CITY OF ELLENSBURG

KITTITAS COUNTY **WASHINGTON**

WASTEWATER TREATMENT FACILITY ENGINEERING REPORT

G&O #10062
APRIL 2015

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF ELLENSBURG

KITTITAS COUNTY **WASHINGTON**

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Gray & Osborne, Inc.
CONSULTING ENGINEERS

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 W Yakima Ave, Ste 200 • Yakima, WA 98902-3452 • (509) 575-2490

April 28, 2015

Ryan Lyyski, P.E.
Public Works Director
City of Ellensburg
501 N. Anderson Street
Ellensburg, WA 98926

RE: City of Ellensburg - National Pollution Discharge Elimination System (NPDES) Permit No. WA0024341, Wastewater Treatment Facility Engineering Report Received April 23, 2015, Tracking Number 1309-1A

Dear Mr. Lyyski:

The Department of Ecology (Ecology) has reviewed and issued comments in regard to the City of Ellensburg Wastewater Treatment Facility Engineering Report. The City responded to comments on April 23, 2015.

In accordance with RCW 90.48.110 and Chapter 173-240 WAC, and on behalf of Ecology, the subject document is hereby **APPROVED.**

This office is to be notified of any proposed changes or revisions to the approved document. Any such changes or revisions must be approved in writing by Ecology.

Ecology's review and approval of this document is only to assure compliance and consistency with the appropriate rules and is not to be construed as a quality control check. Nothing in this approval shall be construed as satisfying other applicable federal, state or local statues, ordinances or regulations.

Should you have any questions or need any additional information, please contact Ian Laseke at (509) 457-7108 or ilas461@ecy.wa.gov.

Sincerely,

Charles McKinney

Charles McKinney
Section Manager
Water Quality Section

cc: Rod Paul, Assistant Public Works Director, City of Ellensburg
Eric Neumeyer, Wastewater Foreman, City of Ellensburg
Nancy Wetch, P.E., Gray and Osborne, Inc.
Sanjay Barik, Ecology-Yakima

City of Ellensburg WASHINGTON
DEPARTMENT OF COMMUNITY DEVELOPMENT
501 North Anderson Street, Ellensburg WA 98926

July 31, 2012

John Akers
Department of Public Works
501 N Anderson
Ellensburg, WA 98926

Re: FINAL DETERMINATION OF NON-SIGNIFICNANCE (DNS)
SEPA Checklist S12-03
Wastewater Treatment Facility (WWTF) Engineering Report

On July 11, 2012 the City issued a SEPA Determination of Non-Significance (DNS) for this non-project application. The comment period for that DNS ended on July 25, 2012 and there were two comments received. The WA Department of Ecology is requesting that a designation be made for the destination of any dredged materials resulting from future projects. KVFR commented that adequate emergency vehicle access needs to be maintained as future development occurs.

The City has reviewed the SEPA Checklist, initial Threshold Determination, existing environmental documents adopted, comments from agencies and the public, and has made a determination that the DNS issued on July 11, 2012 is now a Final Determination of Non-Significance.

If you have any questions in this regard please contact me at (509) 962-7108.

Sincerely,

Lance Bailey
Planning Supervisor

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EXECUTIVE SUMMARY

This Wastewater Treatment Facility Engineering Report provides a 20-year plan for upgrading the City's Wastewater Treatment Facility (WWTF) and collection system. This Report was prepared in accordance with the Washington State Department of Ecology's guidelines for an engineering report, as set forth in WAC 173-240-060.

The Plan achieves the following objectives:

- Develops design wastewater flows and loadings
- Describes the condition of the existing WWTF and collection system
- Evaluates the WWTF for capacity, performance and compliance with Ecology's reliability and redundancy standards
- Identifies WWTF and collection system deficiencies and needs
- Recommends capital improvements

PROJECTED WASTEWATER FLOWS AND LOADINGS

Projected wastewater flows and loadings to the WWTF for the design year 2031 are based on historical flows and loadings and growth projections for the sewer service area. These projections assume that the population in Ellensburg's service area will grow at 1.8 percent per year during the next 20 years, to a design population of 26,351 in 2031.

An evaluation of the City's WWTF flow records and winter potable water records was conducted to estimate the amount of infiltration and inflow (I/I) entering the WWTF. It was determined that on a maximum monthly average flow basis the I/I is approximately 61 percent of the total flow to the WWTF.

An evaluation of the effects of wastewater discharges from Twin City Foods (TCF), the City's only major industrial discharger, on the City's WWTF was performed. Although TCF discharges high concentrations of BOD_5, the wastewater flows are relatively small and, consequently, the loads from the industry do not significantly affect the capacity of the WWTF. According to the existing agreement with the City, TCF could potentially discharge up to 100,000 gallons of wastewater per day and, based on historical records, up to 625 lbs/day BOD_5 on an average annual basis. The flows and loading projections for the City's WWTF were based on the assumption that TCF would not be expanding operations and their discharge characteristics remain the same for the 20-year planning period.

A summary of the existing WWTF design criteria and the projected design criteria for the City of Ellensburg for the year 2031 is presented in Table ES-1. The existing design criteria were obtained from the City's NPDES waste discharge permit.

TABLE ES-1

Existing, Projected and Recommended Design Criteria, Year 2031(1)

Flow Criteria	Existing NPDES Permit Design Criteria	Projected 2031 Design Criteria	Recommended 2031 Design Criteria
Average Annual Flow (MGD)	NR	4.30	5.86
Maximum Month Flow (MGD)	8.0	5.87	8.0
Maximum Day Flow (MGD)	NR	8.39	11.43
Peak Hour Flow (MGD)	15.0	15.28	15.28
Loading Criteria	**Existing NPDES Permit Design Criteria**	**Projected 2031 Design Criteria**	**Recommended 2031 Design Criteria**
Annual Average BOD_5 Loading (lb/d)	NR	5,370	8,332
Maximum Month BOD_5 Loading (lb/d)	10,000	6,445	10,000
Annual Average TSS Loading (lb/d)	NR	4,215	5,220
Maximum Month TSS Loading (lb/d)	8,000	6,460	8,000
Average Annual TKN Loading (lb/d)	NR	673	1,139
Maximum Month TKN Loading (lb/d)	NR	1,107	1,853
Design Population	31,000	26,351	31,000

The existing WWTF design maximum month flow, BOD_5 loading and TSS loading are greater than the 2031 projections shown in Table ES-2. The projected peak hour flow in 2031 is slightly higher than the existing design peak hour flow. It is recommended that any improvements identified for the WWTF be designed to provide a capacity equal to or greater than the existing design capacity, as shown in the NPDES permit. This approach will maintain the existing, permitted WWTF capacity and will provide adequate reserve capacity for future commercial and industrial growth.

EXISTING FACILITIES

The sanitary sewer system consists of approximately 77 miles of sanitary sewer pipe and two pump stations. Much of the existing collection system was constructed of vitrified clay pipe in the 1930's. From 1960 to 1980 most of the pipe installed was asbestos cement pipe or concrete pipe, and most pipe since the 1980's has been PVC pipe. There are approximately 12 blocks of downtown service area that have combined sewers. Through the years the City has worked to separate the sanitary sewer system from the storm water collection system, but there are still several areas of combined sewers.

The City has two pump stations that are over 30 years old and have had minimal upgrades since their installations. The Cora Street lift station consists of a concrete wet well with two submersible centrifugal pumps. The First Avenue lift station is a wet well/dry well packaged pump station with two centrifugal pumps.

The WWTF utilizes the extended aeration activated sludge process to provide secondary treatment of wastewater. Raw wastewater from the 42-inch interceptor sewer enters the influent pump station. From the influent pump station wet well, wastewater is pumped to the plant headworks. At the plant headworks the wastewater is degritted and screened to remove large debris and material that could deposit in and damage downstream equipment or accumulate in the biosolids generated by the plant.

The screened and degritted wastewater enters the two aeration basins. Floating mechanical aerators provide air and mixing for the activated sludge process. Effluent from the aeration basin flows to the two secondary clarifiers where the activated sludge biomass is separated from the plant effluent. Secondary effluent receives disinfection by ultraviolet light prior to discharge to the Yakima River.

The solids that are wasted from the activated sludge process are thickened in either a dissolved air flotation thickener or a gravity belt thickener. Waste sludge is stabilized in the anaerobic digesters and stored in lagoons until it can be pumped to drying beds. The dried biosolids are stockpiled and subsequently hauled off site for beneficial reuse by land application.

WASTEWATER TREATMENT FACILITY IMPROVEMENTS

Recommended WWTF capital improvements address equipment redundancy and reliability requirements and replace deteriorated plant components, some of which are 40 years old, obsolete and nearing the end of their useful lives. The recommended capital improvements are assigned into four levels of priority, with Level I priority indicating immediate need. The improvements are prioritized based on regulatory requirements, reliability and redundancy needs, operations and maintenance considerations, and City preference. The recommended prioritization of these projects and their respective cost estimates, are shown in Table ES-2 below. Implementation schedules for these recommended improvements will be determined by the City based on priority level, costs, and available funding. Cost estimates include contingency, sales tax, administration, legal and engineering.

