West Blaine would be treated at a new WWTP located in the upland area of West Blaine. This alternative is identical to Alternative 6 except for the discharge location.

Site Location

The West Blaine Uplands WWTP would be located within the western portion of the City's sewer service area, in an area approximately bounded by Semiahmoo Drive on the north and west, Drayton Harbor Road on the east, and the Urban Growth Area boundary on the south.

Site Size (approximate)

Total land area for the new WWTP would be approximately 6 to 8 acres, depending on land availability.

General Treatment Technology Attributes and Assumptions

The new treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use conventional activated sludge technology. A high degree of odor control would be employed because of existing and/or planned residential areas in the site area.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1 and would be pumped beneath Drayton Harbor to the site of the existing WWTP. From here, a new pump station and force main would convey wastewater flows uphill to the new WWTP, using existing roads as much as possible. Influent wastewater from West Blaine would also flow to the pump station at the site of the City's existing WWTP, and would be pumped to the new plant along with the East Blaine flows. Treated effluent from the new treatment plant would flow by gravity to the existing outfall for discharge.

Treated effluent from the new treatment plant would flow by gravity to a new deep-water outfall for discharge. The new outfall would be located in the vicinity of Birch Point. Treated effluent would be conveyed through a new pipeline running southwest along Semiahmoo Drive to a location at or north of Birch Point. Final location of the outfall would depend upon detailed studies to characterize ocean currents, dispersion and dilution characteristics, and engineering considerations such as bathymetry and geotechnical conditions.

Conveyance Requirements

- Improvements to Lift Station 1 (including capacity expansion, potential headworks improvements, and development of equalization storage)
- New lift station at site of existing WWTP
- New force main from existing WWTP lift station to new West Blaine WWTP
- New outfall and diffuser structure

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year
- Design and permitting: 18 months or more (see below)
- Construction and startup: 18-24 months
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): 4.5-5 years. The primary schedule uncertainty is the time required to site, design, and permit a new outfall in Puget Sound, which could add up to 2 years to this schedule.

Protection of the Natural Environment

Discharge Location

This alternative would involve construction of a new outfall to discharge treated effluent into Semiahmoo Bay off Birch Point.

Effluent Water Quality

The new activated sludge plant would produce an effluent that would meet or exceed the City's current NPDES permit standards.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use to carry untreated sewage from East Blaine, as it does currently.

Other Environmental/Permitting Considerations

- Environmental impacts of this alternative include construction of the new WWTP, which would likely involve the clearing of forested land, and construction of the conveyance line from the existing WWTP site to the new WWTP, which would cross steep slopes. Some Class 2 and 3 wetlands are mapped in the general site area; however, final site identification and facility layout would avoid wetlands to the greatest extent possible.

- Development of the new outfall would have a number of potential environmental impacts. The outfall pipeline would need to traverse steep slopes to reach the shoreline, and would likely involve significant excavation in the nearshore area. Nearshore construction is regulated by a number of agencies and is carefully scrutinized because of the potential to affect eelgrass, geoduck, and other aquatic resources.
- Although deep-water marine discharge locations are generally considered superior to shallow freshwater discharges, permitting of a new discharge in this area may be problematic. Resource agencies are likely to question why the impacts of a new discharge are warranted if the existing outfall location provides satisfactory water quality. In addition, there may be tribal concerns related to usual and customary fishing areas. However, it is also possible that a new discharge point could relieve concerns about perceived contributions by the existing outfall to coliform levels in Drayton Harbor. A new discharge location would also allow the Department of Health to reopen the shellfish harvesting area west of Semiahmoo Spit (though the new outfall would have its own shellfish harvest closure zone).
- Due to long-term historic and prehistoric use of Semiahmoo Spit and the Drayton Harbor shoreline by Native American peoples, the potential for encountering cultural resources during construction is high. This could lead to schedule delays while archaeological investigations take place or to the need to relocate the treatment plant or conveyance facilities.
- Although it does not change operations from existing conditions, continued use of the line across Drayton Harbor for conveyance of sewage may be perceived by permitting agencies and concerned citizens as a potential threat to water quality in the harbor should the line develop leaks in the future.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses in the West Blaine Uplands site area are residential and recreational.

Comprehensive Plan/Zoning Designation

The West Blaine site area is zoned RPR (Residential Planned Recreation) within Blaine City limits and UR4 (Urban Residential with a maximum of 4 dwelling units per acre) within the Urban Growth Area outside city limits.

Potential Amenities and/or Benefits

A site in this location could be developed with multipurpose facilities to serve residents of the surrounding neighborhoods. Inclusion of amenities that would serve a more city-wide population are also possible, but might cause concerns related to increased traffic and noise in this presently quiet area.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Secondary effluent from the treatment plant could be used on nearby golf courses, though additional treatment may be required to meet Class A reclaimed water standards.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. Onsite solutions such as composting probably are not feasible because of the proximity to existing or planned residential areas, but digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2008 (or later, depending upon permitting timelines).

Growth and Development Requirements

Potential for Phased/Staged Development

Depending on design of the new WWTP, it may be feasible to construct a headworks facility, as well as permanent storage for peak flows, at Lift Station 1. This would relieve some of the pressure on the existing WWTP.

Opportunity for Future Expansion

The potential for expansion at this location depends primarily on how large a site the City is able to acquire. Expansion beyond 20 years would require enough space to maintain an adequate buffer from residential uses even after the facility was enlarged. Because flows beyond 20 years are not known, it is difficult to predict what an optimum site size would be to allow for expansion, but an area of 10 to 20 acres would be desirable.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States.

Operation and Maintenance Complexity

Conventional activated sludge is relatively easy to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable, such as funding for reclaimed water system development.

DRAFT Fact Sheet: Alternative 8 (West Blaine WWTP on Semiahmoo Spit)

Overview of Alternative

Wastewater from both East and West Blaine would be treated at a new WWTP located on Semiahmoo Spit.

Site Location

The new WWTP would be located on Semiahmoo Spit in an area with sufficient contiguous property available to meet land area requirements for conventional treatment.

Site Size (approximate)

Total land area for the new WWTP would be approximately 6 to 8 acres, depending on land availability.

General Treatment Technology Attributes and Assumptions

The new treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use conventional activated sludge technology. A high degree of odor control would be employed because of the nearby residential areas, resort, and park.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1 and would be pumped beneath Drayton Harbor to the site of the new WWTP. Influent wastewater from West Blaine would flow to a pump station at the site of the City's existing WWTP, and would then be pumped to the new plant. (It may be possible to convey flows from the existing to the new WWTP by gravity.) Treated effluent from the new treatment plant would be pumped from an effluent pump station at the WWTP to the existing outfall for discharge.

Conveyance Requirements

- Improvements to Lift Station 1 (including capacity expansion, potential headworks improvements, and development of equalization storage)
- New lift station at site of existing WWTP (if required)
- New pipeline from existing WWTP lift station to new West Blaine WWTP

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable

- Facility planning: Up to 1 year (2004)
- Design and permitting: 18 months (2005-06)
- Construction and startup: 18 months (2006-07)
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years

Protection of the Natural Environment

Discharge Location

This alternative would use the existing outfall to discharge into Semiahmoo Bay.

Effluent Water Quality

The new activated sludge plant would produce an effluent that would meet or exceed the City's current NPDES permit standards.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use to carry untreated sewage from East Blaine, as it does currently.

Other Environmental/Permitting Considerations

- Environmental impacts of this alternative include construction of the new WWTP, which would take place within the environmentally sensitive shoreline zone. Although best management practices would be followed to limit erosion, some sedimentation into nearshore areas of Drayton Harbor could occur. Construction would also cause temporary disruption of habitat, particularly for shorebirds in Drayton Harbor.
- Due to long-term historic and prehistoric use of Semiahmoo Spit by Native American peoples, the potential for encountering cultural resources during construction is high. This could lead to schedule delays while archaeological investigations take place or, in a worst-case scenario, abandonment of the site for treatment plant use.
- Although it does not change operations from existing conditions, continued use of the line across Drayton Harbor for conveyance of sewage may be perceived by permitting agencies and concerned citizens as a potential threat to water quality in the harbor should the line develop leaks in the future.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses on Semiahmoo Spit are resort-oriented and recreational.

Comprehensive Plan/Zoning Designation

The site area is zoned MPR (Marine Planned Recreation) and RPR (Residential Planned Recreation).

Potential Amenities and/or Benefits

A site in this location could be developed with multipurpose facilities to serve residents of the surrounding neighborhoods and/or guests at the resort. The shoreline location lends itself to interpretive opportunities such as Drayton Harbor overlooks and displays on shoreline ecology. Inclusion of amenities that would serve a city-wide population is also possible, but might cause concerns related to increased traffic and noise.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Secondary effluent from the treatment plant could be used on nearby golf courses, though additional treatment could be required to meet Class A reclaimed water standards.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. Onsite solutions such as composting probably are not feasible because of the proximity to residential and resort areas, but digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it involves a single new plant, this alternative does not offer potential for phasing. However, permanent storage for peak flows could be constructed at the current site of Lift Station 1 at any time prior to WWTP construction to alleviate peak flow conditions at the existing WWTP.

Opportunity for Future Expansion

The potential for expansion at this location is limited, due to the small amount of land available and the potential for surrounding areas to develop in the future. However, to gain additional treatment capacity in the future the WWTP could be designed to be retrofitted with membrane technology.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States.

Operation and Maintenance Complexity

Conventional activated sludge facilities are relatively easy to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plant, other funding sources could also be applicable, such as funding for reclaimed water system development and/or development of a natural resource interpretive center.

DRAFT Fact Sheet: Alternative 7 (West Blaine WWTP South of Drayton Harbor)

Overview of Alternative

Wastewater from throughout the City's service area would be treated at a new WWTP located south of Drayton Harbor.

Site Location

The area identified for this alternative is generally south of Drayton Harbor Road and east of Harbor View Road. This area is outside Blaine city limits but within the Urban Growth Area.

Site Size (approximate)

Total land area for the new WWTP would be 6 to 10 acres, depending upon land availability.

General Treatment Technology Attributes and Assumptions

The new treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use conventional activated sludge technology. Odor control would be provided because of the area's designation for residential development.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1, cross Drayton Harbor using the existing pipeline, and flow to the site of the existing WWTP. A new pump station built at this location would pump flows through a new force main along Semiahmoo Parkway and Drayton Harbor Road to the new WWTP. Influent wastewater from West Blaine would also flow to the pump station at the site of the City's existing WWTP, and would be pumped to the new plant along with the East Blaine flows. Treated effluent from the new treatment plant would be pumped through an effluent force main to the existing outfall for discharge. The effluent force main could be placed in the same trench as the pipeline carrying influent to the plant.

It would be possible to eliminate the Drayton Harbor crossing with this alternative by pumping flows from East Blaine around the east side of Drayton Harbor. However, this option would involve almost twice the amount of new conveyance pipeline and would require crossing of both Dakota and California Creeks. As a result, continued use of the existing crossing was assumed.

Conveyance Requirements

- Improvements to Lift Station 1 (including equalization storage)
- New pump station at site of existing WWTP

- Force main from existing WWTP to new WWTP
- Effluent pump station and force main from new WWTP to existing outfall

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year
- Design and permitting: 18 months
- Construction and startup: 18 months
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years (completion estimated in late 2007).

Protection of the Natural Environment

Discharge Location

This alternative would discharge through a the existing outfall into Semiahmoo Bay.

Effluent Water Quality

The new activated sludge plant would produce an effluent that would meet or exceed the City's current NPDES permit standards.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use to carry untreated sewage from East Blaine, as it does currently.

Other Environmental/Permitting Considerations

A treatment plant south of Drayton Harbor has a number of potential environmental impacts:

- The site area contains Class 2 and 3 wetlands, which would require permitting if filled. Given the prevalence and configuration of wetlands in this area, some degree of filling would be difficult to avoid.
- The conveyance lines between the existing treatment plant and the new treatment plant would require construction along the shoreline on Drayton Harbor Road. They would also pass next to Class 2 wetlands in approximately four locations. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands and/or sedimentation into nearshore areas of Drayton Harbor could occur. Construction would also cause temporary disruption of habitat, particularly for shorebirds in Drayton Harbor.

- Due to long-term historic and prehistoric use of the Drayton Harbor shoreline by Native American peoples, the potential for encountering cultural resources during construction is high. This could lead to schedule delays while archaeological investigations take place or the need to relocate the treatment plant site.

Protection and Enhancement of Community Livability

Surrounding Land Uses

The WWTP site area and much of the conveyance route are located in a low-density residential area.

Comprehensive Plan/Zoning Designation

The WWTP site area is zoned by Whatcom County as UR 4 (urban residential with a maximum of 4-dwelling units per acre).

This alternative is unique in that the City of Blaine's WWTP would be located within the current sewer service area of the Birch Bay Water and Sewer District (BBWSD), although the site is within Blaine's Urban Growth Area.

Potential Amenities and/or Benefits

The location of the treatment plant at the south end of Drayton Harbor could make it suitable for amenities or interpretive features related to water quality in the harbor and the overall ecology of the area (marine life, shorebirds, etc.).

Other Non-Technical Objectives

Potential for Recycling of Effluent

Secondary effluent from the treatment plant could be used on nearby golf courses, though additional treatment could be required to meet Class A reclaimed water standards.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. There may be room at the site for composting of biosolids for reuse; alternatively, digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it involves a single new plant, this alternative does not offer potential for phasing. However, permanent storage for peak flows could be constructed at the current site of Lift

Station 1 at any time prior to WWTP construction to alleviate peak flow conditions at the existing WWTP.

Opportunity for Future Expansion

Because of its location in a less developed area, the new WWTP could be expanded to accommodate future flows if a parcel of suitable size (10-20 acres) were acquired. However, the location of wetlands or other sensitive environmental features could limit the area available for expansion.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States.

Operation and Maintenance Complexity

Conventional activated sludge treatment systems are relatively easy to operate and maintain.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable, such as funding for reclaimed water system development or development of a water quality/natural resource interpretive center.

Fact Sheet
Alternative 6 (West Blaine Uplands WWTP with Existing Outfall)

Overview of Alternative

Wastewater from both East and West Blaine would be treated at a new WWTP located in the upland area of West Blaine.

Site Location

The West Blaine Uplands WWTP would be located within the western portion of the City's sewer service area, in an area approximately bounded by Semiahmoo Drive on the north and west, Drayton Harbor Road on the east, and the Urban Growth Area boundary on the south.

Site Size (approximate)

Total land area for the new WWTP would be approximately 6 to 8 acres, depending on land availability.

General Treatment Technology Attributes and Assumptions

The new treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use conventional activated sludge technology. A high degree of odor control would be employed because of existing and/or planned residential areas in the site area.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1 and would be pumped beneath Drayton Harbor to the site of the existing WWTP. From here, a new pump station and force main would convey wastewater flows uphill to the new WWTP, using existing roads as much as possible. Influent wastewater from West Blaine would also flow to the pump station at the site of the City's existing WWTP, and would be pumped to the new plant along with the East Blaine flows. Treated effluent from the new treatment plant would flow by gravity to the existing outfall for discharge.

Conveyance Requirements

- Improvements to Lift Station 1 (including capacity expansion, potential headworks improvements, and development of equalization storage)
- New lift station at site of existing WWTP
- New force main from existing WWTP lift station to new West Blaine WWTP

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year (2004)
- Design and permitting: 18 months (2005-06)
- Construction and startup: 18 months (2006-07)
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years

Protection of the Natural Environment

Discharge Location

This alternative would use the existing outfall to discharge into Semiahmoo Bay.

Effluent Water Quality

The new activated sludge plant would produce an effluent that would meet or exceed the City's current NPDES permit standards.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use to carry untreated sewage from East Blaine, as it does currently.

Other Environmental/Permitting Considerations

- Environmental impacts of this alternative include construction of the new WWTP, which would likely involve the clearing of forested land, and construction of the conveyance line from the existing WWTP site to the new WWTP, which would cross steep slopes. Some Class 2 and 3 wetlands are mapped in the general site area; however, final site identification and facility layout would avoid wetlands to the greatest extent possible.
- Due to long-term historic and prehistoric use of Semiahmoo Spit and the Drayton Harbor shoreline by Native American peoples, the potential for encountering cultural resources during construction is high. This could lead to schedule delays while archaeological investigations take place or the need to relocate of the treatment plant or conveyance facilities.
- Although it does not change operations from existing conditions, continued use of the line across Drayton Harbor for conveyance of sewage may be perceived by permitting agencies and concerned citizens as a potential threat to water quality in the harbor should the line develop leaks in the future.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses in the West Blaine Uplands site area are residential and recreational.

Comprehensive Plan/Zoning Designation

The West Blaine site area is zoned RPR (Residential Planned Recreation) within Blaine City limits and UR4 (Urban Residential with a maximum of 4 dwelling units per acre) within the Urban Growth Area outside city limits.

Potential Amenities and/or Benefits

A site in this location could be developed with multipurpose facilities to serve residents of the surrounding neighborhoods. Inclusion of amenities that would serve a more city-wide population are also possible, but might cause concerns related to increased traffic and noise in this presently quiet area.

Other Non-Technical Objectives

Potential for Recycling of Effluent

Secondary effluent from the treatment plant could be used on nearby golf courses, though additional treatment could be required to meet Class A reclaimed water standards.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. Onsite solutions such as composting may not be feasible because of the proximity to existing or planned residential areas, but digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Depending on design of the new WWTP, it may be feasible to construct a headworks facility, as well as permanent storage for peak flows, at Lift Station 1. This would relieve some of the pressure on the existing WWTP.

Opportunity for Future Expansion

The potential for expansion at this location depends primarily on how large a site the City is able to acquire. Expansion beyond 20 years would require enough space to maintain an adequate buffer from residential uses even after the facility was enlarged. Because flows

beyond 20 years are not known, it is difficult to predict what an optimum site size would be to allow for expansion, but an area of 10 to 20 acres would be desirable.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States. The MBR technology is relatively new in the United States however; it has been used extensively outside of the U.S. MBR installations are increasing in number in the U.S., as the driver for higher quality water and smaller footprints becomes more important.

Operation and Maintenance Complexity

Conventional activated sludge systems are relatively simple to operate and maintain. MBR technology is also relatively simple to operate. Membrane treatment is comparatively more difficult and labor-intensive, and requires a higher level of operator training. Most MBR facilities are highly automated.

Capital Cost

The capital cost estimate shown below includes the construction cost estimate for the main treatment facilities, ancillary support facilities, yard piping and site development, and building structures. The costs were developed based on the relationship of historical cost estimates for similar treatment facilities of various flow capacities. Construction costs also included markups for contractor overhead (10% of construction cost), contractor profit (5%), bonds/insurance/mobilization (5%), and contingency (20%).

Also included in the capital costs are the non-construction-related costs such as permitting, engineering services, land acquisitions and right -of-way, legal/administrative services, and sales taxes.

Conventional Activated Sludge (CAS) Facilities

Treatment Facilities Cost Includes:.....

- Headworks facilities (screening, and aerated grit chamber)
- Aeration basin and secondary clarifiers
- UV disinfection (low pressure)
- Aerobic digesters
- Sludge thickening/dewatering (centrifuge)

Outfall Facilities Cost Includes: .....

- Improvements to existing outfall on Semiahmoo Spit

Conveyance Facilities Cost Includes: .....

- Two (2) raw sewage lift stations
- One (1) effluent lift station
- Approximately _____ linear feet of ___-inch pipeline

- Approximately _____ linear feet of ___-inch pipeline

Total Capital Cost for CAS Facilities .....

Membrane Bioreactor (MBR) Facilities

Treatment Facilities Cost Includes:.....

- Headworks facilities (screening, and aerated grit chamber)
- Membrane Bioreactor
- UV disinfection (low pressure)
- Aerobic digesters
- Sludge thickening/dewatering (centrifuge)

Outfall Facilities Cost Includes: .....

- Improvements to existing outfall on Semiahmoo Spit

Conveyance Facilities Cost Includes: .....

- Two (2) raw sewage lift stations
- One (1) effluent lift station
- Approximately _____ linear feet of ___-inch pipeline
- Approximately _____ linear feet of ___-inch pipeline

Total Capital Cost for MBR Facilities .....

Operation and Maintenance Cost

The annual operations and maintenance cost estimate are shown below. They are based on labor costs using an average labor rate of $50 per hr. for estimated labor hours of approximately 1,100 hrs. for O&M staff time. They also include consumables such as power cost of $0.07 per kWh, and fuel costs of $1.75 per gallon. An average O&M repair and maintenance expenditure of approximately 2.5% of the capital equipment cost per year and a contingency of 20-percent are also included.

Conventional Activated Sludge (CAS) Facilities

Treatment Facilities Annual O&M Cost .....

Outfall Facilities Annual O&M Cost .....

Conveyance Facilities Annual O&M Cost.....

Total Annual O&M Cost for CAS Facilities.....

Membrane Bioreactor (MBR) Facilities

Treatment Facilities Annual O&M Cost .....

Outfall Facilities Annual O&M Cost .....

Conveyance Facilities Annual O&M Cost.....

Total Annual O&M Cost for MBR Facilities.....

Annualized Life Cycle Cost

The annualized life cycle cost estimate for each treatment facility is shown below. They are based on a project life of 20 years, an annual interest rate of 3.5-percent, and an inflation rate of 2.5-percent. The annualized cost includes average annual O&M costs plus the amortized cost of debt repayment.

Conventional Activated Sludge (CAS) Facilities

Total Annualized Life Cost for CAS Facilities .....

Membrane Bioreactor (MBR) Facilities

Total Annualized Life Cost for MBR Facilities .....

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable, such as funding for reclaimed water system development.

DRAFT Fact Sheet: Alternative 5 (Natural Treatment System at Dakota Creek)

Overview of Alternative

Wastewater from throughout the City's service area would be treated at a new WWTP located along Dakota Creek. The WWTP would use natural treatment technology with constructed wetlands.

Site Location

The Dakota Creek WWTP would be located in the general area south of Sweet Road, east of Blaine city limits, and north of Dakota Creek within the City's Urban Growth Area.

Site Size (approximate)

The total land required for the Dakota Creek WWTP is estimated at approximately 110 acres. Final determination of the size would depend upon a variety of factors, including wastewater characteristics, NPDES permit requirements, site soils, and location of onsite wetlands.

General Treatment Technology Attributes and Assumptions

The Dakota Creek treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd). Influent wastewater would pass through a preliminary treatment process before being routed to a system of constructed wetlands for secondary treatment. Vegetation within the wetlands would remove solids, biological oxygen demand, and nutrients in the wastewater. Additional treatment may be required before discharge to remove ammonia from the effluent.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1, and would be routed from there to the new WWTP via a new force main along Marine Drive, Peace Portal Drive, and Hughes Avenue/Sweet Road. Influent wastewater from West Blaine would flow to a pump station at the site of the City's existing WWTP, then conveyed through a new force main east and north to the Dakota Creek WWTP. The new force main would follow Drayton Harbor Road to Blaine Road, turn north on Blaine Road/Bell Road, and turn east on Hughes Avenue/Sweet Road to the new WWTP. From the Bell Road/Hughes Avenue intersection east, the two conveyance lines could be placed in the same trench.

Treated effluent from the Dakota Creek plant would be discharged through a new outfall into Dakota Creek.

Conveyance Requirements

- Improvements to Lift Station 1 (including equalization storage)

- Force main from Lift Station 1 to Dakota Creek WWTP
- New pump station at site of existing WWTP
- Force main from existing WWTP to Dakota Creek WWTP

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year
- Design and permitting: 18 months (or more; see below)
- Construction and startup: 18 months
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years (completion estimated in late 2007). The major schedule uncertainty is the time required to permit the new outfall, which could add as much as 2 years to the schedule.

Protection of the Natural Environment

Discharge Location

This alternative would discharge through a new outfall to the waters of Dakota Creek.

Effluent Water Quality

The natural treatment process would produce a quality of effluent similar to that of a conventional activated sludge facility.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would be removed from use, and the new pipeline to convey East Blaine wastewater to the new treatment plant would not cross any water bodies. However, the new conveyance line carrying West Blaine wastewater to the new treatment plant would cross California Creek and Dakota Creek.

Other Environmental/Permitting Considerations

A treatment plant at the Dakota Creek site has a number of potential environmental impacts:

- The area identified for the treatment facility contains Class 2 wetlands (classified as "a significant resource based on functional values and diversity"). Two small watercourses with associated wetlands run through the area. The large area required for wetland treatment makes it likely that existing wetlands would be affected by the WWTP. Although natural treatment systems can enhance existing nearby wetlands, conversion

of existing wetlands to NTS is considered "filling" by the Corps of Engineers, and mitigation would be required under federal and local regulations. Wetlands constructed for wastewater treatment cannot be counted as replacement wetlands for mitigation purposes.

- Although the discharge into Dakota Creek would be highly treated and could be beneficial in augmenting summer low flows, extensive planning and study would be required to ensure that Drayton Harbor shellfish resources and wild salmon runs in the creek are not affected. Permitting agencies will give intense scrutiny to discharge in a small stream when other discharge points are available. From a practical standpoint, it will probably be necessary to provide a net benefit to Drayton Harbor water quality in order for this discharge to be permitted. In addition, discharge would need to be carefully calibrated with tidally influenced flows to ensure that effluent did not travel upstream.
- The conveyance line from West Blaine to the new treatment plant would require construction along the shoreline on Drayton Harbor Road. Due to long-term historic and prehistoric use of the Semiahmoo area and the Drayton Harbor shoreline by Native American peoples, the potential for encountering cultural resources during construction is high. This could lead to schedule delays while archaeological investigations take place or relocation of the lines to avoid cultural resource areas.
- The conveyance line would also pass next to or cross Class 2 and 3 wetlands in approximately 10 locations. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands and/or sedimentation into nearshore areas of Drayton Harbor could occur. Construction would also cause temporary disruption of habitat, particularly for shorebirds in Drayton Harbor.
- In addition to wetland crossings, the force main carrying untreated wastewater from West Blaine would cross both Dakota Creek and California Creek. To minimize impacts on the creeks, these crossings would probably be tunneled beneath the streambeds. Although highly unlikely, potential impacts could include malfunction of tunneling equipment during construction (which would necessitate excavation of the streambed) or leakage of the line during operation.

Protection and Enhancement of Community Livability

Surrounding Land Uses

The Dakota Creek site area is rural, with little surrounding development; adjacent land to the east within Blaine city limits is zoned for manufacturing.

Comprehensive Plan/Zoning Designation

The Dakota Creek site is zoned by Whatcom County as UR 4 (urban residential with a maximum of 4 dwelling units per acre).

Potential Amenities and/or Benefits

The location of the treatment plant near Dakota Creek could make it suitable for amenities or interpretive features related to water quality in the creek and Drayton Harbor, the salmon life cycle, and the use of natural wetland treatment processes in purifying wastewater.

Other Non-Technical Objectives

Potential for Recycling of Effluent

The Dakota Creek treatment plant site could provide potential for reuse, depending on a number of factors. Effluent would be suitable for a number of uses, but would not be of as high a quality as effluent from a membrane system. Land application for irrigation is possible during the summer months; alternatively, if a water-intensive industry located in the nearby manufacturing areas, the treatment plant could provide a year-round source of cooling water.

Potential for Beneficial Use of Process Byproducts

This alternative would not afford significant opportunities for reuse of biosolids, as most solids are assimilated in the natural treatment process.

Restoration of Existing Site

The existing treatment plant would remain in use until 2007 or later.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it involves a single new plant, this alternative does not offer potential for phasing. However, permanent storage for peak flows could be constructed at the current site of Lift Station 1 at any time prior to WWTP construction to alleviate peak flow conditions at the existing WWTP.

Opportunity for Future Expansion

Because of the large acreage required for wetland treatment, expansion of a Dakota Creek natural treatment system may be difficult in the future, particularly if development in this part of the UGA limits land availability and/or increases land prices.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Natural treatment is less widely used in this country than conventional activated sludge, though it is common in Europe. Design criteria for systems in the U.S. are not uniform, and natural treatment is considered an emerging or innovative technology.

Operation and Maintenance Complexity

Natural treatment is a passive system (i.e., generally functioning with minimal operator intervention), and therefore relatively low in complexity and training requirements. Operation and maintenance complexity of the primary treatment facilities would be similar to primary treatment facilities at the City's existing WWTP.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plant, other funding sources could also be applicable—e.g., funding for reclaimed water system development, development of an environmental education center, etc.

DRAFT Fact Sheet: Alternative 4 (New MBR WWTP at Dakota Creek)

Overview of Alternative

Wastewater from throughout the City's service area would be treated at a new WWTP located near Dakota Creek.

Site Location

The Dakota Creek WWTP would be located in the general area south of Sweet Road, east of Blaine city limits, and north of Dakota Creek within the City's Urban Growth Area.

Site Size (approximate)

Total land area for the Dakota Creek WWTP would be 6 to 10 acres, depending upon land availability.

General Treatment Technology Attributes and Assumptions

The Dakota Creek treatment plant would be built with a 20-year capacity of 2.2 million gallons per day (mgd) and would use membrane bioreactor (MBR) technology. Membrane technology would be a desirable method for this site because it would satisfy the stringent water quality standards for discharge into fresh water. Because of the rural location of the site, less odor control would be required than for a site surrounded by urban or residential uses.

Influent wastewater from East Blaine would flow through the existing collection system to Lift Station 1, and would be routed from there to the new WWTP via a new force main along Marine Drive, Peace Portal Drive, and Hughes Avenue/Sweet Road. Influent wastewater from West Blaine would flow to a pump station at the site of the City's existing WWTP, then conveyed through a new force main east and north to the Dakota Creek WWTP. The new force main would follow Drayton Harbor Road to Blaine Road, turn north on Blaine Road/Bell Road, and turn east on Hughes Avenue/Sweet Road to the new WWTP. From the Bell Road/Hughes Avenue intersection east, the two conveyance lines could be placed in the same trench.

Treated effluent from the Dakota Creek plant would be discharged through a new outfall into Dakota Creek.

Conveyance Requirements

- Improvements to Lift Station 1 (including equalization storage)
- Force main from Lift Station 1 to Dakota Creek WWTP
- New pump station at site of existing WWTP

- Force main from existing WWTP to Dakota Creek WWTP

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year
- Design and permitting: 18 months (or more; see below)
- Construction and startup: 18 months
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years (completion estimated in late 2007). The major schedule uncertainty is the time required to permit the new outfall, which could add as much as 2 years to the schedule.

Protection of the Natural Environment

Discharge Location

This alternative would discharge through a new outfall to the waters of Dakota Creek.

Effluent Water Quality

The membrane treatment process would produce a high quality of effluent, significantly lower in solids and nutrients than discharge from the existing WWTP or from a new conventional activated sludge facility.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would be removed from use, and the new pipeline to convey East Blaine wastewater to the new treatment plant would not cross any water bodies. However, the new conveyance line carrying West Blaine wastewater to the new treatment plant would cross California Creek and Dakota Creek.

Other Environmental/Permitting Considerations

A treatment plant at the Dakota Creek site has a number of potential environmental impacts:

- The area identified for the treatment facility contains Class 2 wetlands (classified as "a significant resource based on functional values and diversity"). Two small watercourses with associated wetlands run through the area.
- Although the discharge into Dakota Creek would be highly treated and could be beneficial in augmenting summer low flows, extensive planning and study would be required to ensure that Drayton Harbor shellfish resources and wild salmon runs in the creek are not affected. Permitting agencies will give intense scrutiny to discharge in a

small stream when other discharge points are available. From a practical standpoint, it will probably be necessary to provide a net benefit to Drayton Harbor water quality in order for this discharge to be permitted. In addition, discharge would need to be carefully calibrated with tidally influenced flows to ensure that effluent did not travel upstream.

- The conveyance line from West Blaine to the new treatment plant would require construction along the shoreline on Drayton Harbor Road. It would also pass next to or cross Class 2 and 3 wetlands in approximately 10 locations. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands and/or sedimentation into nearshore areas of Drayton Harbor could occur. Construction would also cause temporary disruption of habitat, particularly for shorebirds in Drayton Harbor.
- Due to long-term historic and prehistoric use of the Semiahmoo area and Drayton Harbor shoreline by Native American peoples, the potential for encountering cultural resources during construction of conveyance to this site is high. This could lead to schedule delays while archaeological investigations take place or relocation of the lines to avoid cultural resource areas.
- In addition to wetland crossings, the force main carrying untreated wastewater from West Blaine would cross both Dakota Creek and California Creek. To minimize impacts on the creeks, these crossings would probably be tunneled beneath the streambeds. Although highly unlikely, potential impacts could include malfunction of tunneling equipment during construction (which would necessitate excavation of the streambed) or leakage of the line during operation.

Protection and Enhancement of Community Livability

Surrounding Land Uses

The Dakota Creek site area is rural with little surrounding development; adjacent land to the east within Blaine city limits is zoned for manufacturing.

Comprehensive Plan/Zoning Designation

The Dakota Creek site area is zoned by Whatcom County as UR 4 (urban residential with a maximum of 4 dwelling units per acre).

Potential Amenities and/or Benefits

The location of the treatment plant near Dakota Creek could make it suitable for amenities or interpretive features related to water quality in the creek and Drayton Harbor, the salmon life cycle, and the effectiveness of the membrane treatment process in purifying wastewater.

Other Non-Technical Objectives

Potential for Recycling of Effluent

The Dakota Creek treatment plant location and treatment process would provide moderate to significant potential for reuse, depending on a number of factors. The high levels to which wastewater would be treated allow the effluent to be put to a wide range of uses. Land application for irrigation is possible during the summer months; alternatively, if a water-intensive industry located in the nearby manufacturing areas, the treatment plant could provide a year-round source of high-quality cooling or process water. Another possibility would be recharge of area aquifers with the treated effluent. Although effluent from membrane treatment would likely meet drinking water standards, recharge of drinking water aquifers for direct or indirect potable reuse has not been permitted in Washington to date and may not be publicly acceptable.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. There may be room at the site for composting of biosolids for reuse; alternatively, digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until 2007 or later.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it involves a single new plant, this alternative does not offer potential for phasing. However, permanent storage for peak flows could be constructed at the current site of Lift Station 1 at any time prior to WWTP construction to alleviate peak flow conditions at the existing WWTP.

Opportunity for Future Expansion

Because of its location in a relatively undeveloped area, the Dakota Creek WWTP could be expanded to accommodate future flows if a parcel of suitable size (10-20 acres) were acquired. However, the location of wetlands or other sensitive environmental features could limit the area available for expansion.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Membrane treatment is less widely used in this country than conventional activated sludge (though it is more common in other countries such as Japan), and is considered an emerging or innovative technology.

Operation and Maintenance Complexity

Membrane treatment is comparatively more difficult and labor-intensive than conventional activated sludge, and requires a higher level of operator training.

Capital Cost

To be developed.

Operation and Maintenance Cost

To be developed.

Annualized Life Cycle Cost

To be developed.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plant, other funding sources could also be applicable—e.g., funding for reclaimed water system development, development of an environmental education center, etc.

DRAFT Fact Sheet: Alternative 3 (Marine Drive WWTP with West Blaine Flows to BBWSD)

Overview of Alternative

Wastewater from East Blaine would be treated at a new WWTP on Marine Drive, while wastewater from West Blaine would be conveyed via a new force main for treatment at the Birch Bay Water and Sewer District (BBWSD) WWTP.

Site Location

The Marine Drive WWTP would be located on two non-contiguous pieces of City-owned property—one at the current site of Lift Station 1 and one within the current boundaries of Marine Park. The BBWSD treatment plant is located in Birch Bay, south of Terrell Road and east of Point Whitehorn Road.

Site Size (approximate)

Total land area for the Marine Drive WWTP would be approximately 3 acres (0.5 acre at Lift Station 1 and 2.47 acres in Marine Park).

General Treatment Technology Attributes and Assumptions

The Marine Drive treatment plant would be built with a 20-year capacity of 1.7 million gallons per day (mgd) and would use conventional activated sludge technology. A high degree of odor control would be employed because of the nearby recreational uses. Headworks facilities (which have high odor potential) would be located at the site of Lift Station 1, while primary/secondary treatment and solids handling would occur at the Marine Park portion of the site. Wastewater would be conveyed between the two parts of the site by underground pipes.

The BBWSD's existing treatment facility uses an activated sludge treatment process and has a capacity of 1.3 mgd. Flows from West Blaine to the BBWSD are estimated at 0.5 mgd in 2023; this would necessitate capacity improvements at the BBWSD treatment facility.

Influent wastewater from East Blaine would flow through the existing collection system to the Marine Drive facility. Influent wastewater from West Blaine would flow to a pump station at the site of the City's existing WWTP, then conveyed through a new force main east and south to the BBWSD facility. The new conveyance line would generally follow existing roads, including Drayton Harbor Road and Harbor View Road, joining the BBWSD system at BBWSD Pump Station No. 6.

Treated effluent from the Marine Drive plant would be pumped through the existing pipe under Drayton Harbor and discharged through Blaine's existing outfall. Treated effluent from the BBWSD plant would be discharged through BBWSD's existing outfall at Point Whitehorn.

Conveyance Requirements

- Improvements to Lift Station 1
- New pump station at existing WWTP site
- New force main from existing WWTP site to BBWSD Pump Station No. 6
- Improvements to BBWSD Pump Stations 3, 4, 5, and 6

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): 6 months (completion assumed in mid-2004)
- Facility planning: Up to 1 year for Marine Drive WWTP; up to 6 months for conveyance to BBWSD
- Design and permitting: 18 months for Marine Drive WWTP; 12 months for conveyance to BBWSD
- Construction and startup: 18 months for Marine Drive WWTP; 12 months for conveyance to BBWSD
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years for Marine Drive plant; approximately 2.5 years for conveyance of West Blaine flows to BBWSD. The major uncertainty in the schedule is the time required to negotiate an agreement between the City and BBWSD for treatment of flows at the BBWSD facility.

Protection of the Natural Environment

Discharge Location

This alternative would use the City's existing outfall to discharge into Semiahmoo Bay and the BBWSD's existing outfall at Point Whitehorn.

Effluent Water Quality

The activated sludge plant at Marine Drive would produce an effluent that would meet or exceed the City's current NPDES permit standards. The BBWSD treatment plant is also a conventional activated sludge facility and would produce a similar quality of effluent.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use, but would carry treated effluent rather than untreated sewage. The new pipeline to convey West Blaine wastewater to BBWSD would not cross any water bodies.

Other Environmental/Permitting Considerations

- The Marine Drive treatment plant has few environmental impacts, because it makes maximum use of existing infrastructure (collection system, Lift Station 1, and outfall) while eliminating pumping of raw sewage across Drayton Harbor and improving the overall quality of effluent discharged from the outfall. The Marine Park portion of the Marine Drive site was historically used as a solid waste landfill, and is known to contain subsurface contamination. This would make construction more complex, and could require stringent control measures to prevent contamination from entering nearby waters.
- The conveyance line from West Blaine to BBWSD Pump Station 6 would require construction along the shoreline on Drayton Harbor Road and would pass next to or cross Class 2 wetlands in at least six locations along Drayton Harbor Road and Harbor View Drive. Because the line would follow existing rights-of-way the impact would be minimized, but some excavation and filling of wetlands and/or sedimentation into nearshore areas of Drayton Harbor could occur. Construction would also cause temporary disruption of habitat, particularly for shorebirds in Drayton Harbor.
- Due to long-term historic and prehistoric use of the Drayton Harbor shoreline by Native American peoples, the potential for encountering cultural resources during construction of new conveyance lines is high. This could lead to schedule delays while archaeological investigations take place or, in a worst-case scenario, relocation of lines and construction of additional pump stations.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses surrounding the Marine Drive site include Port of Blaine businesses and Marine Park itself. Land uses at the West Blaine site are related to the Semiahmoo Resort.

The new conveyance line from West Blaine to BBWSD would pass through the Semiahmoo residential area before reaching the Drayton Harbor shoreline, which is largely undeveloped in this area. Development along Harbor View Road is low-density residential in nature.

Comprehensive Plan/Zoning Designation

The Marine Drive site is zoned MC (Marine Commercial).

Potential Amenities and/or Benefits

The location of the Marine Drive site at Marine Park offers the potential to co-locate other uses, such as a marine education center, with the treatment plant. The WWTP could be "blended" with the park and designed so as to be an attractive feature.

Other Non-Technical Objectives

Potential for Recycling of Effluent

As with Alternative 1, reuse of effluent from the Marine Drive WWTP is not likely to be feasible unless an industry with high water demand locates in or near central Blaine.

Effluent reuse for Blaine wastewater is possible with conveyance to the BBWSD. The District has identified an industrial user that could have a high demand (up to 6 mgd) for treated wastewater. Although the City would not directly produce or provide the effluent for reuse, it would be assisting in reducing regional demand for potable water.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. There would not be room at the Marine Park site for composting, but digested solids could continue to be taken offsite and used for beneficial purposes within the community.

The BBWSD currently processes its solids in an aerobic digester. The solids are then land-applied locally under separate contracts for hauling and land application. This practice would continue if West Blaine wastewater were treated by BBWSD.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it includes two treatment locations, this alternative could be phased. The conveyance line to BBWSD could be completed first (potentially as soon as 2005), since it would take a shorter time to design and construct. Sending West Blaine flows to BBWSD while the Marine Drive Plant was being constructed would free up capacity at the existing WWTP and allow NPDES permit requirements to be met consistently.

Another potential phasing scenario involves first constructing the headworks facility and permanent storage for peak flows at the current site of Lift Station 1. This would relieve some of the pressure on the existing WWTP. The new facilities would be designed to connect to the remainder of the WWTP when it is constructed.

Opportunity for Future Expansion

Because of its relatively small size and the fact that it is tightly constrained by other land uses, the Marine Drive site would not provide expansion opportunities beyond the 20-year planning horizon, assuming that the City maintains current growth rates. The BBWSD facility is not significantly constrained by land area and could be expanded beyond the 20-year planning period to meet additional demand.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs around the United States.

Operation and Maintenance Complexity

Conventional activated sludge systems are relatively simple to operate and maintain.

Capital Cost

To be determined.

Operation and Maintenance Cost

To be determined.

Annualized Life Cycle Cost

To be determined.

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable—e.g., funding for reclaimed water system development, economic development, etc. Because this solution involves improvements at BBW&SD as well as Blaine it could potentially have broader political support.

Fact Sheet
Alternative 2 (Two-Plant System: Marine Drive and West Blaine)

Overview of Alternative

Wastewater from East Blaine would be treated at a new WWTP on Marine Drive, while wastewater from West Blaine would be treated at a smaller WWTP located in the Semiahmoo area.

Site Location

The Marine Drive WWTP would be located on two non-contiguous pieces of City-owned property—one at the current site of Lift Station 1 and one within the current boundaries of Marine Park. Another potential site option identified along Marine Drive is property currently owned by the Port. The West Blaine site would be located somewhere on the Semiahmoo Peninsula.

Site Size (approximate)

Total land area for the Marine Drive WWTP would be approximately 3 acres (0.5 acre at Lift Station 1 and 2.47 acres in Marine Park). The West Blaine site would require approximately 1 acre of land.

General Treatment Technology Attributes and Assumptions

The Marine Drive treatment plant would be built with a 20-year capacity of **1.7** million gallons per day (mgd) and would use either conventional activated sludge or membrane biological reactor (MBR) technology. A high degree of odor control would be employed because of the nearby recreational uses. Headworks facilities (which have high odor potential) would be located at the site of Lift Station 1, while liquids and solids treatment would occur at the Marine Park portion of the site. Wastewater would be conveyed between the two parts of the site by underground pipes.

The West Blaine treatment plant would have an ultimate capacity of **0.5** mgd to accommodate growth. It would also use either conventional activated sludge or membrane biological reactor (MBR) technology. It also would have a high degree of odor control because of adjacent land uses.

Influent wastewater from East Blaine would flow through the existing collection system to the Marine Drive facility. Influent wastewater from West Blaine would flow to a pump station at the site of the City's existing WWTP, which would pump to the new West Blaine plant. Treated effluent from the Marine Drive plant would be pumped through the existing

pipe under Drayton Harbor and combined with the effluent from the West Blaine plant before being pumped back to the existing outfall for discharge.

Conveyance Requirements

Improvements to Lift Station 1 (including capacity expansion, construction of headworks, and development of equalization storage)

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Memorandum of agreement/contract negotiations (if applicable): Not applicable
- Facility planning: Up to 1 year (2004)
- Design and permitting: 18 months (2005-06)
- Construction and startup: 18 months (2006-07)
- Total timeline (approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years

Protection of the Natural Environment

Discharge Location

This alternative would use the existing outfall to discharge into Semiahmoo Bay.

Effluent Water Quality

The activated sludge plant at Marine Drive would produce an effluent that would meet or exceed the City's current NPDES permit standards. The West Blaine membrane plant would produce a higher quality of effluent, suitable for irrigation or other purposes without further treatment.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use, but would carry treated effluent rather than untreated sewage.

Other Environmental/Permitting Considerations

- This alternative has relatively few impacts to the natural environment, because it makes maximum use of existing infrastructure (collection system, Lift Station 1, and outfall) while eliminating pumping of raw sewage across Drayton Harbor and improving the overall quality of effluent discharged from the outfall.
- The Marine Park portion of the Marine Drive site was historically used as a solid waste landfill, and is known to contain subsurface contamination. This would make

construction more complex, and could require stringent control measures to prevent contamination from entering nearby waters.

- Due to long-term historic and prehistoric use of Semiahmoo Spit by Native American peoples, the potential for encountering cultural resources during construction is high. This could lead to schedule delays while archaeological investigations take place or, in a worst-case scenario, abandonment of the site for treatment plant use.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses surrounding the Marine Drive site include Port of Blaine businesses and Marine Park itself. Land uses on Semiahmoo Spit include the resort, planned housing, and park.

Comprehensive Plan/Zoning Designation

The Marine Drive site is zoned MC (Marine Commercial). The West Blaine site area is zoned MPR (Marine Planned Recreation) and RPR (Residential Planned Recreation).

Potential Amenities and/or Benefits

The location of the Marine Drive site at Marine Park offers the potential to co-locate other recreational and educational uses with the treatment plant. The WWTP could be "blended" with the park and designed so as to be an attractive feature. A West Blaine facility could offer the opportunity to provide features such as a viewing or performance platform or other amenities related to a location near the shoreline.

Other Non-Technical Objectives

Potential for Recycling of Effluent

This alternative lends itself well to reuse of effluent. The membrane treatment facility in West Blaine would produce a very high quality of effluent that could be used on nearby golf courses.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. There would not be room at either site for composting, but digested solids could be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

Because it includes two treatment plants, this alternative could be phased. One possible scenario is to construct the new West Blaine plant first; as a package facility, it would take a shorter time to design and construct. Putting this plant to use for West Blaine flows while the Marine Drive Plant was being constructed would free up capacity at the existing WWTP and allow NPDES permit requirements to be met consistently.

Another potential phasing scenario involves first constructing the headworks facility and permanent storage for peak flows at the current site of Lift Station 1. This would relieve some of the pressure on the existing WWTP. The new facilities would be designed to connect to the remainder of the WWTP when it is constructed.

Opportunity for Future Expansion

Because of its relatively small size and the fact that it is tightly constrained by other land uses, the Marine Drive site would not provide expansion opportunities beyond the 20-year planning horizon with conventional treatment. However, the treatment plant could be designed to allow for future retrofitting with membrane technology, which would allow significant capacity expansion within the same site footprint at some point in the future.

The potential for expansion at the West Blaine location is limited, due to the small amount of land available and the potential for surrounding areas to develop in the future.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States. Membrane treatment is less widely used in this country (though it is more prevalent in other countries such as Japan), and is considered an emerging or innovative technology.

Operation and Maintenance Complexity

Conventional activated sludge is relatively easy to operate and maintain. Membrane treatment is comparatively more difficult and labor-intensive, and requires a higher level of operator training.

Capital Cost

Conventional Activated Sludge (CAS) Facilities

Treatment Facility (Marine Drive) Cost Includes:.....

Treatment Facility (Semiahmoo) Cost Includes:.....

- Headworks facilities (screening, and aerated grit chamber)
- Aeration basin and secondary clarifiers
- UV disinfection (low pressure)

- Aerobic digesters
- Sludge thickening/dewatering (centrifuge)

Outfall Facilities Cost Includes: .....

- Improvements to existing outfall on Semiahmoo Spit

Conveyance Facilities Cost Includes: .....

- Two (2) raw sewage lift stations
- One (1) effluent lift station
- Approximately _____ linear feet of ___-inch pipeline
- Approximately _____ linear feet of ___-inch pipeline

Total Capital Cost for CAS Facilities .....

Membrane Bioreactor (MBR) Facilities

Treatment Facility (Marine Drive) Cost Includes:.....

Treatment Facility (Semiahmoo) Cost Includes:.....

- Headworks facilities (screening, and aerated grit chamber)
- Membrane Bioreactor
- UV disinfection (low pressure)
- Aerobic digesters
- Sludge thickening/dewatering (centrifuge)

Outfall Facilities Cost Includes: .....

- Improvements to existing outfall on Semiahmoo Spit

Conveyance Facilities Cost Includes: .....

- Two (2) raw sewage lift stations
- One (1) effluent lift station
- Approximately _____ linear feet of ___-inch pipeline
- Approximately _____ linear feet of ___-inch pipeline

Total Capital Cost for MBR Facilities .....

Operation and Maintenance Cost

The annual operations and maintenance cost estimate are shown below. They are based on labor costs using an average labor rate of $50 per hr. for estimated labor hours of approximately 1,100 hrs. for O&M staff time. They also include consumables such as power cost of $0.07 per kWh, and fuel costs of $1.75 per gallon. An average O&M repair and maintenance expenditure of approximately 2.5% of the capital equipment cost per year and a contingency of 20-percent are also included.

Conventional Activated Sludge (CAS) Facilities

Treatment Facility (Marine Drive) Annual O&M Cost.....

Treatment Facility (Semiahmoo) Annual O&M Cost .....

Outfall Facilities Annual O&M Cost .....

Conveyance Facilities Annual O&M Cost.....

Total Annual O&M Cost for CAS Facilities.....

Membrane Bioreactor (MBR) Facilities

Treatment Facility (Marine Drive) Annual O&M Cost.....

Treatment Facility (Semiahmoo) Annual O&M Cost .....

Outfall Facilities Annual O&M Cost .....

Conveyance Facilities Annual O&M Cost.....

Total Annual O&M Cost for MBR Facilities.....

Annualized Life Cycle Cost

The annualized life cycle cost estimate for each treatment facility is shown below. They are based on a project life of 20 years, an annual interest rate of 3.5-percent, and an inflation rate of 2.5-percent. The annualized cost includes average annual O&M costs plus the amortized cost of debt repayment.

Conventional Activated Sludge (CAS) Facilities

Total Annualized Life Cost for CAS Facilities .....

Membrane Bioreactor (MBR) Facilities

Total Annualized Life Cost for MBR Facilities .....

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable—e.g., funding for reclaimed water system development, economic development, etc.

Fact Sheet
Alternative 1 (Single WWTP at Marine Drive)

Overview of Alternative

Wastewater from the entire Blaine service area would be treated at a single new WWTP on Marine Drive.

Site Location

The Marine Drive WWTP would be located on two non-contiguous pieces of City-owned property—one at the current site of Lift Station 1 and one within the current boundaries of Marine Park. Another potential site option identified along Marine Drive is property currently owned by the Port.

Site Size (approximate)

Total land area for the Marine Drive WWTP would be approximately 3 acres (0.5 acre at Lift Station 1 and 2.47 acres in Marine Park).

General Treatment Technology Attributes and Assumptions

The new Marine Drive treatment plant would be built with a 20-year capacity of 1.6 million gallons per day (mgd) and would use either conventional activated sludge or membrane biological reactor (MBR) technology. A high degree of odor control would be employed because of the nearby recreational uses. Headworks facilities (which have high odor potential) would be located at the site of Lift Station 1, while liquids and solids treatment would occur at the Marine Park portion of the site. Wastewater would be conveyed between the two parts of the site by underground pipes.

Influent wastewater from East Blaine would flow through the existing collection system to the Marine Drive facility. Influent wastewater from West Blaine would flow to a pump station on or near the site of the City's existing WWTP, which would pump to the new Marine Drive plant. Untreated wastewater from West Blaine would be pumped through the existing pipe under Drayton Harbor. A second conveyance line across the harbor would be needed to carry the treated effluent from the new WWTP back to the existing outfall for discharge.

Conveyance Requirements

- Improvements to Lift Station 1 (including capacity expansion, construction of headworks, and development of equalization storage)
- Force main to carry treated effluent across Drayton Harbor from new WWTP to outfall, or to carry untreated effluent across Drayton Harbor from West Blaine to new WWTP (only one new line would be needed, as the existing force main would be reused).

- New pump station at or near site of existing WWTP.

Timeline for Implementation

- Grant/loan funding: Facility planning funding in 2004; design/construction funding in 2005
- Facility planning: Up to 1 year (2004)
- Design and permitting: 18 months (2005-06)
- Construction and startup: 18 months (2006-07)
- Total timeline (from approval of General Sewer Plan to transfer of flows to new treatment location): Approximately 4 years

Protection of the Natural Environment

Discharge Location

This alternative would use the existing outfall to discharge into Semiahmoo Bay.

Effluent Water Quality

The activated sludge plant at Marine Drive would produce an effluent that would meet or exceed the City's current NPDES permit standards. A MBR plant would provide a higher quality effluent that is consistent with water reuse applications.

Crossing of Water Bodies

The Drayton Harbor pipeline crossing would remain in use, carrying untreated sewage in the opposite direction from its current operations; a second pipeline across the harbor mouth would also be required to carry treated effluent to the existing outfall from the Marine Drive plant.

Other Environmental/Permitting Considerations

This alternative would involve continued conveyance of raw sewage under the mouth of Drayton Harbor; however, design and operational features of the harbor crossing would minimize the risk of potential spills. If existing unused water system pipelines under the harbor are not suitable for effluent transport, a new pipeline may need to be constructed in this location. This new pipeline would require extensive permitting that could delay the timeline for project implementation.

The Marine Park portion of the Marine Drive site was historically used as a solid waste landfill, and is known to contain subsurface contamination. This would make construction more complex, and could require stringent control measures to prevent contamination from entering nearby waters.

Protection and Enhancement of Community Livability

Surrounding Land Uses

Land uses surrounding the Marine Drive site include Port of Blaine businesses and Marine Park itself.

Comprehensive Plan/Zoning Designation

The Marine Drive site area is zoned MC (Marine Commercial).

Potential Amenities and/or Benefits

The location of the Marine Drive site at Marine Park offers the potential to co-locate other recreational or educational uses with the treatment plant. The WWTP could be "blended" with the park and designed so as to be an attractive feature. A location on the Port of Blaine's property would also lend itself to this approach.

Other Non-Technical Objectives

Potential for Recycling of Effluent

This alternative may not be highly suited for effluent reuse unless an industry requiring large volumes of non-potable water (such as cooling water) locates within Blaine. This could make a reclaimed water conveyance system cost-effective.

Potential for Beneficial Use of Process Byproducts

Opportunities for reuse of biosolids would be present with this alternative. There would not be room at the site for composting, but digested solids could continue to be taken offsite and used for beneficial purposes within the community.

Restoration of Existing Site

The existing treatment plant would remain in use until approximately 2007.

Growth and Development Requirements

Potential for Phased/Staged Development

There is a potential to phase this alternative by first constructing the headworks facility and permanent storage for peak flows at the current site of Lift Station 1. This would relieve some of the pressure on the existing WWTP. The other new treatment facilities would be designed to connect to the new headworks in a later phase.

Opportunity for Future Expansion

Because of its relatively small size and the fact that it is tightly constrained by other land uses, the Marine Drive site would not provide expansion opportunities beyond the 20-year planning horizon with conventional treatment. However, a membrane facility could be

designed to provide additional capacity for growth beyond 20 years. In addition, a conventional treatment plant could be designed to allow for future retrofitting with membrane technology, which would allow significant capacity expansion within the same site footprint at some point in the future.

Constructibility, Operability, Reliability, and Cost Efficiency

Use of Proven Technology

Conventional activated sludge is a proven and reliable technology, used at hundreds of WWTPs across the United States. The MBR technology is relatively new in the United States; however, it has been used extensively outside of the U.S. MBR installations are increasing in number in the U.S., as higher quality water and smaller footprints become more important drivers in treatment plant design.

Operation and Maintenance Complexity

Conventional activated sludge systems are relatively simple to operate and maintain. MBR technology is also relatively simple to operate, but comparatively more labor-intensive, and requires a higher level of operator training. Most MBR facilities are highly automated.

Capital Cost

The capital cost estimate shown below includes the construction cost estimate for the main treatment facilities, ancillary support facilities, yard piping and site development, and building structures. The costs were developed based on historical cost estimates for similar treatment facilities of various flow capacities. Construction costs also included markups for contractor overhead (10% of construction cost), contractor profit (5%), bonds/insurance/mobilization (5%), and contingency (20%).

Also included in the capital costs are the non-construction-related costs such as permitting, engineering services, land acquisitions and right -of-way, legal/administrative services, and sales taxes.

Conventional Activated Sludge (CAS) Facilities

Treatment Facilities Cost Includes:.....

- Headworks facilities (screening, and aerated grit chamber)
- Aeration basin and secondary clarifiers
- UV disinfection (low pressure)
- Aerobic digesters
- Sludge thickening/dewatering (centrifuge)

Outfall Facilities Cost Includes: .....

- Improvements to existing outfall on Semiahmoo Spit

Conveyance Facilities Cost Includes: .....

- Two (2) raw sewage lift stations
- One (1) effluent lift station

- Approximately _____ linear feet of ___-inch pipeline
- Approximately _____ linear feet of ___-inch pipeline

Total Capital Cost for CAS Facilities .....

Membrane Bioreactor (MBR) Facilities

Treatment Facilities Cost Includes:.....

- Headworks facilities (screening, and aerated grit chamber)
- Membrane Bioreactor
- UV disinfection (low pressure)
- Aerobic digesters
- Sludge thickening/dewatering (centrifuge)

Outfall Facilities Cost Includes: .....

- Improvements to existing outfall on Semiahmoo Spit

Conveyance Facilities Cost Includes: .....

- Two (2) raw sewage lift stations
- One (1) effluent lift station
- Approximately _____ linear feet of ___-inch pipeline
- Approximately _____ linear feet of ___-inch pipeline

Total Capital Cost for MBR Facilities .....

Operation and Maintenance Cost

The annual operations and maintenance cost estimate are shown below. They are based on labor costs using an average labor rate of $50 per hr. for estimated labor hours of approximately 1,100 hrs. for O&M staff time. They also include consumables such as power cost of $0.07 per kWh, and fuel costs of $1.75 per gallon. An average O&M repair and maintenance expenditure of approximately 2.5% of the capital equipment cost per year and a contingency of 20-percent are also included.

Conventional Activated Sludge (CAS) Facilities

Treatment Facilities Annual O&M Cost .....

Outfall Facilities Annual O&M Cost .....

Conveyance Facilities Annual O&M Cost.....

Total Annual O&M Cost for CAS Facilities.....

Membrane Bioreactor (MBR) Facilities

Treatment Facilities Annual O&M Cost .....

Outfall Facilities Annual O&M Cost .....

Conveyance Facilities Annual O&M Cost.....

Total Annual O&M Cost for MBR Facilities.....

Annualized Life Cycle Cost

The annualized life cycle cost estimate for each treatment facility is shown below. They are based on a project life of 20 years, an annual interest rate of 3.5-percent, and an inflation rate of 2.5-percent. The annualized cost includes average annual O&M costs plus the amortized cost of debt repayment.

Conventional Activated Sludge (CAS) Facilities

Total Annualized Life Cost for CAS Facilities .....

Membrane Bioreactor (MBR) Facilities

Total Annualized Life Cost for MBR Facilities .....

Potential Grant and Loan Funding Sources

This alternative could be funded with grants and/or loans from federal programs (Community Development Block Grant, USDA Rural Utilities Service) and state programs (Public Works Trust Fund and Centennial Clean Water Fund). Depending upon ultimate features of the plants, other funding sources could also be applicable—e.g., funding for reclaimed water system development, economic development, etc.

Appendix M

Technical Cost Development for Wastewater Treatment Alternatives

Blaine Wastewater Management System
Alternatives Analysis

interest rate	3.5%
inflation rate	2.5%
project life	25

Alt. Groupings	Alternative	Alternative Description	Treatment Process	Flow Rate (mgd)	Treatment Costs		Treatment Area Req'd (acres)	Treatment/Outfall Location		Outfall Capital Costs	Conveyance Costs		Total Cost Analysis					Monetary Ranking
					Capital	Annual		Plant Site	Discharge Point		Capital	Annual	Capital	Annual	Amortized Debt Payment (n=25yrs., i=3.5%)	Avg. Annual O&M Costs (25 yrs., 2.5% infl.)	Total Annual Cost	
Marine Drive Alternatives	Alt. #1	Build one new plant in Central Blaine on Marine Drive. Pump untreated West Blaine flow through a pipeline under the harbor entrance to the new plant and pump treated flow to the existing outfall at the site of the present WWTP.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	3.0	Marine Drive	Extg. Outfall	$ 250,000	$ 4,900,000	$ 84,900	$ 21,750,000	$ 714,900	$ 1,319,660.27	$ 976,775	$ 2,296,436	
			Alt. #1 Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*3.0*			*$ 250,000*	*$ 4,900,000*	*$ 84,900*	*$ 21,750,000*	*$ 714,900*	*$ 1,319,660*	*$ 976,775*	***$ 2,296,436***	3
	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.	Conventional Activated Sludge	1.3	$ 14,500,000	$ 580,000	3.0	Marine Drive	Extg. Outfall	$ 250,000	$ 1,115,400	$ 84,900	$ 15,865,400	$ 664,900	$ 962,618	$ 908,460	$ 1,871,078	
			Membrane Bioreactor	0.3	$ 5,300,000	$ 350,000	2.0	W. Blaine	Extg. Outfall	$ -	$ 568,800	$ 40,000	$ 5,868,800	$ 390,000	$ 356,084	$ 532,861	$ 888,945	
			Alt. #2 Total	*1.6*	*$ 19,800,000*	*$ 930,000*	*5.0*			*$ 250,000*	*$ 1,684,200*	*$ 124,900*	*$ 21,734,200*	*$ 1,054,900*	*$ 1,318,702*	*$ 1,441,321*	***$ 2,760,023***	10
	Alt. #3	Build one new WWTP in Central Blaine on Marine Drive, with the plant effluent being discharged through the existing outfall. Untreated West Blaine flow would be conveyed to the Birch Bay WSD WWTP for discharge.	Conventional Activated Sludge	1.3	$ 14,500,000	$ 580,000	3.0	Marine Drive	Extg. Outfall	$ 250,000	$ 1,115,400	$ 84,900	$ 15,865,400	$ 664,900	$ 962,618	$ 908,460	$ 1,871,078	
			Pump to BBWSD	0.3	$ 1,860,000	$ 390,000	1.0	W. Blaine	BBWSD	$ -	$ 8,695,000	$ 40,000	$ 10,555,000	$ 430,000	$ 640,414	$ 587,514	$ 1,227,928	
			Alt. #3 Total	*1.6*	*$ 16,360,000*	*$ 970,000*	*4.0*			*$ 250,000*	*$ 9,810,400*	*$ 124,900*	*$ 26,420,400*	*$ 1,094,900*	*$ 1,603,032*	*$ 1,495,973*	***$ 3,099,006***	13
Dakota Creek Alternatives	Alt. #4	Build one new membrane bioreactor plant with the plant effluent discharged to a shallow, freshwater outfall on Dakota Creek.	Membrane Bioreactor	1.6	$ 19,060,000	$ 820,000	6.0	Dakota Creek	Dakota Creek	$ 1,000,000	$ 16,146,000	$ 84,900	$ 36,206,000	$ 904,900	$ 2,196,764	$ 1,236,374	$ 3,433,139	
			Alt. #4 Total	*1.6*	*$ 19,060,000*	*$ 820,000*	*6.0*			*$ 1,000,000*	*$ 16,146,000*	*$ 84,900*	*$ 36,206,000*	*$ 904,900*	*$ 2,196,764*	*$ 1,236,374*	***$ 3,433,139***	14
	Alt. #5	Build a treatment system along one of the creeks utilizing a more natural treatment system such as constructed wetlands, etc.	Primary Treatment w/ Natural Treatment	1.6	$ 17,100,000	$ 340,000	110.0	Dakota Creek	Dakota Creek	$ 1,000,000	$ 16,146,000	$ 84,900	$ 34,246,000	$ 424,900	$ 2,077,843	$ 580,545	$ 2,658,388	
			Alt. #5 Total	*1.6*	*$ 17,100,000*	*$ 340,000*	*110.0*			*$ 1,000,000*	*$ 16,146,000*	*$ 84,900*	*$ 34,246,000*	*$ 424,900*	*$ 2,077,843*	*$ 580,545*	***$ 2,658,388***	8
West Blaine Alternatives	Alt. #6	Build one new conventional plant on the West Blaine uplands and utilize the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	6.0	W. Blaine (top of hill)	Extg. Outfall	$ 250,000	$ 7,183,000	$ 84,900	$ 24,033,000	$ 714,900	$ 1,458,179	$ 976,775	$ 2,434,955	
			Alt. #6 Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*6.0*			*$ 250,000*	*$ 7,183,000*	*$ 84,900*	*$ 24,033,000*	*$ 714,900*	*$ 1,458,179*	*$ 976,775*	***$ 2,434,955***	4
	Alt. #7	Build one new conventional plant on the West Blaine lowlands and utilize the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	6.0	W. Blaine (radio tower)	Extg. Outfall	$ 250,000	$ 10,265,000	$ 84,900	$ 27,115,000	$ 714,900	$ 1,645,176	$ 976,775	$ 2,621,952	
			Alt. #7 Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*6.0*			*$ 250,000*	*$ 10,265,000*	*$ 84,900*	*$ 27,115,000*	*$ 714,900*	*$ 1,645,176*	*$ 976,775*	***$ 2,621,952***	7
	Alt. #8	Build one new conventional plant on the Semiahmoo Spit and utilize the existing outfall at the Semiahmoo STP. Pump untreated East Blaine flow to the new plant for treatment.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	6.0	W. Blaine (Semiahmoo Spit)	Extg. Outfall	$ 250,000	$ 3,113,000	$ 150,000	$ 19,963,000	$ 780,000	$ 1,211,236	$ 1,065,722	$ 2,276,958	
			Alt. #8Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*6.0*			*$ 250,000*	*$ 3,113,000*	*$ 150,000*	*$ 19,963,000*	*$ 780,000*	*$ 1,211,236*	*$ 1,065,722*	***$ 2,276,958***	2
	Alt. #9	Build one new conventional plant on the West Blaine uplands and utilize a new deep, saltwater outfall from Birch Point. Pump untreated East Blaine flow to the new treatment plant.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	6.0	W. Blaine (top of hill)	New Outfall	$ 2,000,000	$ 7,183,000	$ 84,900	$ 25,783,000	$ 714,900	$ 1,564,359	$ 976,775	$ 2,541,134	
			Alt. #9 Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*6.0*			*$ 2,000,000*	*$ 7,183,000*	*$ 84,900*	*$ 25,783,000*	*$ 714,900*	*$ 1,564,359*	*$ 976,775*	***$ 2,541,134***	6
Conveyance to Others Alternatives	Alt. #10	Build new lift station and 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 lift station.	Pump Sta. #1 to GVRD	1.6	$ 1,000,000	$ 442,000	2.0	Annacis Island (BC)	Fraser River	$ -	$ 17,336,000	$ 84,900	$ 18,336,000	$ 526,900	$ 1,112,519	$ 719,909	$ 1,832,428	
			Alt. #10 Total	*1.6*	*$ 1,000,000*	*$ 442,000*	*2.0*			*$ -*	*$ 17,336,000*	*$ 84,900*	*$ 18,336,000*	*$ 526,900*	*$ 1,112,519*	*$ 719,909*	***$ 1,832,428***	1
	Alt. #11	Separately pump East Blaine and West Blaine flow to Birch Bay for treatment in an expanded Birch Bay WWTP.	Pump Sta. #1 to BBWSD	1.3	$ 9,300,000	$ 551,000	1.5	BBWWTP	Pt. Whitehorn	$ -	$ 13,824,000	$ 84,900	$ 23,124,000	$ 635,900	$ 1,403,026	$ 868,837	$ 2,271,863	
			Pump Sta. #2 to BBWSD	0.3	$ -	$ -	1.0	BBWWTP	Pt. Whitehorn	$ -	$ 9,195,000	$ 40,000	$ 9,195,000	$ 40,000	$ 557,898	$ 54,652	$ 612,550	
			Alt. #11 Total	*1.6*	*$ 9,300,000*	*$ 551,000*	*2.5*			*$ -*	*$ 23,019,000*	*$ 124,900*	*$ 32,319,000*	*$ 675,900*	*$ 1,960,924*	*$ 923,489*	***$ 2,884,413***	11
East Blaine Upland Alternatives	Alt. #12	Build one new conventional plant on the East Blaine uplands. Pump untreated West Blaine flow to Lift Station 1 and convey East and West Blaine flows to new WWTP through a new force main. Effluent would flow back across Drayton Harbor crossing for discharge at existing outfall.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	6.0	E. Blaine (Gravel Pit)	Extg. Outfall	$ 250,000	$ 15,482,000	$ 84,900	$ 32,332,000	$ 714,900	$ 1,961,713	$ 976,775	$ 2,938,488	
			Alt. #12 Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*6.0*			*$ 250,000*	*$ 15,482,000*	*$ 84,900*	*$ 32,332,000*	*$ 714,900*	*$ 1,961,713*	*$ 976,775*	***$ 2,938,488***	12
	Alt. #13	Build one new conventional plant in the commercial/industrial area. Pump untreated West Blaine flow to Lift Station 1 and convey East and West Blaine flows to new WWTP through a new force main. Effluent would flow back across Drayton Harbor crossing for discharge at existing outfall.	Conventional Activated Sludge	1.6	$ 16,600,000	$ 630,000	6.0	E. Blaine (Commercial and Industrial Area)	Extg. Outfall	$ 250,000	$ 8,897,000	$ 84,900	$ 25,747,000	$ 714,900	$ 1,562,174	$ 976,775	$ 2,538,950	
			Alt. #13 Total	*1.6*	*$ 16,600,000*	*$ 630,000*	*6.0*			*$ 250,000*	*$ 8,897,000*	*$ 84,900*	*$ 25,747,000*	*$ 714,900*	*$ 1,562,174*	*$ 976,775*	***$ 2,538,950***	5
Additional Marine Dr. Alternative	Alt. #14	Build one new WWTP in West Blaine uplands, with the plant effluent being discharged through the existing outfall. Untreated East Blaine flow would be conveyed to GVRD's Annacis Island WWTP for discharge.	Pump Sta. #1 to GVRD	1.3	$ 1,000,000	$ 442,000	2.0	Annacis Island (BC)	Fraser River	$ -	$ 17,096,000	$ 84,900	$ 18,096,000	$ 526,900	$ 1,097,957	$ 719,909	$ 1,817,866	
			Membrane Bioreactor	0.3	$ 5,300,000	$ 350,000	2.0	W. Blaine	Extg. Outfall	$ 250,000	$ 568,800	$ 40,000	$ 6,118,800	$ 390,000	$ 371,252	$ 532,861	$ 904,113	
			Alt. #14 Total	*1.6*	*$ 6,300,000*	*$ 792,000*	*4.0*			*$ 250,000*	*$ 17,664,800*	*$ 124,900*	*$ 24,214,800*	*$ 916,900*	*$ 1,469,210*	*$ 1,252,770*	***$ 2,721,980***	9

Appendix N

Wastewater Treatment Alternative Evaluation Process

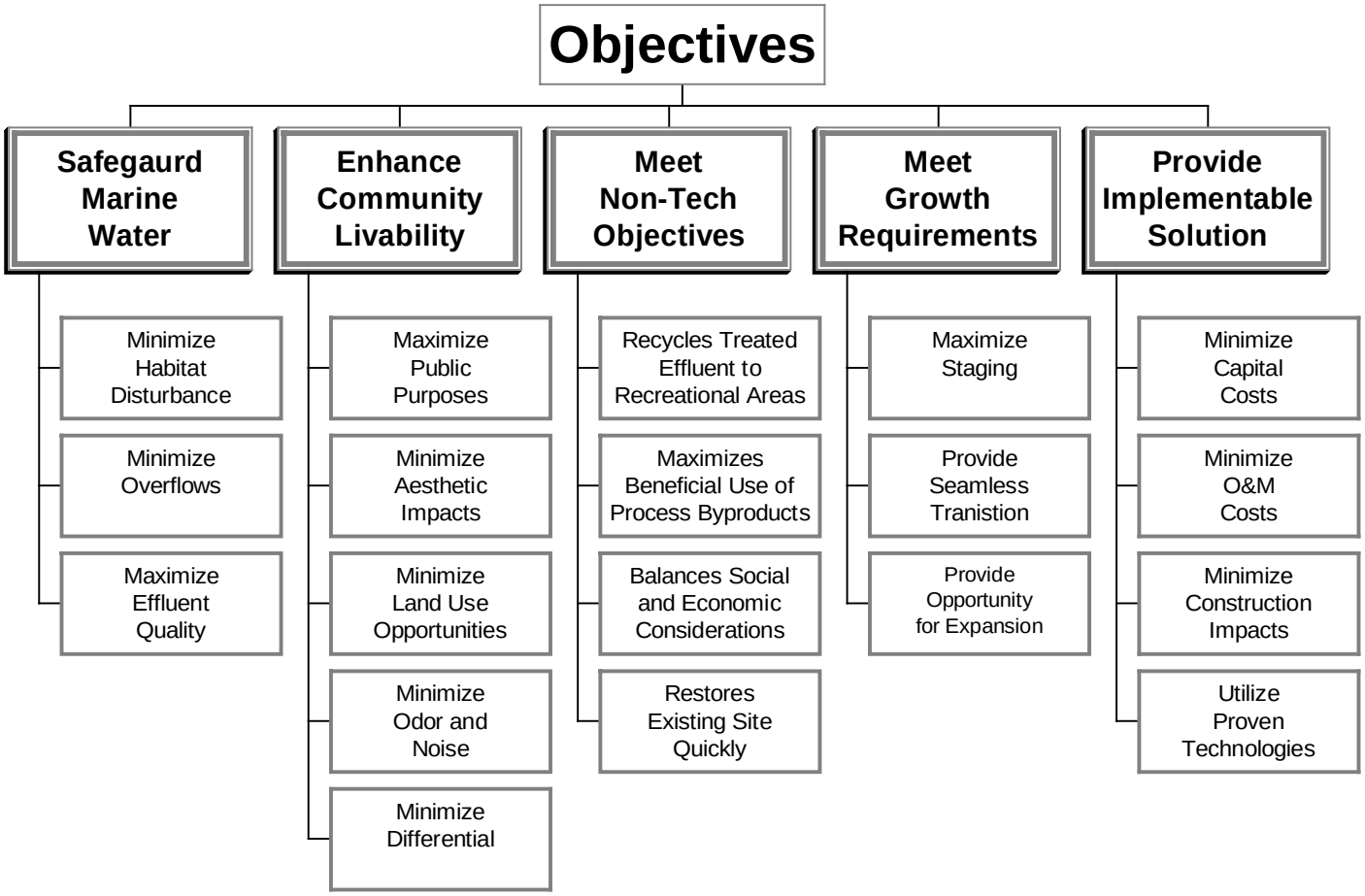
Summary of Results of a Decision Tool CWAC used to Visualize the Results of Ranking of Alternatives