TABLE ES-2

Recommended WWTF Capital Improvements, Priority Levels and Estimated Costs

Priority Level I	**Estimated Cost**
Electrical Improvements Predesign Report	$40,000
Priority Level II	
Electrical Service(1)	$2,411,000
Biological Selectors	$786,000
Influent Flow Meter	$166,000
SCADA	$514,000
Priority Level III	
RAS System	$355,000
Lagoon Dredge (2)	$83,000
Aeration System	$1,087,000
Priority Level IV	
Effluent Flow Meter	$69,000
Operations Building	$153,000
Secondary Clarifier Rehabilitation	$226,000
Grit Rehabilitation	$79,000
Headworks Screen	$510,000
Total Capital Improvement Plan	**$6,479,000**

(1) The final estimated capital cost of the electrical upgrade will be determined as part of the Electrical Improvements Predesign Report noted under Priority Level I. This line item provides a conservative estimate that assumes the complete rebuild and relocation of the main electrical services and the rebuild and relocation of most of the MCCs.

(2) Assumes this would be competitive equipment procurement without engineering services.

SEWER COLLECTION SYSTEM IMPROVEMENTS

Based on the need to identify I/I removal projects, prioritize replacement of older deteriorated pipes, investigate elimination of some pump stations with gravity interceptors, and evaluate the impacts of development that is planned for the next 20 years on the sewer system, it is recommended that the City complete a General Sewer Plan as part of the 6-year capital improvement plan. At a minimum the General Sewer Plan should include the following studies:

1. Computer modeling of the system for capacity evaluation of trunk and interceptor lines. The modeling would also include scenarios for future growth and system expansion.
2. I/I reduction evaluation which would include TV inspection and smoke testing of sewers. This evaluation will help the City determine which pipes are in the most need of repair and determine where storm sewers need to be separated.

3. Evaluation of the elimination or replacement of the 1st Avenue Pump Station.
4. Evaluation of the elimination or replacement of the Cora Street Pump Station.

An evaluation of the lift stations revealed that they are both over 30 years old and are nearing the end of their useful lives. In the past it had been proposed to eliminate the lift stations with new gravity interceptors. This proposal has never been fully analyzed and has not been included in any of the City's previous planning documents. The elimination proposal as well as the actual capacities of the pump stations should be evaluated as part of the General Sewer Plan. The General Sewer Plan will assist the City in determining the most economical plan for either upgrading the lift stations or eliminating them by installing gravity interceptors.

Approximately 50 percent of the City's collection system is old concrete or vitrified clay pipe. Clay and concrete pipe have a serviceability life expectancy of 50 to 75 years. Serviceability life expectancy is based on service issues such as amount of I/I, root intrusion and other maintenance issues. Based on the amount of I/I in the system, most of the concrete and clay pipe is at or nearing its service life. The City has been spending approximately $100,000 per year on cured-in-place rehabilitation. It is recommended that the City prioritize which sections of the collections system to replace or line based on the I/I reduction evaluation in the recommended General Sewer Plan. It is anticipated that the Plan will focus on the highest-priority maintenance needs identified in Table 7-3 of this Engineering Report and build on that list based on the I/I investigations.

The General Sewer Plan should address the specific maintenance problems noted in Chapter 7. The General Sewer Plan will assist the City in determining where the City's financial resources are best invested. Projects that will be better identified and prioritized include the elimination or replacement of the Cora Street Pump Station and the 1st Avenue Pump Station and development of a program for replacement of the concrete and clay pipes. A list of recommended sewer system capital projects is presented in Table ES-3.

Table ES-3

Recommended Sewer System Capital Projects, Schedule and Estimated Costs

Capital Project	Estimated Cost	2012	2013	2014	2015	2016	2017	2018-2031
General Sewer Plan and I/I Investigation	$125,000-$250,000	**X**						
Maintenance Issues & Concrete & Clay Pipe Replacement	$100,000 per year	**X**	**X**	**X**	**X**	**X**	**X**	
Concrete & Clay Pipe Replacement	$450,000 per year							**X**
1st Avenue Pump Station(3)(4)	$525,000							**X**
Cora Street Pump Station(4)	$486,000							**X**

(1) These are specific maintenance items as identified and show in Figure 7-1.
(2) This is an estimate of the replacement of concrete and clay pipe based on serviceability life expectancy.
(3) Assumes the City does not eliminate the pump station and upgrades the existing station.
(4) At a minimum the City should replace or repair the vent fan at the 1st Avenue Pump Station within the next year.

FINANCING

The recommended 20-year capital improvement plan for the WWTF includes a total of $6,479,000 of improvements. The highest priority project is the replacement of the existing electrical system. Therefore, it is recommended that an Electrical Improvements Predesign Report be completed within the next year to prepare a more detailed plan and cost estimates for this work. This report is estimated to cost approximately $40,000 and will be funded from the City sewer fund. The City does not intend to fund any other capital improvement projects over the next three years.

The recommended 20-year capital improvement plan for the sewer collection system starts with completion of a General Sewer Plan., which is estimated to cost between $125,000-$250,000, dependent upon the level of field work and sewer system computer modeling performed. The City plans to complete the General Sewer Plan within the next three years and will fund the report from the City sewer fund.

CHAPTER 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

BACKGROUND

This Wastewater Treatment Facility Engineering Report (Report) addresses the City's comprehensive planning needs for wastewater treatment and disposal for the next 20 years. This Report has been prepared in accordance with the provisions of the Washington Administrative Code (WAC) Section WAC 173-240-060, *Engineering Report*. Development of the Report has been coordinated with City of Ellensburg, 2006 Comprehensive Plan Update, As Amended Through 2008, (City of Ellensburg, 2008).

The Report is intended to be feasible in terms of engineering, economic, regulatory, and political frameworks. Included in the Report are descriptions conceptual layouts, and cost estimates for recommended major improvements to treatment facilities, as well as a proposed schedule for construction and a financing plan. The projects described in the Report are consistent with State regulations relating to the prevention and control of pollutants discharged into State waters, anti-degradation of existing and future beneficial uses of ground waters, and anti-degradation of surface waters. The Report will have sufficient flexibility to provide wastewater facilities for existing areas of need and to support future development within the planning area.

OVERVIEW

The City of Ellensburg is located in central Kittitas County along I-90 near the foothills of the Cascade Mountains as shown in Figure 1-1. Ellensburg serves as the county seat. The City of Kittitas is seven miles to the east. The City of Ellensburg's topography slopes southwest to the Yakima River, and elevations within the service area range from 1,420 feet to 1,720 feet above mean sea level (amsl). The City's sewer system serves residential, business, commercial and industrial customers within the City limits. The City also provides sewer service to the Central Washington University (CWU) campus.

The City of Ellensburg has a Manager/Council form of government with a City Manager hired by the City Council. The City Council elects a Mayor and Vice Mayor from the Council. The City owns and operates the municipal sewer collection system and the Wastewater Treatment Facility (WWTF), which discharges to the Yakima River. The City Manager is Ted Barkley, the Public Works Director is John Akers and the Assistant Public Works Director is Rick Bollinger. The mailing address for the City is:

City of Ellensburg
501 North Anderson Street
Ellensburg, WA 98926
509-962-7133

The City of Ellensburg has owned and operated the sewage collection and treatment facilities in its service area for several decades and possesses the necessary legal, financial, institutional, and managerial resources to insure the construction, operation, and maintenance of the proposed treatment works.

HISTORY AND DEVELOPMENT OF THE SEWER SYSTEM

Prior to 1974, wastewater treatment for the City of Ellensburg was provided at a primary treatment facility that discharged into Wilson Creek. In 1974 the primary treatment facility was decommissioned and a newly constructed secondary treatment facility that discharges into the Yakima River was placed in service. At that time the wastewater collection system was modified such that in the event of a major storm, if flow to the secondary facility reached plant capacity, excess flows were diverted at an overflow structure to the primary treatment plant and discharged to Wilson Creek. This overflow system was last used during the flooding events of 1997. In 2001 the City isolated the primary facility from the sanitary sewer system and it is no longer used for overflows. There are no longer any sanitary sewer discharges at the Wilson Creek outfall. All sewage flows to the secondary facility, which is located at 2415 Canyon Road.

The secondary WWTF is an activated sludge plant consisting of headworks with grit removal and screening, aeration basins, secondary clarifiers, and ultraviolet disinfection facility. The solids handling system consists of a waste sludge belt thickener, an anaerobic digester system, sludge storage lagoon and sludge drying beds.

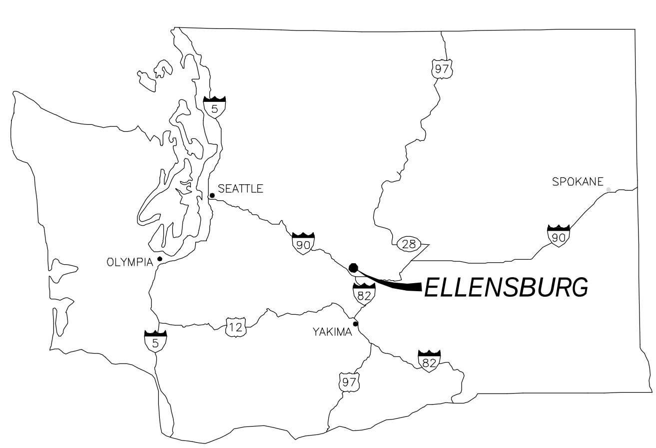
Since construction of the WWTF there have been a number of upgrades to the facility including the addition of UV disinfection, improvements to the solids handling system, and upgrades to the anaerobic digester gas system.

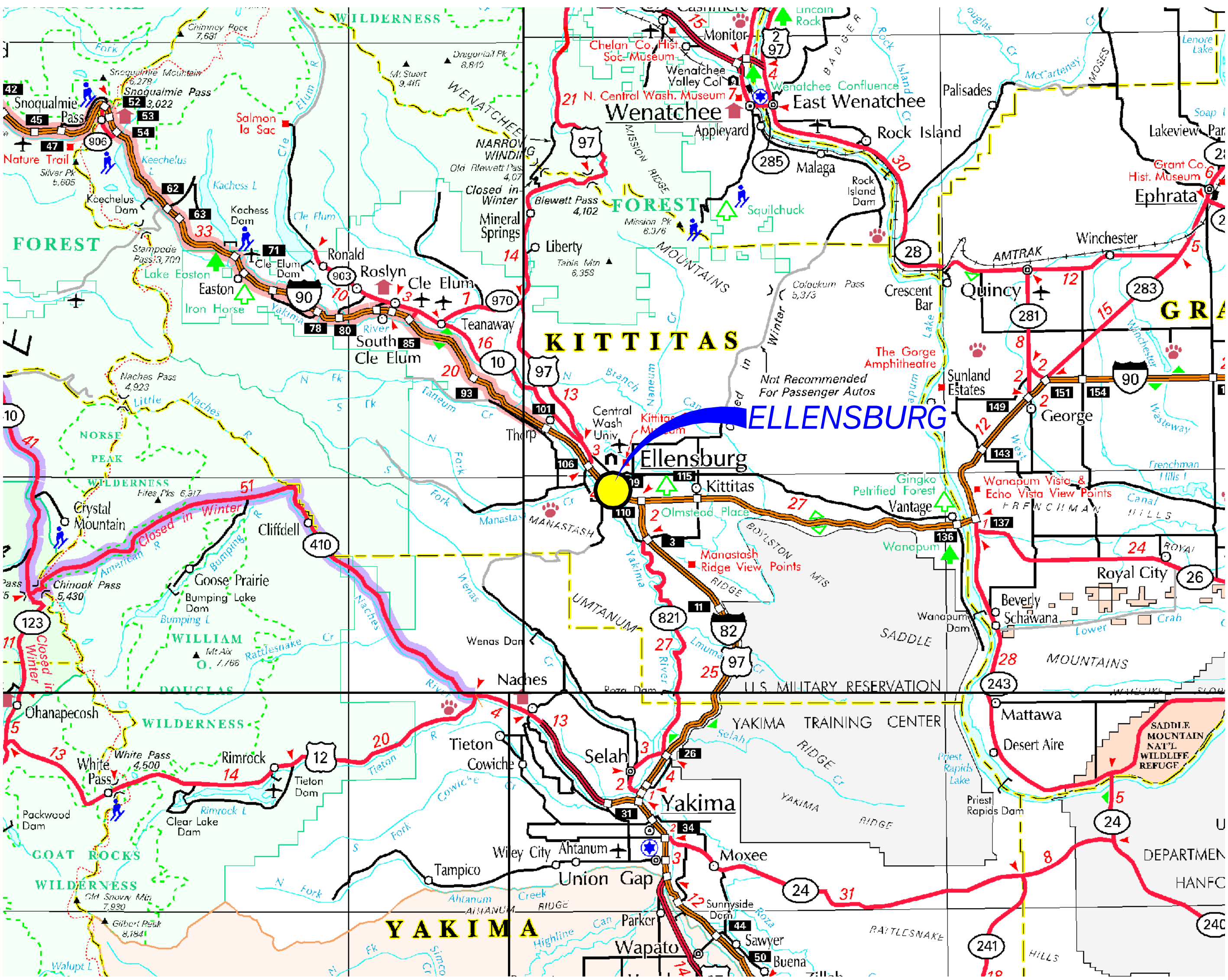
REVIEW OF EXISTING REPORTS

Existing documents and reports that were reviewed in preparing this Report include:

- *City of Ellensburg Wastewater – Storm Sewer Study*, HDR Engineering, February 2001.
- *City of Ellensburg Wastewater Treatment Plant – O&M Manual*, HDR Engineering, April 2001.
- *City of Ellensburg Water System Plan*, Gray & Osborne, Inc., October 2007
- *City of Ellensburg*, *2006 Comprehensive Plan Update, As Amended Through 2008,* City of Ellensburg, 2008.

In addition to the above documents, City of Ellensburg staff was consulted to help develop the planning data and assumptions used in this Report. Gray & Osborne and City staff held several meetings and conducted field inspections to evaluate the condition of the wastewater system.





CITY OF ELLENSBURG

WWTF ENGINEERING REPORT

FIGURE 1–1

LOCATION MAP

Gray & Osborne, Inc.

CONSULTING ENGINEERS

L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 1–1

REPORT OUTLINE

This document is organized into the following chapters:

Chapter 1 – Introduction. This chapter presents information on the background of the project and the purpose and scope of the report.

Chapter 2 – Planning Considerations. This chapter discusses general planning data required to complete later chapters of the report.

Chapter 3 – Regulatory Requirements. This chapter discusses the City's NPDES permit and Biosolids Management (WAC 173-308) regulations and their effect on the WWTF. Information is also presented on the required environmental permitting for WWTF improvement projects.

Chapter 4 – Wastewater Flows and Loadings. This chapter develops flows and loadings that are used in subsequent chapters to evaluate the capacity of the WWTF and to plan improvements to the existing WWTF.

Chapter 5 - Existing Wastewater Treatment Facilities. This chapter describes and provides a detailed capacity analysis of the existing WWTF.

Chapter 6 – Wastewater Treatment Facility Improvements. This chapter evaluates wastewater treatment alternatives and recommends capital improvements at the WWTF.

Chapter 5 –Sewer Collection System. This chapter describes and provides information on the condition of the existing sewer collection system.

Chapter 7 – Capital Improvement Financing. This chapter presents a plan for the City to finance the capital improvements and operation and maintenance costs associated with the recommended sewer collection system and wastewater treatment facility upgrades.

CHAPTER 2

PLANNING CONSIDERATIONS

CHAPTER 2

PLANNING CONSIDERATIONS

INTRODUCTION

The configuration of a wastewater collection and treatment system is influenced by development trends and timing, regulatory requirements, growth considerations, and topography. This chapter provides projections of the population growth within the sewer service area for the 20-year planning period.

PLANNING PERIOD

The wastewater system requires periodic evaluation and improvement to continue to provide adequate wastewater services for existing customers and to serve future growth. The planning period for the wastewater utility evaluations should be long enough to be useful for an extended period, but not impractical. The planning period for this Wastewater Treatment Facility Engineering Report is from 2011 through 2031, a 20-year planning interval.

SERVICE AREA

The City of Ellensburg is subject to the State Growth Management Act, which requires cities to plan their growth and avoid inefficient land use. Figure 2-1 delineates the Ellensburg city limits and the urban growth area (UGA). A UGA is an area outside the current city limits that the City has identified as having potential to experience development pressure over the next 20 years. The city limits encompasses an area of approximately 4,260 acres, while the UGA boundary encompasses an area of approximately 4,590 acres per the City of Ellensburg, 2006 Comprehensive Plan Update, As Amended Through 2008.

The current sewer service area is defined as the residential, business, commercial, industrial, and public areas inside of the existing city limits and four residential areas outside of the City limits, within the UGA where sewer service is provided.

PROJECTED SERVICE AREA

The sewer service area is expected to grow within the existing city limits and UGA during the 20-year planning period. The City expects most of the growth to occur in the northwest and southwest areas of the City and the UGA.

LAND USE AND ZONING

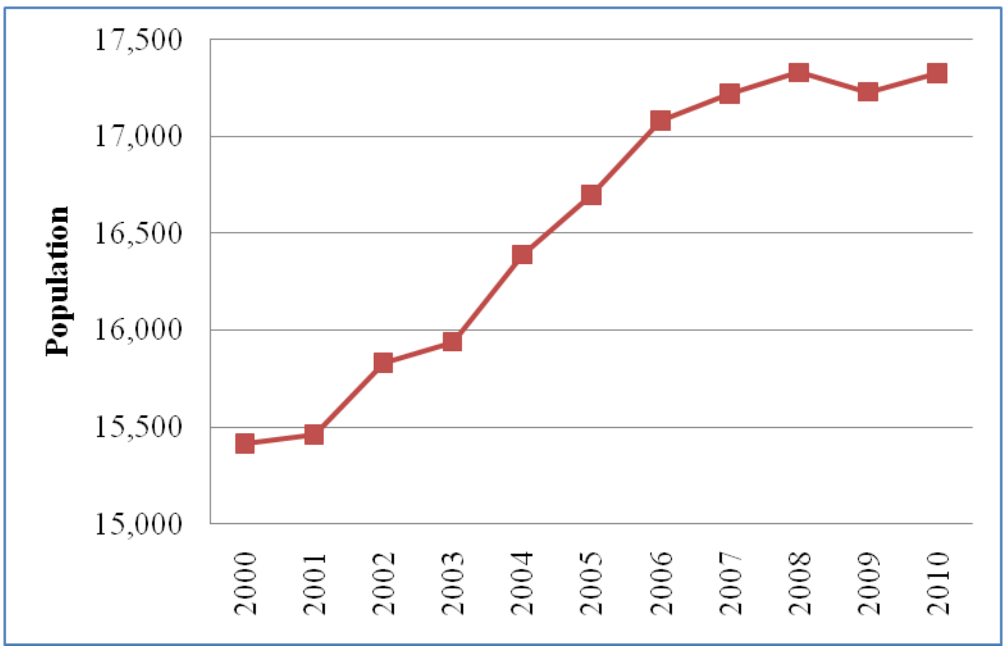
Figure 2-2 shows zoning for the City.