CWAC Meetings - September 15 & 24, 2003
City of Blaine/ CH2M HILL

9/15/03

City of Blaine Wastewater Management System

*Initial Value Hierarchy**

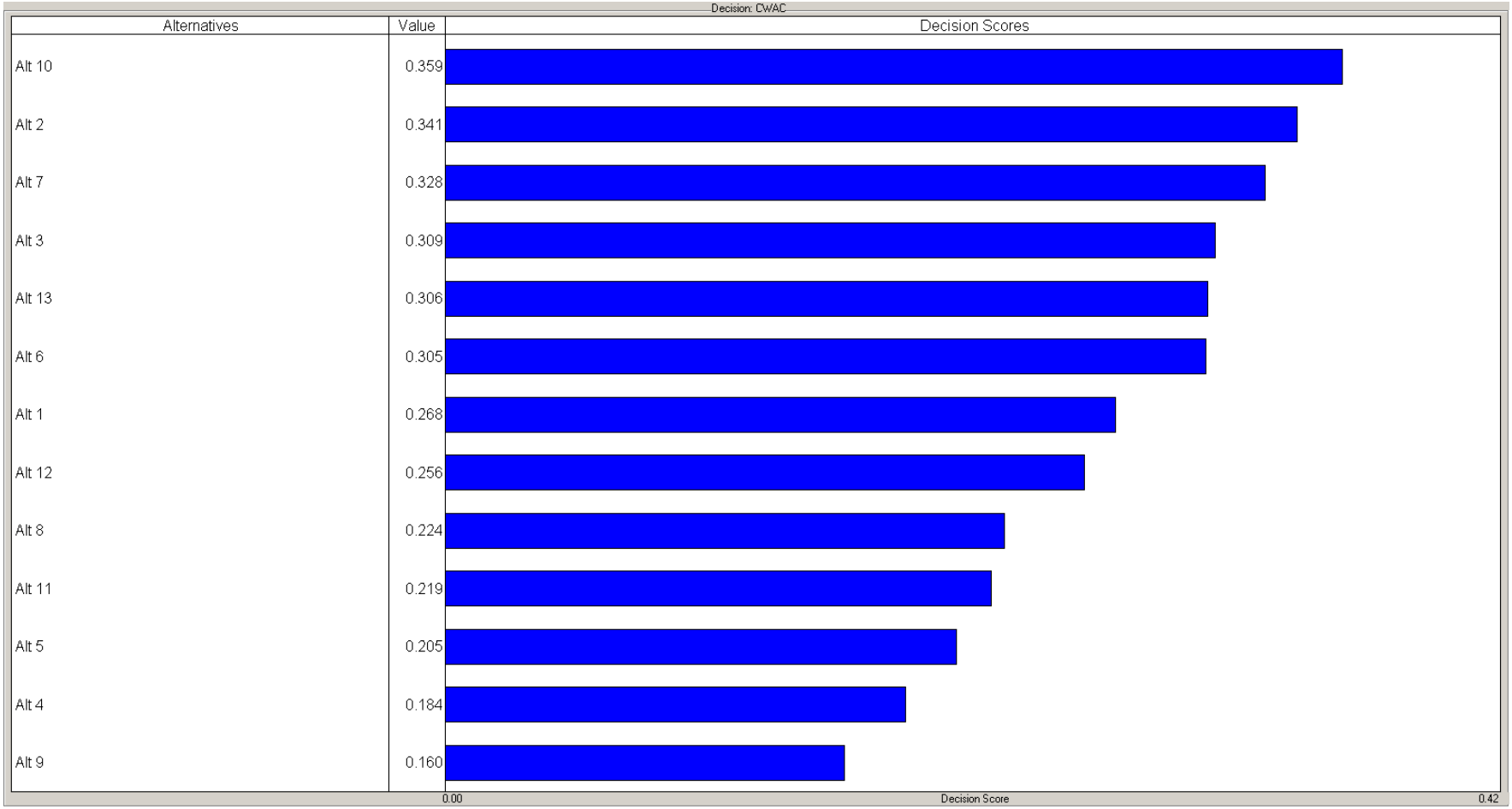


** Prior to September 15th Workshop*

9/15/03

City of Blaine Wastewater Management System

*Pre-Workshop Alternative Scores**

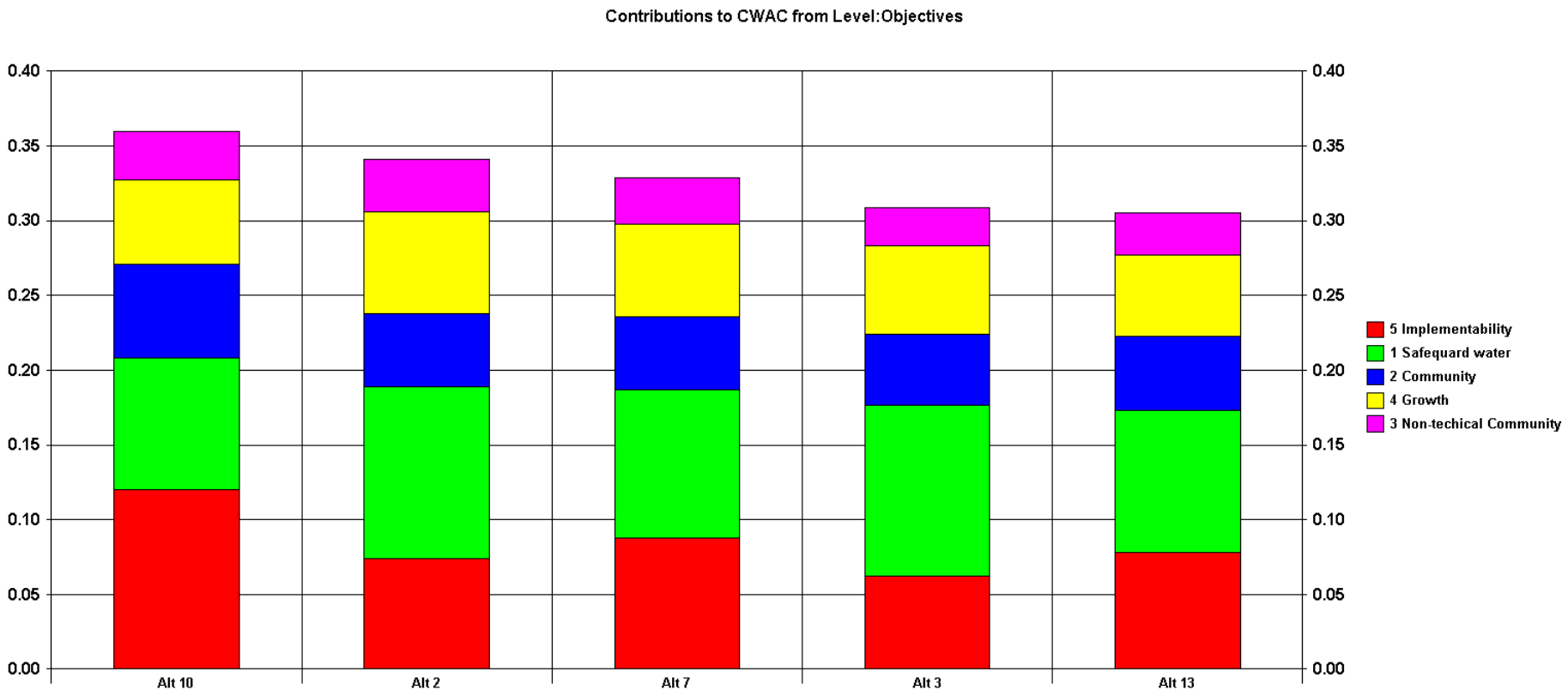


* Based on pre-workshop input from 5 team members. Individuals' ratings of alternatives across top-level objectives (not sub-criteria) were averaged.

9/15/03

City of Blaine Wastewater Management System

Pre-workshop Contributions by Criteria for Top 5 Alternatives

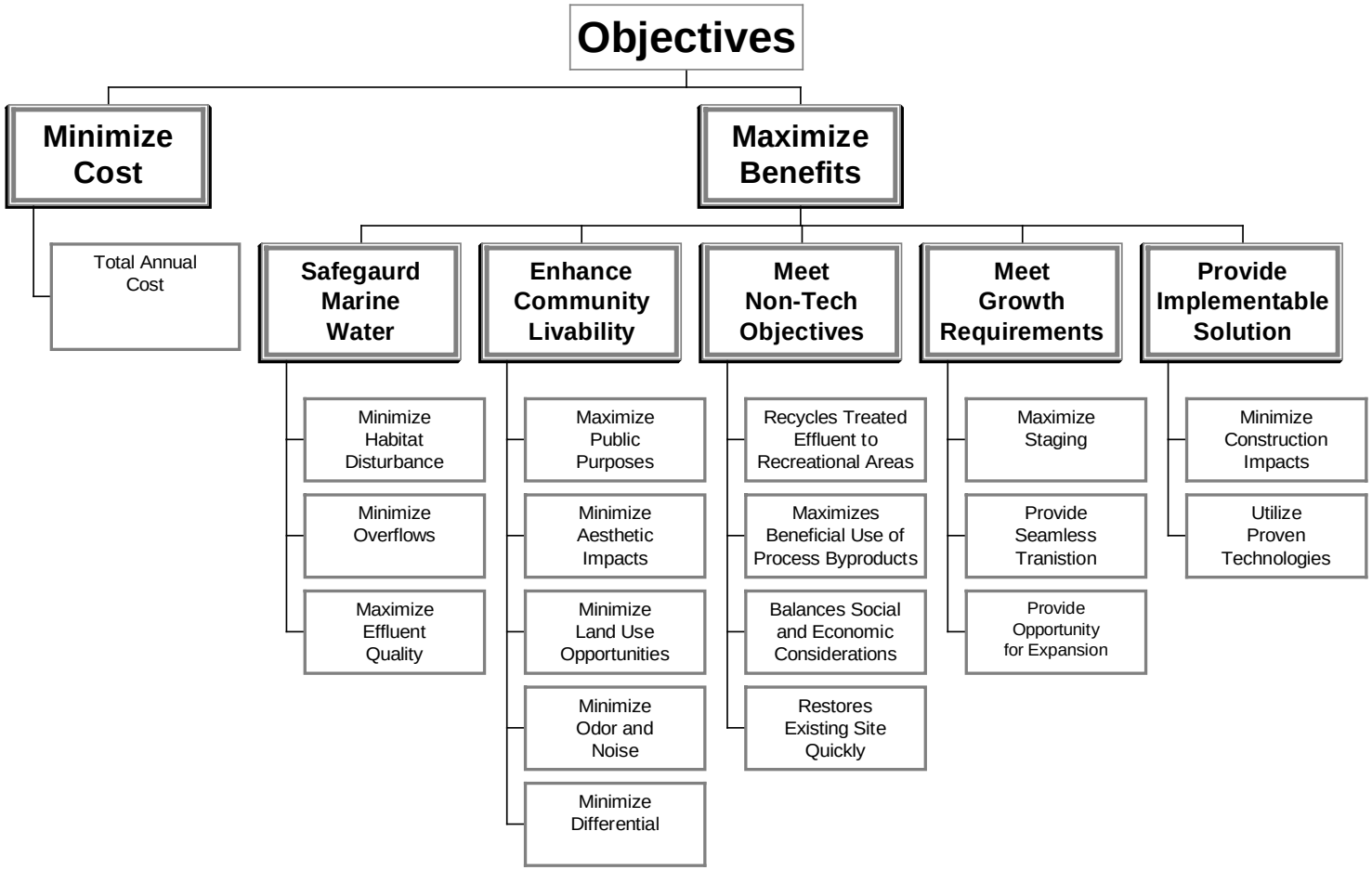


Note: Option 10 scores highest on Implementability (lowest cost) although not as high on safeguarding marine water.

9/15/03

City of Blaine Wastewater Management System

*Revised Value Hierarchy**



** Revised in September 15th workshop to separate costs from benefits.*

9/15/03

City of Blaine Wastewater Management System

*Re-weighting of objectives based on revised Value Hierarchy**

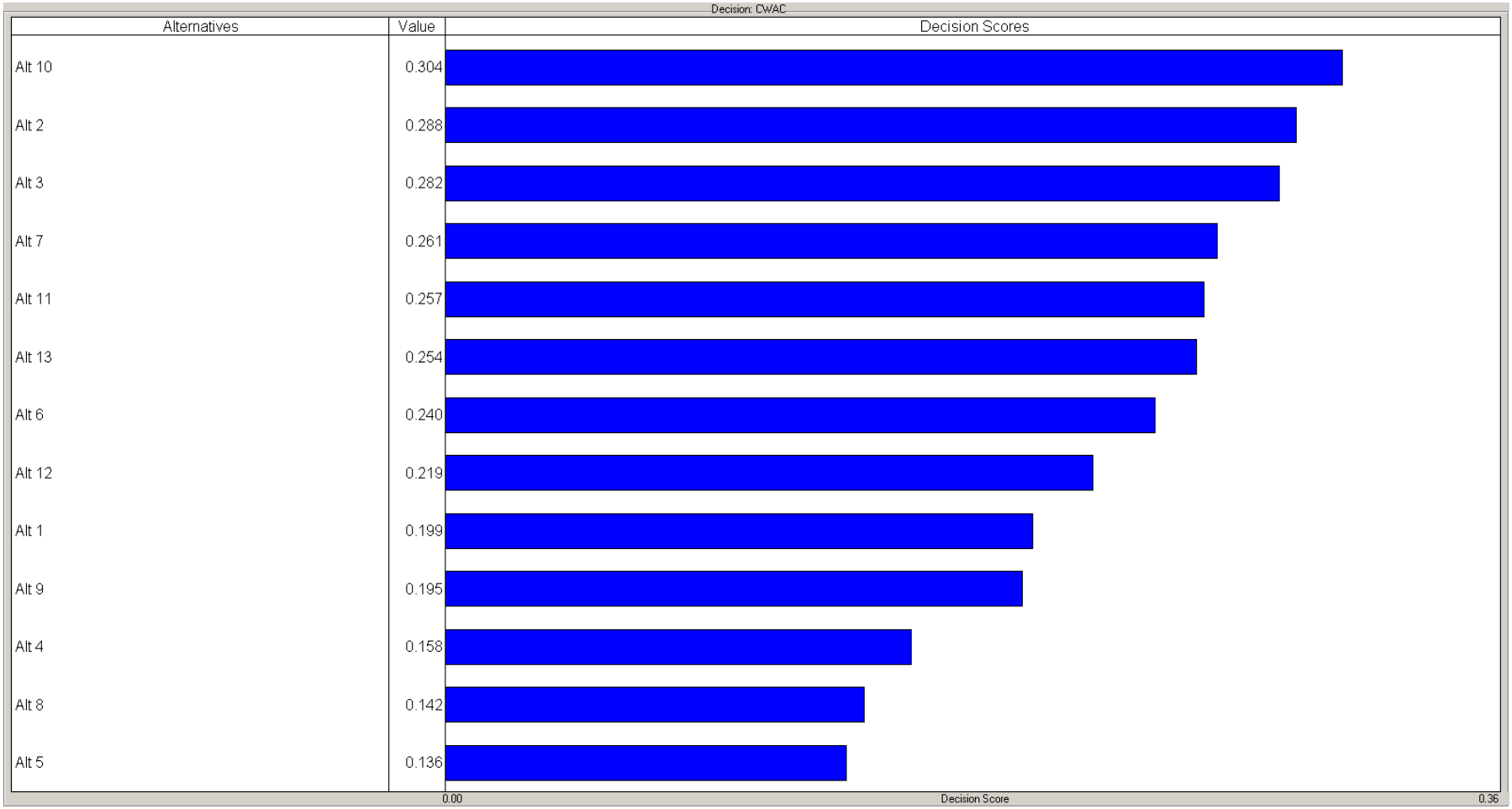
Objectives	Original Weight	Revised Weight	Method
1 Safeguard water	31	36	increased proportional to original weight
2 Community	15	18	" "
3 Non-technical Community	9	11	" "
4 Growth	18	21	" "
5 Implementability	27	15	based on average on participant average
	100	100	

** Implementability weight was reduced to account for removal of cost sub-criteria. Other weights were increased proportional to sum to 100.*

9/15/03

City of Blaine Wastewater Management System

Workshop Alternative Scores - ***Round One****

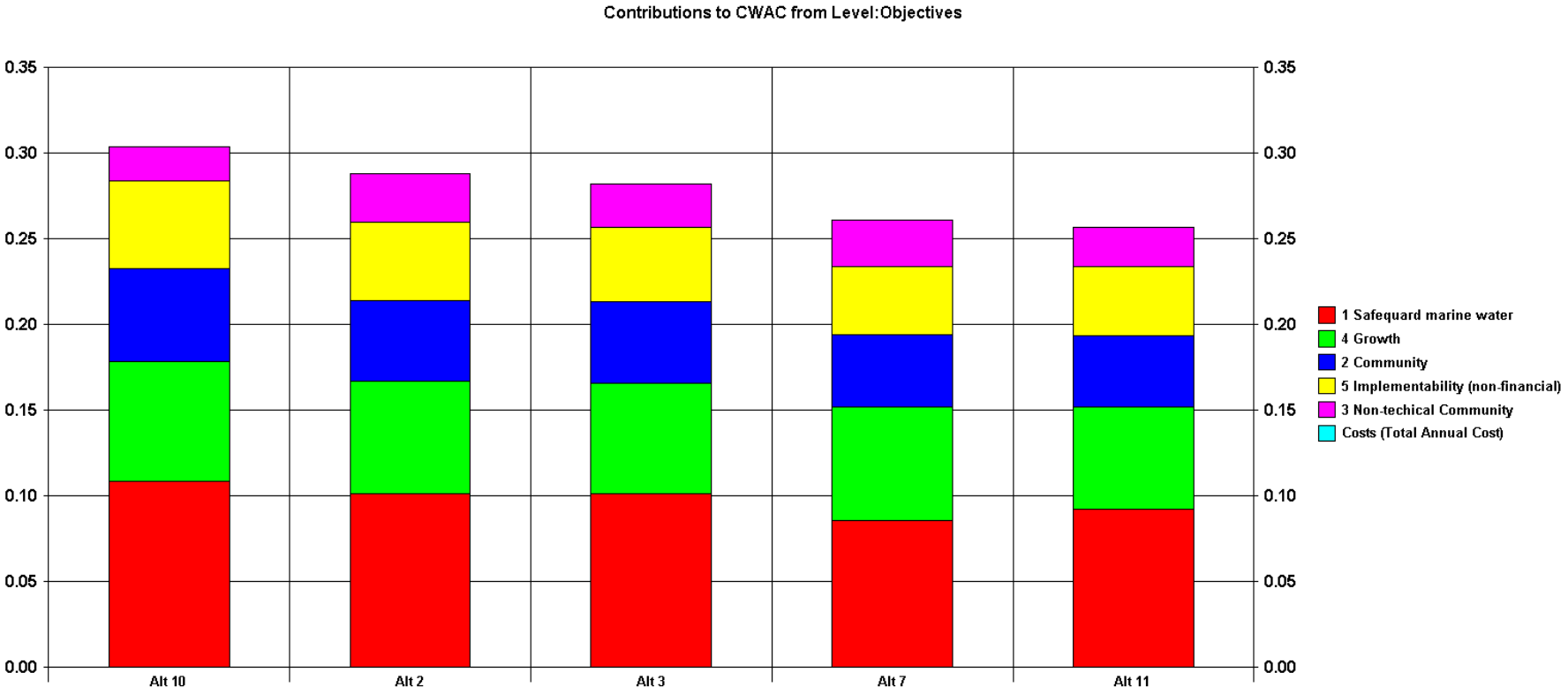


* Based on the average of individuals' rating of alternatives across top-level objectives (no sub-criteria rating at this point). Note top 4 alternatives are the same.

9/15/03

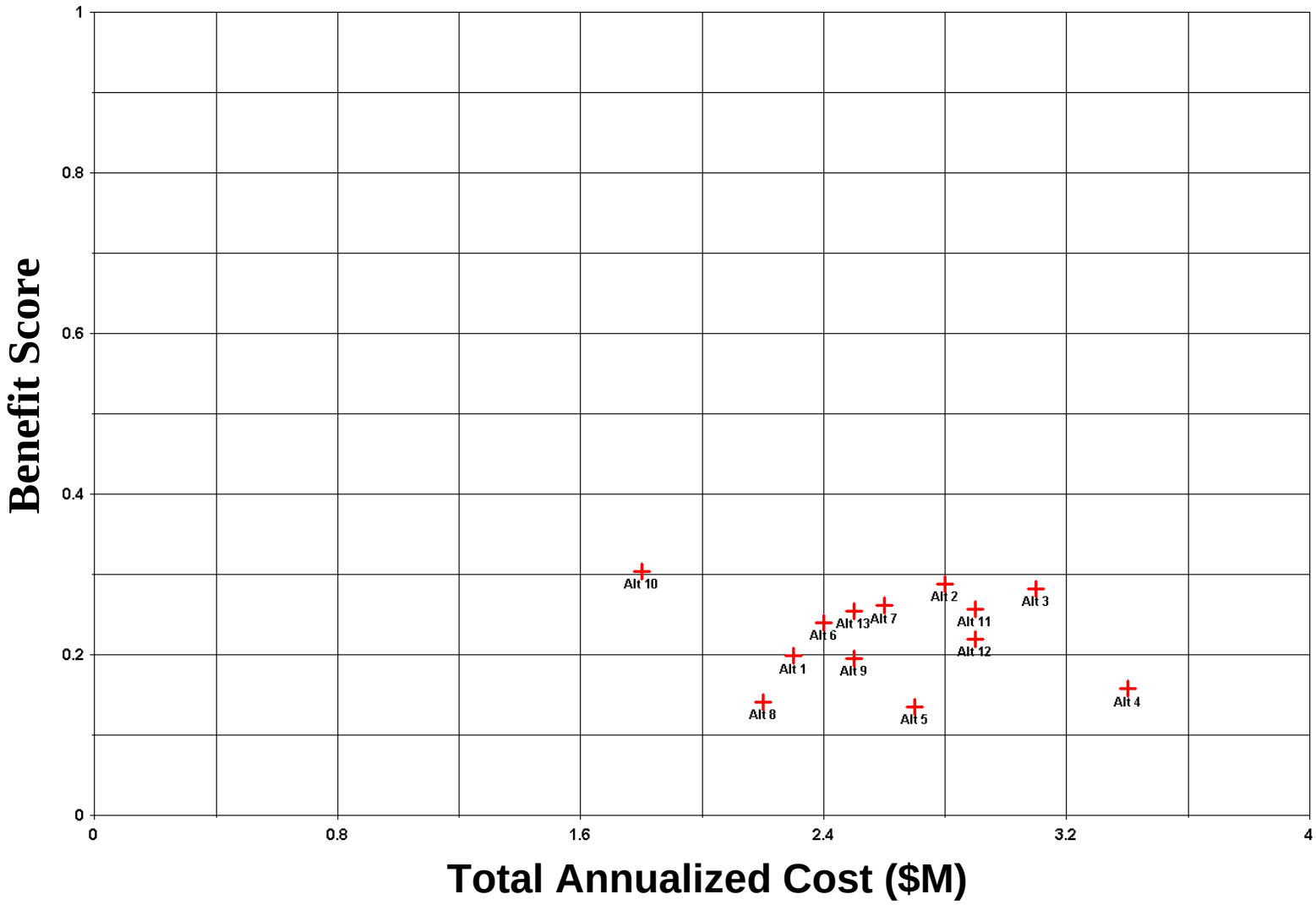
City of Blaine Wastewater Management System

Workshop Contributions by Criteria - ***Round One***



City of Blaine Wastewater Management System

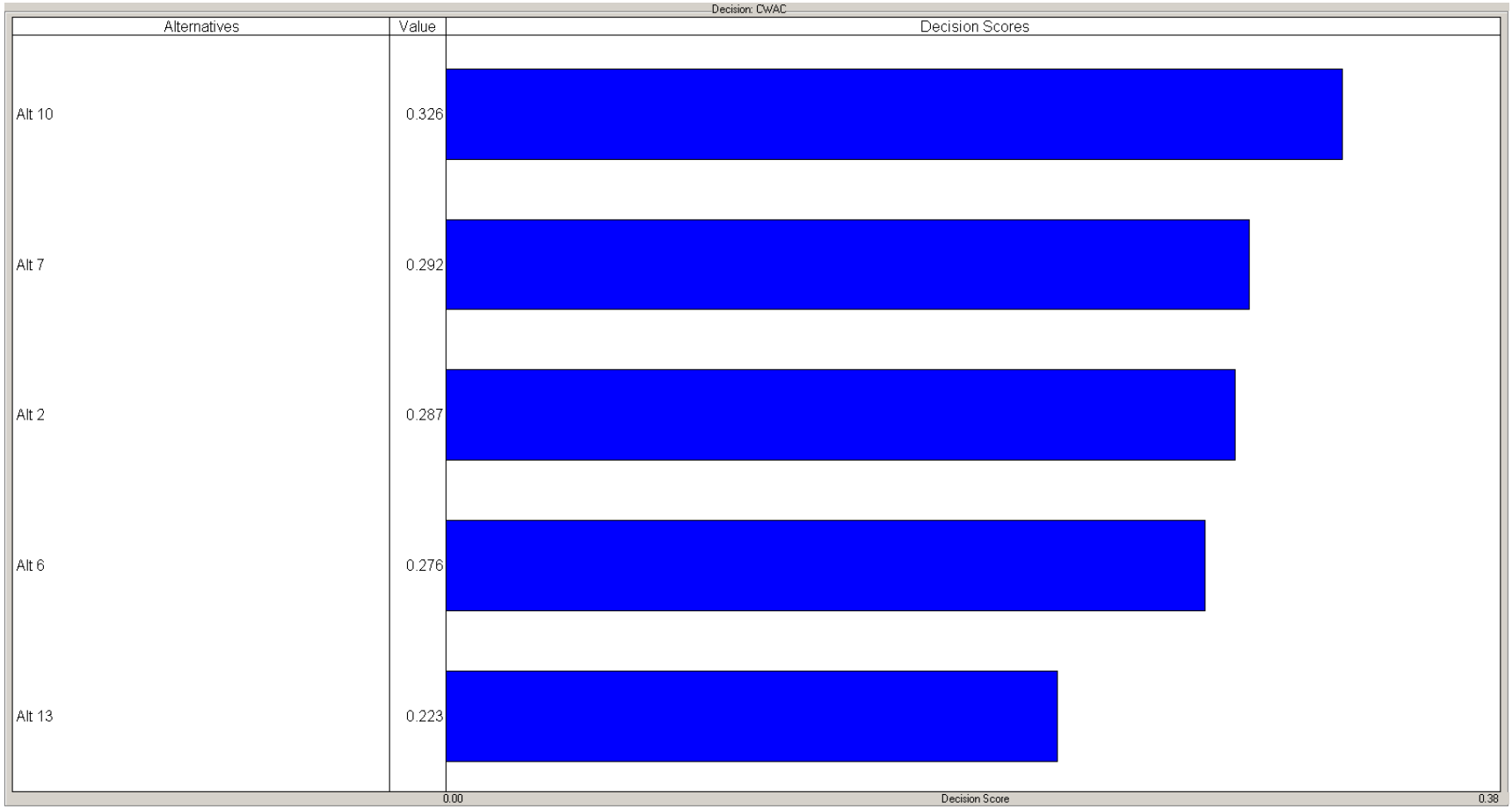
Benefit vs. Cost - ***Round One***



9/15/03

City of Blaine Wastewater Management System

*Workshop Alternative Scores - **Round Two****

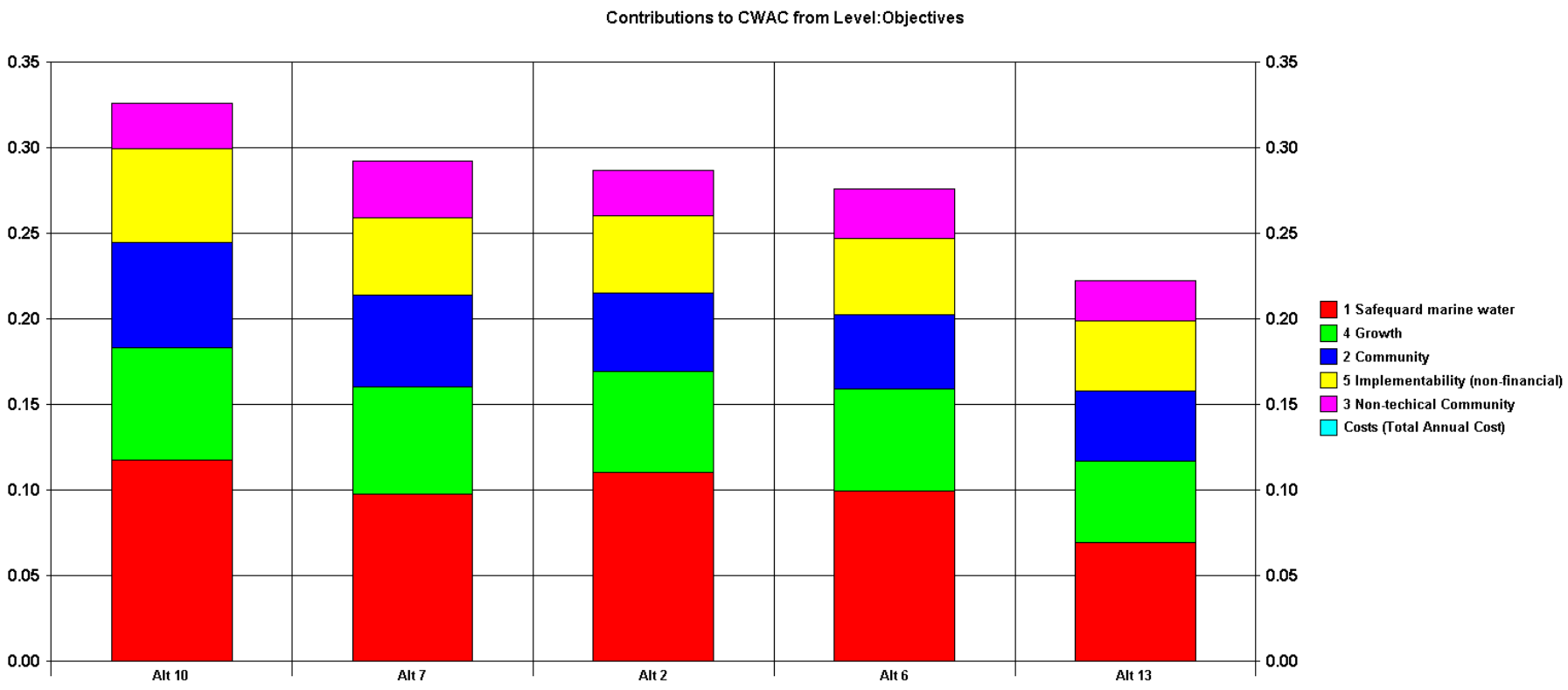


* Lowest scoring alternatives from round one are eliminated. Based on the average of individuals' rating of alternatives across top-level objectives only.

9/15/03

City of Blaine Wastewater Management System

Workshop Contributions by Criteria - ***Round Two***

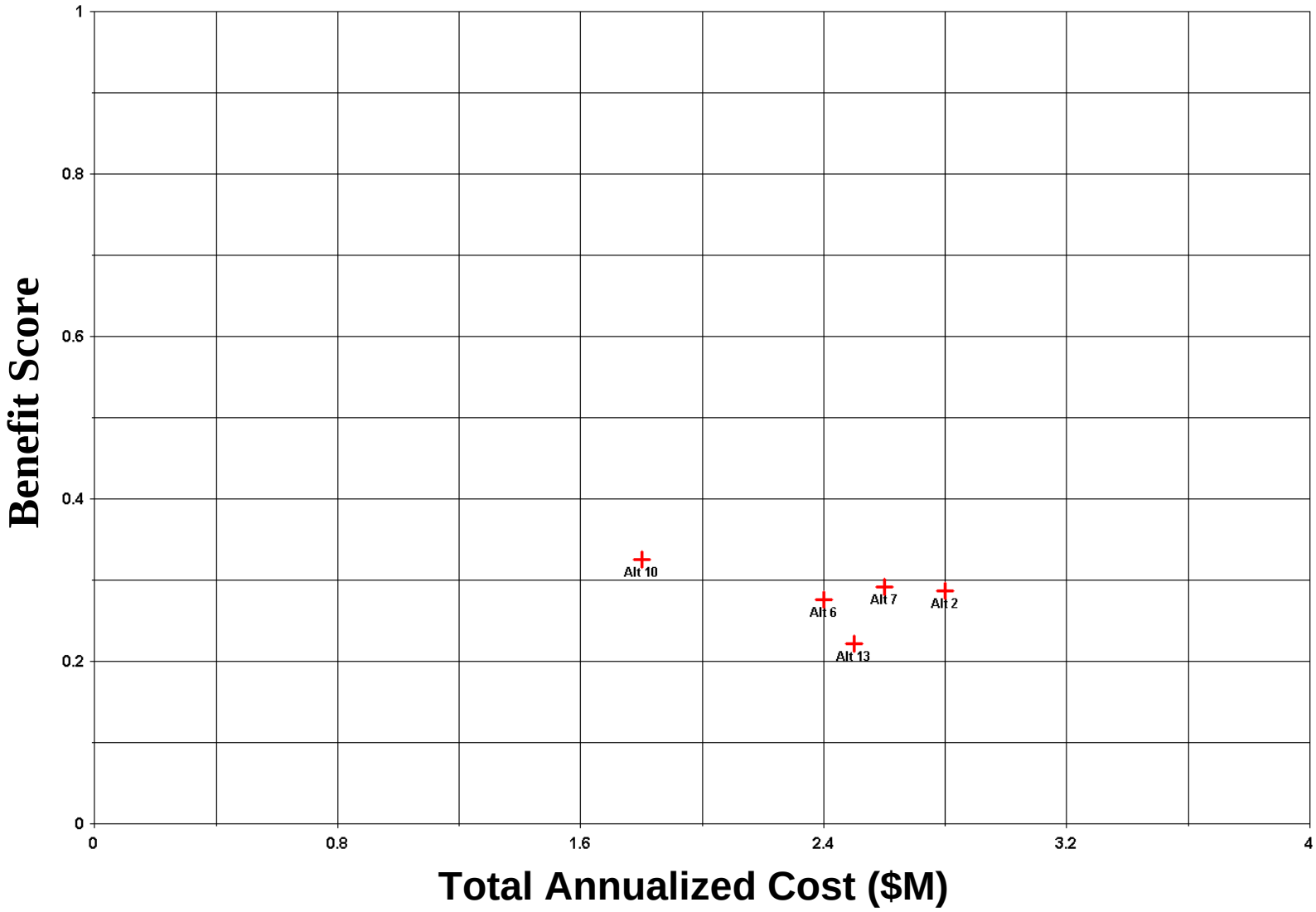


Performance Ratings and Conveyance of Wastewater to Others

- CWAC members noted that they rated alternatives high for some of the objectives that transmitted wastewater to others because it minimized the perception of any problems related to adverse local impacts

City of Blaine Wastewater Management System

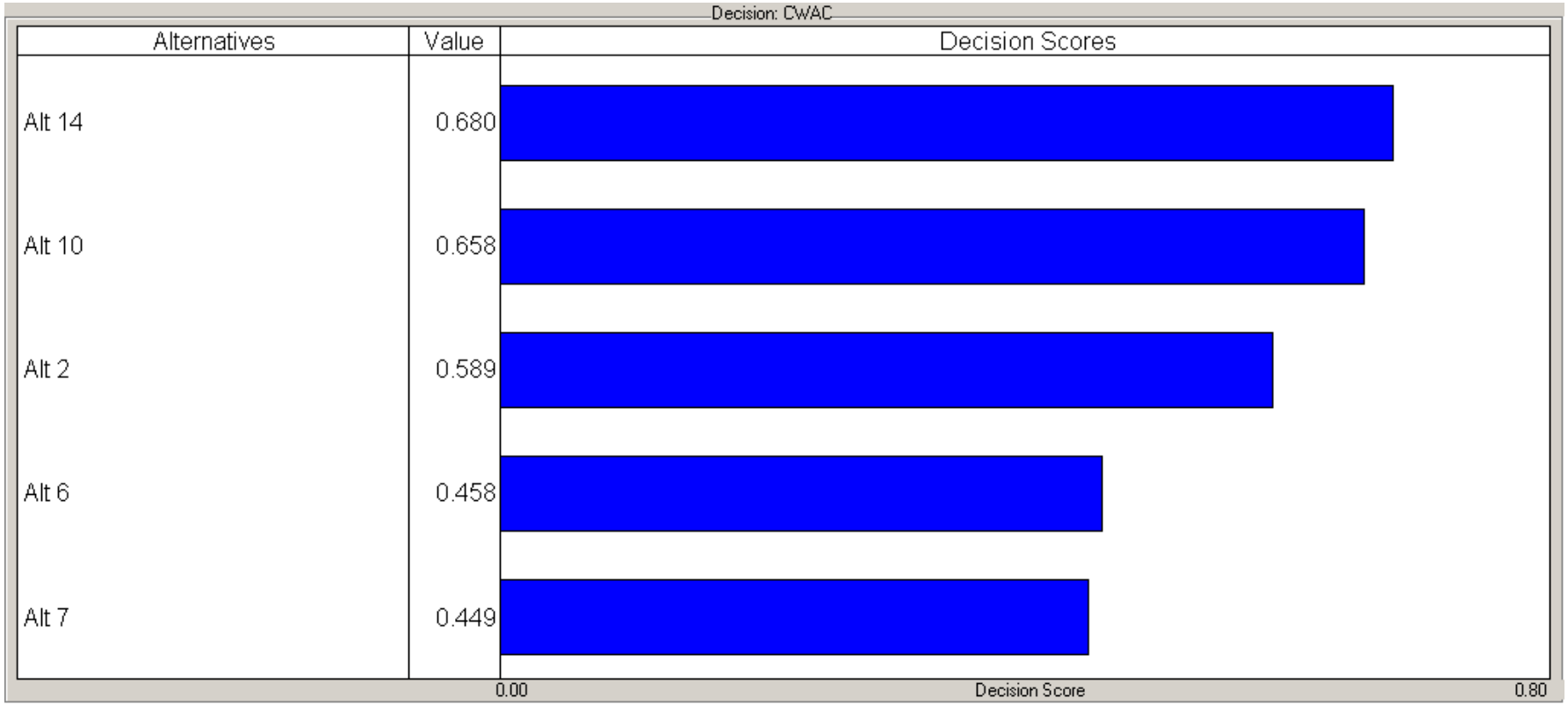
Benefit vs. Cost - ***Round Two***



9/24/03

City of Blaine Wastewater Management System

Workshop Decision Scores - ***Round Three***

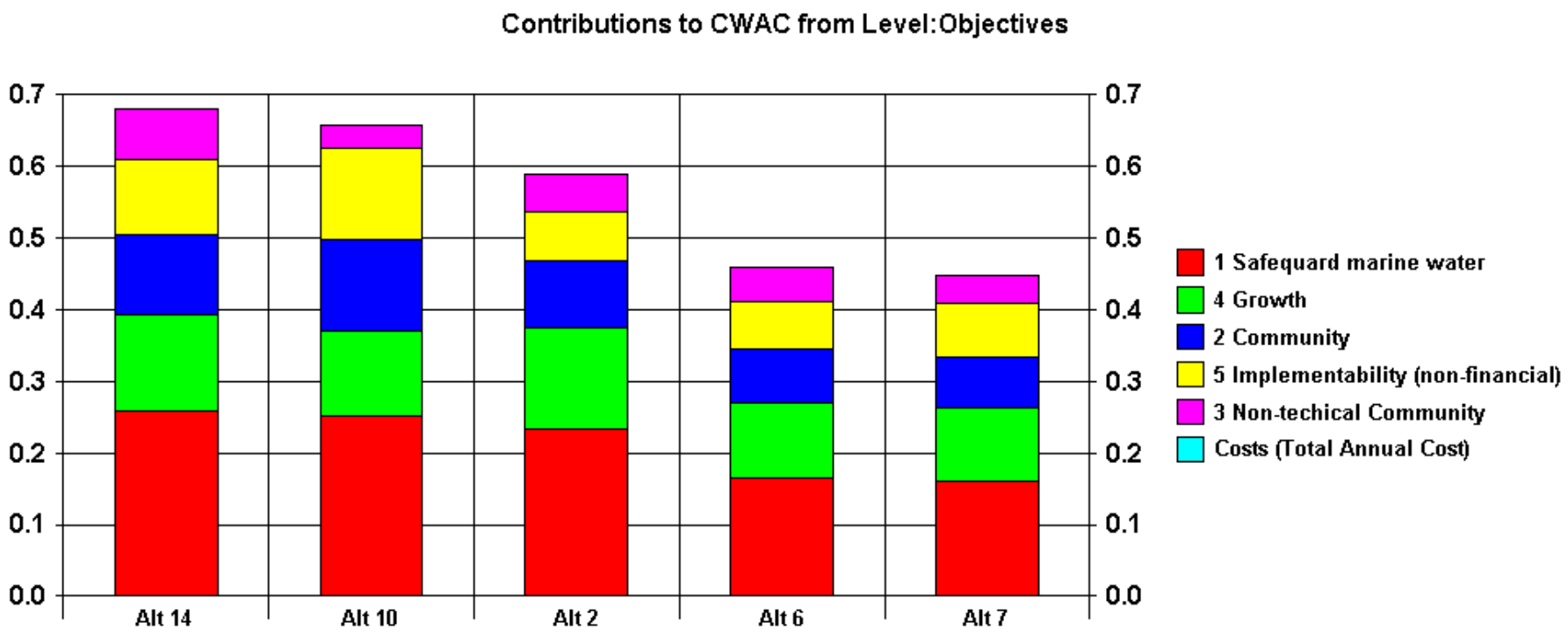


* Scores only take into account benefits. Cost was not considered when generating these scores. The results indicate that Alt. 14 provides the most benefit.

9/24/03

City of Blaine Wastewater Management System

Workshop Contributions by Criteria - ***Round Three***

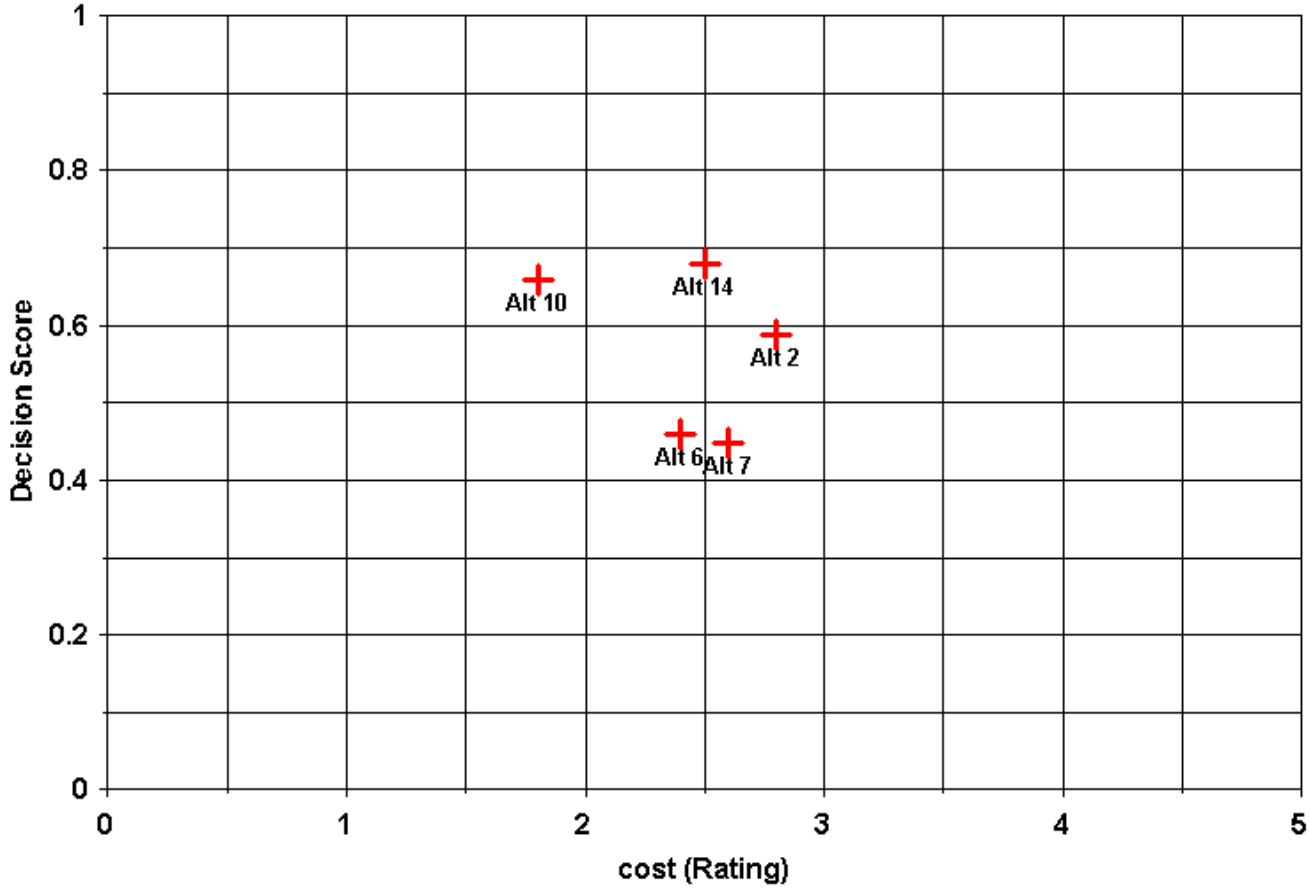


* The stacked bars represent the portion of the decision score received from each of the five categories.

9/24/03

City of Blaine Wastewater Management System

Workshop Cost/Benefit Analysis - ***Round Three***



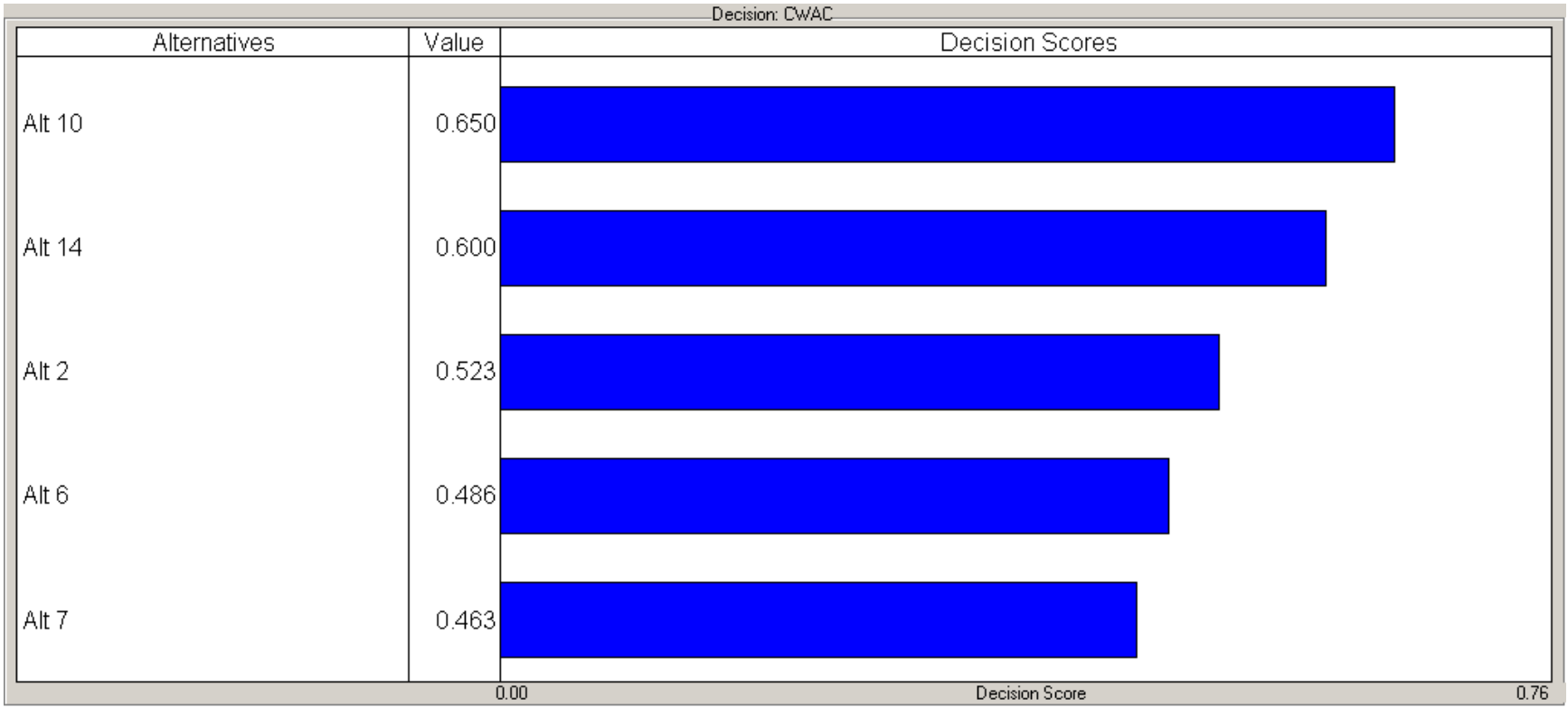
* This ratio compares the benefits of the alternatives against the costs. This ratio infers that the importance of the cost is equal to the combined importance of the five categories used to generate the benefit scores. Alt. 14 has a better benefit score, but it also costs more than Alt. 10. Is this additional benefit worth the extra cost?

9/24/03

City of Blaine Wastewater Management System

Workshop Decision Scores with Cost Included at 80% weight -

Round Three

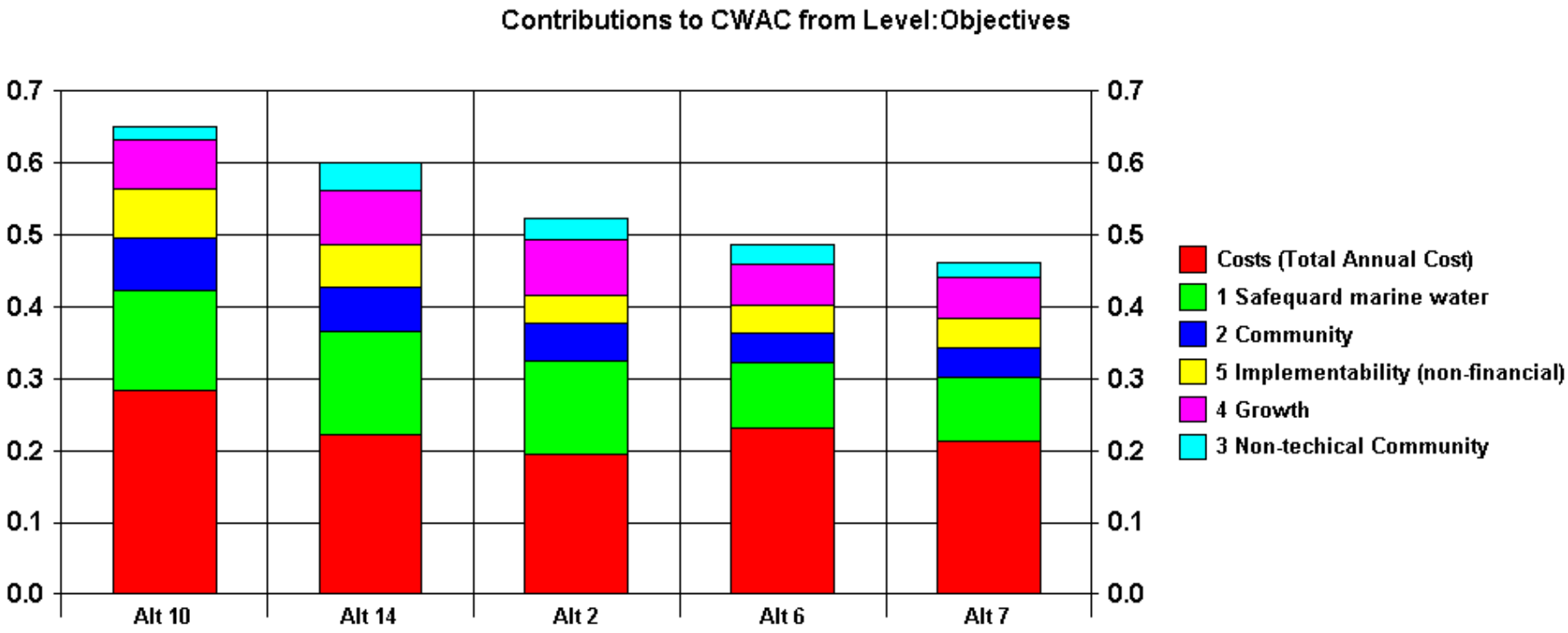


* For comparison purposes, cost was incorporated in the decision model and provided a weight of 80% of total benefits. When cost is incorporated Alt. 10 ranks on top because it is less expensive than Alt. 14.

9/24/03

City of Blaine Wastewater Management System

Workshop Contributions by Criteria with Cost Included at 80% of benefits- ***Round Three***

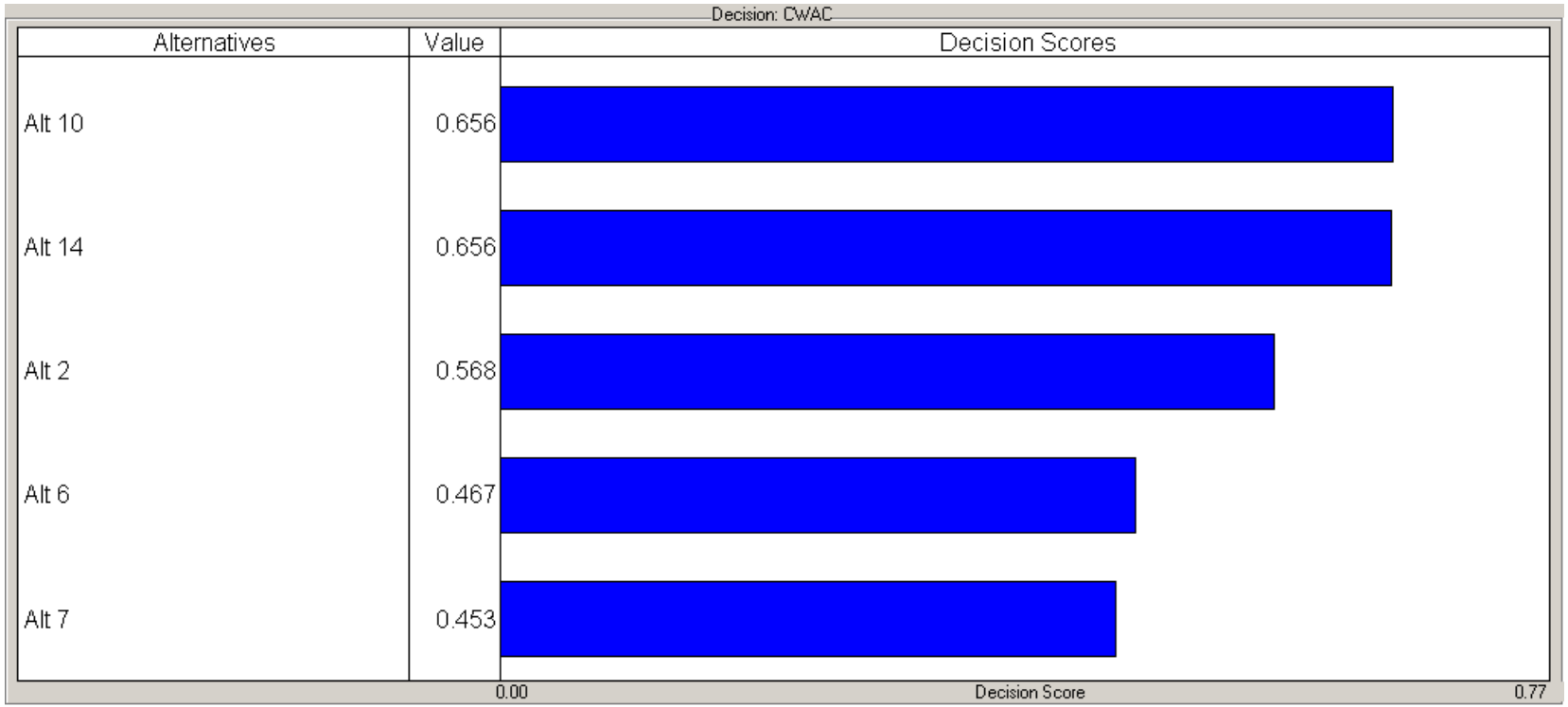


* Cost provides the most value to the total score because of the high weighting it received. A cost/benefit curve of this information would be inappropriate because cost was incorporated with the benefits to produce the total decision score.

9/24/03

City of Blaine Wastewater Management System

Workshop Decision Scores with Cost - ***Round Three***

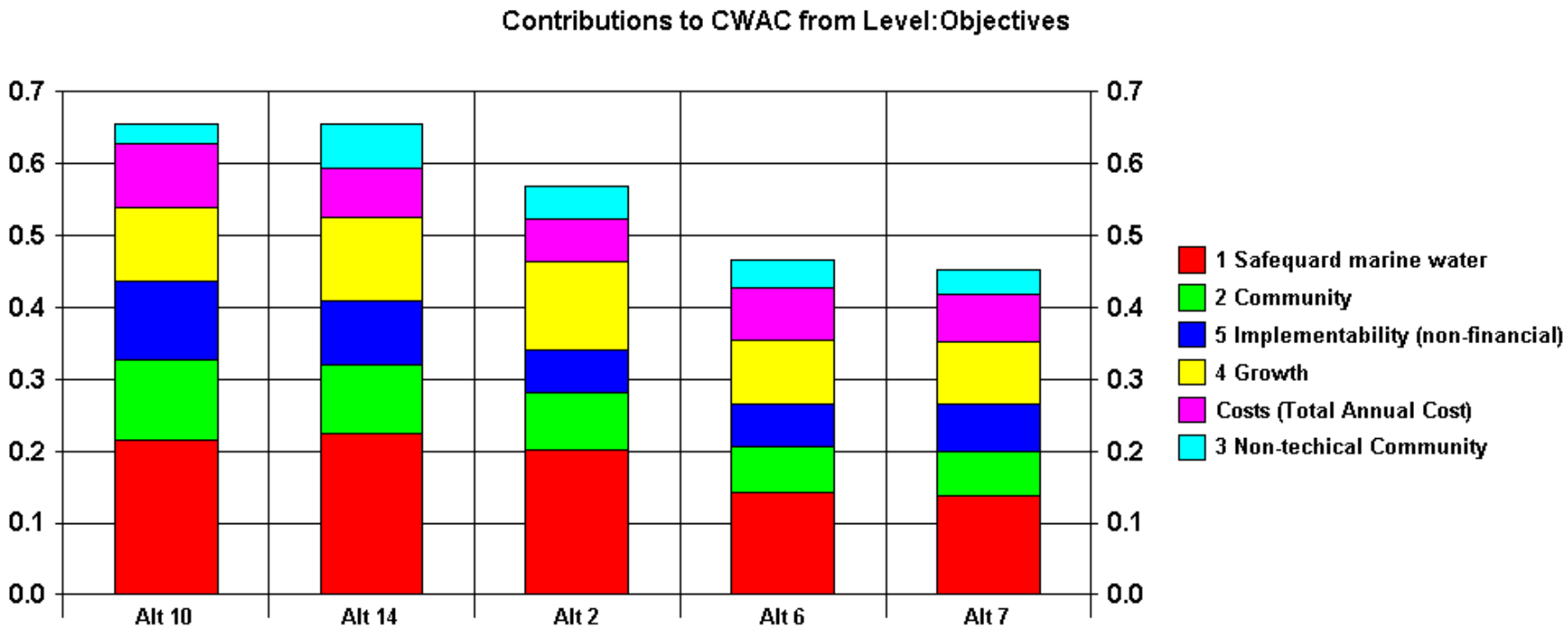


*The question asked is- How much weight would cost have to have to place Alt. 10 at the top. The answer is 16% of the benefits weight. Any weight of cost above 16% of benefits will place Alt. 10 at the top. These decision scores above show these results.

9/24/03

City of Blaine Wastewater Management System

*Workshop Contributions by Criteria with Cost at 16%- **Round Three***



* Costs were provided a weight of 16% of total benefits. A cost/benefit curve of this information would be inappropriate because cost was incorporated with the benefits to produce the total decision score.

9/24/03

City of Blaine Wastewater Management System

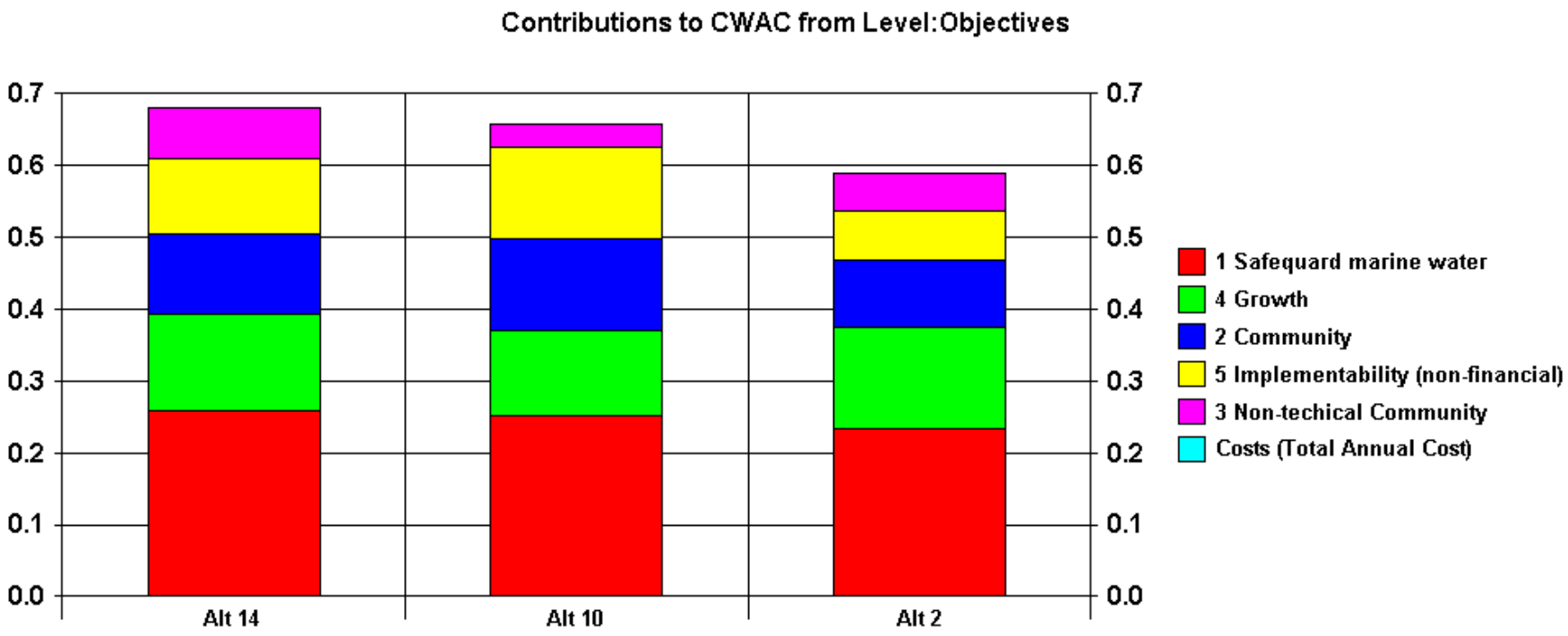
Workshop Decision Scores - ***Round Three***

*These results are the benefit scores for the three top alternatives. Cost was not included.

9/24/03

City of Blaine Wastewater Management System

Workshop Contributions by criteria - ***Round Three***

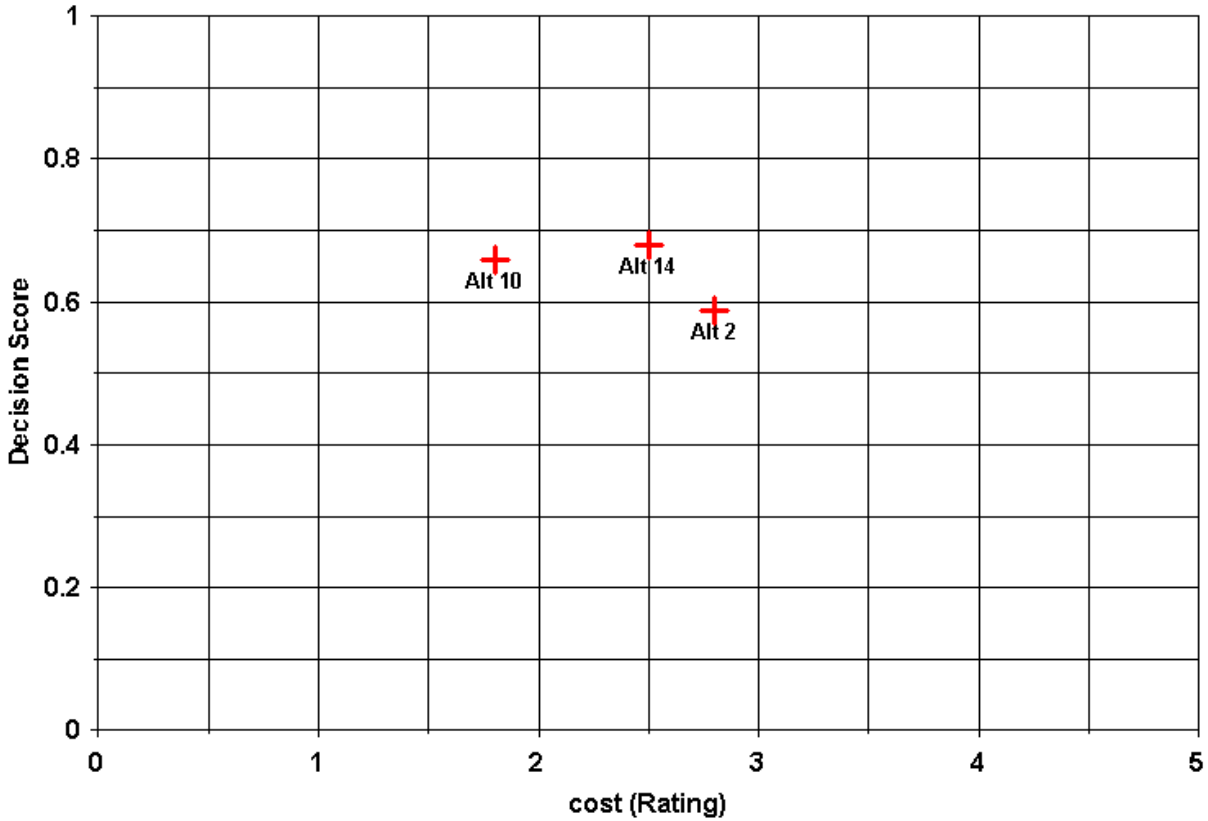


* Contributions by objectives for the top three alternatives without cost included.

9/24/03

City of Blaine Wastewater Management System

Workshop Benefit/cost ratio - ***Round Three***

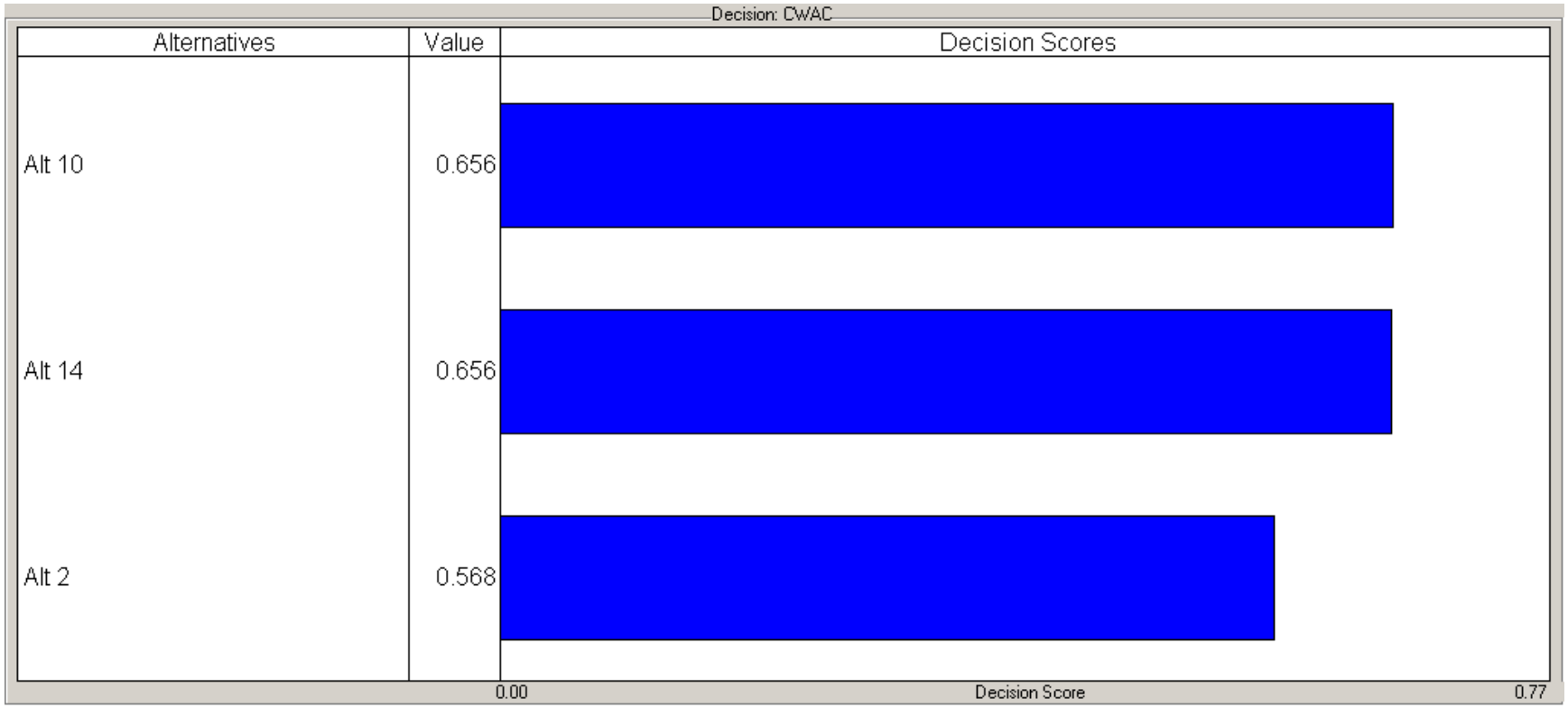


* Benefit/cost position of the top three alternatives -- with 80% weight given to Cost

9/24/03

City of Blaine Wastewater Management System

*Workshop Decision Scores with Cost at 16%- **Round Three***

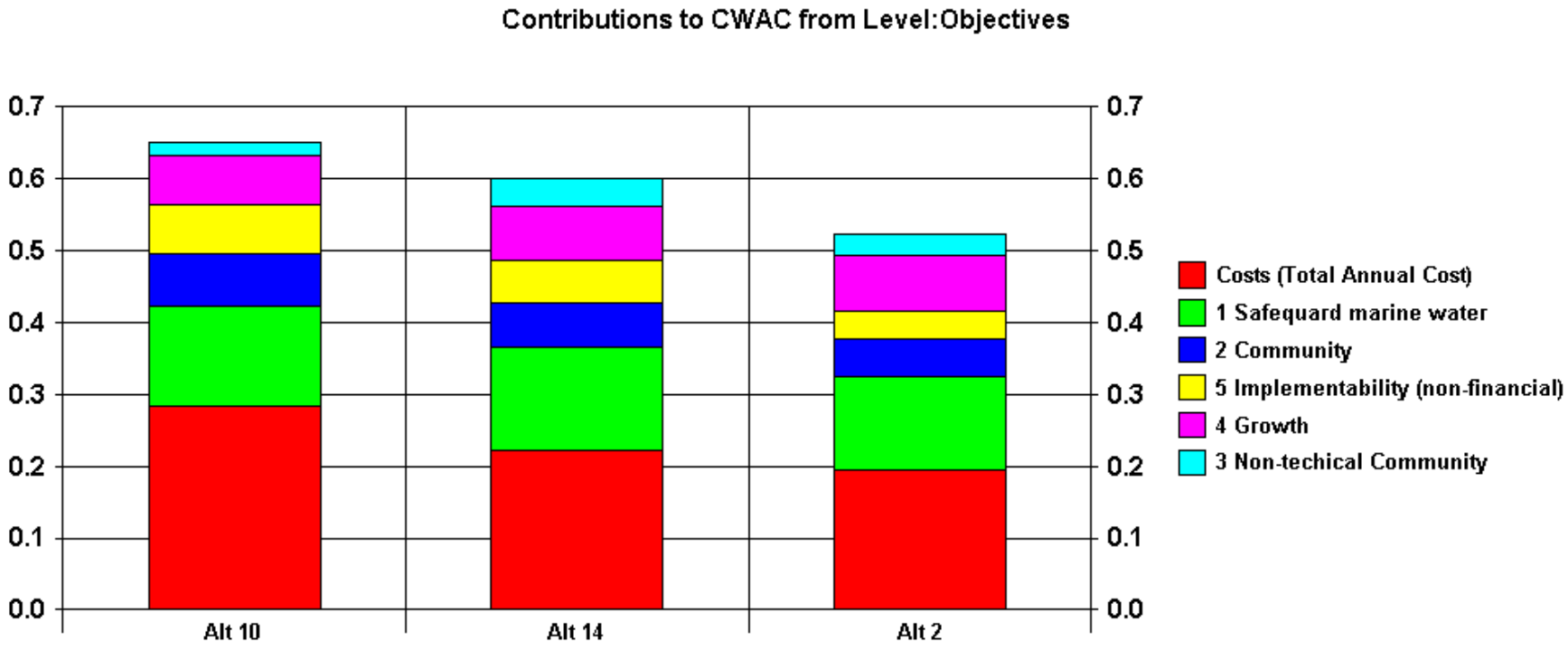


*Decision scores with cost at a weight of 16% of benefits for the top three alternatives.

9/24/03

City of Blaine Wastewater Management System

*Workshop Contributions by criteria with Cost at 16%- **Round Three***



*Contributions with cost at 16% of benefits of the top three alternatives.