SERVICE AREA POPULATION

Figure 2-3 is a graph of the historical population for the City for the past 10 years. The population of the City has grown 12% in the last 10 years. The current population according to the Washington State Office of Financial Management (OFM) is 17,638.

FIGURE 2-3

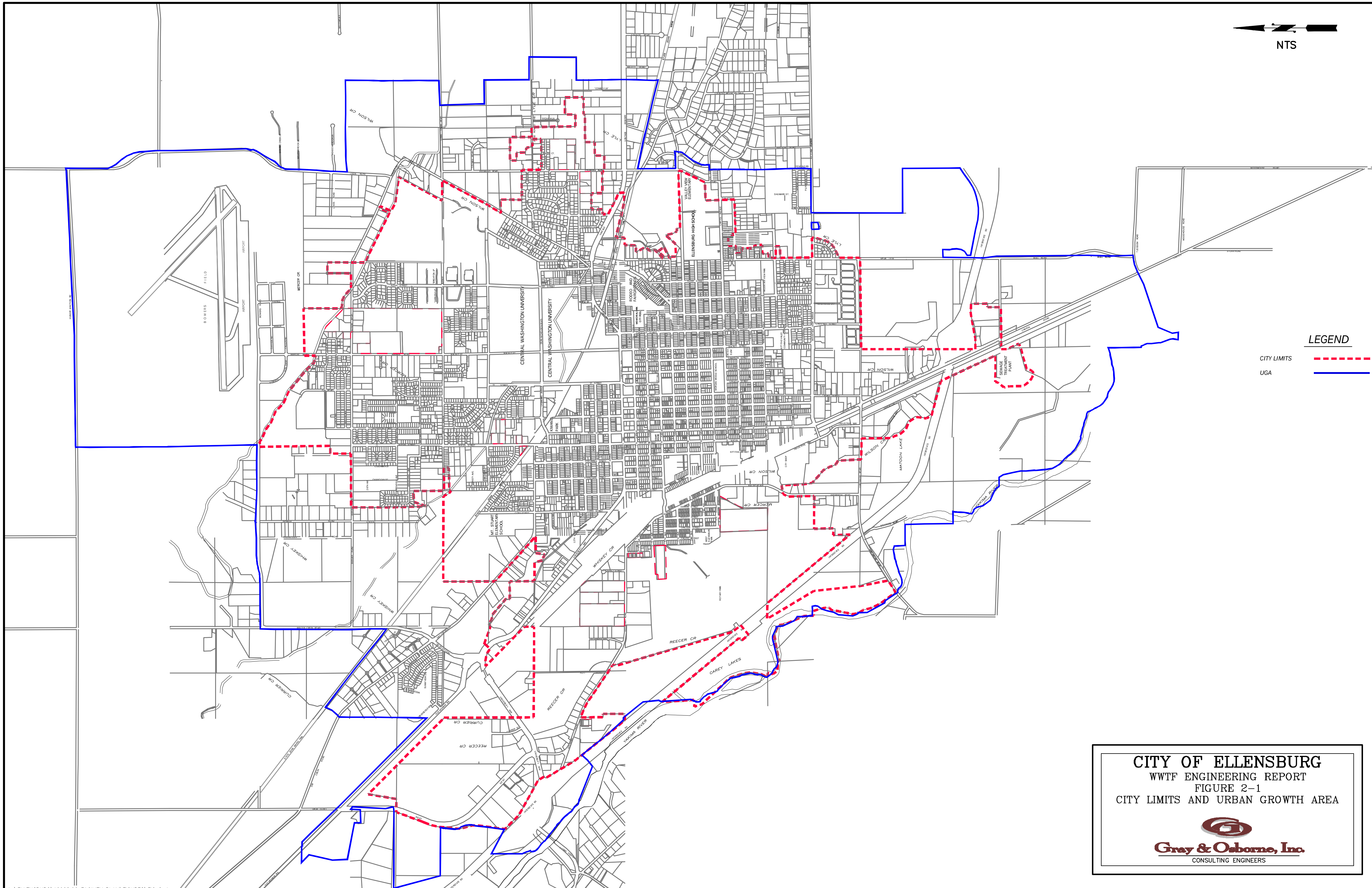
City Of Ellensburg Historical Population (1)



(1) Source: Washington State Office of Financial Management.

According to City staff, there are approximately 350 residences that are served by City sewer and that are outside the City limits. The County dwelling population density is estimated to be 2.3 persons per household according to the US Census. This results in approximately 805 persons served outside the City limits for a total service area population of 18,443.

Population forecasts are based on the OFM projections for Kittitas County and are consistent with the City's Comprehensive Plan and its 2007 Water System Plan. The City's projected population is equal to 45 percent of the County's population. Over the 20-year planning period a growth rate of approximately 1.8 percent is projected by OFM and the County. Table 2-1 shows the projected population growth within the service area.



CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 2-1
CITY LIMITS AND URBAN GROWTH AREA

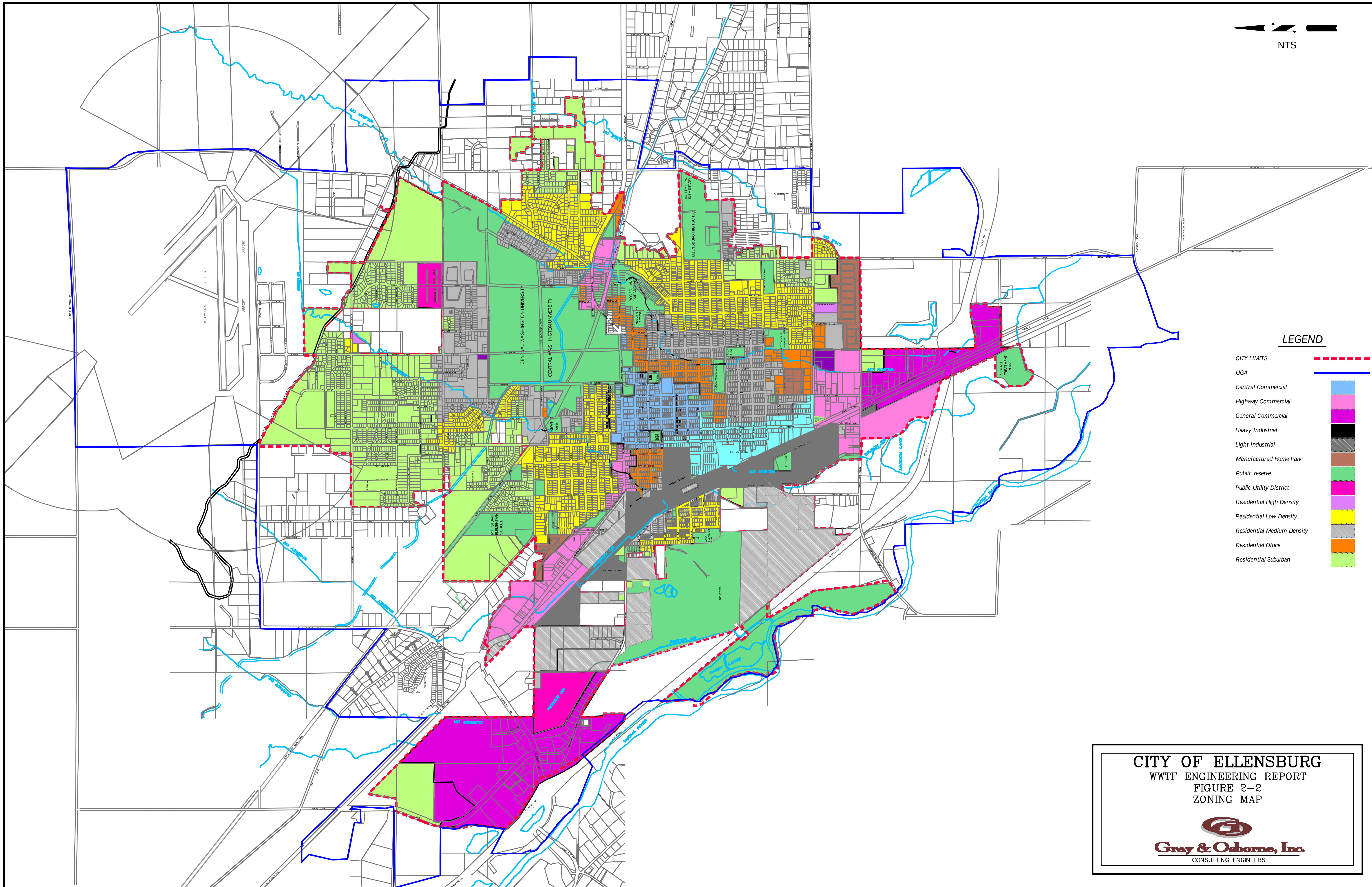

NTS
LEGEND
CITY LIMITS
UGA
Central Commercial
Highway Commercial
General Commercial
Heavy Industrial
Light Industrial
Manufactured Home Park
Public reserve
Public Utility District
Residential High Density
Residential Low Density
Residential Medium Density
Residential Office
Residential Suburban
CENTRAL WASHINGTON UNIVERSITY
CENTRAL WASHINGTON UNIVERSITY
ELLENSBURG HIGH SCHOOL
CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 2-2
ZONING MAP
Gray & Osborne, Inc.
CONSULTING ENGINEERS
L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 2-2

TABLE 2-1

City of Ellensburg Projected Population

Year	Projected Population
2011	18,443
2016	20,164
2021	20,045
2026	24,102
2031	26,351

City officials are not aware of any large businesses with plans to begin operations in the City in the near future. However, as the population increases, new businesses are expected to open, and businesses serving the everyday needs of the community are expected to expand to meet these needs. As a result, it is projected that the number of commercial businesses, including the wastewater generated by these businesses, will continue to grow at the same annual rate as the population.

The City is home to Central Washington University (CWU). CWU is a public university with a graduate and undergraduate enrollment of approximately 7,000 students at the Ellensburg campus. Another 1,000 more students are enrolled at branch campuses throughout Washington State. Students are present on campus from mid September to mid June. The impacts of CWU on the wastewater flows and loadings to the WWTF are further discussed in Chapter 4.

The City's only major industry contributing influent to the WWTF is Twin City Foods (TCF), a frozen vegetable packer. TCF is a seasonal operation with most of the packing occurring in the summer months. During the summer months, TCF discharges to its own WWTF (sprayfield) rather than the City sewer. TCF repacks vegetables and discharges wastewater to the City's WWTF during the winter. The impacts of TCF on the WWTF are further discussed in Chapter 4.

COLLECTION SYSTEM

The sewer collection system consists of approximately 77 miles of sanitary sewer and two pump stations. Figure 2-4 (a full-sized maplocated at the back of this Report) presents a map of the sewer system.

The City owns and operates two pump stations. Pump station No. 1 is located at Cora Street and Pump Station No. 2 is at First Avenue. Also, there are several privately-owned and operated sewage pump stations.

ENVIRONMENTAL FACTORS

Various natural features of the service area are discussed below, such as climate, topography, geology, soils, flood plains, and surface and ground water resources.

Climate

Ellensburg has a climate that experiences hot summers and cold winters. Temperature patterns vary considerably within the seasons. The mountains to the west effectively block much of the rain for Ellensburg and the east side of the State, producing a dry climate with less than 10 inches of rainfall per year. The annual mean temperature ranges from 54.9^{o}F to 60^{o}F. High summertime temperatures (June through September) average 79.7^{o}F and low temperatures average below freezing around 21^{o}F in January.

Geological and Physical Setting

Located in Kittitas County, Ellensburg is situated on a fertile plateau next to the Yakima River just east of the Cascade Mountain Range at an elevation of 1,540 feet amsl. The Ellensburg Plateau is composed of agricultural land with a significant portion within the 100-year floodplain.

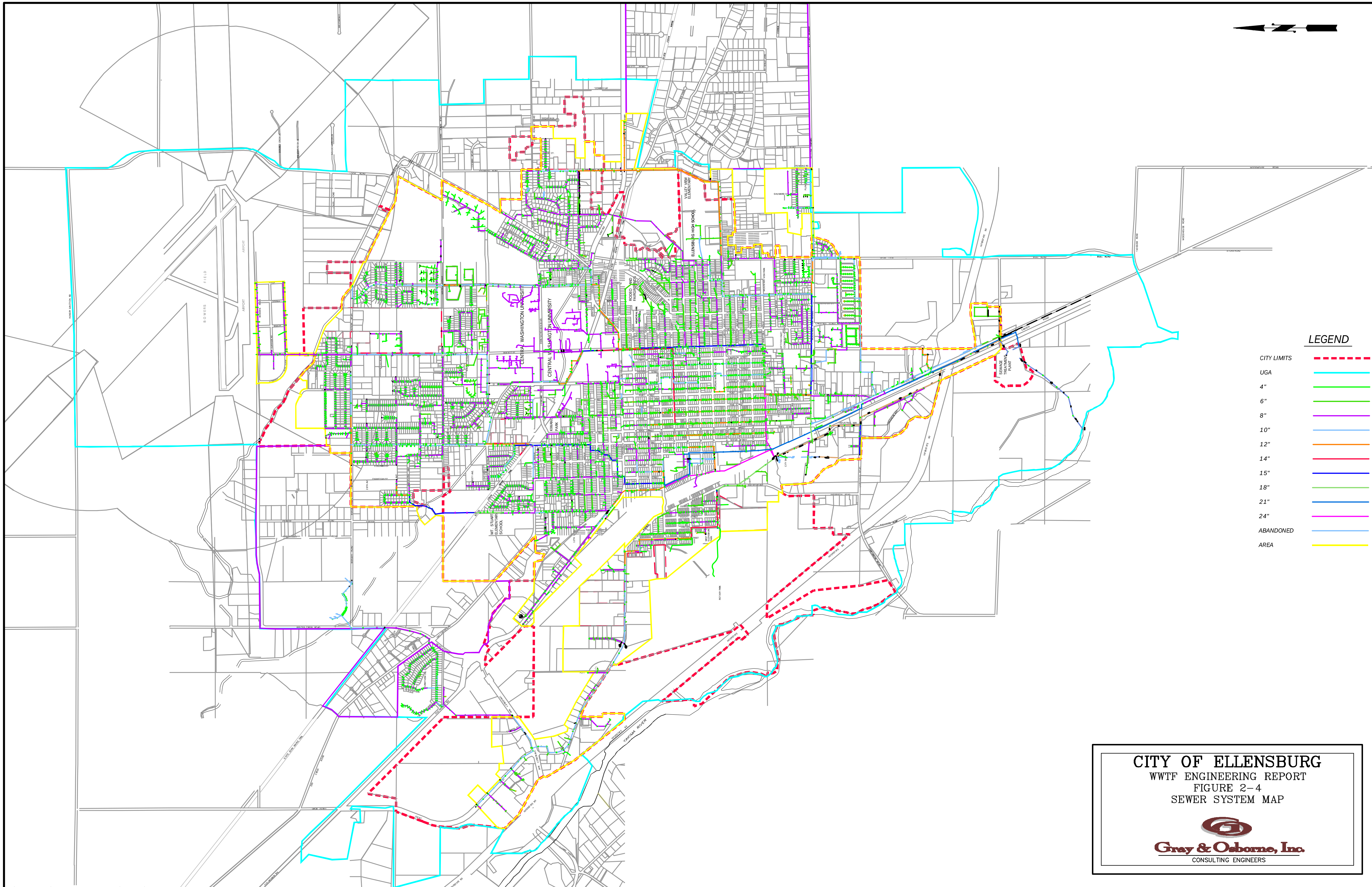
The surrounding area includes snow-capped mountains, irrigation valley land, desert terrain, and two major rivers, the Yakima and the Columbia. The topography is gently sloping, rising to an elevation between 1,500 and 1,580 amsl. Located 110 miles east of Seattle and 170 miles west of Spokane, Ellensburg lies at the heart of central Washington. Interstate 90, Interstate 82, US Highway 97, and State highways 10 and 821, allow access in, out and through the area. A topographical map is provided in Figure 2-5.