Conclusion

- If only benefits are taken into account the priority ranking of alternatives is 14, 10 and 2.
- When cost is incorporated and cost is given and equal weight to benefits, a cost benefit ratio of the alternatives can be generated.
- Alternative 14 has the most benefit but is more costly than 10 or 2. **Is the additional cost worth the additional benefit? This is a judgement which the community must make.**
- **How much influence cost should have in the overall decision?** It may be helpful to the decision to know that if we were to incorporate cost in the decision score, a weight of 16% of the weight of the total benefits must be given in order to result in alternative 10 being the priority one ranked alternative -- between zero and 15% influence related to benefits alternative 14 would be the first priority -- in other words a weight of anything 16 percent or above results in alternative 10 being ranked as the top priority.
- **Since some of the alternatives have more risks than others, it was determined that the top three alternatives would be advanced to City Council and the Community for further consideration.**

Appendix O

WWTP Maintenance Activities

Appendix O

TABLE O-1
City of Blaine WWTP: Maintenance Program

Process	Equipment	Maintenance	FREQUENCY
Headworks Building			
	VALVES	EXCERCISE	Annual
	ODOR CONTROL		
	CHLORINE METERING PUMP (W & T SERIES 748)	CHECK OIL	Weekly
		LUBE CHANGES	Annual
		CHECK VALVES	Semi-Annual
	RECIRCULATING PUMP	LEAKS	Daily
		CHECK OUTPUT	Daily
	BLOWERS	CHECK OPERATION	Daily
		BELT TENSION	Daily
		LUBRICATION	Monthly
	pH CONTROLER	CALIBRATION	Semi-Annual
	PACKED COLUMN	DRAIN AND FLUSH	Annual
	FINE SCREENS (HYCOR) - 2		
		CLEANING	Daily
		ADJUST CYLINDER WIPE SEALS	Monthly
		ADJUST CYLINDER RIM SEALS	Semi-Annual
	EURODRIVER GEARMOTORS	OIL LEVEL	Weekly
		LUBE CHANGES	Annual
	SHAFT BEARINGS	LUBRICATIONS	Monthly
		REPLACEMENT	AS NEEDED
	DOCTOR BLADES	CLEANING	Daily
		ADJUSTMENT	AS NEEDED
		REPLACEMENT	AS NEEDED
Rotating Biological Contatctors			
	RBC (AUTOTROL# 701-251) - 6	CHECK WEIR FLOWRATE	Daily

TABLE O-1
City of Blaine WWTP: Maintenance Program

Process	Equipment	Maintenance	FREQUENCY
	CROSS SCREW COLLECTORS	CHECK OIL LEVEL	Weekly
		LUBRICATE BEARINGS	Annual
		CHAIN ADJUST	Semi-Annual
		CHAIN REPLACEMENT	AS NEEDED
	GEAR REDUCER & MOTOR	CHECK OIL LEVEL	Weekly
		GEARBOX OIL CHANGE	Annual
		SHEAR PINS	AS NEEDED
	SLUDGE PUMPS (3)	ADJUST PACKING	AS NEEDED
		LUBRICATE PACKING	AS NEEDED
		ADJUST BELTS	AS NEEDED
		REPLACE BELTS	AS NEEDED
		PUMP OVERHAUL	5 YEARS
		CHECK VALVES	5 YEARS
		MOTOR LUBRICATION	Annual
		REPLACE BEARINGS	AS NEEDED
	TANKS	CLEANING	Annual
		DRAIN & INSPECT	Annual
		CHECK FOR SHORT CIRCUITS	Quarterly
	WEIRS	CLEANING	EVERY OTHER DAY
		CHECK LEVEL	Annual
	SCUM TROUGHS	LUBRICATION	Monthly
		CHECK LEVEL	Annual
Aerobic Digesters	*Total Basins - 4 Cells*		
	TANKS	CLEAN	DAILY
		DRAIN & INSPECT	Annual
	COVERS (TARPS)	TARP TENSION	Daily
		REPLACE TARPS	AS NEEDED
		REPLACE BUNGEES	AS NEEDED
	AERATION EQUIPMENT	CLEAN DIFFUSERS	AS NEEDED
		REPLACE DIFFUSERS	AS NEEDED

TABLE O-1
City of Blaine WWTP: Maintenance Program

Process	Equipment	Maintenance	FREQUENCY
	ALARM	ELECTROLYTE LEVEL	Weekly
		PROPER OPERATION	Daily
		DRIP RATE	Daily
	CHLORINE SCALES	CHECK OPERATION	Daily
		CALIBRATE	EVERY 2 YEARS
	CHLORINE CONTACT CHAMBER	CHECK FOR SHORT CIRCUTS	Monthly
		CLEAN	Weekly
		CHECK MUD VALVES	Quarterly
GENERATOR		RUN UNDER LOAD	2 / MONTH

TABLE O-1
City of Blaine WWTP: Maintenance Program

Process	Equipment		Maintenance	FREQUENCY
			LUBRICATE SWINGARMS	Monthly
			CHECK AIR SHUTOFF VALVE	Monthly
			REPLACE AIR VALVE	AS NEEDED
			CHECK PIPING FOR AIR LEAKS	Quarterly
	DIGESTER BLOWERS (Spencer - 3 @ 25 HP)			
			ADJUST LOADING	Daily
			CHECK AIR FILTERS	Daily
		BEARINGS	CHECK VIBRATION	Daily
			LUBRICATE	4000 HRS
			REPLACE	AS NEEDED
		COUPLERS	CHECK ALIGNMENT	AS NEEDED
			REPLACE	AS NEEDED
		MOTORS	LUBRICATE	Annual
			CHECK ALIGNMENT	AS NEEDED
			REPLACE BEARINGS	AS NEEDED
Disinifection (Chlorine)	*Chlorinator (Wallace & Tiernan, V-800)*			
			CHECK FOR LEAKS	Daily
			CHECK ROTOMETER	Daily
			ADJUST FEED	Daily IF NEEDED
			CHECK AUTOMATIC SWITCHOVER	AT CYL CHANGE
			CHECK/CALIBRATE FLOW PACING	Daily
			VERIFY INJECTOR VACCUM	Daily
		RAPID MIX SYSTEM	CHECK INJECTOR PUMP OPERATION	Daily
			CHECK INJECTOR NOZZLE OPERATION	Daily
			CLEAN INJECTOR NOZZLE	IF PLUGGED
			CHECK PUMP ALIGNMENT	WITH ABOVE
			COVER IN FREEZING WEATHER	AS NEEDED

TABLE O-1
City of Blaine WWTP: Maintenance Program

Process	Equipment	Maintenance	FREQUENCY
	ALARM	ELECTROLYTE LEVEL	Weekly
		PROPER OPERATION	Daily
		DRIP RATE	Daily
	CHLORINE SCALES	CHECK OPERATION	Daily
		CALIBRATE	EVERY 2 YEARS
	CHLORINE CONTACT CHAMBER	CHECK FOR SHORT CIRCUTS	Monthly
		CLEAN	Weekly
		CHECK MUD VALVES	Quarterly
GENERATOR		RUN UNDER LOAD	2 / MONTH

Appendix P

Blaine Fats, Oils, and Grease (FOG) Ordinance 04-2572

ORDINANCE NO. 04-2572

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF BLAINE, WASHINGTON, CREATING A NEW SECTION 13.08.075 DEFINING GREASE INTERCEPTOR/TRAP AND AMENDING BLAINE MUNICIPAL CODE SECTIONS 13.08.260, 13.08.310 AND 13.08.350 TO ELIMINATE REFERENCES TO COMBINED SEWER SYSTEMS AND TO REGULATE FATS, OILS, GREASE, AND GRIT ENTERING THE SANITARY SEWER SYSTEM.

WHEREAS, the City of Blaine is continuing to plan for replacement of its existing wastewater treatment plant, following early termination of a project to upgrade and expand at the current site, and

WHEREAS, efficient operation of both the existing and future wastewater treatment facilities necessitates monitoring and regulation of the waste stream to minimize certain types of waste having greater impact on wastewater operations, and

WHEREAS, fats, oils, grease, and grit entering the sanitary sewage collection and conveyance system can have significant adverse effects on the ability of sanitary sewer pipes and sewage pump stations to convey sewage, as well as the ability of a plant to treat waste, and

WHEREAS, current regulatory provisions for these substances in the Blaine Municipal Code are inadequate to assure management of the waste stream with regard to fats, oils, grease, and grit, and

WHEREAS, current regulations include references to the use of combined sewers, which are no longer legal;

NOW, THEREFORE, be it ordained by the City Council of the City of Blaine that a new Blaine Municipal Code Sections 13.08.075 is hereby created and Sections 13.08.260, 13.08.310, and 13.08.350 are hereby amended as follows:

SECTION 1. A new Section 13.08.075 is hereby created to read as follows:

13.08.075 Grease Interceptor/Trap.

"Grease interceptor" or "grease trap" shall mean a water-tight receptacle utilized by commercial or industrial generators of liquid waste to intercept, collect, and restrict the passage of grease and food particles into the public wastewater system to which the receptacle is directly or indirectly connected, and to separate and retain grease and food particles from the wastewater discharged by a facility.

SECTION 2. Section 13.08.260 BMC is amended to read as follows:

13.08.260 Toilet facilities and connection to available sewer.

The owner of all houses, buildings, or properties for human occupancy, employment, recreation or other purposes, situated within the city and abutting on any street, alley, or right-of-way, in which there is now located, or in the future may be located, a public sanitary sewer of the city, is required, at his expense, to install suitable toilet facilities therein, and to connect such facilities directly with the proper public sewer in accordance with the provisions of this chapter, within 30 days after the date of official notice to do so, provided that the public sewer is within 200 feet (61.0 meters) of the property line.

SECTION 3. Section 13.08.310 BMC is amended to read as follows:

Section 13.08.310 Unpolluted waters – Proper discharge.

Storm water and all other non-sanitary drainage shall be discharged to such sewers as are specifically designed as storm sewers, or to a natural outlet approved by the director of public works. Industrial cooling water or unpolluted process waters may be discharged, on approval of the director of public works, to a storm sewer or natural outlet.

SECTION 4. Section 13.08.350 BMC is rewritten to read as follows**:**

13.08.350 Fat, oil, grease, and grit removal.

A. Pretreatment Equipment Required.
The following uses shall be required to install pretreatment equipment to remove fats, oils, greases, and grit:

1. **Grease Interceptors/Traps**. Food service-related activities or other establishments that prepare and serve food or engage in food clean-up where grease may be introduced to the sewer system. These include: restaurants, school kitchens, cafes, butcher shops, delicatessens, lunch counters, cafeterias, bars, hospitals, nursing homes, senior centers, hotels, grocery stores, factories, or other establishments that prepare, serve or sell food or engage in food cleanup. Those that serve only prepackaged foods and beverages are exempted. Commercial properties developed into shopping centers shall provide adequate space for on-site interceptors within each defined commercial space.

2. **Oil-Water Separators and Grit Removal Devices**. Businesses which operate automatic and coin-operated laundries, car washes, filling stations, commercial garages, car sales lots, or similar business having any type of washing facilities or grease racks, and any other discharger producing grit, sand, oils, or other materials that have the potential of causing partial or complete obstruction of the wastewater system, shall install City-approved interceptor tanks in accordance with the latest specifications adopted by the City that effectively limit sand and inert solids entering the sanitary sewerage system.

B. Installation and Maintenance.

1. Information on specific pretreatment equipment for the removal of fats, oils, greases, and grit must be submitted for review by the Public Works Department at the time of application for a building permit. Information submitted must show clearly that devices are being installed in accordance with the requirements of Chapter 10 of the Uniform Plumbing Code. Toilet waste shall not be discharged into interceptors/traps.

2. All such devices shall be installed, maintained, and operated by the discharger at the discharger's own expense, and shall be located as to be readily and easily accessible for cleaning and inspection. All installations of pretreatment equipment must be inspected and approved by the Public Works Department prior to final occupancy.

3. Pretreatment equipment shall be kept in continuous operation at all times, and shall be maintained to provide effective operation. Pretreatment equipment shall be pumped on a regular cycle sufficient to prevent excess discharges of fats, oil and/or grease into the Blaine sewer system, normally twice a year, unless interference with the Blaine sewer system occurs or slug load discharges occur. Cleaning of traps, interceptors, or oil/water separators must be performed by a person qualified to perform such cleaning. All material removed shall be disposed of in accordance with all state and federal regulations. Certification of maintenance shall be made readily available to Public Works Department personnel for review and inspection. The use of degreasers, "enzymes," or other chemicals which keep grease in suspension past the grease interceptor/trap is prohibited.

4. If failure to maintain settling tanks, grit traps, grease interceptors, or oil/water separators adversely affects the treatment or transmission capabilities of the system, or requires excessive maintenance by the city, the discharger responsible for the facilities shall be subject to the remedies, including enforcement and penalties, detailed in this chapter.

C. Periodic Testing.

1. The Director of Public Works may require periodic testing of the effluent from businesses listed in paragraph A above when there is a reasonable belief that the business is not meeting treatment standards as indicated by any of the following:

a. Results of testing downstream of the business violate effluent standards; or

b. Fat, oil, grease, or grit build-up downstream; or

c. The discharger's records are incomplete, false, or not made available for inspection; or

d. There is evidence of tampering with pretreatment equipment; or

e. There is evidence of use of degreasers, "enzymes" or other chemicals which keep grease in suspension past the grease trap or interceptor; or

f. Other reasons established by facts which warrant a belief that the applicable discharge standards are being violated.

2. Testing Procedures. Testing procedures and testing duration are to be determined by the Public Works Director, with testing to be conducted by a certified testing facility. The discharger shall pay for testing by the City if the discharger is in violation.

SECTION 5. 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 6. This Ordinance shall take effect immediately, or ten days after publication, as provided by law.

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.

_____
Dieter Schugt, Mayor

ATTEST:

APPROVED:

_____
Shirley Thorsteinson, CMC, City Clerk

_____
Jon Sitkin, City Attorney

Appendix Q

Summary of Industrial Discharger Study

SUMMARY OF FINDINGS

The purpose of this study was to identify and classify industrial and commercial users within the service area of the Blaine Wastewater collection and treatment system. First, water usage records were obtained from the billing Department, for the year 2001, to ascertain those customers that fit the profile of high water usage. The 12 months of water usage was averaged for a daily total. Secondly, historical records were used to identify those businesses that traditionally contribute high loading parameters to the STP. Thirdly, a sampling of commercial entities that would most exemplify common businesses found in most communities such as, hotel, motels and restaurants. A list of thirteen businesses was used to conduct the study. Following is the list of businesses and their type of business.

- Justesen Industries- Fireplace screen manufacturer
- Geographics- Makers of preprinted stationary
- Blaine Cold Storage- Cold storage of food products
- Natures Path- Manufacturer of Cereal products
- Stafholt - Senior care facility
- Dennys- Restaurant
- Paso Del Norte- Restaurant
- Semiahmoo Hotel- Hotel/resort
- Northwest Podiatric- Manufacturer of prescription orthotics
- Samson Net- Manufacture of fishing net and twine
- Totally Chocolate- Maker of designer chocolate novelties
- Cost Cutter Market- Grocery store

Samplers were placed out at these sites and data was collected in regard to the biological loading of each business. BOD, TSS and VSS analysis was conducted, refer to the charts in this report to find the loading contribution of each site. The average flow totals were used to figure poundage of each business, this information can also be found on the charts provided.

Next, an interview and inspection was conducted with each business to visually familiarize and discuss business operations. The businesses were informed of the need to conduct this survey and to let each business know that the purpose was to better serve them and the general Public. Some of the businesses were asked to provide a MSDS file or add/delete some items that may have changed since the last survey was conducted. The MSDS files are useful in helping to spot any possible contaminate sources that may enter the sanitary sewer system. Operational schedules were discussed and inspection of any pre-treatment devices was conducted.

Interesting findings included, the comparison of overall STP flow with the business flow as tested, industrial/commercial flow contribution was only approximately 6% of the total STP flow. Yet, the industrial/commercial BOD loading was approximately 43% of total

STP loading during this testing period. The charts show all the totals and can be used to quickly identify those businesses put a higher demand on the treatment system. Surprisingly, though some business that were originally thought to be lower impact are actually a much larger impact on the treatment system. An example of this is Dennys restaurant which contribute 124 lbs. of BOD/per day compared with say Northwest Podiatrics or the Samson Net Factory which both contribute only .7 lbs./per day each.

Appendix Q

DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/ day)	Total oil & Grease (mg/L)
11-Sep-02	& D st.		314				305		250					
27-Feb-02	Blaine Cold Storage	.001292	200				188		164					
20-Feb-02	Blaine Cold Storage	.001292	3750											
28-Jul-83	Boundary Fish	.001385	375	4	180	2	66	2						
29-Jul-83	Boundary Fish	.004331	2040	68	660	3								
17-Aug-83	Boundary Fish	.005	1080	45	738	31								
03-Aug-83	Boundary Fish	.005					50	1						
18-Aug-83	Boundary Fish	.003964					103	3						
22-Sep-83	Boundary Fish	.005					2060	86						
22-May-95	Burger King		265				152							
02-Oct-00	Chocolate Factory										1687	1220		
02-Oct-00	Chocolate Factory										1940	1404		
02-Oct-00	Chocolate Factory										1876	1292		
02-Oct-00	Chocolate Factory										1700	1060		
02-Oct-00	Chocolate Factory		940								1444	876		
02-Oct-00	Chocolate Factory										2200	1560		
02-Oct-00	Chocolate Factory										1692	1012		
02-Oct-00	Chocolate Factory										1480	976		
02-Oct-00	Chocolate Factory										2332	1876		
02-Oct-00	Chocolate Factory										1040	628		
02-Oct-00	Chocolate Factory										1260	792		
02-Oct-00	Chocolate Factory										872	464		
02-Oct-00	Chocolate Factory										2148	1344		
02-Oct-00	Chocolate Factory										1304	772		
02-Oct-00	Chocolate Factory										1624	1156		
02-Oct-00	Chocolate Factory										1516	1060		
02-Oct-00	Chocolate Factory		1790								1784	1304		
03-Oct-00	Chocolate Factory										1776	1276		
03-Oct-00	Chocolate Factory										1064	568		
03-Oct-00	Chocolate Factory		9000								2732	2060		
03-Oct-00	Chocolate Factory										47600			
03-Oct-00	Chocolate Factory										13960	2468		
03-Oct-00	Chocolate Factory										2788	596		
03-Oct-00	Chocolate Factory										1504	680		
02-Oct-00	Chocolate Factory	.001219	1700	17.3			727	7.4	711				7.2	
04-Aug-00	Chucks manhole		348		162		264		223					
28-Aug-00	COST CUTTER		555				1087		789					
20-Mar-03	COST CUTTER	0.005954	554	22			483	19	427	15				

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DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/day)	Total oil & Grease (mg/L)
16-Jan-02	Country Club	.00953	848	6.7			806	6.4	775					
04-Sep-03	Denny's - Paso	.015	3060	383			4890	611	4220	528				
18-Jun-03	Denny's - Paso	0.014	670	78			1048	122						
21-Aug-02	Denny's - Paso		1140											
28-Aug-02	downstream		1470											
09-Apr-99	RESTAURANT		250				88							
28-Aug-02	Denny's Upstream		1260											
11-Sep-02	Denny's Upstream		1215				2068		1795					
10-Sep-03	E1-5	.010508	1200	105			3002	263	2571	225				
09-Sep-03	E1-5	.0029	161	3.9			100	2.4	88	2.1				
06-Nov-01	manhole in front of		87											
17-Apr-03	G2-1	.013857	180	21			117	14						
22-May-95	Harbor Café		2010				892							
22-Feb-00	Harbor Café						340							
22-May-95	Place		144				173							
22-Aug-00	Place						652		620					
22-Aug-00	Place						488		482					
22-Aug-00	Place						308		264					
23-Aug-00	Place						248		236					
23-Aug-00	Place						66		78					
23-Aug-00	Place						38		89					
23-Aug-00	Place						310		312					
23-Aug-00	Place						744		850					
22-Aug-00	Place						270		224					
22-Aug-00	Place						467		405					
22-Aug-00	Place						96		92					
22-Aug-00	Place						286		284					
22-Aug-00	Place						220		192					
22-Aug-00	Place						710		658					
22-Aug-00	Place						184		176					
22-Aug-00	Place						168		160					
22-Aug-00	Place						283		273					
22-Aug-00	Place						122		118					
12-Mar-01	Lift Station # 3		100				36		26					
12-Mar-01	Lift Station # 3		100				33		29					
12-Mar-01	Lift Station # 3		100				17		13					
12-Mar-01	Lift Station # 3		100				19		14					
12-Mar-01	Lift Station # 3		350				223		210					

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DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/ day)	Total oil & Grease (mg/L)
12-Mar-01	Lift Station # 3		360				138		246					
12-Mar-01	Lift Station # 3		180				156		141					
12-Mar-01	Lift Station # 3		120				61		61					
12-Mar-01	Lift Station # 3		100				26		19					
12-Mar-01	Lift Station # 3		100				40		17					
12-Mar-01	Lift Station # 3		400				22		194					
12-Mar-01	Lift Station # 3		370				595		570					
12-Mar-01	Lift Station # 3		190				98		79					
12-Mar-01	Lift Station # 3		115				58		42					
12-Mar-01	Lift Station # 3		100				48		28					
12-Mar-01	Lift Station # 3		100				39		24					
12-Mar-01	Lift Station # 3		100				32		25					
12-Mar-01	Lift Station # 3		100				31		27					
12-Mar-01	Lift Station # 3		100				29		17					
12-Mar-01	Lift Station # 3		100				88		77					
12-Mar-01	Lift Station # 3		100				102		93					
12-Mar-01	Lift Station # 3		100				101		97					
12-Mar-01	Lift Station # 3		100				46		43					
12-Mar-01	Lift Station # 3		100				28		25					
14-Mar-01	Lift Station # 3		185				194		177					
14-Mar-01	Lift Station # 3		100				44		38					
14-Mar-01	Lift Station # 3		100				41		37					
14-Mar-01	Lift Station # 3		100				31		12					
14-Mar-01	Lift Station # 3		100				62		51					
14-Mar-01	Lift Station # 3		185				72		67					
14-Mar-01	Lift Station # 3		100				51		51					
14-Mar-01	Lift Station # 3		100				35		35					
14-Mar-01	Lift Station # 3		100				29		26					
14-Mar-01	Lift Station # 3		100				22		15					
14-Mar-01	Lift Station # 3		100				18		4					
14-Mar-01	Lift Station # 3		100				15		6					
14-Mar-01	Lift Station # 3		100				12		10					
14-Mar-01	Lift Station # 3		440				464		440					
14-Mar-01	Lift Station # 3		380				90		75					
14-Mar-01	Lift Station # 3		200				57		63					
14-Mar-01	Lift Station # 3		115				42		40					
14-Mar-01	Lift Station # 3		100				33		33					
14-Mar-01	Lift Station # 3		100				24		23					

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DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/ day)	Total oil & Grease (mg/L)
14-Mar-01	Lift Station # 3		100				23		22					
14-Mar-01	Lift Station # 3		100				15		17					
14-Mar-01	Lift Station # 3		100				20		16					
14-Mar-01	Lift Station # 3		100				27		26					
14-Mar-01	Lift Station # 3		100				25		17					
27-Feb-01	Lift Station # 5		660				188		170					
27-Feb-01	Lift Station # 5		350				280		274					
27-Feb-01	Lift Station # 5		275				271		252					
27-Feb-01	Lift Station # 5		265				244		220					
27-Feb-01	Lift Station # 5		205				166		148					
27-Feb-01	Lift Station # 5		360				377		360					
27-Feb-01	Lift Station # 5		600				203		182					
27-Feb-01	Lift Station # 5		280				281		277					
27-Feb-01	Lift Station # 5		260				195		159					
27-Feb-01	Lift Station # 5		400				332		311					
27-Feb-01	Lift Station # 5		330				256		238					
27-Feb-01	Lift Station # 5		420				214		203					
27-Feb-01	Lift Station # 5		620				318		284					
27-Feb-01	Lift Station # 5		285				180		163					
27-Feb-01	Lift Station # 5		220				92		92					
28-Feb-01	Lift Station # 5		315				98		93					
28-Feb-01	Lift Station # 5		155				133		120					
28-Feb-01	Lift Station # 5		195				160		154					
28-Feb-01	Lift Station # 5		740				246		154					
28-Feb-01	Lift Station # 5		365				88		74					
28-Feb-01	Lift Station # 5		190				123		111					
28-Feb-01	Lift Station # 5		320				392		363					
01-Mar-01	Lift Station # 5		580				430		394					
01-Mar-01	Lift Station # 5		370				379		352					
01-Mar-01	Lift Station # 5		960				387		239					
01-Mar-01	Lift Station # 5		580				335		311					
01-Mar-01	Lift Station # 5		430				529		501					
01-Mar-01	Lift Station # 5		378				564		530					
01-Mar-01	Lift Station # 5		345				359		344					
01-Mar-01	Lift Station # 5		520				257		238					
01-Mar-01	Lift Station # 5		540				322		298					
01-Mar-01	Lift Station # 5		225				156		140					
05-Mar-01	Lift Station # 5		275				192		165					

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DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/ day)	Total oil & Grease (mg/L)
05-Mar-01	Lift Station # 5		195				184		160					
05-Mar-01	Lift Station # 5		380				466		428					
05-Mar-01	Lift Station # 5		250				254		221					
05-Mar-01	Lift Station # 5		340				537		468					
05-Mar-01	Lift Station # 5		250				368		330					
05-Mar-01	Lift Station # 5		370				663		612					
05-Mar-01	Lift Station # 5		330				414		365					
05-Mar-01	Lift Station # 5		255				432		382					
05-Mar-01	Lift Station # 5		155				237		200					
05-Mar-01	Lift Station # 5		170				182		147					
05-Mar-01	Lift Station # 5		290				343		296					
05-Mar-01	Lift Station # 5		240				297		264					
05-Mar-01	Lift Station # 5		220				199		168					
05-Mar-01	Lift Station # 5		265				108		89					
07-Mar-01	Lift Station # 5						252							
07-Mar-01	Lift Station # 5						170							
07-Mar-01	Lift Station # 5						189							
07-Mar-01	Lift Station # 5						273							
07-Mar-01	Lift Station # 5						241							
07-Mar-01	Lift Station # 5						204							
07-Mar-01	Lift Station # 5						278							
07-Mar-01	Lift Station # 5						210							
07-Mar-01	Lift Station # 5						178							
07-Mar-01	Lift Station # 5						185							
07-Mar-01	Lift Station # 5						250							
07-Mar-01	Lift Station # 5						236							
07-Mar-01	Lift Station # 5						293							
07-Mar-01	Lift Station # 5						266							
07-Mar-01	Lift Station # 5						511							
07-Mar-01	Lift Station # 5						246							
07-Mar-01	Lift Station # 5						304							
27-Feb-01	Lift Station # 5		185				206		188					
07-Mar-01	Lift Station # 5						135							
07-Mar-01	Lift Station # 5						230							
07-Mar-01	Lift Station # 5						230							
07-Mar-01	Lift Station # 5						165							
07-Mar-01	Lift Station # 5						293							
07-Mar-01	Lift Station # 5						259							

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DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/day)	Total oil & Grease (mg/L)
07-Mar-01	Lift Station # 5						195							
07-Nov-01	Harbor Café						60		48					
22-May-95	McDonalds		120				30							
26-Jun-00	Natures Path	.001309	49200				7620		7305					
22-Jun-00	Natures Path		23700				15475		15070					
24-Jul-00	Natures Path	.001122	428	4	334	3.1	81	0.8	71				0.7	
03-Aug-00	Natures Path	.00125	540	5.6	278	2.9	442	4.6	209				2.2	
01-Nov-01	Natures Path	.001328	2250	25			192	2.1	185	2				
14-Nov-01	Natures Path	.004192	1395	6										
15-Nov-01	Natures Path	.001619	1770	3										
06-Feb-02	Natures Path	.007263	2340											
06-Feb-02	Natures Path	.007263	2310											
06-Feb-02	Natures Path	.007263	2340											
06-Feb-02	Natures Path	.007263	2340	142										
23-Jan-01	Split with Avocet	.001492	1305	16.2	983	12.2	201	2.5	198					
23-Jan-01	Split with STP	.001492	1500	18.7	1100	13.7	180	2.2						
16-Mar-94	Net Factory/Stafholt		150				126							
09-May-95	Drayton Harbor Mall		162				140							
16-Jun-83	Reef Fish	.017503	369	54	233	34	10	2						
28-Jun-83	Reef Fish	.021243	390	62	150	26	110	10						
29-Jul-83	Reef Fish	.024983	2640	550	1800	375								
17-Aug-83	Reef Fish	.024534	1830	382	690	141								
24-Aug-83	Reef Fish	.025806	1762	367	740	160	467	97						
18-Aug-83	Reef Fish	.024534					7620	1588						
22-Aug-83	Reef Fish	.016530					162	22						
06-Oct-83	Reef Fish	.025					340	70						
06-Oct-83	Reef Fish	.025	635	132	210	43								
05-Mar-02	Samson Rope	.00102	78	0.7			65	0.6	52	0.4				
07-Jan-03	Samson Rope		30											
29-Jun-83	Sea-K Fish	.0193	1610	259	825	133	160	26						
28-Jul-83	Sea-K Fish	.025058	705	146	420	88	336	75						
29-Jul-83	Sea-K Fish	.026628	2250	506	1560	346								
24-Aug-83	Sea-K Fish	.025	825	172	320	67								
06-Oct-83	Sea-K Fish	.02	1015	169	650	108	487	81						
22-Aug-83	Sea-k Fish	.032538					200	54						
22-Aug-83	Sea-k Fish	.02					250	41						
09-May-95	Country Club		359				408							
27-Jan-94	Semiahmoo Hotel		805				529							

Appendix Q

DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/day)	Total oil & Grease (mg/L)
18-Jul-94	Semiahmoo Hotel		289				200							
18-Mar-94	Semiahmoo Hotel		320				370							
24-Oct-01	Semiahmoo Hotel	.0165	750	103			738	102	688	95				
03-Nov-95	Semiahmoo hotel		303				183							
06-Oct-95	Semiahmoo hotel		378				348							
01-Jul-95	Semiahmoo hotel		555				705							
17-Jun-95	Semiahmoo hotel		520				530							
06-May-95	Semiahmoo hotel		1050				585							
17-Dec-94	Semiahmoo hotel		1050				1099							
07-Nov-94	Semiahmoo hotel		258				163							
16-Oct-94	Semiahmoo hotel		795				720							
20-Sep-94	Semiahmoo hotel		640				676							
20-Aug-94	Semiahmoo hotel		615				418							
03-Jun-94	Semiahmoo hotel		407				438							
13-May-94	Semiahmoo hotel		324				336							
15-Apr-94	Semiahmoo hotel		197				173							
13-Feb-94	Semiahmoo hotel		274				140							
16-Mar-95	Semiahmoo hotel		700				695							
18-Jan-94	Semiahmoo hotel		492				493							
23-Oct-00	Semiahmoo hotel	.033					2850	784	2640				727	
21-Oct-00	Semiahmoo hotel	.03375	930	256	350	96	998	281	910				256	
13-Oct-00	Semiahmoo hotel	.062084	810	419			602	311						
26-Oct-00	Semiahmoo hotel		680											
05-Nov-00	Semiahmoo hotel	.032	2430	649			2655	709	2340				625	
18-Jan-90	Semiahmoo Hotel	.04	450	150		16	505	168						
30-Jan-90	Semiahmoo Hotel	.039					1683	547						
05-Feb-90	Semiahmoo Hotel	.039	795	259			650	211						
09-Feb-90	Semiahmoo Hotel	.055					473	217						
23-Feb-90	Semiahmoo Hotel	.055	533	244			373	171						
04-Mar-90	Semiahmoo Hotel	.043	670	240			667	239						
10-Mar-90	Semiahmoo Hotel	.047	319	125			280	110						
15-Mar-90	Semiahmoo Hotel	.045	226	85			427	160						
07-Nov-93	Semiahmoo Hotel	.034	460	130			501	142						
13-Feb-93	Semiahmoo Hotel	.0321	427	114			543	145						
07-Nov-90	Semiahmoo Hotel	.033	560	127			501	138						
06-Nov-92	Semiahmoo Hotel	.033	271	77			450	124						
16-Dec-92	Semiahmoo Hotel	.032	670	179			2607	696						
18-Jan-95	Semiahmoo Hotel	.028	492	117			493	117						

Appendix Q

DATE	LOCATION	FLOW (MGD/day)	BOD (mg/L)	BOD (lbs/day)	Soluble BOD (mg/L)	Soluble BOD (lbs/day)	TSS (mg/L)	TSS (lbs/day)	VSS (mg/L)	VSS (lbs/day)	Total Solids (mg/L)	Total VS (mg/L)	VS (lbs/day)	Total oil & Grease (mg/L)
20-Aug-02	Semiahmoo Hotel		630											
11-Feb-01	Semiahmoo Hotel	.031	1035	268	450	116	1295	334	1065	275				
21-Mar-90	Semiahmoo Hotel	.043	930	334			1058	379						
26-Mar-90	Semiahmoo Hotel	.031	222	72			217	56						
05-Apr-90	Semiahmoo Hotel	.062					142	73						
11-Apr-90	Semiahmoo Hotel	.050	339	141			215	90						
25-Apr-90	Semiahmoo Hotel	.049					290	119						
01-May-90	Semiahmoo Hotel	.057	201	96			253	120						
06-May-90	Semiahmoo Hotel	.066	560	308			615	339						
02-Jun-90	Semiahmoo Hotel	.085					1155	819						
06-Apr-00	MARINA		560				568							
11-Jun-03	(L.S.#4)	.026	470	102			375	81						
27-Aug-03	(L.S.#4)	.020	525	88			540	90	503	84				
07-Apr-03	(L.S.#4)	.026	380	82			277	60	263	57				
08-Apr-03	(L.S.#4)	.0256	1770	378			1582	338	1470	314				
21-May-03	Uplands		159											
27-Feb-03	Uplands	.050173	167	70			252	105	154	64				
28-Feb-03	Uplands	.057138	259	123			256	122	226	108				
01-Mar-03	Uplands	.058575	286	140			233	114	199	97				
20-May-03	Uplands		214											
06-Mar-02	Stafholt	.009248	490	38			126	10	110	8				
28-Jul-94	T.M. Protein						87							
14-Jul-94	T.M. Protein		45				16							
08-May-90	T.M. Protein	.00269	20100	453			11954	268						
16-May-90	T.M. Protein	.0014					5124	60						
22-May-90	T.M. Protein	.0013	45000	488			6225	68						
05-Jun-90	T.M. Protein	.0019					25270	274						
12-Jun-90	T.M. Protein	.00157	9813	131			2820	38						
14-May-02	T.M. Protein													35100
09-May-95	Totally Chocolate		875				4213							
06-Feb-02	Totally Chocolate	.000628	2505	13										

Appendix R

Wastewater Response Plan and Agency Contacts

WET WEATHER ACTION PLAN

WASTEWATER MANAGEMENT PROCEDURES DURING HIGH FLOW CONDITIONS

REVISED
NOVEMBER 14, 2000

REVIEWED AND UPDATED
NOVEMBER 8, 2001

REVIEWED AND UPDATED
NOVEMBER 7, 2002

REVIEWED AND UPDATED
OCTOBER 22, 2003

PREPARED BY:

CITY OF BLAINE PUBLIC WORKS DEPARTMENT
1200 YEW AVENUE
BLAINE, WA 98230

Summary

In compliance with Administrative Order No. DE99WQ-N392, the City of Blaine has prepared this Wet Weather Action Plan update to take the place of the plan submitted in 1995. This plan establishes procedures intended to prevent sanitary sewer overflows (SSOs) that are driven by excess flow from rainfall-derived inflow and infiltration (RDII). It is also intended to guide operational changes at our wastewater treatment plant to accommodate high flow conditions.

Past SSOs released raw wastewater from manholes along Marine Drive upstream of Lift Station No. 1. During several SSOs, pump failures extended the volume and duration of the overflow event. Measures taken since issuance of the administrative order to improve the performance of the collection system include:

- 1997 replacement of the Drayton Harbor crossing force main from Lift Station No. 1
- 1997 replacement of 5,200 feet of leaky residential sewer pipe in North Blaine
- 1998 pipe burst and slip lining of Peace Portal Drive gravity trunk sewer
- 1999 extensive dye and smoke testing followed by elimination of 43 illicit connections
- 1999 Lift Station No. 1 piping change to allow use of 60,000 storage tank
- 1999 Lift Station No. 1 piping change to allow emergency pump-around
- 2000 Lift Station No. 1 replacement of pump access rails and discharge piping
- 2000 addition of four 50,000-gallon bladder tanks
- 2002 Lift Station No. 1 telemetry improvements
- 2003 repairs to Marine Drive collection system
- 2003 addition of high performance impellers to Lift Station No. 1 pumps

Anticipated improvements to our existing wastewater treatment plant that might have improved the hydraulic capacity are not expected to reach completion. Plant construction was terminated in early August 1999 when human burial remains were encountered. The following plan establishes the threshold for declaring a wet weather emergency and specifies procedures to be followed by city maintenance staff as they respond to high flow conditions.

Contents

I. Emergency Storage Hydraulic Design

II. Wet Weather Readiness

III. Wet Weather Emergency Criteria and Response

IV. Filling Emergency Storage

V. Emptying Emergency Storage and Terminating Trucking Operations (if applicable)

VI. Lift Station No. 1 Pump Failure Pump-Around Procedures

VII. Wastewater Treatment Plant High Flow Management

VIII. On-site Temporary Storage & Protection of Bladders

IX. Off-Season Storage of Bladders & Equipment

X. Emergency Notification

Enclosures

(1) Cross-section of tank
(2) Bladder pictures
(3) Trucking forms
(4) Pump curves for Lift Station No. 1
(5) Hydraulic analysis
(6) Overall design configuration
(7) Schematic of bladders

I. Emergency Storage Hydraulic Design

A recently completed analysis by CH2M Hill predicts the volumes of wastewater that must be stored off-line to prevent discharges during peak flows associated with different design storms. With a single pump operating at Lift Station No. 1, approximately 1,600 gallons per minute (gpm) can be transported across Drayton Harbor to the wastewater treatment plant (WWTP). During peak flows lift station inflow exceeds pumping capacity and off-line storage becomes necessary to prevent an overflow. Based on the analysis, 197,000 gallons of off-line storage are required to handle the five-year design storm. The 10-year storm requires 308,000 gallons.

To temporarily contain excess sewage flows, the old 60,000-gallon clarifier-digestor tank will be used as the first stage for off-line storage of wastewater. Enclosure (1) shows a cross section of that tank as originally constructed. In addition to this fixed tank, four vinyl coated 50,000-gallon Terra Tanks® (bladder tanks) were purchased from SEI Industries LTD of Delta, B.C. Canada and will be used to provide the additional capacity necessary to contain the 10-year design storm. Pictures of the bladders are shown in enclosure (2). The bladder tanks are installed near the existing 60,000-gallon clarifier-digestor tank and are connected to the top of the tank so that when full, the bladder tanks automatically begin filling through a manifold system. The total combined capacity of these tanks is 260,000 gallons. In addition, in 2003 the City has secured the services of six tanker trucking firms (enclosure 3) to haul excess flow from Marine Drive to Semiahmoo for controlled release into the collection system where adequate excess capacity had been identified.

A trailer-mounted 58 horsepower diesel-powered centrifugal trash pump is being used to fill this tank by drawing from a manhole upstream of Lift Station No. 1. The specifications and pump curve information for this pump are provided in enclosure (4).

Hydraulic analysis of various components of the systems is presented in enclosure (5). The overall design configuration, based on that analysis, is presented in enclosure (6). With the fixed clarifier-digestor tank and the four bladder tanks adding to the existing approximately 70,000-gallon capacity of the surcharged lines, excess sanitary sewer flow from a 10-year plus design storm can be contained, thereby averting SSOs. This configuration will be employed until such time as the permanent fix, now in progress, can be designed and constructed. The use of tanker trucks to haul excess flow will add to collection system capacity during higher frequency storm events.

II. Wet Weather Readiness

Each October (the start of the rainy season), the bladder tanks will be removed from storage and placed in position around the clarifier-digestor tank as shown in enclosure (6) and the schematic diagram, enclosure (7). The following additional steps will then be taken to prepare for handling potential overflow conditions in the following months:

A. Ensure that the current emergency standby list is available at Lift Station No. 1 and that the Operations Supervisor also has a copy. Prepare laminated cards with emergency telephone/radio contact information for all Public Works emergency personnel.

B. Test the emergency trailer-mounted 58-hp pump to ensure that it is fully operational and that the fuel tank is full

C. Inspect the bladder tanks for watertight integrity. Make repairs as necessary to eliminate any leaks. Ensure that there are bladder patch kits available at Lift Station No. 1.

D. Prepare/update enclosure (8) list of fittings and parts necessary for bladder and pumping systems operations to be maintained on site for emergency operation.

E. From October 1 to April 1 each year, regularly monitor weather information sources for heavy rainfall warnings. Potential sources for information on heavy rainfall forecasts include:

1. **Environment Canada** morning forecast is at 5:00 a.m. They also issue heavy rainfall warning if greater than one inch (1") is expected in forecast area. Their web page is: http://weatheroffice.ec.gc.ca/scripts/citygen.pl?client=eccdn_e&city=yvr
2. **National Weather Service** issues updates to forecasts at approximately six (6)-hour intervals. The morning forecast is at 4:15 a.m. Their web page is: http://www.srh.noaa.gov/data/forecasts/WAZ002.php?warncounty=WAC073&city=Blaine
3. **KING 5 Weather** web page: http://www.instaweather.com/king/default.asp?cid=90&id=blain
4. **Weather Underground Inc.** web page:

   http://www.wunderground.com/US/WA/Bellingham.html
5. **Whatcom County Emergency Management Service** faxes National Weather Service watch notices and warnings directly to the Public Works Department.
6. **AccuWeather**: http://wwwa.accuweather.com/adcbin/public/hbh_local.asp?nav=home

F. Inspect Lift Station No. 1 at least weekly (normally, daily) and record variable frequency drive operating frequency. At the start of the season, test the telemetry system to make sure that it is fully operational.

G. Remove accumulated grease at lift stations every two months during the rainy season.

H. Inspect the flapper valve at old Lift Station No. 2 for proper operation.

I. Install barricades with health hazard signs around the perimeter of the Lift Station area.

J. Check and update the Emergency Notification List (Section X) as necessary to ensure names and phone numbers are current.

K. Install high performance impellers in pumps at Lift Station No. 1 in October and replace with regular ones in May.

L. Call company contacts on Enclosure (3) Tanker Truck List, verify/update all data.

III. Wet Weather Emergency Criteria and Response

During periods of prolonged intense rainfall, a member of the Public Works sewer crew will daily monitor the operation of Lift Station No. 1. During these periods the telemetry system will be set so that the Operations Supervisor or his designated alternate is automatically notified of a high-level alarm in the wet well at Lift Station No. 1. When the high-level alarm notification is received, or when the daily inspection identifies a problem, someone will be immediately dispatched to Lift Station No. 1 to identify the cause of the alarm or other concern. Based on the below-listed criteria, the Operations Supervisor or, in his absence, the Wastewater Collection Lead, may declare a wet weather emergency and initiate appropriate action as indicated:

A. If the high-level alarm is due to mechanical failure of one or more of the submersible pumps, connect the trailer mounted pump to operate as a backup for pump-around following procedures detailed in Section VI, *Pump Failure Pump-around Procedures*. If it is raining hard, declare a wet weather emergency.

B. If monitoring of the wet well shows that, even with both submersible pumps running, the fluid level continues to rise above the high-level alarm and/or water in any of the manholes along Marine Drive is within two feet of overflowing, typically at six feet from the rim of the wet well, immediately begin filling emergency storage tanks as outlined in Section IV, *Filling Emergency Storage*. Declare a wet weather emergency.

C. If a wet weather emergency has been declared, call Public Works Director and call in additional personnel as required to address the specific situation. Call a WWTP operator to report to the WWTP if required (see Section VII, *WWTP High Flow Management*).

D. Monitor and record fluid levels in Lift Station No. 1 and critical manholes along Marine Drive every hour around the clock until an end is declared to the wet weather emergency.

E. Consult available rain data and current weather forecasts to determine anticipated duration of the storm. The National Weather Service in Seattle (1-800-882-1431) may be contacted for current weather and precipitation forecasts. NWS and Environment Canada forecasts may also be accessed via the Internet. (See Section II, *Wet Weather Readiness*, paragraph E above.)

F. Whenever the level in the clarifier-digestor tank reaches three-quarters full (i.e., five feet from the top), and rainfall is occurring, contact trucking company (enclosure (3)) and call out four 3,000-gallon (minimum) truck/tankers. Whenever sewage begins filling the third and/or fourth bladder, call out additional tanker trucks.

IV. Filling Emergency Storage and Ordering Trucking

Filling of off-line storage should begin when the level in the wet well at Lift Station No. 1 has exceeded the high-level alarm and the water level is rising or the level in any of the manholes along Marine Drive is within two feet of the rim. The following actions will be taken to fill emergency storage.

A. Confirm that all piping and valves are connected as shown in the schematic diagram in enclosure (7). Valves will be opened and bladders prepared to accept overflow from the tank.

B. Prime the trailer-mounted pump and begin pumping into the clarifier-digestor tank.

C. Put the flapper valve at old Lift Station No. 2 into operation.

D. During pumping operations, hourly record wet well fluid level, submersible pump status, quantity of off-line storage filled, and weather conditions. When wet well levels are high, and as time permits, inspect levels in manholes along Marine Drive.

E. Pumping will continue with two bladders automatically being filled from the overflow of the clarifier-digestor tank once it reaches the lower discharge port level. The remaining two bladders will fill automatically after the clarifier-digestor tank level reaches the upper discharge level. The clarifier-digestor tank has piping to the upper weir so that any overflow returns to a sanitary sewer manhole.

F. Once a bladder is filled to maximum height, close the valve to that specific bladder but allow the other bladders to continue to fill.

G. If the water in the wet well at Lift Station No. 1 drops below the high-level alarm and the rain has subsided, stop emergency pumping and prepare to empty emergency storage as detailed in Section V, *Emptying Emergency Storage*.

H. Whenever the level in the clarifier-digestor tank reaches three-quarters full (i.e., five feet from the top), and rainfall is occurring, contact trucking company (enclosure (3)) and call out four 3,000-gallon (minimum) truck/tankers. Whenever sewage begins filling the third and/or fourth bladder, call out additional tanker trucks.

1. Contact in order:
   - ☐ Pacific Pumping
   - ☐ Western Refinery Services
   - ☐ Vac Tank Western
   - ☐ Philip Services Corporation

- ☐ LTI
- ☐ Johnny's Septic Service.

2. For each contact, and until four trucks are scheduled to arrive at Lift Station No 1 within two hours from the trucking trigger clock time:

   a) Introduce self, advise that City of Blaine needs tanker trucks to supplement sewage conveyance capabilities for about _____ {insert number of estimated hours based on weather conditions, time of day, past experience} hours.

   b) Inquire truck/driver availability, and estimated best time to arrive at Lift Station No 1. Complete log in Enclosure (3).

   c) If company contact states that truck(s) can probably be on site at Lift Station No 1 in less than two hours:

      (1) Request that he/she dispatch fully fueled truck(s) equipped with at least 45 feet of collection/discharge hose and manhole cover removing tool to sanitary sewer manhole in the Marine Drive shoulder immediately adjacent to Lift Station No 1.

      (2) Advise company contact that discharge location is sanitary sewer manhole in Semiahmoo Parkway east shoulder opposite Semiahmoo Fire Station, on Drayton Harbor Road, as shown on enclosure (9).

      (3) Advise company contact that bridge weight limits require that trucks must travel following route to discharge location:

         (i) East on Marine Drive.

         (ii) South on Interstate 5 (entry ramp at east end of Marine Drive)

         (iii) Off at Exit 270 (Birch Bay/Lynden Road)

         (iv) West (right turn) on Birch Bay Lynden Road

         (v) North (right turn) on Harborview Road

         (vi) West (left turn) on Lincoln Road (which transitions into Semiahmoo Parkway).

      (4) Advise company contact to advise drivers that they will be discharging tank contents without assistance. Drivers will need to remove and replace manhole cover, and connect/disconnect

hoses solo. If necessary, City will install traffic cones and barricades at manholes.

(5) Advise company contact to direct drivers to take fastest route back to Lift Station No 1 to minimize cycle time.

3. Notify following people that you have activated trucking operations:
   - ☐ Public Works Director
   - ☐ Police Department duty officer, 332-6769, or 332-8781 (Border Patrol – after hours)

4. If trucking operations are occurring at night, arrange to energize exterior lighting at Semiahmoo Fire Station.

5. If truck loading/congestion at the Lift Station No. 1 manhole forces truck stacking/waiting, then direct truck drivers to collect sewage from other nearby manholes along Marine Drive.

V. Emptying Emergency Storage and Terminating Trucking Operations (if applicable)

Once the heavy rainfall has ceased and the fluid level in Lift Station No. 1 wet well level has dropped to ten feet below the rim, or Marine Drive sanitary sewer manhole surcharging no longer exists, perform the following:

A. Call trucking company contacts, advise each to terminate trucking operations once each full, or currently filling, truck discharges last load.

B. Connect the hoses from the bladder tanks to the manhole drains as shown in enclosure (7) and begin emptying the four bladder tanks. Monitor flow during emptying to ensure that the wet well level does not increase too rapidly.

C. Once the bladder tanks are emptying, start emptying the clarifier-digestor tank. If necessary, use the trailer-mounted pump or another pump to speed up the process and keep pace with both submersible pumps operating in the wet well to ensure maximum storage volume availability for the next storm surge.

D. Drain tanks to fullest extent possible.

E. Fill the fuel tank on the trailer-mounted pump in preparation for the next wet weather event.

VI. Lift Station No. 1 Pump Failure Pump-around Procedures

The failure of one or more of the submersible hydromatic pumps at Lift Station No. 1 results in reduced system flow capacity, leading to potential overflow discharges during heavy flow periods. Maximizing flow from the lift station is a top priority, especially during wet weather. With only one pump operable there is no redundancy in the system and there is increased risk of failure and potential overflow. In this situation the trailer-mounted pump may be used as a backup to the submersible pumps to continue to pump sewage across the harbor if the second pump fails. The following steps should be taken when one pump has failed:

A. Make sure that the trailer-mounted bypass pump is operational and connect necessary hoses so it can be engaged rapidly if the second pump fails.

B. If one submersible pump is still operational but not keeping up with the flow, then divert the trailer-mounted pump and begin filling overflow storage tanks as described in Section III above.

C. In the event that both submersible pumps fail, start trailer-mounted bypass pump. Make sure pump discharge line is pressurized prior to opening valve to eight-inch DI bypass piping.

D. Control the trailer-mounted bypass pump manually by continuing to observe wet well level.

E. While the pump is operating, fuel levels in the pump should be checked every eight hours.

F. Upon repair of submersible pumps, termination of wet weather emergency, or completion of need for pump-around, shut down the pump and return Lift Station No. 1 pumping to existing submersibles.

VII. Wastewater Treatment Plant (WWTP) High Flow Management

Once a wet weather emergency condition has been declared, the WWTP can expect to see prolonged flow rates of 1,600 gpm or greater. Operating the wastewater treatment plant (WWTP) at or slightly above capacity may be necessary to ensure that Lift Station No. 1 is keeping up with storm flow. For the plant to be able to most effectively handle the impact of this increased load, perform the following procedures:

A. Upon arrival, record flow and time from the flow totalizer (located to the right of the flow chart in the control panel in the southeast corner of the control/laboratory building). Use the checklist, enclosure (7), to record all observations and actions taken.

B. Check operation of the headworks screens. Follow confined space entry procedures when entering headworks building. Use the multi-gas detector to assure that the headworks building atmosphere will support life before entering. The multi-gas detector and its operating instructions are located on the table across from the influent flow meter. If both screens are not rotating, call an operator (Mike at 332-1216, Frank at 366-4912, or Cliff at 384-6983) right away. Check that the plant influent valves going into the back of the screens (upstairs) are open. Adjust these valves to equalize flow to reduce overflow into dumpsters. A short orange valve wrench is needed and is located on one of these two valves. Assure that both dumpsters are dewatering properly and not overflowing.

C. Open the RBC influent valves to equalize flow through RBCs. Count and record the number of turns. These valves are located just southeast of the headworks personnel door and painted orange. Use the orange valve wrench located on the headworks screens influent valves. Confirm that RBC effluent weirs are not plugged with debris.

D. Open the clarifier influent valves to equalize flow through clarifiers. The valves have orange handwheels with rising stems and are located on the south end of the clarifiers. Open east valve fully and adjust west valve to equalize flows. If possible, tie a burlap bag on the end of the pipe in the scum pit. Skim off grease into burlap bag before scum baffles become submerged. Very high flows will submerge the scum baffles allowing floating scum to exit the clarifier and flow to contact chamber. High flows will quickly submerge the scummers, allowing uncontrolled flow to enter the yard pump wet well and overcome the yard pumps. Insert the painted orange plywood “keys”, located by scum pit, into the scummer slot by the scum pit and rotate 90 degrees. Tie off the key handle to the guardrail. This will slow the flow from the scummers to the yard pumps. Alternately, cover the grate on the scum pit floor with plywood to slow the flow to the yard pump wet well. A plug could be inserted into the end of the scum pipe, but sewage will probably be flowing through the pipe by now. The plywood key is quicker and more sanitary.

E. Close the underground valves with orange covers from the sludge pumps to the digesters located at the south end of the digesters. Use the short orange valve wrench with the handwheel located at the southwest corner of the digesters. When the clarifiers surcharge, liquid from the clarifiers can flow through the sludge pumps into the digesters. Tag the sludge pump controls on the control panel just inside the southeast door of the control /laboratory building, informing others that the valves are closed.

F. Check the chlorine residual at the contact chamber sampling point. Adjust the dosage to assure a residual between 0.1 and 0.9 mg/L, but limited to six {nine??} pounds per day. An operator should do this if one is available.

G. High flows or high tides will surcharge or submerge the scummers in the chlorine contact chamber, overcoming the yard pumps and resulting in some wet well contents escaping back through the scummers, flowing directly to receiving waters. The flow through the scummers must be reduced. Insert the orange plywood “keys”, located inside the sampler housing, into both scummer slots by the sampler housing and rotate 90 degrees. Tie off the key handle to the guardrail to slow the flow from the scummers to the yard pumps.

H. Before leaving, record time and flow and from the flow totalizer (located to the right of the flowchart in the control panel in the southeast corner of the control/laboratory building). Leave completed checklist on clipboard on laboratory counter by the phone. Lock the doors and fence when leaving.

VIII. On-Site Temporary Storage & Protection of Bladders

Once a wet weather emergency condition has been declared over and the tanks emptied and cleaned, the bladders should be secured in preparation for the next major rainfall.

A. Inspect various components, including hoses and piping and identify any replacements required.

B. Repair bladders per the manufacturer's recommendations.

C. Enclose the area used for offline storage with a fence to provide security and protection for the public.

D. Inspect the trailer-mounted pump, and perform any required preventative maintenance. Drain volute to prevent freezing during cold weather.

IX. Off Season Storage of Bladders & Equipment

At the end of the rainy season, May 1 (or later if significant rainfall is still in the forecast) the bladder tanks will be stored inside protective enclosures within the permanently fenced area at Lift Station No.1 to protect them from damage and extend their life. The emergency pump will be returned to the Public Works Facility, 1200 Yew Avenue.

A. Completely empty the tanks and thoroughly clean them making any repairs that are required.

B. During the summer, service the submersible pumps at Lift Station No. 1 to ensure continued proper operations.

C. Review this plan annually and identify improvements in procedures or additional components required to be purchased and include these in formal revisions.

X. Emergency Notification

In the unlikely event that all these preventative measures are unsuccessful and an overflow discharge does occur, contact the following agencies and individuals in the order listed below:

Agency	Contact	Telephone	FAX
D.O.E. Spill Response		425-649-7000	
Department of Ecology	Mark Henderson	360-676-2198	360-738-6253
Department of Ecology	Ralph Svrjcek	425-649-7165	
Wash. Dept. of Health (Shellfish Division)	Frank Meriwether	360-236-3321 360-753-5992	360-236-2257
Whatcom County Health Department		360-738-2504, ext. 50808	360-738-2504
Starfish Foods	Harvey Wilson	332-8066	
Drayton Harbor Shellfish Advisory Committee	Geoff Menzies	384-5519	
Department of Emergency Management	Duty Officer	360-676-6681	
City of White Rock	Doug Stone, Dir. Of Ops.	604-541-2188 or 604-541-2181	604-541-2190
Provincial Emergency Program (PEP)		1-800-663-3456 1-250-387-5956	250-952-4872

NOTIFICATION PROCEDURES

When dealing with state agencies and private individuals, entities or organizations, it is important that you not speculate or deviate from known facts. The report should include as much of the following as is known with certainty: how long it is known to have been in overflow; causes of the overflow; strength of sewage (percentage of stormwater to sewage); gallons per minute; total gallons overflowing; condition of the pumping station or time it will take for the event to pass.

When leaving a voice message, always give your name, your position with the City, the time you are calling, the time the overflow was observed; the location of the overflow (street intersection, if applicable), weather conditions, the body of water it is flowing into, a phone number where you can be reached, and the City's emergency phone number (360-815-0494).

When making the calls, write down the number you called, the time of the call, the name of the person you talked to, or the number at which you left a message. Agencies don't always get their messages. Without documentation to the contrary, there could be a question as to whether we followed proper notification procedures.

1. Notify the D.O.E. Northwest Regional Office Spill Response at 425-649-7000. Report your information to the person on duty.

2. Notify the D.O.E. Bellingham Office (contact person Mark Henderson) at 360-676-2198 or fax at 738-6253. If Mark is not in, leave a message in his voice mail system.

3. Notify the Department of Health Shellfish Division (contact person, Frank Meriwether) after hours, weekends and holidays by way of 24-hour pager at 360-753-5992. This is a numeric pager that will require you to leave a phone number where you can be reached (it will take approximately 10-15 minutes to receive a return call). You will have to wait by this phone for a return call before you proceed to the next call. After you have received this call, telephone Frank's office at 360-236-3321 and leave your message on his voice mail.

4. Notify the Whatcom County Health Department (738-2504, ext. 50808), and leave a message in the voice mail system if no one is on duty.

5. Notify Starfish Foods (contact person Harvey Wilson) at 332-8066.

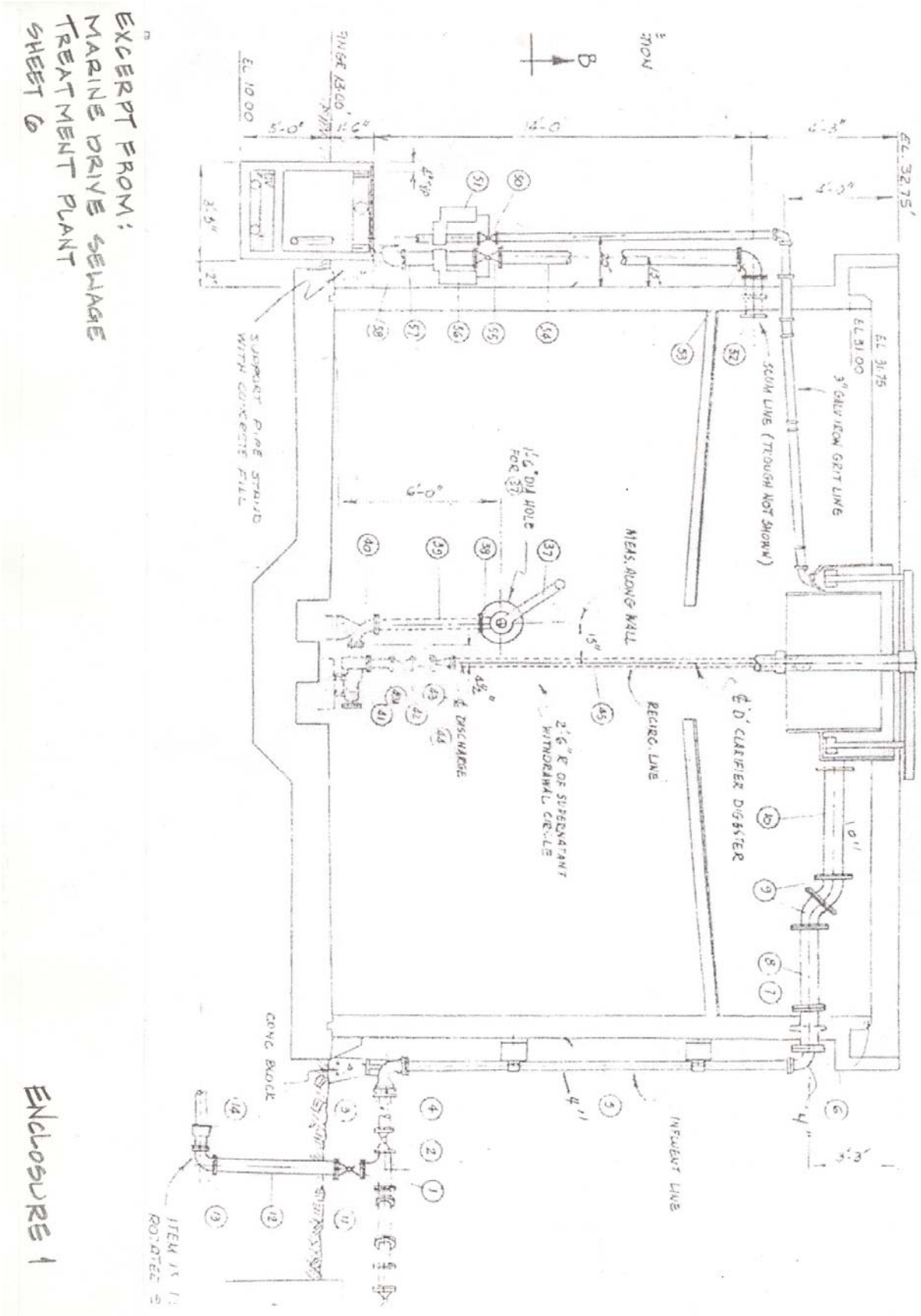
6. Notify the Drayton Harbor Shellfish Committee (contact person Geoff Menzies) at 384-5519.

7. Notify the Department of Emergency Management at 360-676-6681.

8. Notify the City of White Rock, B.C. (contact person Doug Stone, Director of Operations) at 604-541-2188 or 604-541-2181, or his cell phone at 604-351-0848.

9. Notify the Provincial Emergency Program (PEP, contact person Bill Rodgers, S. Frasier Health Region) at 800-663-3456 or 1-250-387-5956 or fax at 250-952-4872.

10. Notify the City's emergency phone at 815-0494. If you get an answering machine, leave a report of what has occurred and the notifications you've made. Leave a telephone number where you can be reached.


EXCERPT FROM:
MARINE DRIVE SEWAGE
TREATMENT PLANT
SHEET 6
ENCLOSURE 1
EL. 32.75'
EL. 31.00
3" GALV IRON GRIT LINE
SCUM LINE (THOUGH NOT SHOWN)
MEAS. ALONG WALL
REGIRC. LINE
CLARIFIER DIGESTER
INFLUENT LINE
CONC. BADGE
SUPPORT PIPE STAND WITH CONCRETE FILL
DISCHARGE
WITHDRAWAL CIRCLE
EL. 10.00

WASTEWATER OVERFLOW MITIGATION
One of four new bladder tanks is shown here being tested prior to being deployed to Lift Station # 1.

Enclosure 2

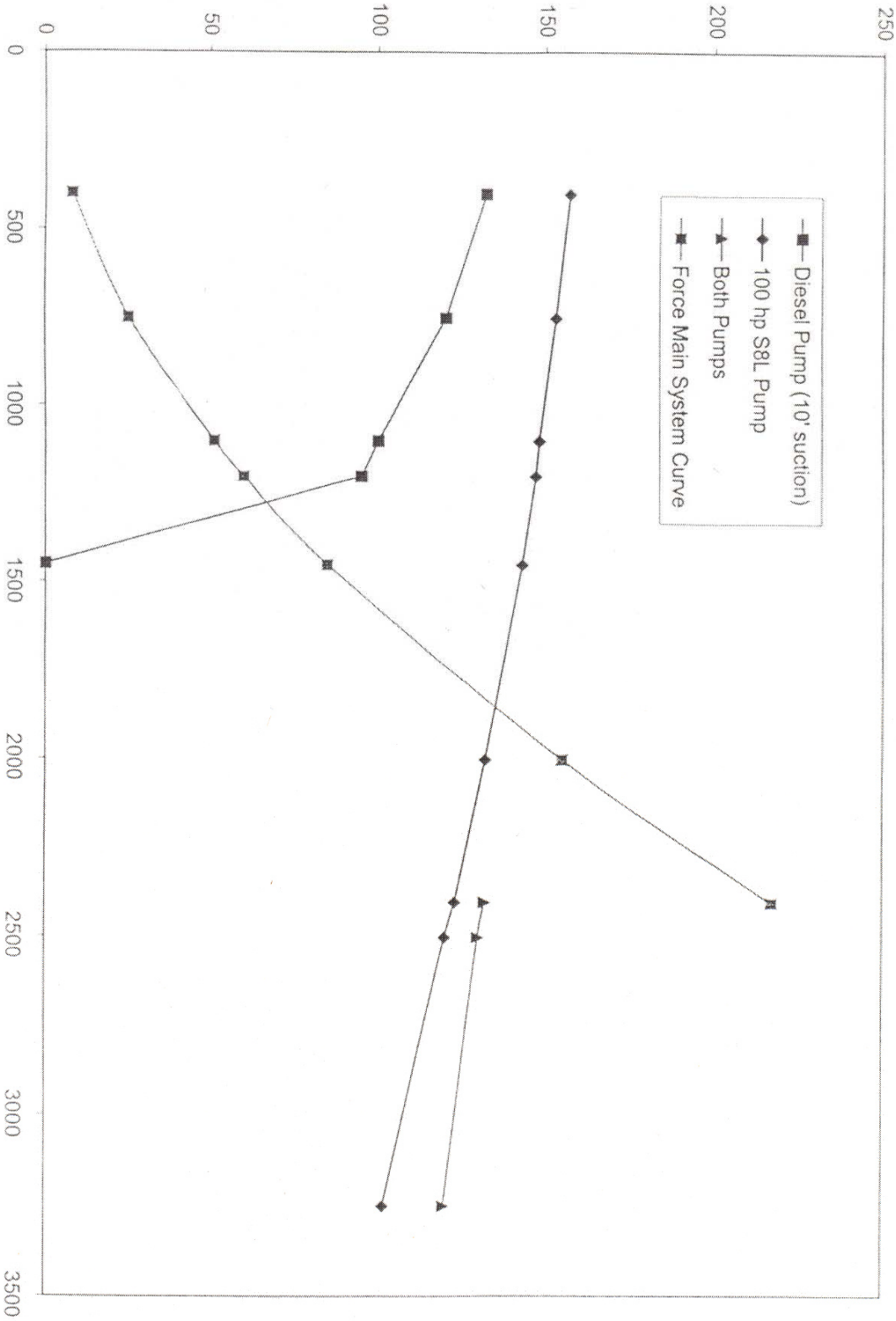
City of Blaine
Wet Weather Plan
Tanker Truck List

Company Name:		Vac Tank Western	Philip Services Corp	Johnny's Septic Service	LTI	Pacific Pumping		Western Refinery Services
Company Address:		811 N 8th St Lynden, WA 98264	4430 Pacific Hway Bellingham, WA 98226	14062 Hillwood Dr Bow, WA 98232	PO Box 433 Lynden, WA 98264	464 W Badger Road Lynden, WA 98264		100-C Grover Street Lynden, WA 98264
Equipment Availability:		24h/d; 365d/y	24h/d; 365d/y	24h/d; 365d/y except holidays	24h/d; 365d/y	24h/d; 365d/y		24h/d; 365d/y
Equipment Description; Charges; Applicable times:		• 5,500 gal vac (2 ea); $80/hr port to port. • 3,500 gal vac (1 ea.); $80/hr port to port.	• ~5,000 gal vac (4 ea); ST $80/hr port to port. • ~2,500 gal vac (2 ea); ST $80/hr port to port. • OT for both above at 1.5x operator rate + materials.	• 3,300 gal vac (2 ea); $150/hr once on site. • 2,300 gal vac (1 ea); $125/hr once on site.	• 8,500 gal double rig (2 ea); $85/hr port to port. • 4,500 gal single rig (4 ea); $85/hr port to port. • 600 gpm gasoline trash pump, incl in above (necessary w/ this company).	• 4,000 gal vac (2 ea); $85/hr port to port		• 3,000 gal vac (3 ea); $___/hr _____ • 21,000 gal portable tanks; $___/_____
Best estimated response time to Lift Station No 1:		Info not provided	1 hour	Info not provided	2 hours	1 hour		ASAP
Primary Contact:	**Name:**	John (Mick Van Dalen)	Bret Leavitt	Mike Tamman	Jason Jansen	Marion Schouten		Ryan Likkel
	Phone:	(360) 354-4339 (W) 24 Hours (360) 815-2399 (C) (360) 318-1268	(360) 734-5155 (W) 24 Hours	(360) 734-9894 (W) (360) 708-9674 (C)	(360) 354-2103 (W) 354-3590 (H) (360) 319-8030 (C)	(360) 318-1444 (360) 507-4802 (C)		(360) 366-3303 (360) 507-3998 (C)
Secondary Contact(s):	**Name:**	n/a	On-Call Person	N/A	Jeff Kok	Marv Schouten	Pete	Billy
	Phone:	n/a	734-5155 (W) 24 Hours	N/A	(360) 354-2101 (W) 354-5522 (H) (360) 739-2106 (C)	(360) 354-4409	(360) 507-4045 (C)	(360) 507-4001 (C)

(W) - Work (H) - Home (C) - Cellular (P) - Pager

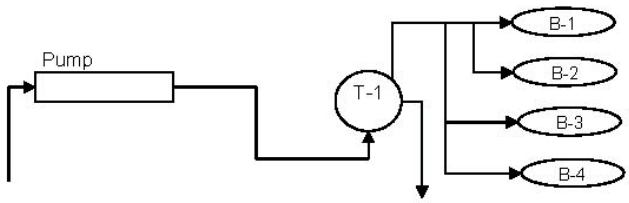
Filed: W:\Operations\WASTEWATER\Wet Weather Plan\TankerTruckList

Enclosure (3)


Emergency Pumping @ L.S. No. 1
Diesel Pump (10' suction)
100 hp S8L Pump
Both Pumps
Force Main System Curve
250
200
150
100
50
0
0
500
1000
1500
2000
2500
3000
3500

ENCLOSURE 4

Overflow Mitigation @ Lift Station No. 1
Temporary Storage - Hydraulic Analysis



Givens:
Digestor Tank Diameter = 24.625'
Invert Dischage to Baldder = 16.25'
Digestor Overflow Weir = 19'
Bladder Tank Top = 48"
Pump Suction = -6'
6" hose sections available in 50' lengths

Flow Strategy:

1 Start pump and fill digester (T-1)
2 When Tank 1 reaches 16.25' overflow to bladder header and start filling bladders
3 To limit head applied to bladders provide an overflow riser unit at intake of each bladder
4 When flow spills over top of each overflow riser, close valve to full bladder
5 When last bladder is full, allow overflow to continue
6 Liquid level in Tank 1 rises to elev. 19 and begins to spill over weir
7 Overflows from Tank 1 and all four bladders linked to manhole
8 When static level in sewer begins to drop after rain, begin by draining T-1 then bladders

Piping/Hose Links:

No.	Segment	Length	Diameter	Ent. Elev	Exit Elev.
1	Pump Suction	25'	6"	-6	2
2	Pump Discharge	100'	6"	2	19
3	Tank 1 Discharge to 1st Tee	50'	6"	16	0
4	1st Tee to B-1/B-2 Tee	50'	6"	0	0
5	B-1/B-2 Tee to B-1	50'	6"	0	5
6	B-1/B-2 Tee to B-2	50'	6"	0	5
7	1st Tee to B-3/B-4 Tee	50'	6"	0	5
8	B-3/B-4 Tee to B-3	50'	6"	0	5
9	B-3/B-4 Tee to B-4	50'	6"	0	5
10	T-1 Weir Box to manhole	50'	6"	16	0

Critical Hydraulic Considerations:

1 Max flow through weir box at top of T-1

Available head (feet) = 3
Orifice Opening (inch) = 6
Orifice Coef. (sw edge tube) 0.82

Flow (gpm):	500	1000	1740	2000	2500
Head Rqd. (ft)	0.9	1.7	3.0	3.5	4.3

Conclusion: flow exiting T-1 over weir can not exeed 1740 gpm

2 Reqd. pipe/hose size overflow from weir box orifice, top of T-1

Available head (feet) = 16
Hose length = 50
Roughness C = 140
Calculation of friction loss by Hazen Williams Eq. (feet of head)

Flow (gpm):		500	1000	1740	2000	2500
Hose =	4	6	23	65	84	127
Hose =	6	0.9	3.2	**9.0**	12	18
Hose =	8	0.2	0.8	2.2	2.9	4.4

Conclusion: use 6" pipe/hose, flow can be up to 1750 gpm

3 Pump operating point

Suction head:

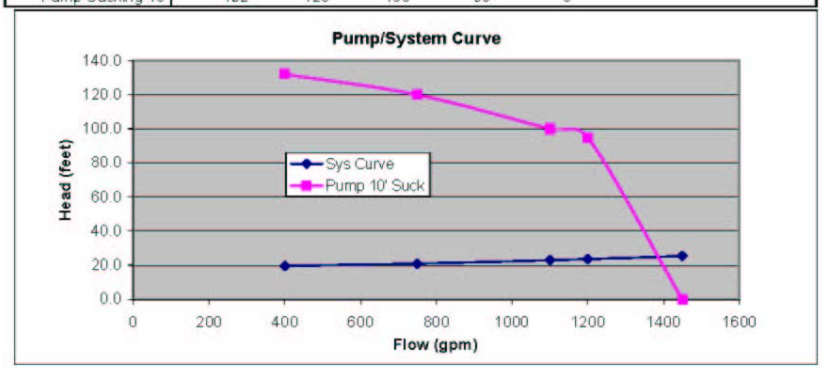
Overflow Mitigation @ Lift Station No. 1
Temporary Storage - Hydraulic Analysis

Depth to bottom of manhole = 6'
Suction hose loss = 2.3' @ 1200 gpm
3.0' @ 1400 gpm
Total suction head = less than 10'

System curves:

Pump = Gorman_Rupp 16C2-F4L
Pipe dia. = 6
Hose Length = 50
Roughness C = 140

Flow (gpm):	400	750	1100	1200	1450	0	0	0
System Head (feet)	19.6	21	23	23.5	25.5	19		
Pump Sucking 10'	132	120	100	95	0			



Conclusion: Operating point with this pump is 1400 gpm

4 Maxium flow through side exit from T-1

Available head (feet) = 2.5
Orifice Opening (inch) = 6
Orifice Coef. (square edge tube) 0.82

Flow (gpm):	500	1000	1450	2000	2500
Head Rqd. (ft)	0.9	1.7	2.5	3.5	4.3

Conclusion: flow can be up to 1450 gpm before topping the T-1 perimeter weir

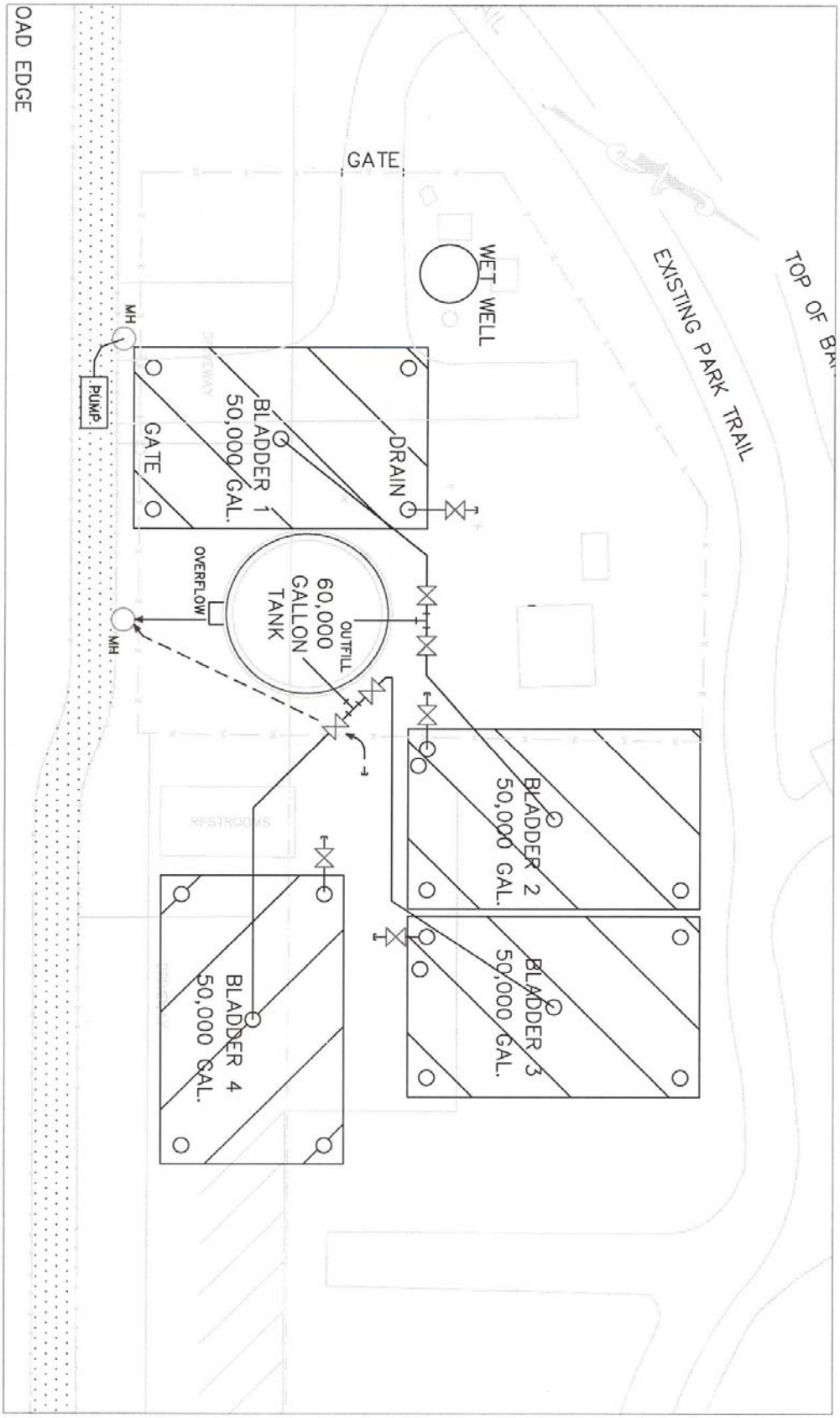
5 Pipe/hose size between T-1 and 1st Tee