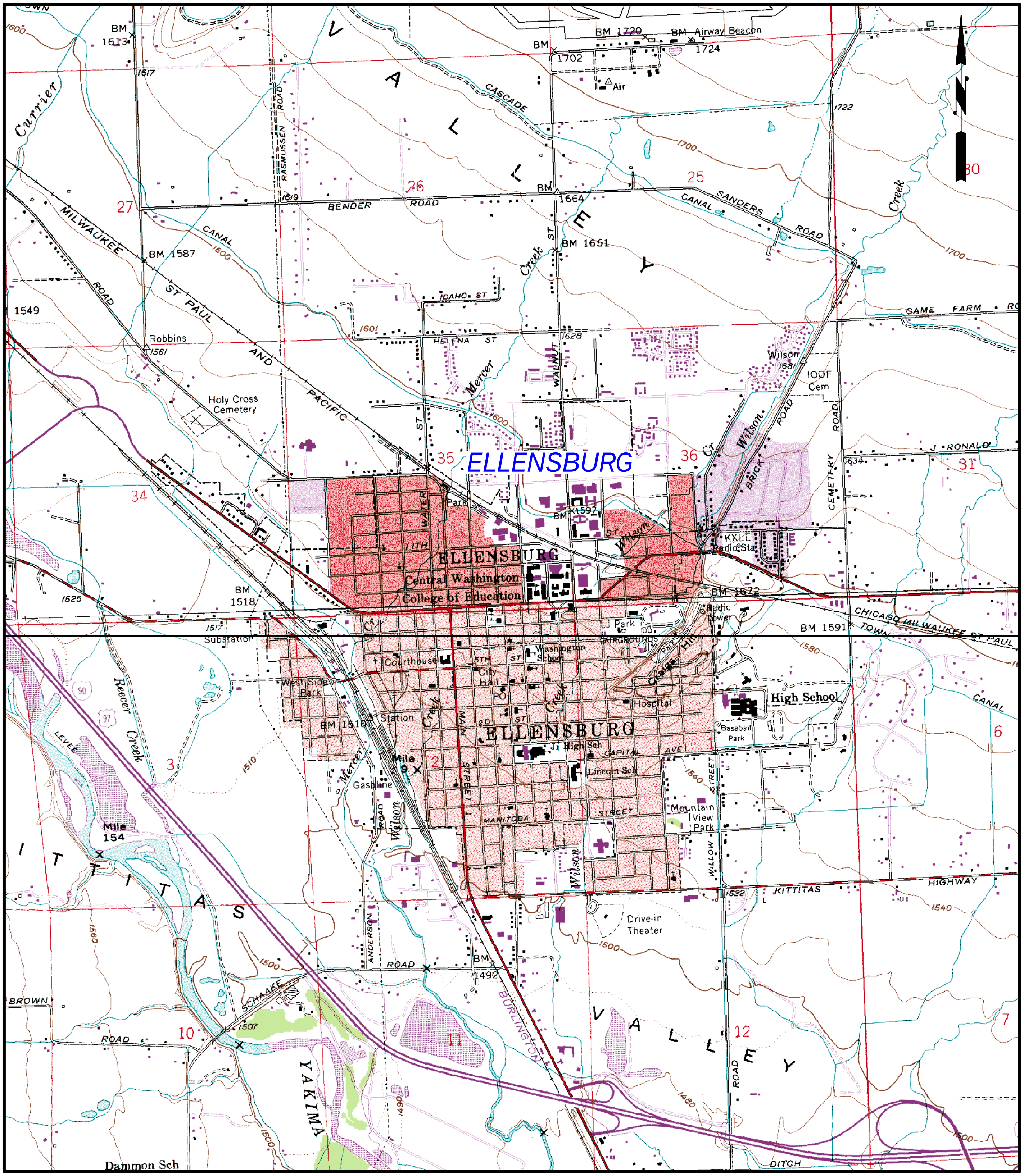
Surface water

The Yakima River is located approximately one-half mile south of the City's WWTF. There are several creeks located within the City limits including Reecer, Currier, and Wilson. Currier Creek and Reecer Creek are located in the northwest part of the City and intercept each other near the intersection of US highway 97 and West University Way. Wilson Creek runs through the middle of the City, eventually paralleling the Yakima River and ultimately intersecting with the Yakima River. There are several ponds within the City's urban growth area include Dolarway Road, Mattoon, Goose Inn, Bull Run and Hanson Pit.

Ground Water

Shallow groundwater levels are influenced by irrigation practices throughout the Kittitas Valley. Water levels rise during the early spring and fluctuate somewhat through the summer due principally to irrigation activities. The permeable granular soils of the


LEGEND
CITY LIMITS
UGA
4"
6"
8"
10"
12"
14"
15"
18"
21"
24"
ABANDONED
AREA
CENTRAL WASHINGTON UNIVERSITY
ELLENSBURG HIGH SCHOOL
VALLEY VIEW ELEMENTARY
SEWAGE TREATMENT PLANT
YAKIMA RIVER
CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 2-4
SEWER SYSTEM MAP
Gray & Osborne, Inc.
CONSULTING ENGINEERS
L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 2-4



CITY OF ELLENSBURG

WWTF ENGINEERING REPORT

FIGURE 2–5

TOPOGRAPHICAL MAP

Gray & Osborne, Inc.

CONSULTING ENGINEERS

L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 2–5

Valley overlie confining layers which separate the near surface groundwater from the deeper aquifers that supply most of the local drinking water. Groundwater may rise to within a foot or two of the surface at certain areas within the City of Ellensburg.

DOMESTIC WATER SUPPLY

The City's potable water supply is provided by ground water wells. The City has eight wells equipped from 300 to 1200 feet deep with capacities of 420 to 2,800 gpm. The wells are chlorinated to provide a residual. The current water system operating permit is classified as Green, which means that the water system is in compliance with all regulatory requirements, as certified by the Washington State Department of Health.

OTHER DOMESTIC/INDUSTRIAL WWTFs

The City is located in water resource inventory area (WRIA) 39, Upper Yakima. The Yakima River flows approximately 30 miles south to the Cities of Selah and Yakima. Other dischargers within 20 miles of the City include the City of Kittitas WWTF, which discharges effluent into Cooke Creek, which flows to the Yakima River. Additionally TCF has a State Waste Discharge Permit that allows this industry to discharge process water in the summer to a sprayfield near the City of Ellensburg's WWTF. The TCF permit also allows discharge to the City's WWTF during the winter months. The TCF discharge is further discussed in Chapter 4.

CHAPTER 3

REGULATORY REQUIREMENTS

CHAPTER 3

REGULATORY REQUIREMENTS

INTRODUCTION

Regulatory requirements are used to develop design criteria as well as devise a long term strategy for discharge of treated liquid effluent and management of residual solids generated by the City's Wastewater Treatment Facility. The purpose of this chapter is to identify and summarize the regulations that affect the planning, design, and approval of improvements to the City's Wastewater Treatment Facilities at the federal, state and local regulatory levels.

WATER QUALITY STANDARDS FOR SURFACE WATERS OF THE STATE OF WASHINGTON, CHAPTER 173-201A WAC

WAC 173-201A establishes water quality standards for the State of Washington. The standards are based on two objectives: protection of public health and enjoyment, and protection of fish, shellfish, and wildlife. For each surface water body in the state, the revised standards assign specific uses, such as aquatic life, recreation or water supply uses. Water quality standards have been developed for each use, for parameters such as fecal coliform, dissolved oxygen, temperature, pH, turbidity, and toxic, radioactive, deleterious substances.

DESIGNATED USES AND SURFACE WATER QUALITY CRITERIA

The Ellensburg WWTF discharges into the upper Yakima River (river mile 151.6), WRIA No. 39, Upper Yakima. This segment of the Yakima River is classified in WAC 173-201A-602 as having the following uses:

- Aquatic Life Uses: Salmonid spawning, rearing, and migration;
- Recreation Uses: Primary contact recreation;
- Water Supply Uses: Domestic, agricultural, industrial, and stock watering
- Miscellaneous Freshwater Uses: Wildlife habitat, harvesting, commerce/navigation, boating aesthetics

Water quality criteria for salmonid spawning, rearing, and migration use are shown in Table 3-1.

TABLE 3-1

Water Quality Criteria for the
Salmonid Spawning, Rearing, and Migration Use

Parameter	Surface Water Criteria Value
Temperature	Temperature shall not exceed a 1-DMax of 21.0^{o}C due to human activities. When natural conditions exceed a 1-DMax of 21^{o}C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3^{o}C, nor shall such temperature increases at any time exceed >t=34(T+9).
Dissolved Oxygen (lowest 1-day minimum)	8.0 mg/L
Turbidity	Turbidity shall not exceed: • 5 NTU over background when the background is 50 NTU or less or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Total Dissolved Gas	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.
pH	pH shall be within the range of 6.5 to 8.5 with a human caused variation within the above range of less than 0.5 units.

The bacterial water quality criteria for the Yakima River are based on the assigned recreational use. The Yakima River is classified as Primary Contact Recreation with the following bacterial water quality criteria:

> Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100 ml, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/100 ml.

The water supply and miscellaneous uses do not have additional numerical criteria.

The water quality standards have narrative criteria regarding toxic, radioactive, otherwise deleterious materials, or materials that impair aesthetics. These materials are prohibited in concentrations that affect aquatic life, human health or impair aesthetics. Numeric criteria for 29 toxic substances are listed in WAC 173-201A-040. Criteria are listed on both an acute and chronic basis and for certain substances (e.g. metals, chlorine, and ammonia), the criteria must be calculated as a function of receiving water pH, hardness and whether salmonids are present.

The water quality standards allow for variances and site-specific criteria to be developed in individual cases.

ANTI-DEGRADATION POLICY

The Washington State anti-degradation policy aims to maintain the highest possible quality of water in the State, by preventing the deterioration of water bodies that currently have higher quality than the water quality standards require.

The antidegredation policy follows the federal regulation guides and has three tiers of protection. Tier I ensures existing and designated uses are maintained and protected and applies to all water and all sources of pollution. Tier II is used to ensure that waters of higher quality than the criteria assigned in the standards are not degraded unless such lowering of water quality standards is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource water," and applies to all sources of pollution. The water quality and uses of these waters must be maintained and protected against all sources of pollution.

According to the City's permit fact sheet this facility must meet the Tier I requirements.

MIXING ZONES

A mixing zone is defined as the area in the receiving water surrounding the WWTF outfall discharge ports where treated wastewater mixes with the receiving water. Within the mixing zones the pollutant concentrations may exceed water quality numeric standards. The pollutant concentrations outside of the mixing zone must meet water quality numeric standards.