Available head 16' - 5' = 11'
Hose Length = 50
Roughness C = 140
Calculation of friction loss by Hazen Williams Eq. (feet of head)

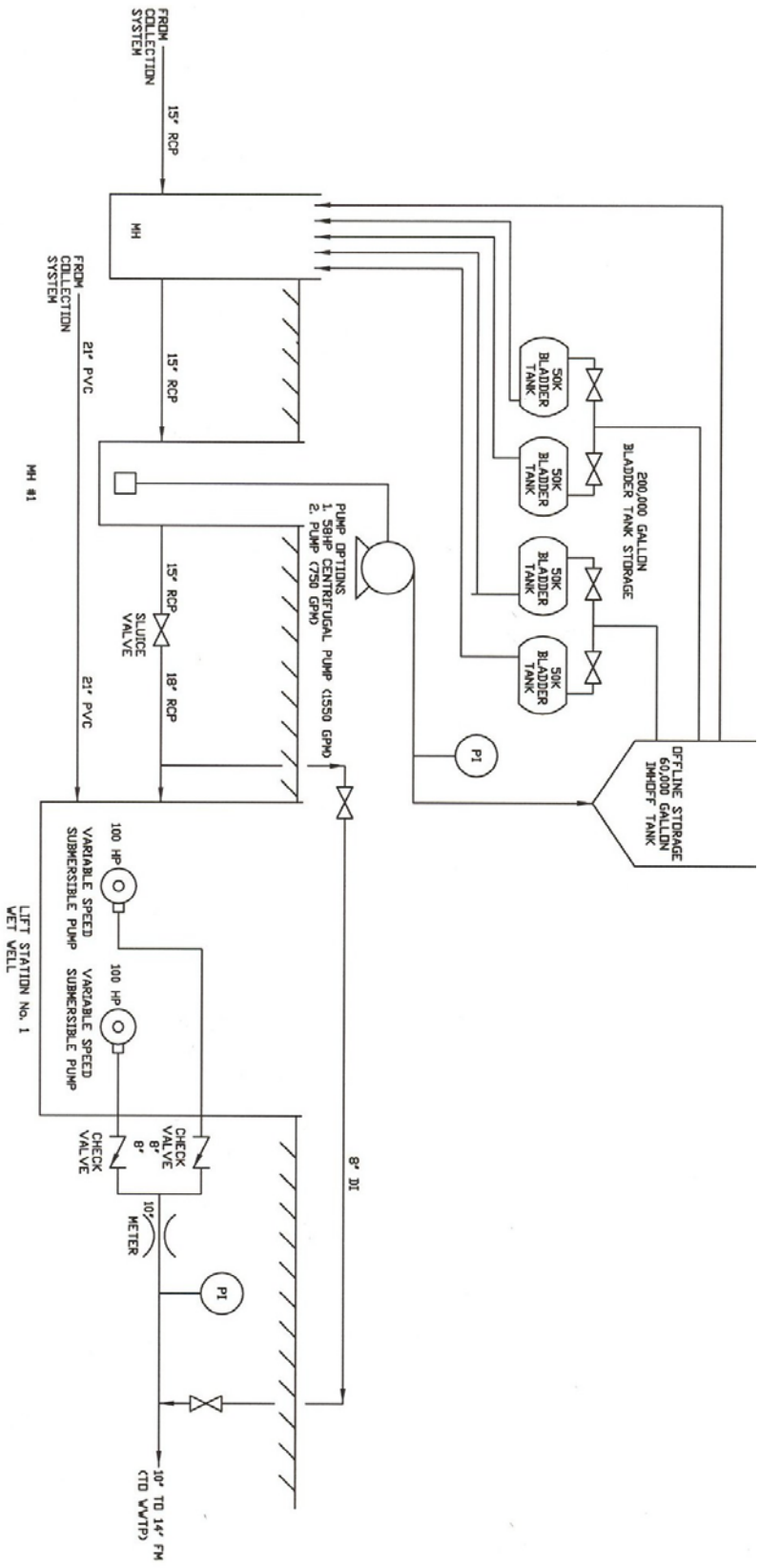
Flow (gpm):		0	1200	1450	0	0
Pipe =	4	0.00	33	46	0.00	0.00
Pipe =	6	0.00	**4.5**	**6.5**	0.00	0.00
Pipe =	8	0.00	1.1	1.6	0.00	0.00

Conclusions: 6" pipe/hose is adequate, 6.5' to 4.5' of head for other 50' hose sections after split

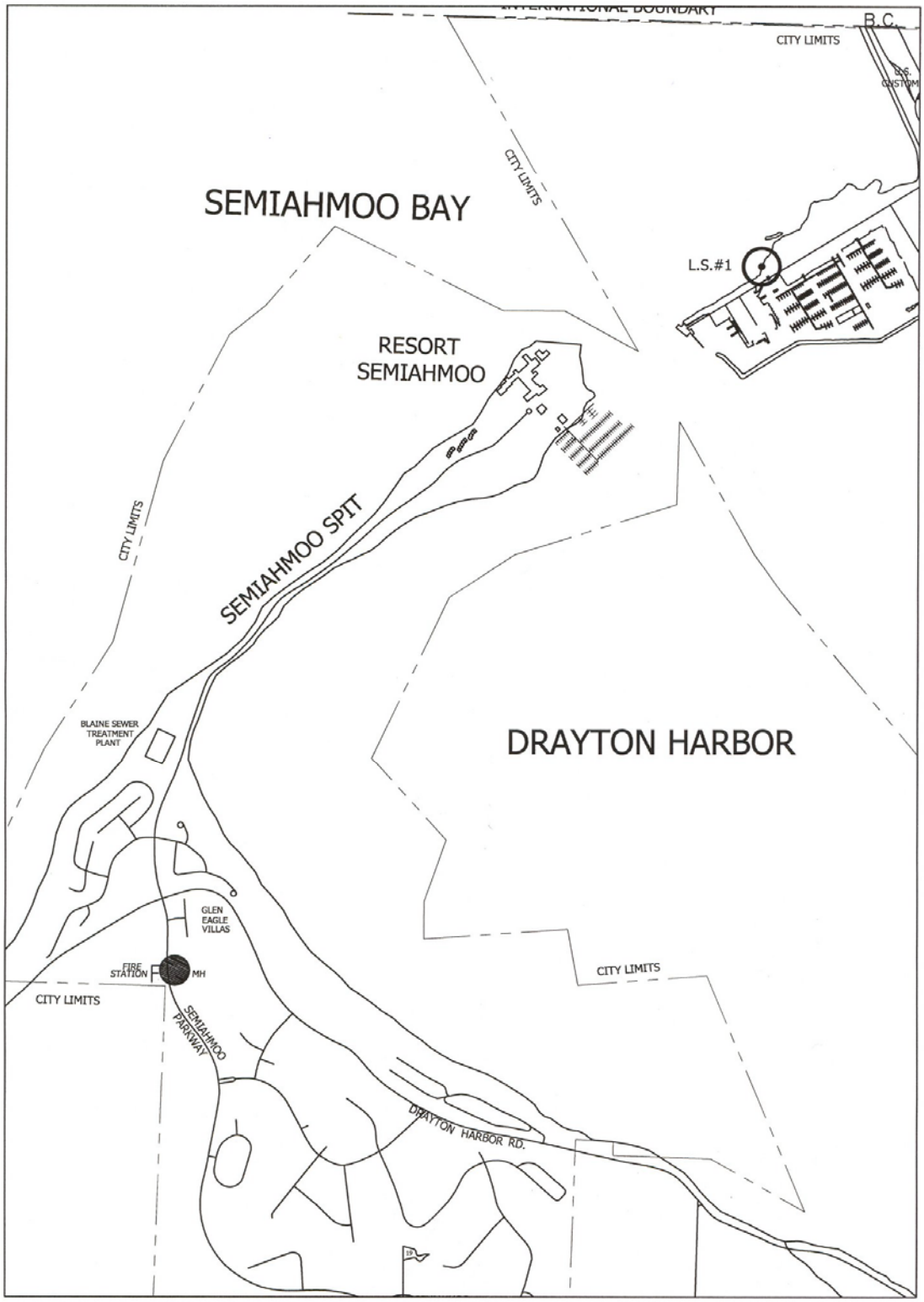
Enclosure 5


TOP OF BA
EXISTING PARK TRAIL
GATE
WET WELL
DRAIN
BLADDER 1
50,000 GAL.
GATE
MH
PUMP
OVERFLOW
60,000
GALLON
TANK
OUTFILL
MH
BLADDER 2
50,000 GAL.
BLADDER 3
50,000 GAL.
BLADDER 4
50,000 GAL.
RESTROOMS
OAD EDGE

ENCLOSURE 6


FROM COLLECTION SYSTEM
15" RCP
MH
FROM COLLECTION SYSTEM
21" PVC
15" RCP
MH #1
50K BLADDER TANK
50K BLADDER TANK
50K BLADDER TANK
50K BLADDER TANK
200,000 GALLON BLADDER TANK STORAGE
PUMP OPTIONS
1. 5BHP CENTRIFUGAL PUMP (1550 GPM)
2. PUMP (750 GPM)
15" RCP
SLUICE VALVE
18" RCP
21" PVC
PI
OFFLINE STORAGE 60,000 GALLON IMHOFF TANK
100 HP
VARIABLE SPEED SUBMERSIBLE PUMP
100 HP
VARIABLE SPEED SUBMERSIBLE PUMP
LIFT STATION No. 1 WET WELL
CHECK VALVE
CHECK VALVE 8"
8"
8" DI
10" METER
PI
10" TO 14" FM CTD VVTP)

ENCLOSURE 7


B.C.
CITY LIMITS
U.S. CUSTOM
CITY LIMITS
SEMIAHMOO BAY
L.S.#1
RESORT SEMIAHMOO
CITY LIMITS
SEMIAHMOO SPIT
BLAINE SEWER TREATMENT PLANT
DRAYTON HARBOR
GLEN EAGLE VILLAS
FIRE STATION
MH
CITY LIMITS
CITY LIMITS
SEMIAHMOO PARKWAY
DRAYTON HARBOR RD.

ENCLOSURE 8

Appendix S

Support Documentation for CIP

Appendix S
Capital Improvement Program

This appendix supersedes the September 2004 version of Appendix S.

PROJECT		Finance Source	2005	2006	2007	2008	2009	2010	2011-2025	Total
Treatment Improvements										
T1	Construct new wastewater equalization storage, improvements to Marine Drive, and upgrade the existing LS 1.	Rural Development PWTF Loan TIB Grant	$450,000	$3,500,000						$3,950,000
T2	Construct new Water Reclamation Facility on Marine Drive location, including influent and effluent pumping. New WRF would continue to use the existing outfall.	City PWTF Loan Centennial Loan	$300,000	$1,500,000	$10,500,000	$10,000,000				$22,300,000
T3	Construct new wastewater treatment facility for West Blaine or convey to Birch Bay	PWTF Loan Centennial Loan						$500,000	$4,012,000	$4,512,000
Collection System Improvements										
A-1a	Replace existing 10-inch pipeline with a 15-inch, between manholes E3-4 and E3-9 (approximately 560 ft). Includes 250 ft bore and jack Interstate-5 undercrossing.	Developer funded		$466,000						$466,000
A-1b	Replace existing 10-inch pipeline with a 18-inch, between manholes E3-9 and F4-1, parallel to I-5 (approximately 360 ft).	Developer funded			$155,000					$155,000
A-1c	Replace existing 8-inch pipeline with a 12-inch, between manholes F4-1and H4-2, between G Street and H Street (approximately 1895 ft).	Developer funded			$668,000					$668,000
A-2a	Replace existing 8-inch pipeline with a 10-inch, between manholes G3-4 and G3-5 and between manholes G2-8 and I1-5, along 8th Street and A Street (approximately 3,010 ft).						$1,050,000			$1,050,000
A-2b	Replace existing 8-inch pipeline with a 12-inch, between manholes G3-5 and G2-8, along 8th Street (approximately 400 ft).						$154,000			$154,000
B-1	Replace existing 10-inch pipeline with a 12-inch, between manholes F5-3 and G7-1, parallel to Garfield Avenue (approximately 2,080 ft).					$765,000				$765,000
B-2	Replace existing 8-inch pipeline with a 12-inch, between manholes H4-7 and I4-2 (connection point to service East Blaine) along G Street. (approximately 955 ft).				$339,000					$339,000
P-1&P-2	Proposed sewer main extension along H Street	Developer funded				$2,400,000				$2,400,000
P-3	Proposed sewer sub-main extension								$200,000	$200,000
P-4	Proposed sewer sub-main extension								$140,000	$140,000
P-5	Proposed sewer sub-main extension								$130,000	$130,000
P-6	Proposed sewer sub-main extension along Jerome Street								$400,000	$400,000
P-7	Proposed sewer sub-main extension along Harvey Road								$390,000	$390,000
P-8	Proposed sewer sub-main extension								$390,000	$390,000
P-9	Proposed sewer sub-main extension along Old Mill Road								$380,000	$380,000
P-10&P-11	Proposed sewer main extension along H Street	Developer funded				$570,000				$570,000
Lift Station Improvements										
LS-1	Upgrade firm capacity to 2,820 gpm and total capacity to 3,760 (costs included in Project T-1 previous page).									$0
General Programs										
G-1	Annual pipeline rehabilitation, replacement and I/I program, including backyard sewer replacement.	City	$50,000	$50,000						$100,000
	Total		$800,000	$5,516,000	$11,662,000	$13,735,000	$1,204,000	$500,000	$6,042,000	$39,459,000

Appendix S
CIP Support

This appendix supersedes the September 2004 version of Appendix S.

IMPROVEMENT	DESCRIPTION	Diameter (in)	Length (ft)	Construction Cost	Contingency	Mobilizatio	Sales Tax	Allied cost	Env/ROW	TOTAL COST	CAPACITY CRITERIA	CONDITION
A-1	The 10-inch gravity line should be replaced with 4,800 feet of a 14-inch pipeline between manholes H6-2 (MH392) and E3-4 (MH485). A 12-inch is adequate for conveyance, however, if the City is going to upgrade the line, it is recommended a 2 pipe size increase. This main line conveys wastewater from basin 6B and downstream collects wastewater from basin 4B. The wastewater level in these pipes exceeded the overflow criteria at the manholes and the pipe capacity criteria were exceeded.	14	4,800	$777,503	233,251	101,075	91,170	333,549	101,075	$1,650,000	SSO	Poor
A-2	The receiving main line from LS 5, a 10-inch gravity line should be replaced with 3,200 feet of an 18-inch pipeline between G7-3 (MH565) and F4-4 (MH518). This main line conveys wastewater from basin 5B and 8B. The wastewater level in these pipes exceeded the overflow criteria at the manholes and the pipe capacity criteria were exceeded.	18	3,200	$666,431	199,929	86,636	78,146	285,899	86,636	$1,410,000	SSO	Fair
A-3	The 8-inch gravity line should be replaced with 4,800 feet of a 10-inch pipeline between I1-5 (MH403) and F4-1 (MH475). This main line conveys wastewater from basin 6B and 9B. The wastewater level in these pipes exceeded the overflow criteria at the manholes and the pipe capacity criteria were exceeded.	10	4,800	$555,359	166,608	72,197	65,121	238,249	72,197	$1,200,000	SSO	Poor
A-4	To increase the conveyance capacity of the discharge pipeline of LS 5, the existing 8-inch line between the pump station and the existing treatment plant should be replaced with approximately 1,350 feet of 10-inch pipeline.	10	1,350	$156,195	46,858	20,305	18,315	67,008	20,305	$350,000	SSO	Good
B-1	The 8-inch gravity line should be replaced with 1,000 feet of 10-inch pipeline between manholes J6-1 (MH10) and H6-2 (MH392). This main line conveys wastewater from the industrial area of basin 6B. The wastewater level in these pipes exceeded the overflow criteria at the manholes, although there was no surcharge observed. The pipe capacity criteria were exceeded.	10	1,000	$115,700	34,710	15,041	13,567	49,635	15,041	$245,000	< 2' from rim	Poor
B-2	The 8-inch gravity line should be replaced with 280 feet of 10-inch pipeline between manholes D3-8 (MH447) and D3-1 (MH561). This main line conveys wastewater basin 2B,which is a commercial and residential zone primarily. The wastewater level in these pipes exceeded the overflow criteria at the manholes, although there was no surcharge observed. The pipe capacity criteria were exceeded.	10	280	$32,396	9,719	4,211	3,799	13,898	4,211	$69,000	< 2' from rim	Poor
C-1	The 8-inch gravity line should be replaced with 750 feet of 16-inch pipeline between manholes E2-4 (MH358) and E2-11 (MH453). The pipe slope in this segment affects significantly the capacity of this line. This line conveys wastewater from the upper portion of basin 2B. The wastewater level in these pipes did not exceed the overflow criteria at the manholes, although the wastewater elevation indicates potential basement flooding.	16	750	$138,840	41,652	18,049	16,280	59,562	18,049	$293,000	2-8' from rim	Good (except for a 6"-section = poor)
P-1 & P-2	Proposed sewer main extension along H Street	8	11,844	$1,096,280	328,884	142,516	128,550	470,304	142,516	$2,400,000	Proposed	
P-3	Proposed sewer sub-main extension	6	1,304	$90,524	27,157	11,768	10,615	38,835	11,768	$200,000	Proposed	
P-4	Proposed sewer sub-main extension	6	894	$62,061	18,618	8,068	7,277	26,624	8,068	$140,000	Proposed	
P-5	Proposed sewer sub-main extension	6	857	$59,493	17,848	7,734	6,976	25,522	7,734	$130,000	Proposed	
P-6	Proposed sewer sub-main extension along Jerome Street	6	2,722	$188,961	56,688	24,565	22,158	81,064	24,565	$400,000	Proposed	
P-7	Proposed sewer sub-main extension along Harvey Road	6	2,665	$185,004	55,501	24,051	21,694	79,367	24,051	$390,000	Proposed	
P-8	Proposed sewer sub-main extension	6	2,627	$182,366	54,710	23,708	21,384	78,235	23,708	$390,000	Proposed	
P-9	Proposed sewer sub-main extension along Old Mill Road	6	2,571	$178,479	53,544	23,202	20,928	76,567	23,202	$380,000	Proposed	
P-10 & P-11	Proposed sewer main extension along H Street	6	3,862	$268,100	80,430	34,853	31,437	115,015	34,853	$570,000	Proposed	
P-12	Proposed sewer sub-main extension	6	2,496	$173,272	51,982	22,525	20,318	74,334	22,525	$370,000	Proposed	
LS-5	Upgrade capacity from 450 gpm to 1,200 gpm			$235,000	70,500	30,550	27,556	100,815	30,550	$500,000	SSO	Good
LS-3	Upgrade capacity from 150 gpm to 210 gpm			$90,000	27,000	11,700	10,553	38,610	11,700	$100,000		Good

Mark-ups

10%	Mobilization
30%	Contingency
8.20%	Sales Tax
30%	Allied costs as an allowance for engineering, legal, inspection, and City administrative expenses
5%	Environmental mitigation
5%	Easements and ROW acquisition

Appendix S
CIP Support

This appendix supersedes the September 2004 version of Appendix S.

Score	
1	Worst ranking
5	Superior ranking

Criteria	Environmental/ Health Impacts		Impact on Community		Current Condition		Total	Ranking	Total Cost
Relative Weight	50%		20%		30%		100%		
Improvements	Score	Weighted Score	Score	Weighted Score	Score	Weighted Score	Weighted Score		
A-1	5.0	2.5	5.0	1.0	5.0	1.5	5.0	1	$1,650,000
A-2	5.0	2.5	4.0	0.8	3.0	0.9	4.2	2	$1,410,000
A-3	5.0	2.5	1.0	0.2	5.0	1.5	4.2	3	$1,200,000
B-1	3.0	1.5	3.0	0.6	5.0	1.5	3.6	4	$245,000
B-2	3.0	1.5	2.0	0.4	5.0	1.5	3.4	5	$69,000
A-4	5.0	2.5	3.0	0.6	1.0	0.3	3.4	6	$350,000
C-1	1.0	0.5	3.0	0.6	1.0	0.3	1.4	7	$293,000

Condition Ratings	
Good	1.0
Fair	3.0
Poor	5.0

Appendix T

Financial Plan

Appendix T
Financial Plan

This appendix supersedes the September 2004 version of Appendix T.

PROJECT		2005	2006	2007	2008	2009	2010	Total
CIP								
T1	Construct new wastewater equalization storage.	$450,000	$3,500,000					$3,950,000
T2	Construct new Water Reclamation Facility on Marine Drive location.	$300,000	$1,500,000	$10,500,000	$10,000,000			$22,300,000
T3	Construct new wastewater treatment facility for West Blaine or convey to Birch Bay						$500,000	$500,000
A-1a	Replace existing 10-inch pipeline with a 15-inch (560 ft)		$466,000					$466,000
A-1b	Replace existing 10-inch pipeline with a 18-inch parallel to I-5 (360 ft)			$155,000				$155,000
A-1c	Replace existing 8-inch pipeline with a 12-inch between G Street and H Street (1,895 ft)			$668,000				$668,000
A-2a	Replace existing 8-inch pipeline with a 10-inch along 8th Street and A Street (3,010 ft)					$1,050,000		$1,050,000
A-2b	Replace existing 8-inch pipeline with a 12-inch along 8th Street (400 ft)					$154,000		$154,000
B-1	Replace existing 10-inch pipeline with a 12-inch parallel to Garfield Avenue (2,080 ft)				$765,000			$765,000
B-2	Replace existing 8-inch pipeline with a 12-inch along G Street (955 ft)			$339,000				$339,000
P-1&P-2	Proposed sewer main extension along H Street				$2,400,000			$2,400,000
P-10&P-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	**$800,000**	**$5,516,000**	**$11,662,000**	**$13,735,000**	**$1,204,000**	**$500,000**	**$33,417,000**
City Project List								
T5	Interim WWTP Improvements	$100,000						$100,000
LS-5	Install Controller and Telemetry on Lift Station 5	$15,000						$15,000
	Subtotal	**$115,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$115,000**
	Total	**$915,000**	**$5,516,000**	**$11,662,000**	**$13,735,000**	**$1,204,000**	**$500,000**	**$33,532,000**
	City Funded	**$915,000**	**$5,050,000**	**$10,839,000**	**$10,765,000**	**$1,204,000**	**$500,000**	**$29,273,000**

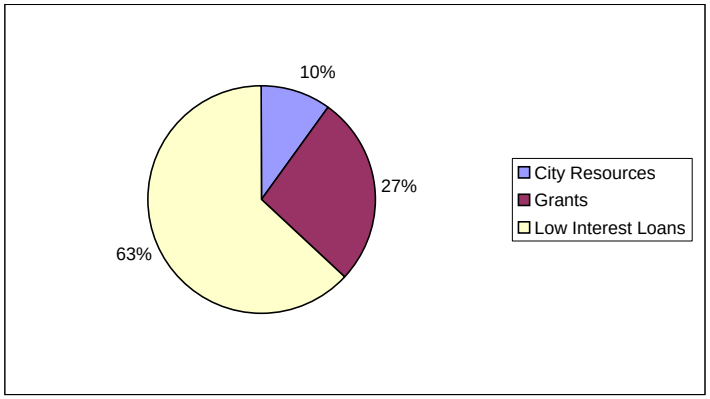
Appendix T
Financial Plan

This appendix supersedes the September 2004 version of Appendix T.

Revenue Sources			T1 - Equalization Storage	T2 Design	T2 Construction	T3 Design	T3 Construction	Total Cost
Estimated Cost			$3,950,000	$1,500,000	$20,500,000	$500,000	$4,012,000	$30,462,000
Duration			5/05 - 12/06	1/05 - 12/06	3/07 - 6/08	2010	3/11 - 4/12	
City Resources								
Sewer Capital Facilities Fund				$500,000	$2,500,000		$12,000	$3,012,000
Grants								
Rural Development			$700,000					$700,000
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
Total Grants			$1,200,000	$0	$5,000,000	$0	$2,000,000	$8,200,000
Low Interest Loans								
PWTF Pre-Construction (15% City Match)	5	0.5%		$1,000,000		$500,000		$1,500,000
PWTF Construction (15% City Match)	20	0.5%	$2,750,000		$10,000,000			$12,750,000
Centennial Clean-water	20	0.0%			$2,500,000		$2,000,000	$4,500,000
Rural Sales Tax	20	2.5%			$500,000			$500,000
Total Low Interest Loans			$2,750,000	$1,000,000	$13,000,000	$500,000	$2,000,000	$19,250,000
Market Interest Loans/Bonds								
Revenue Bonds	25	6%						$0
*Rural Development Loan**	40	4.25%	*$3,500,000*					$3,500,000
Total Market Interest Loans/Bonds			$3,500,000	$0	$0	$0	$0	$3,500,000
Total Revenues for Project			$3,950,000	$1,500,000	$20,500,000	$500,000	$4,012,000	$30,462,000
Annual Debt Service								
PWTF Pre-Construction (0.5%)	5	0.5%	$0	($203,010)	$0	($101,505)	$0	($304,515)
PWTF Construction (0.5%)	20	0.5%	($144,833)	$0	($526,665)	$0	$0	($671,497)
Centennial	20	0.0%	$0	$0	($125,000)	$0	($100,000)	($225,000)
Rural Sales Tax	20	2.5%	$0	$0	($32,074)	$0	$0	($32,074)
Revenue Bonds	25	6%	$0	$0	$0	$0	$0	$0
Rural Development	40	4.25%	$0	$0	$0	$0	$0	$0
Total			**($144,833)**	**($203,010)**	**($683,738)**	**($101,505)**	**($100,000)**	**($1,233,086)**

City Resources	3,012,000
Grants	8,200,000
Low Interest Loans	19,250,000
Market Interest Loans/Bonds	3,500,000
Total	33,962,000

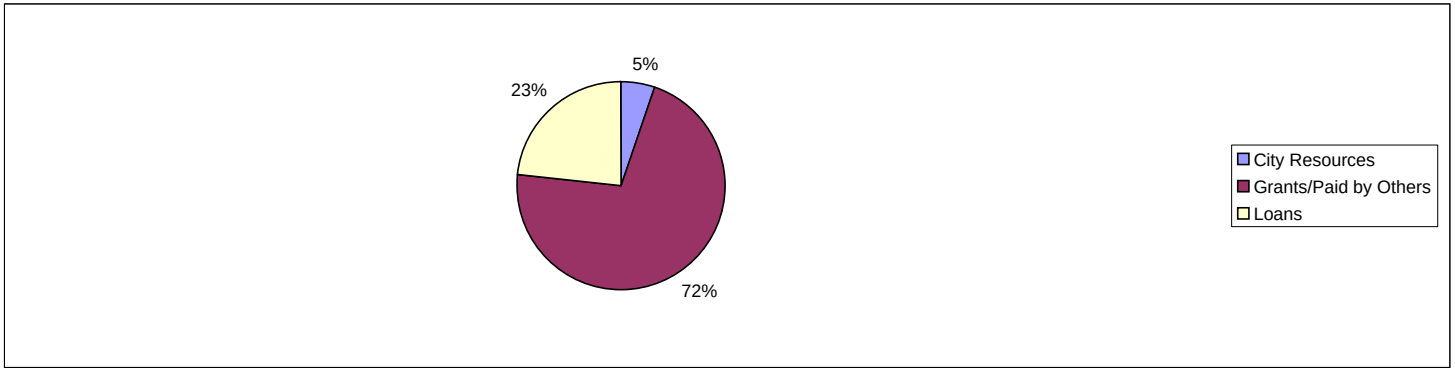
**Will be paid off by PWTF loan*



Appendix T
Financial Plan
This appendix supersedes the September 2004 version of Appendix T.

Revenue Sources			A-1a	A-1b	A-1c	A-2a	A-2b	B-1	B-2	P-1&2	P-10&11	Total Cost
Estimated Cost			$466,000	$155,000	$668,000	$1,050,000	$154,000	$765,000	$339,000	$2,400,000	$570,000	$6,567,000
Duration			2006	2007	2007	2009	2009	2008	2007			
City Resources												
Sewer Capital Facilities Fund							$154,000	$100,000	$100,000			$354,000
Grants/Paid by Others												
CERB Grant						$300,000						$300,000
Paid by Others			$466,000	$155,000	$668,000			$45,000	$69,000	$2,400,000	$570,000	$4,373,000
Total Grants			$466,000	$155,000	$668,000	$300,000	$0	$45,000	$69,000	$2,400,000	$570,000	$4,673,000
Loans												
Rural Sales Tax	20	2.5%						$620,000	$170,000			$790,000
CERB Loan	20	3.0%				$750,000						$750,000
Total Loans			$0	$0	$0	$750,000	$0	$620,000	$170,000	$0	$0	$1,540,000
Total Revenues for Project			$466,000	$155,000	$668,000	$1,050,000	$154,000	$765,000	$339,000			$3,597,000
Annual Debt Service												
Rural Sales Tax	20	2.5%						($39,771)	($10,905)			($50,676)
CERB Loan	20	3.0%				($50,412)						($50,412)
Total			**$0**	**$0**	**$0**	**($50,412)**	**$0**	**($39,771)**	**($10,905)**	**$0**	**$0**	**($101,088)**

City Resources	354,000
Grants/Paid by Others	4,673,000
Loans	1,540,000
Total	6,567,000



Appendix T
Financial Plan
This appendix supersedes the September 2004 version of Appendix T.

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Forecasted Growth Revenues																												
Estimated total ERUs	2359	2417	2478	2540	2603	2668	2735	2804	2874	2945	3019	3095	3172	3251	3333	3416	3501	3589	3678	3770	3865	3961	4060	4162	4266	4373	4482	4594
Additional ERUs in East/Central Blaine	16	17	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	25	25	26	26	27	28	28	29	30	31	31
Additional ERUs in Semiahmoo	41	42	44	45	46	47	48	49	50	52	53	54	56	57	59	60	61	63	65	66	68	70	71	73	75	77	79	81
GFF for East/Central Blaine	$3,130	$3,209	$3,289	$3,371	$3,455	$3,542	$3,630	$3,721	$3,814	$3,909	$4,007	$4,107	$4,210	$4,315	$4,423	$4,534	$4,647	$4,763	$4,882	$5,004	$5,130	$5,258	$5,389	$5,524	$5,662	$5,804	$5,949	$6,097
GFF for Semiahmoo	$3,855	$3,951	$4,050	$4,151	$4,255	$4,361	$4,470	$4,582	$4,696	$4,814	$4,934	$5,057	$5,184	$5,313	$5,446	$5,582	$5,722	$5,865	$6,012	$6,162	$6,316	$6,474	$6,636	$6,802	$6,972	$7,146	$7,325	$7,508
Annual Increase	30.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
GFF Revenue	$157,550	$165,526	$173,906	$182,710	$191,960	$201,678	$211,888	$222,614	$233,884	$245,725	$258,164	$271,234	$284,965	$299,392	$314,548	$330,472	$347,203	$364,780	$383,247	$402,648	$423,033	$444,449	$466,949	$490,588	$515,424	$541,517	$568,932	$597,734
ERU Base Rate	$39.78	$44.16	$46.36	$48.68	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12	$51.12
Rate Increase	0.0%	**11.0%**	**5.0%**	**5.0%**	**5.0%**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Estimated Low Strength Flow	24543	24788	25036	25287	25540	25795	26053	26313	26577	26842	27111	27382	27656	27932	28212	28494	28779	29066	29357	29651	29947	30247	30549	30855	31163	31475	31789	32107
Commodity Charge (CCF) Low Strength	$5.88	$6.53	$6.85	$7.20	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56	$7.56
Estimated Low Strength Flow	19695	19892	20091	20292	20495	20700	20907	21116	21327	21540	21756	21973	22193	22415	22639	22865	23094	23325	23558	23794	24032	24272	24515	24760	25007	25257	25510	25765
Commodity Charge (CCF) Low Strength	$8.30	$9.21	$9.67	$10.16	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67	$10.67
Commodity Revenue	$0	$34,195	$51,962	$70,961	$91,268	$92,180	$93,102	$94,033	$94,974	$95,923	$96,883	$97,851	$98,830	$99,818	$100,816	$101,825	$102,843	$103,871	$104,910	$105,959	$107,019	$108,089	$109,170	$110,261	$111,364	$112,478	$113,602	$114,738
Annual Rate Increase Revenue	$0	$161,136	$247,725	$342,273	$445,405	$455,171	$465,168	$475,400	$485,875	$496,597	$507,573	$518,809	$530,312	$542,087	$554,142	$566,483	$579,118	$592,053	$605,297	$618,855	$632,737	$646,950	$661,503	$676,403	$691,659	$707,280	$723,275	$739,653
Total Revenue	$157,550	$326,662	$421,631	$524,983	$637,365	$656,849	$677,055	$698,015	$719,759	$742,322	$765,738	$790,043	$815,277	$841,479	$868,690	$896,956	$926,321	$956,833	$988,543	$1,021,504	$1,055,770	$1,091,399	$1,128,452	$1,166,991	$1,207,083	$1,248,798	$1,292,207	$1,337,387
New Debt Service																												
T1 - Equalization Storage			($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)	($144,833)						
T2 Design			($203,010)	($203,010)	($203,010)	($203,010)	($203,010)																					
T2 Construction					($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)	($683,738)				
T3 Design							($101,505)	($101,505)	($101,505)	($101,505)	($101,505)																	
T3 Construction									($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)	($100,000)
Total Cost			($347,843)	($347,843)	($1,031,581)	($1,031,581)	($1,133,086)	($930,076)	($1,030,076)	($1,030,076)	($1,030,076)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($928,571)	($783,738)	($783,738)	($100,000)	($100,000)	($100,000)	($100,000)
Current Debt Service	$561,276	556,673	554,120	492,686	492,130	485,520	485,649	327,337	324,578	321,320	257,589	258,500	114,175	112,079	31,720	15,789												
"Availability" of Debt Service	$65,918	70,521	73,075	134,509	135,064	141,674	141,546	299,858	302,617	305,875	369,606	368,695	513,020	515,116	595,475	611,406	627,195	627,195	627,195	627,195	627,195	627,195	627,195	627,195	627,195	627,195	627,195	627,195
Effective Debt Service to Fund	$65,918	$70,521	($274,768)	($213,334)	($896,517)	($889,906)	($991,540)	($630,218)	($727,459)	($724,201)	($660,470)	($559,876)	($415,551)	($413,455)	($333,096)	($317,165)	($301,376)	($301,376)	($301,376)	($301,376)	($301,376)	($301,376)	($156,543)	($156,543)	$527,195	$527,195	$527,195	$527,195
WWTP Cash Flow	$223,469	$397,184	$146,863	$311,649	($259,152)	($233,058)	($314,495)	$67,797	($7,700)	$18,121	$105,267	$230,167	$399,726	$428,024	$535,594	$579,791	$624,944	$655,457	$687,167	$720,128	$754,394	$790,023	$971,908	$1,010,448	$1,734,278	$1,775,992	$1,819,401	$1,864,581
WWTP Fund Balance	**$223,469**	**$620,652**	**$767,515**	**$1,079,165**	**$820,013**	**$586,955**	**$272,470**	**$340,267**	**$332,567**	**$350,687**	**$455,955**	**$686,122**	**$1,085,848**	**$1,513,871**	**$2,049,465**	**$2,629,256**	**$3,254,200**	**$3,909,657**	**$4,596,824**	**$5,316,952**	**$6,071,345**	**$6,861,368**	**$7,833,276**	**$8,843,724**	**$10,578,002**	**$12,353,994**	**$14,173,395**	**$16,037,976**
Collection System CIP																												
GFF Revenue for CIP	$52,517	$55,175	$57,969	$60,903	$63,987	$67,226	$70,629	$74,205	$77,961	$81,908	$86,055	$90,411	$94,988	$99,797	$104,849	$110,157	$115,734	$121,593	$127,749	$134,216	$141,011	$148,150	$155,650	$163,529	$171,808	$180,506	$189,644	$199,245
Excess from WWTP Fund												$686,122	$1,085,848	$1,513,871	$2,049,465	$2,629,256	$3,254,200	$3,909,657	$4,596,824	$5,316,952	$6,071,345	$6,861,368	$7,833,276	$8,843,724	$10,578,002	$12,353,994	$14,173,395	$16,037,976
Total Revenue for CIP	**$52,517**	**$55,175**	**$57,969**	**$60,903**	**$63,987**	**$67,226**	**$70,629**	**$74,205**	**$77,961**	**$81,908**	**$86,055**	**$776,533**	**$1,180,836**	**$1,613,669**	**$2,154,315**	**$2,739,414**	**$3,369,935**	**$4,031,250**	**$4,724,573**	**$5,451,168**	**$6,212,356**	**$7,009,518**	**$7,988,926**	**$9,007,253**	**$10,749,810**	**$12,534,500**	**$14,363,039**	**$16,237,221**
CIP Debt Service																												
A-1a					$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0				
Total CIP Debt	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**				
CIP Debt Funded	$52,517	$55,175	$57,969	$60,903	$63,987	$67,226	$70,629	$74,205	$77,961	$81,908	$86,055	$776,533	$1,180,836	$1,613,669	$2,154,315	$2,739,414	$3,369,935	$4,031,250	$4,724,573	$5,451,168	$6,212,356	$7,009,518	$7,988,926	$9,007,253				
New CIP Fund	**$52,517**	**$107,692**	**$165,661**	**$226,564**	**$290,551**	**$357,777**	**$428,406**	**$502,611**	**$580,572**	**$662,480**	**$748,535**	**$1,525,068**	**$2,705,905**	**$4,319,573**	**$6,473,888**	**$9,213,302**	**$12,583,236**	**$16,614,487**	**$21,339,060**	**$26,790,227**	**$33,002,584**	**$40,012,101**	**$48,001,027**	**$57,008,280**				

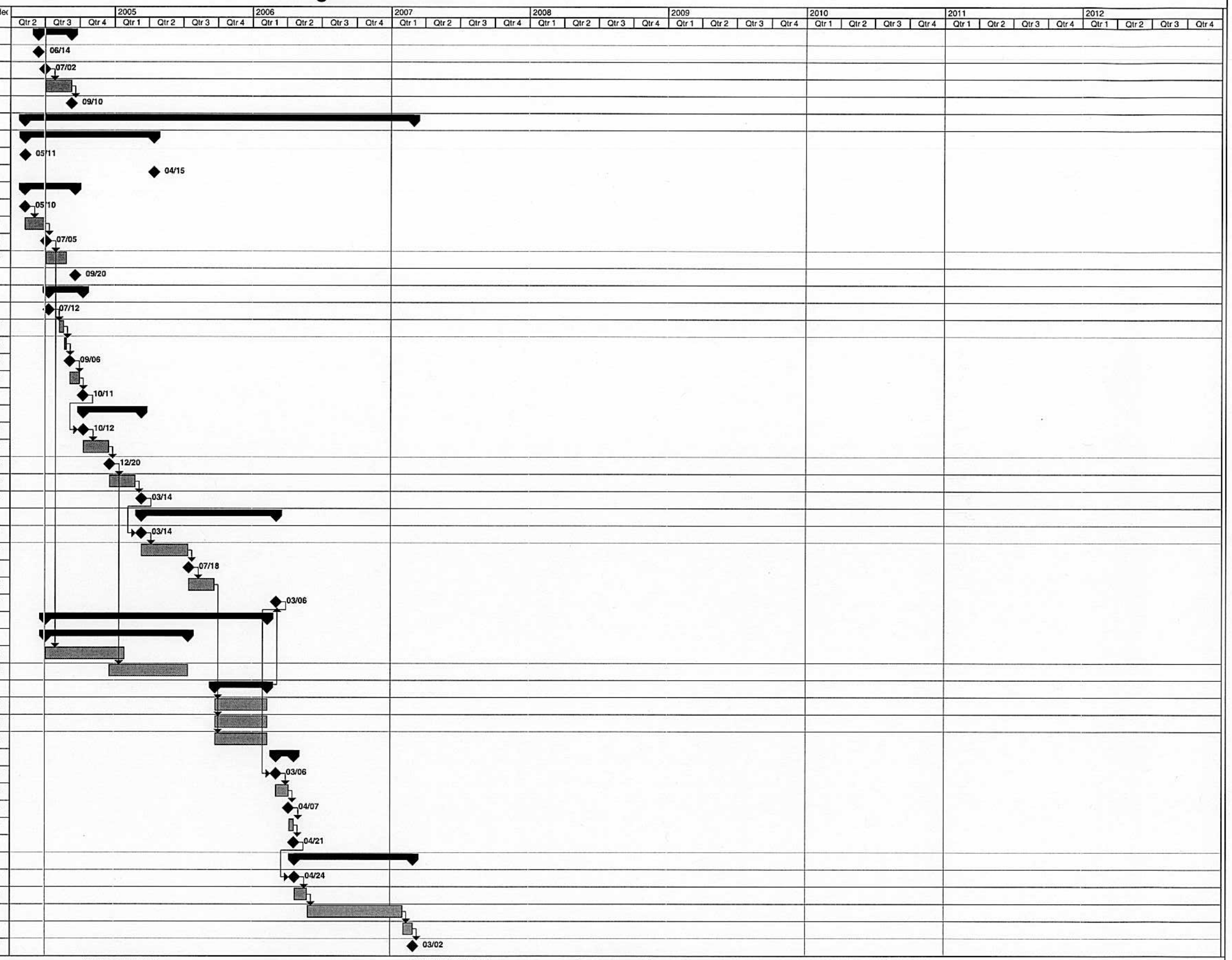
Appendix U

Wastewater Treatment Program Schedule

Blaine WWTP
Program Schedule

Updated: June30, 2004

ID	Task Name	Duration	Start	Finish	Predec
1	**General Sewer Plan**	**64 days**	**Mon 06/14/04**	**Fri 09/10/04**	
2	Submit Draft General Sewer Plan to Blaine Council	0 days	Mon 06/14/04	Mon 06/14/04	
3	Submit Draft General Sewer Plan to DOE	0 days	Fri 07/02/04	Fri 07/02/04	
4	DOE Review of Draft General Sewer Plan	50 days	Fri 07/02/04	Thu 09/09/04	3
5	Submit Final General Sewer Plan to DOE	0 days	Fri 09/10/04	Fri 09/10/04	4
6	**Phase 1 Activities (Flow EQ, LS #1 Improvements)**	**735 days**	**Mon 05/10/04**	**Fri 03/02/07**	
7	**Phase 1 - Funding Activities**	**243 days**	**Tue 05/11/04**	**Fri 04/15/05**	
8	Submit for PWTF Design & Construction Funds	0 days	Tue 05/11/04	Tue 05/11/04	
9	Receive PWTF Design & Construction Funds	0 days	Fri 04/15/05	Fri 04/15/05	
10	**Phase 1 - Facility Planning Activities**	**95 days**	**Mon 05/10/04**	**Mon 09/20/04**	
11	NTP - Facility Planning Activities	0 days	Mon 05/10/04	Mon 05/10/04	
12	Facility Plan Activities	40 days	Mon 05/10/04	Fri 07/02/04	11
13	Submit Draft Facility to DOE	0 days	Mon 07/05/04	Mon 07/05/04	12
14	DOE Review of Draft Facility Plan	40 days	Mon 07/05/04	Fri 08/27/04	13
15	Submit Final Facility Plan to DOE	0 days	Mon 09/20/04	Mon 09/20/04	
16	**Phase 1 - Design Consultant Selection Process**	**65 days**	**Mon 07/12/04**	**Mon 10/11/04**	
17	Issue RFP for Design Services	0 days	Mon 07/12/04	Mon 07/12/04	
18	Receive and Review Proposals	10 days	Mon 08/09/04	Fri 08/20/04	17
19	Conduct Interviews of Short listed Firms	5 days	Mon 08/23/04	Fri 08/27/04	18
20	Select Design Consultant	0 days	Mon 09/06/04	Mon 09/06/04	19
21	Negotiate Design Services Scope & Budget	20 days	Mon 09/06/04	Fri 10/01/04	20
22	Execute Contract	0 days	Mon 10/11/04	Mon 10/11/04	21
23	**Phase 1 - Predesign Activities**	**109 days**	**Tue 10/12/04**	**Mon 03/14/05**	
24	NTP - Predesign Activities	0 days	Tue 10/12/04	Tue 10/12/04	22
25	Predesign Activities	49 days	Tue 10/12/04	Fri 12/17/04	24
26	Submit Draft Predesign Report to DOE	0 days	Mon 12/20/04	Mon 12/20/04	25
27	DOE Review of Draft Predesign Report	50 days	Mon 12/20/04	Fri 02/25/05	26
28	Submit Final Predesign Report to DOE	0 days	Mon 03/14/05	Mon 03/14/05	27
29	**Phase 1 - Final Design Activities**	**255 days**	**Mon 03/14/05**	**Mon 03/06/06**	
30	NTP - Final Design Activities	0 days	Mon 03/14/05	Mon 03/14/05	28
31	Final Design Activities	90 days	Mon 03/14/05	Fri 07/15/05	30
32	Submit 90-Percent Design Documents for Permitting	0 days	Mon 07/18/05	Mon 07/18/05	31
33	DOE Review of 90-Percent Documents	50 days	Mon 07/18/05	Fri 09/23/05	32
34	Submit Final Contract Documents	0 days	Mon 03/06/06	Mon 03/06/06	39
35	**Phase 1 - Permitting Activities**	**420 days**	**Mon 07/05/04**	**Fri 02/10/06**	
36	**Environmental Permitting**	**270 days**	**Mon 07/05/04**	**Fri 07/15/05**	
37	SEPA Checklist w/ Support Documents	150 days	Mon 07/05/04	Fri 01/28/05	13
38	Shoreline Permit	150 days	Mon 12/20/04	Fri 07/15/05	26
39	**Construction Permitting**	**100 days**	**Mon 09/26/05**	**Fri 02/10/06**	
40	Clearing & Grading Permit	100 days	Mon 09/26/05	Fri 02/10/06	33
41	Drainage Permit	100 days	Mon 09/26/05	Fri 02/10/06	33
42	Building Permit	100 days	Mon 09/26/05	Fri 02/10/06	33
43	**Phase 1 -Bidding Activities**	**35 days**	**Mon 03/06/06**	**Fri 04/21/06**	
44	Bid Advertisement Date	0 days	Mon 03/06/06	Mon 03/06/06	34
45	Bid Advertisement Period	25 days	Mon 03/06/06	Fri 04/07/06	44
46	Bid Submittal Date	0 days	Fri 04/07/06	Fri 04/07/06	45
47	Bid Evaluation	10 days	Mon 04/10/06	Fri 04/21/06	46
48	Bid Award	0 days	Fri 04/21/06	Fri 04/21/06	47
49	**Phase 1 - Construction / Startup Activities**	**225 days**	**Mon 04/24/06**	**Fri 03/02/07**	
50	NTP Construction Activities	0 days	Mon 04/24/06	Mon 04/24/06	48
51	Contractor Mobilization	25 days	Mon 04/24/06	Fri 05/26/06	50
52	Construction Activities	180 days	Mon 05/29/06	Fri 02/02/07	51
53	Startup Activities	20 days	Mon 02/05/07	Fri 03/02/07	52
54	Commission the LS	0 days	Fri 03/02/07	Fri 03/02/07	53



Project: WWTP_ProjectSchedule_062
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Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary

Blaine WWTP
Program Schedule

Updated: June30, 2004

ID	Task Name	Duration	Start	Finish	Predec
55	**Phase 2 Activities (Marine Drive WRF)**	**1095 days**	**Mon 06/07/04**	**Fri 08/15/08**	
56	**Phase 2 - Funding Activities**	**734 days**	**Mon 09/13/04**	**Fri 07/06/07**	
57	Submit for PWTF Pre-Construction Funds	0 days	Mon 09/13/04	Mon 09/13/04	
58	Receive PWTF Pre-Construction Funds	0 days	Mon 12/06/04	Mon 12/06/04	
59	Submit for Centennial Construction Funds	0 days	Mon 11/06/06	Mon 11/06/06	86
60	Receive Centennial Construction Funds	0 days	Fri 07/06/07	Fri 07/06/07	
61	Submit for PWTF Construction Funds	0 days	Thu 05/11/06	Thu 05/11/06	
62	Receive PWTF Construction Funds	0 days	Fri 04/13/07	Fri 04/13/07	
63	**Phase 2 - Facility Planning Activities**	**165 days**	**Mon 06/07/04**	**Mon 01/24/05**	
64	NTP - Facility Planning Activities	0 days	Mon 06/07/04	Mon 06/07/04	
65	Facility Planning Activities	80 days	Mon 06/07/04	Fri 09/24/04	64
66	Submit Draft Facility Plan to DOE	0 days	Mon 09/27/04	Mon 09/27/04	65
67	DOE Review of Draft Facility Plan	70 days	Mon 09/27/04	Fri 12/31/04	66
68	Submit Final Facility Plan to DOE	0 days	Mon 01/24/05	Mon 01/24/05	67
69	**Phase 2 - Design Consultant Selection Process**	**65 days**	**Mon 09/27/04**	**Mon 12/27/04**	
70	Issue RFP for Design Services	0 days	Mon 09/27/04	Mon 09/27/04	66
71	Receive and Review Proposals	10 days	Mon 10/25/04	Fri 11/05/04	70
72	Conduct Interviews of Short listed Firms	5 days	Mon 11/08/04	Fri 11/12/04	71
73	Select Design Consultant	0 days	Mon 11/15/04	Mon 11/15/04	72
74	Negotiate Design Services Scope & Budget	25 days	Mon 11/15/04	Fri 12/17/04	73
75	Execute Contract	0 days	Mon 12/27/04	Mon 12/27/04	74
76	**Phase 2 - Predesign Activities**	**185 days**	**Mon 01/10/05**	**Mon 09/26/05**	
77	NTP - Predesign Activities	0 days	Mon 01/10/05	Mon 01/10/05	75
78	Predesign Activities	110 days	Mon 01/10/05	Fri 06/10/05	77
79	Submit Draft Predesign Report to DOE	0 days	Fri 06/10/05	Fri 06/10/05	78
80	DOE Review of Draft Predesign Report	65 days	Mon 06/13/05	Fri 09/09/05	79
81	Submit Final Predesign Report to DOE	0 days	Mon 09/26/05	Mon 09/26/05	80
82	**Phase 2 - Final Design Activities**	**375 days**	**Mon 09/26/05**	**Mon 03/05/07**	
83	NTP - Final Design Activities	0 days	Mon 09/26/05	Mon 09/26/05	81
84	Final Design Activities	180 days	Mon 09/26/05	Fri 06/02/06	83
85	Submit 90-Percent Design Documents for Permitting	0 days	Fri 06/02/06	Fri 06/02/06	84
86	DOE Review of 90-Percent Documents	65 days	Mon 06/05/06	Fri 09/01/06	85
87	Submit Final Contract Documents	0 days	Mon 03/05/07	Mon 03/05/07	92
88	**Phase 2 - Permitting Activities**	**615 days**	**Mon 09/27/04**	**Fri 02/02/07**	
89	**Environmental Permitting**	**335 days**	**Mon 09/27/04**	**Fri 01/06/06**	
90	SEPA Checklist w/ Support Documents	150 days	Mon 09/27/04	Fri 04/22/05	66
91	Shoreline Permit	150 days	Mon 06/13/05	Fri 01/06/06	79
92	**Construction Permitting**	**110 days**	**Mon 09/04/06**	**Fri 02/02/07**	
93	Clearing & Grading Permit	110 days	Mon 09/04/06	Fri 02/02/07	86
94	Drainage Permit	110 days	Mon 09/04/06	Fri 02/02/07	86
95	Building Permit	110 days	Mon 09/04/06	Fri 02/02/07	86
96	**Phase 2 - Bidding Activities**	**50 days**	**Mon 03/05/07**	**Fri 05/11/07**	
97	Bid Advertisement Date	0 days	Mon 03/05/07	Mon 03/05/07	87
98	Bid Advertisement Period	25 days	Mon 03/05/07	Fri 04/06/07	97
99	Bid Submittal Date	0 days	Fri 04/06/07	Fri 04/06/07	98
100	Bid Evaluation	25 days	Mon 04/09/07	Fri 05/11/07	99
101	Bid Award	0 days	Fri 05/11/07	Fri 05/11/07	100
102	**Phase 2 - Construction / Startup Activities**	**330 days**	**Fri 05/11/07**	**Fri 08/15/08**	
103	NTP Construction Activities	0 days	Fri 05/11/07	Fri 05/11/07	101,62
104	Contractor Mobilization	25 days	Mon 05/14/07	Fri 06/15/07	103
105	Construction Activities	260 days	Mon 06/18/07	Fri 06/13/08	104
106	Startup Activities	45 days	Mon 06/16/08	Fri 08/15/08	105
107	Commission the WWTP	0 days	Fri 08/15/08	Fri 08/15/08	106

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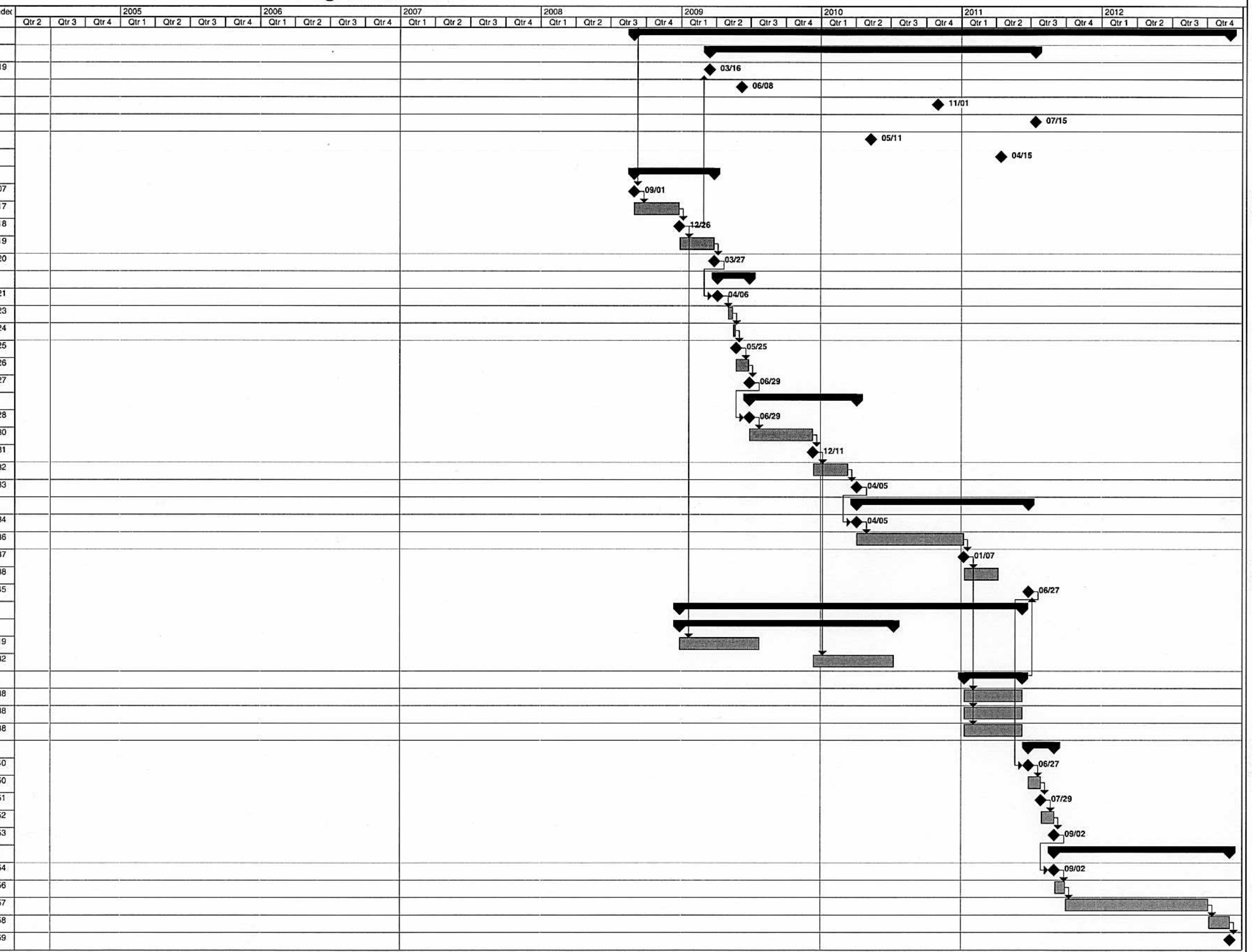
Task | Progress | Milestone | Summary | Rolled Up Task | Rolled Up Milestone | Rolled Up Progress | Split | External Tasks | Project Summary | Group By Summary

Blaine WWTP
Program Schedule

Updated: June30, 2004

ID	Task Name	Duration	Start	Finish	Predec
108	**Phase 3 Activities (West Blaine WW Management)**	**1110 days**	**Mon 09/01/08**	**Fri 11/30/12**	
109	**Phase 3 - Funding Activities**	**609 days**	**Mon 03/16/09**	**Fri 07/15/11**	
110	Submit for PWTF Pre-Construction Funds	0 days	Mon 03/16/09	Mon 03/16/09	119
111	Receive PWTF Pre-Construction Funds	0 days	Mon 06/08/09	Mon 06/08/09	
112	Submit for Centennial Construction Funds	0 days	Mon 11/01/10	Mon 11/01/10	
113	Receive Centennial Construction Funds	0 days	Fri 07/15/11	Fri 07/15/11	
114	Submit for PWTF Construction Funds	0 days	Tue 05/11/10	Tue 05/11/10	
115	Receive PWTF Construction Funds	0 days	Fri 04/15/11	Fri 04/15/11	
116	**Phase 3 - Facility Planning Activities**	**150 days**	**Mon 09/01/08**	**Fri 03/27/09**	
117	NTP - Facility Planning Activities	0 days	Mon 09/01/08	Mon 09/01/08	107
118	Facility Planning Activities	85 days	Mon 09/01/08	Fri 12/26/08	117
119	Submit Draft Facility Plan to DOE	0 days	Fri 12/26/08	Fri 12/26/08	118
120	DOE Review of Draft Facility Plan	65 days	Mon 12/29/08	Fri 03/27/09	119
121	Submit Final Facility Plan to DOE	0 days	Fri 03/27/09	Fri 03/27/09	120
122	**Phase 3 - Design Consultant Selection Process**	**60 days**	**Mon 04/06/09**	**Mon 06/29/09**	
123	Issue RFP for Design Services	0 days	Mon 04/06/09	Mon 04/06/09	121
124	Receive and Review Proposals	10 days	Mon 05/04/09	Fri 05/15/09	123
125	Conduct Interviews of Short listed Firms	5 days	Mon 05/18/09	Fri 05/22/09	124
126	Select Design Consultant	0 days	Mon 05/25/09	Mon 05/25/09	125
127	Negotiate Design Services Scope & Budget	25 days	Mon 05/25/09	Fri 06/26/09	126
128	Execute Contract	0 days	Mon 06/29/09	Mon 06/29/09	127
129	**Phase 3 - Predesign Activities**	**200 days**	**Mon 06/29/09**	**Mon 04/05/10**	
130	NTP - Predesign Activities	0 days	Mon 06/29/09	Mon 06/29/09	128
131	Predesign Activities	120 days	Mon 06/29/09	Fri 12/11/09	130
132	Submit Draft Predesign Report to DOE	0 days	Fri 12/11/09	Fri 12/11/09	131
133	DOE Review of Draft Predesign Report	65 days	Mon 12/14/09	Fri 03/12/10	132
134	Submit Final Predesign Report to DOE	0 days	Mon 04/05/10	Mon 04/05/10	133
135	**Phase 3 - Final Design Activities**	**320 days**	**Mon 04/05/10**	**Mon 06/27/11**	
136	NTP - Final Design Activities	0 days	Mon 04/05/10	Mon 04/05/10	134
137	Final Design Activities	200 days	Mon 04/05/10	Fri 01/07/11	136
138	Submit 90-Percent Design Documents for Permitting	0 days	Fri 01/07/11	Fri 01/07/11	137
139	DOE Review of 90-Percent Documents	65 days	Mon 01/10/11	Fri 04/08/11	138
140	Submit Final Contract Documents	0 days	Mon 06/27/11	Mon 06/27/11	145
141	**Phase 3 - Permitting Activities**	**640 days**	**Mon 12/29/08**	**Fri 06/10/11**	
142	**Environmental Permitting**	**400 days**	**Mon 12/29/08**	**Fri 07/09/10**	
143	SEPA Checklist w/ Support Documents	150 days	Mon 12/29/08	Fri 07/24/09	119
144	Shoreline Permit	150 days	Mon 12/14/09	Fri 07/09/10	132
145	**Construction Permitting**	**110 days**	**Mon 01/10/11**	**Fri 06/10/11**	
146	Clearing & Grading Permit	110 days	Mon 01/10/11	Fri 06/10/11	138
147	Drainage Permit	110 days	Mon 01/10/11	Fri 06/10/11	138
148	Building Permit	110 days	Mon 01/10/11	Fri 06/10/11	138
149	**Phase 3 - Bidding Activities**	**50 days**	**Mon 06/27/11**	**Fri 09/02/11**	
150	Bid Advertisement Date	0 days	Mon 06/27/11	Mon 06/27/11	140
151	Bid Advertisement Period	25 days	Mon 06/27/11	Fri 07/29/11	150
152	Bid Submittal Date	0 days	Fri 07/29/11	Fri 07/29/11	151
153	Bid Evaluation	25 days	Mon 08/01/11	Fri 09/02/11	152
154	Bid Award	0 days	Fri 09/02/11	Fri 09/02/11	153
155	**Phase 3 - Construction / Startup Activities**	**325 days**	**Fri 09/02/11**	**Fri 11/30/12**	
156	NTP Construction Activities	0 days	Fri 09/02/11	Fri 09/02/11	154
157	Contractor Mobilization	20 days	Mon 09/05/11	Fri 09/30/11	156
158	Construction Activities	265 days	Mon 10/03/11	Fri 10/05/12	157
159	Startup Activities	40 days	Mon 10/08/12	Fri 11/30/12	158
160	Commission the WWTP	0 days	Fri 11/30/12	Fri 11/30/12	159



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Task | Milestone | Rolled Up Task | Rolled Up Progress | External Tasks | Group By Summary
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Appendix V

Capacity, Management, and Operations & Maintenance Program Components

CMOM Compliance Checklist

Major Component	Requirement	Summary of the Requirement	Specifics	Proposed Location in General Sewer Plan
1. Goals and Organization	Specify Major Goals	Positions responsible for CMOM implementation	Performance	
			Safety	
			Customer Service	
			Resource Use	
			Compliance	
2. Program Responsibility	Identify Administrative and Maintenance Positions		Org Chart showing responsibility for CMOM implementation	
	Identify Lines of Authority		Org Chart showing responsibility for CMOM implementation	
3. Legal Authorities	Control I/I Source connections	Sewer Ordinance states no storm connections allowed		Chapter 3
Legally binding documents	Require Proper Design/Construction			Chapter 3
	Ensure Proper Installation	Sewer Ordinance and Chapter 3		Chapter 3
	Address Satellite Municipal Flows			N/A
	Implement Prohibitions of Pretreatment Program			Chapter 3, Chapter 5, and Grease Control Ordinance
4. Measures & Activities	Maintain Facilities	Physical Location: equipment, materials, records, personnel dispatch	Storage of equipment, records, and dispatch of personnel	Chapter 5
	Accurate Collection System Map	Have the information in GIS. A GIS map is not required, but it is preferred by most sewerage agencies.		Figure 3-1, Sewer System Map
	Information Management & Analysis	Efficient use of gathered information. Open the lines of communication between the field and management staff. Paper copies are sufficient. If the data management is computer based then any unique hardware or software should be noted.	Information management should address the following items, per EPA	Recommendations in Chap. 5
			Providing emergency responses;	
			Investigating problems and complaints that cause or may lead to overflows, and determine appropriate response	
			Scheduling and tracking inspections;	
			Planning maintenance activities, schedules, and work orders;	
			Managing parts, equipment, and tool inventories;	
			Developing training plans and schedules;	
			Tracking and preventing safety incidents;	
			Planning staffing and budgeting;	
			Identifying hydraulic and physical deficiencies and prioritizing responses; and	
			Identifying programmatic deficiencies and developing appropriate responses.	
	Preventive O&M		Maintenance activities this should address, per the EPA	
			Routinely inspects the collection system, including pump stations, and addresses damage or other problems;	
			Investigates complaints and promptly corrects faulty conditions;	
			Provides maintenance records, an adequate workforce and appropriate equipment in working order; and	
			Maintains and updates a schedule of planned activities.	
			Preventive maintenance activities typically address:	
			Planned, systematic, and scheduled inspections to determine current conditions and plan for maintenance and repairs.	
			Planned, systematic, and scheduled cleaning and repairs of the system based on past history;	
			Proper sealing and/or maintenance of manholes;	
			Regular repair of deteriorating sewer lines;	
			Remediation of poor construction;	

CMOM Compliance Checklist

Major Component	Requirement	Summary of the Requirement	Specifics	Proposed Location in General Sewer Plan
			Inspection and maintenance of pump stations and other appurtenances; and	
			A program to ensure that new sewers and connections are properly designed and constructed and new connections of inflow sources are prohibited.	
	Conveyance Capacity	Develop and implement a program to assess the current capacity of the collection system.	Program should identify:	Chapter 3
			Downstream capacity for new connections	
			Hydraulic deficiencies	
			Note: EPA would require studies in portions of the collection system where peak flows have contributed to SSO.	
	Prioritize & Correct Deficiencies	Condition Assessment. Ongoing program for identifying structural deficiencies and prioritization of corrective actions.		Chapter 3, 5, & 6
	Train Staff		Typical industry standard is 3-5% of the gross annual budget	
	Keep Equipment Operational, Critical Parts	Spare parts inventory	Create list of parts to keep on hand, and procedures for maintaining inventory levels.	Chapter 3
5. Design and Performance	Implement Design Construction Requirements and Standards	Program to ensure design standards are met for new sewers and rehabilitation projects.		Chapter 3 and Sewer Ordinance
	Inspect and Test New Facilities			Chapter 3 and Sewer Ordinance
6. Monitoring, Measurement, and Modifications	Update Program Elements Based on Monitoring, Performance Evaluations	Perform evaluations on performance indicators to determine the effectiveness of each element of the CMOM program		
	Keep Program Up-to-date & Accurate	Adjust CMOM program (and written summary) as necessary based on above listed evaluations.		
7. Overflow Emergency Response Plan	Develop and Implement to Protect Public Health & Environment	Separate Written Document		
8. System Evaluation and Capacity Assurance Program	Evaluate system	Identify, characterize and address hydraulic deficiencies		Chapter 3
Required if peak flows contribute to an SSO unless (1) steps have been taken to correct hydraulic deficiency; or (2) proof that SSO was caused by severe natural conditions	Establish Capacity Enhancement Measures	Prioritization, Alternatives analysis, Schedule		Chapter 3 and Chapter 6
	Update Plans	Keep plan up to date with proposed actions and implementation schedules		
9. Program Audit	Perform Audit	EPA recommends one every 5 years		
Currently, this is not required for small municipalities unless an SSO occurs.	Audit Assess Compliance with CMOM	Written audit report		

CMOM Required Written Documents

1) Written Summary of the CMOM Program
2) Overflow Emergency Response Plan
3) Program Audit Report

These exceptions are the current EPA favored approach (other options are available for comment)

Not required if average daily flow is less than 2.5 mgd, unless there are SSO

N

SCALE

1 inch equals 2,500 feet

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

Legend

- Lift Station Improvements
- WWTP
- Existing Lift Stations
- Trunk System Manholes
- Trunk System Pipes
- System Pipes
- Streets

Conveyance Improvement

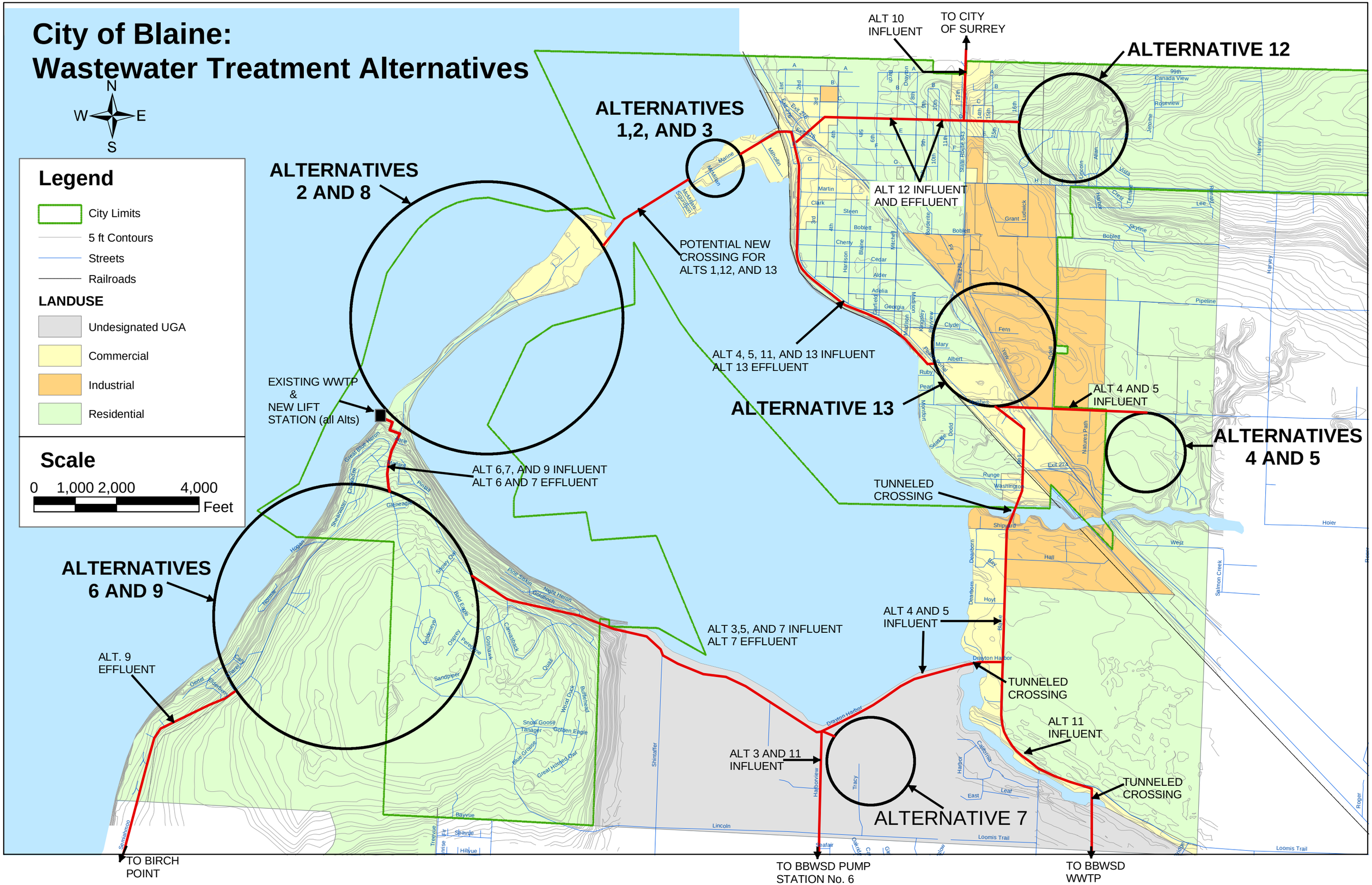
- A
- B
- C
- P

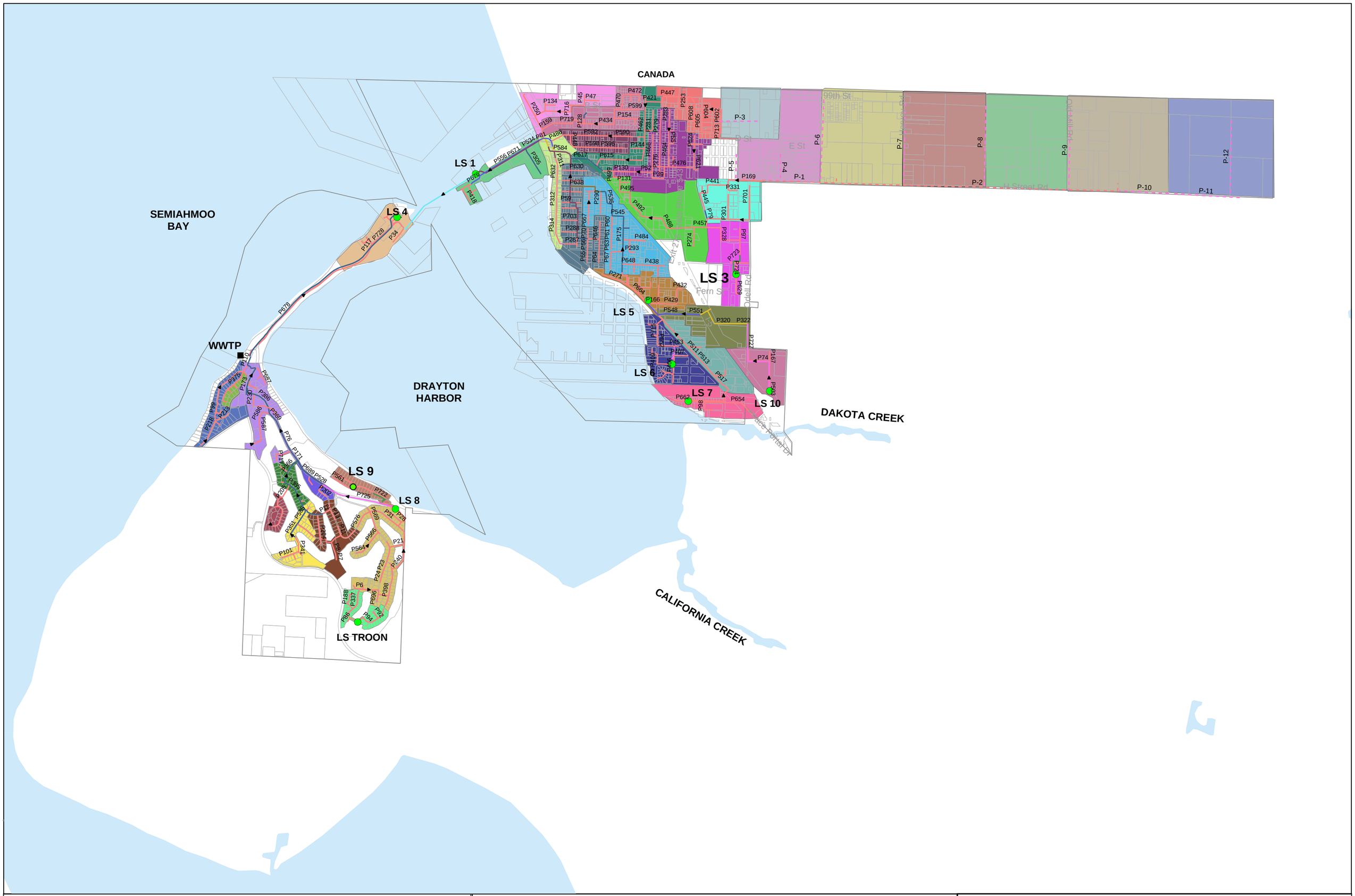
CITY OF BLAINE, WASHINGTON

Figure ES-1
Capital Improvement Program

CH2MHILL

City of Blaine: Wastewater Treatment Alternatives





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SCALE

1 inch equals 2,000 feet

0 2,000 4,000 6,000 8,000 Feet

LEGEND

- Wastewater Treatment Plant (WWTP)
- City Limit
- Lift Station

Pipe Size (inches)
Proposed Pipes shown as dashed

4 10 15
6 12 18
8 14 21

CITY OF BLAINE, WASHINGTON

Sewer System

CH2MHILL