Mixing zones are allowed under the following conditions:

1. All known, available, and reasonable treatment (AKART) is applied prior to discharge to the mixing zone.
2. Water quality is not violated outside the mixing zone boundary.
3. When potential does not exist for damage to sensitive ecosystem or aquatic habitat, adverse public health effects, or interference with characteristic uses of the water.
4. Chronic toxicity criteria are met within a mixing zone that does not exceed 25% of the river width, use more than 25% of the river flow, and does not extend more than 100 ft upstream or 300 ft downstream (plus the depth of water over the discharge port).
5. Acute toxicity criteria are met within a mixing zone that does not exceed 2.5% of the river flow, does not occupy more than 2.5% of the width of the river, and does not extend beyond 10% of the distance towards the upstream and downstream boundaries of an authorized mixing zone.

Ecology uses modeling to estimate the amount of mixing within the mixing zone. The mixing zone analysis provides a numerical value called a dilution factor, which represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Once dilution factors are determined, calculations are performed to determine if the constituent has a reasonable potential to exceed the surface water quality standards at the boundary of the mixing zone. If a reasonable potential exists, then a limit for that constituent is imposed.

The dilution factors found in the NPDES permit fact sheet for the Ellensburg outfall are listed in Table 3-3, at the currently permitted design flows as reported in the City of Ellensburg National Pollution Discharge Elimination System (NPDES) permit fact sheet.

TABLE 3-3

Outfall Dilution Factors at Currently Permitted Design Flows (1)

Criteria	Acute	Chronic
Aquatic Live	4.0	38.2
Human Health, Carcinogen	---	38.2
Human Health, Non-carcinogen	---	38.2

(1) City of Ellensburg NPDES permit fact sheet.

Table 3-4 presents the parameters that were utilized by Ecology to calculate the dilution factors and mixing zones at the WWTF outfall.

TABLE 3-4

Modeling Parameters for the Yakima River Receiving Water (1)

Parameter	Value Used
7Q10 Low Flow	792 cfs
Velocity	1 ft/sec
Depth	5 feet
Width	120 feet
Roughness (Manning's N)	0.035 ft/ft
Temperature	18.5 °C
pH (high)	7.5 SU
Dissolved Oxygen	8.0 mg/L

(1) City of Ellensburg NPDES permit fact sheet.

There are no water quality impairments listed by Ecology for the Yakima River in the Ellensburg area, however there are some total maximum daily loads (TMDLs) and 303(d) listings for the river in the vicinity of and downstream of the City of Yakima. Also, the creeks feeding the Yakima River in the Ellensburg area are impaired to various degrees. These impairments include pesticide contamination of fish tissue, and high levels of fecal coliform bacteria, pH, turbidity and nutrient enrichment.

TOTAL MAXIMUM DAILY LOAD (TMDL)

Section 303 of the Federal Clean Water Act established the Total Maximum Daily Load (TMDL) program. Under this program, states must establish a list of water bodies that will not achieve water quality standards even with "all known available and reasonable technology (AKART)" in place. Department of Ecology establishes and maintains a list of impaired water body segments, known as the 303(d) list. When receiving water is on the 303(d) list, Ecology will initiate a TMDL study which will result in a water quality improvement plan and determine an allotted waste load for any single discharger.

Ecology has completed three TMDL studies on the upper Yakima River Basin for suspended sediments, turbidity and toxics. Ecology has fully implemented water quality improvement plans for these pollutants that are largely a result of agriculture practices.

Presently the upper Yakima River Basin is 303d listed for temperature. According to Ecology the scope of the study has been approved by the EPA; however, the study has been on hold since 2005 due to staffing issues. The scope of the study specifically states that the Cle Elum WWTF, Cle Elum Hatchery and the Ellensburg WWTF point sources will not be included in the study because they discharge directly in the mainstream of the Yakima River and the mainstream of the Yakima River is not included in the study.

The other water quality parameters that are of concern for the entire Yakima River Basin are pH and dissolved oxygen. These two parameters are of significant concern because they could lead to new waste load allocations such as for discharge of phosphorus. At this time there are no TMDL studies being performed, and Ecology has not allocated any staff to conduct these studies at this time. In the event that a TMDL study were performed and allocations were determined in the future, it would be 10 to 15 years before the City would be required to meet any proposed limits due to the time required to develop and complete the TMDL study, incorporate any new effluent limits in the City's discharge permit, and reach the end of an authorized permit compliance schedule.

In summary, at this time there do not appear to be any TMDLs that would be of immediate concern for the City of Ellensburg; however, possible future TMDLs that the City needs to be aware are temperature, pH and dissolved oxygen.

DISCHARGE PERMIT

The primary means for achieving the water quality standards of WAC 173-201A is the issuance of discharge permits, such as NPDES permits or State Waste Discharge permits, issued by the Department of Ecology. The City of Ellensburg's most current NPDES permit was issued on January 14, 2011 and became effective on March 1, 2011. The permit will expire on February 28, 2016. A copy of the permit is included in Appendix A.

Final effluent limits established for the Ellensburg WWTF in its current NPDES permit (Permit No. WA-002064-8) are summarized in Table 3-5.

The current permit requires the City to conduct a study of the metallic constituents contained in the effluent and receiving water in order to assess a reasonable potential for the effluent to violate water quality criteria. Previous analysis done by Ecology (NPDES permit fact sheet) of arsenic, chromium, copper, lead, mercury, nickel, silver, and zinc demonstrated no reasonable potential to exceed water quality criteria and therefore there are no permit limits for metals in the current permit.

Technology based limits in the permit were established for effluent biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH. The fecal coliform limit is based on the fact that the Yakima River is classified as Primary Contact Recreation, and therefore the WWTF must meet the surface water quality standards for fecal coliform.

According to the City's NDPES permit fact sheet, the City's effluent ammonia limit of 8.2 mg/L on a maximum daily basis first appeared in the City's permit in 1996. The NPDES permit fact sheet states there is no documentation provided in the permit to support the limit, and no supporting calculations are included. The fact sheet states that current calculations show that the limit should be higher, but because State and Federal regulations do not allow permit relaxation (backsliding), the limit has been retained.

TABLE 3-5

City of Ellensburg
Final Effluent Limitations in NPDES Permit (1)

Parameter	Average Monthly	Average Weekly
Biochemical Oxygen Demand (5-day) (BOD_5)	30 mg/L; 1,500 lb/day = 85% minimum removal of influent BOD	45 mg/L; 2,250 lb/day
Total Suspended Solids (TSS)	30 mg/L; 1,200 lb/day = 85% minimum removal of influent TSS	45 mg/L; 1,800 lb/day
Fecal Coliform Bacteria	100/100 mL (monthly geometric mean)	200/100 mL (7-day geometric mean)
pH	Between 6.0 and 9.0 at all times	
Parameter	**Average Monthly**	**Maximum Daily(2)**
Total Ammonia (as NH_3-N)	N/A	8.2 mg/L; 547 lbs/day

(1) 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.

(2) 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 calculation as the total mass of pollutant discharged over the day.

Table 3-5 shows an average monthly limit for BOD_5 is a concentration of 30 mg/L, or mass discharge of 1500 lb/day, which is 15 percent of the permitted design influent BOD_5 loading (10,000 lb/day) and is the more stringent limit. Similarly, a projected average monthly limit for TSS is a concentration of 30 mg/L, or 1,200 lb/day, which is 15 percent of the permitted design influent TSS loading (8,000 lb/day) and is the more stringent limit. An average monthly BOD_5 limit of 1,500 lb/day results in an effluent BOD_5 concentration of 22 mg/L at the design flow of 8 MGD, and an average monthly TSS limit of 1,200 lb/day results in an effluent TSS concentration of 18 mg/L.

STATE OF WASHINGTON BIOSOLIDS REGULATIONS, WAC 173-308

WAC 173-308 is the basis for the statewide biosolids management program. Rather than applying for an individual permit, facilities that are subject to the permit program apply for coverage under the existing statewide general permit. The City of Ellensburg is covered under the general permit. The City utilizes Natural Selection Farms for contracted hauling and land application of its biosolids.

The current solids treatment process produces biosolids that meet the requirements for Class "B" pathogen reduction by anaerobic digestion. Per WAC 173-308, the WWTF produces Class "B" biosolids by using a Process to Significantly Reduce Pathogens, whereby the biosolids are treated in the absence of air for a minimum mean cell residence time of 15 days at 35 to 55^{o}C. The required vector attraction reduction is met by reducing the mass of the volatile solids by at least 38 percent in the digester.

OTHER REGULATORY REQUIREMENTS

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

The National Environmental Policy Act (NEPA) was established in 1969 and requires federal agencies to determine environmental impacts on all projects requiring federal funding or federal permits. If a project is determined to be environmentally insignificant, a Finding of No Significant Impact (FONSI) is issued; otherwise an Environmental Impact Statement (EIS) is required. NEPA is not applicable to projects that do not include a federal component. The funding programs that the City will pursue for the capital improvements identified in this plant are unknown at this time. A NEPA assessment is not included in the scope of this planning document.

STATE ENVIRONMENTAL POLICY ACT (SEPA)

The State Environmental Policy Act (SEPA), as presented in WAC 197-11-960, requires all governmental agencies to ensure that applicable environmental concerns are addressed in the process of project planning and documentation. Projects that have potential environmental impacts must complete a SEPA Checklist to satisfy planning and disclosure requirements. A SEPA checklist was completed for this Report and is included in Appendix B.

ARCHEOLOGICAL AND CULTURAL RESOURCES SURVEY

In November of 2005, the Governor of Washington signed Executive Order 05-05 which requires state agencies to review capital construction projects for potential impacts to cultural resources. This review is to be done in conjunction with the Department of Archeological and Historical Preservation (DAHP) and any affected Tribes. It is anticipated that an archeological and cultural resources review will be completed during the design phase of the WWTF improvements project. During design, the City will contract with a state approved archeologist to perform the survey and to consult with the DAHP and affected tribes. The archeologist's report will include survey findings as well as any recommended mitigations such as construction monitoring.

REGULATORY REQUIREMENTS FOR SHORELINE PERMITTING IN THE STATE OF WASHINGTON

The Shoreline Management Program manages shorelines through planning for and supporting all reasonable and appropriate uses of shoreline areas. The Washington State Shoreline Management Act of 1971 (SMA) defines shorelines as including the following:

- Lakes of 20 acres or greater, including reservoirs,
- Streams with a mean annual flow greater than 20 cubic feet per second,
- Marine waters,
- Areas within 200 feet landward of surface waters described above,
- Marshes, bogs, swamps, and river deltas associated with the surface waters described above.

Shoreline permits are required from the local jurisdiction for any sizable development or activity within the shoreline area. Kittitas County administers the local shoreline master program for Ellensburg. A shoreline permit will only be required if work is conducted on the outfall.

JOINT AQUATIC RESOURCES PERMIT APPLICATION (JARPA)

The JARPA application covers several permits that are discussed below.

The Washington Department of Fish & Wildlife administers the Hydraulic Project Approval (HPA) process for projects that use, divert, obstruct, or change the nature of flow or bed of any freshwater or marine water of the State of Washington. The HPA application must include plans and specifications for the proposed action below the high water mark.

A 401 Water Quality Certification is required under the Clean Water Act (CWA) for any activity that may result in discharge to surface waters including excavation activities that occur in streams, wetlands, or other waters of the United States.

Section 404 of the CWA regulates discharges of fill or dredged materials in wetlands, including any related draining, flooding, and excavation. Pipeline and pump station projects in wetlands will require a Section 404 permit, in addition to any related local permits. In most cases, activities impacting more than 1/3 of an acre will also require a Section 401 Certification.

JARPA permitting at Ellensburg will only be required if work is conducted on the outfall.

REGULATORY REQUIREMENTS FOR STORMWATER PERMITTING IN THE STATE OF WASHINGTON

As part of the Federal Clean Water Act, the Department of Ecology administers the State of Washington's Construction Stormwater General Permit. Stormwater is considered a point source of water pollution and therefore an NPDES permit is required. The State of Washington has developed a General Permit for Construction Stormwater.

Stormwater permit coverage is required if the project disturbs more then one acre of land and the possibility of stormwater runoff can enter waters of the state or conveyance systems that convey stormwater to a water of the state.

A Construction Stormwater Permit will be obtained for the project if construction activities disturb more than one-acre of land. It is anticipated that the City will initially obtain any necessary stormwater permits and transfer ownership to the Contractor prior to the start of any construction project.

CITY OF ELLENSBURG CODES

The WWTF is located within the City of Ellensburg. The City will require the following permits for the construction of WWTF improvements:

- Building Permit
- Plumbing Permit
- Electrical Permit (through Labor & Industries)

REGULATORY SUMMARY

A summary of the regulatory requirements for improvements to the Ellensburg WWTF is presented in Table 3-6.

TABLE 3-6

Summary of Regulatory Requirements

Permit/Report	Agency	Comments
NPDES Permit	Ecology	Expires 02/28/2016
Biosolids Permit	Ecology	Covered under General Permit.
NEPA Report	Not included in the scope of this Report. NEPA may be required dependent upon the City's source of funding	
SEPA Checklist	City of Ellensburg	Completed as part of this Report. See Appendix B.
Cultural /Archeological Survey	DAHP	Will be completed by City during design.
Permit/Report	**Agency**	**Comments**
Shoreline Permit	Kittitas County	Not required unless work on outfall is performed.
HPA (JARPA)	Ecology/EPA/ Army Corps of Engineers	Not required unless work on outfall is performed.
Construction Stormwater Permit	Ecology	Applied for by the City during design; transferred to the Contractor prior to the start of construction.
Building Permit, Electrical Permit, Plumbing Permit	City of Ellensburg	Electrical permit by L&I.

CHAPTER 4

WASTEWATER FLOWS AND LOADINGS

CHAPTER 4

WASTEWATER FLOWS AND LOADINGS

INTRODUCTION

The purpose of this chapter is to provide information on existing hydraulic, organic, and solids loadings to the City's existing WWTF and to present projections of future flows and loadings through the 20-year planning period (2031). Quantifying the existing loads to the WWTF is necessary to determine the level at which the existing wastewater treatment systems are operating relative to their current capacities, and to project performance under future flows and loadings.

HISTORICAL WASTEWATER FLOWS

Historical wastewater flows are based on data from the WWTF's discharge monitoring reports (DMRs) for the period January 2006 through December 2010. Annual summaries of flows over the past five years are listed in Table 4-1. A more detailed summary of the discharge monitoring report data is included in Appendix C.

TABLE 4-1

Historical WWTF Influent Flows, 2006-2010

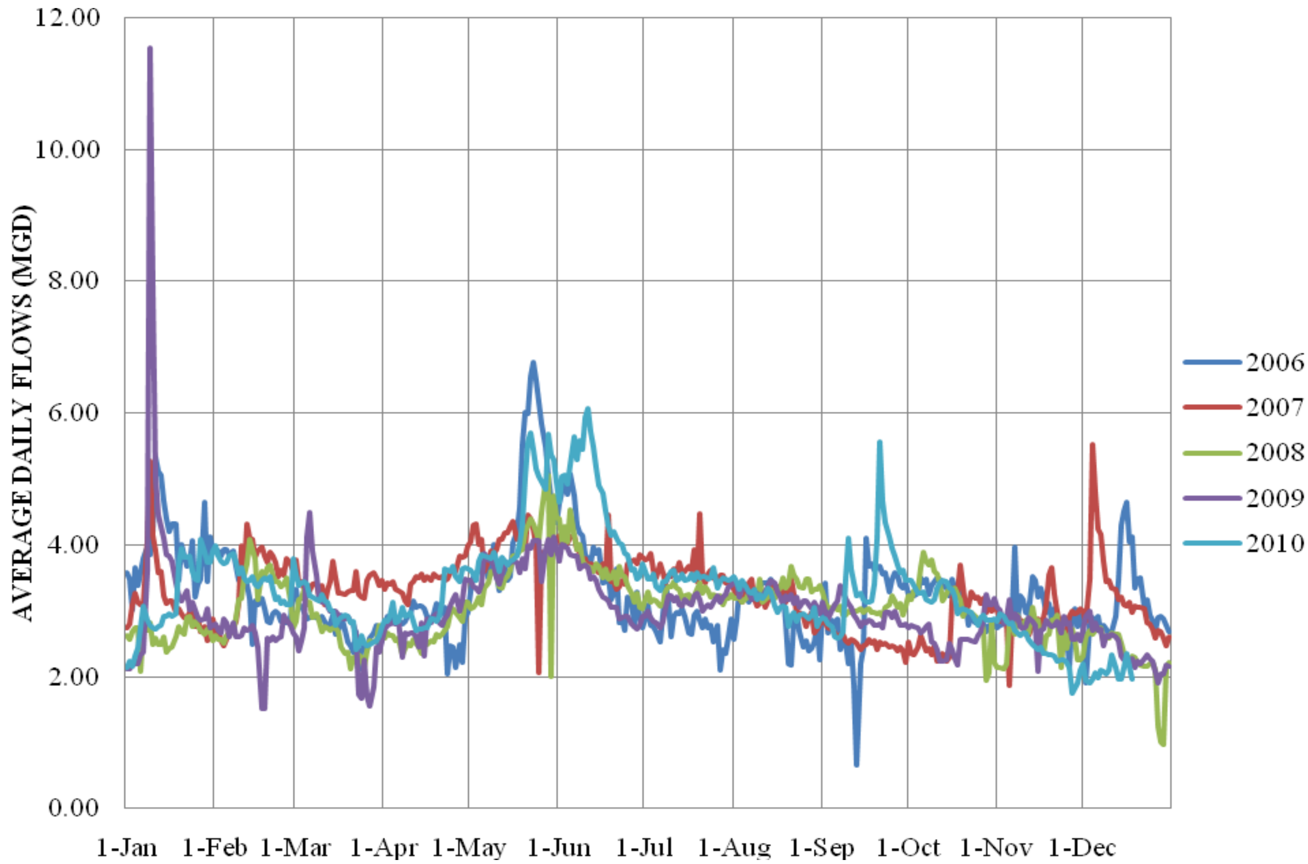
Year	Population (1)	AAF (2) (MGD)	MMF (3) (MGD)	MDF (4) (MGD)
2006	17,885	3.26	4.51	6.78
2007	18,025	3.29	4.00	5.52
2008	18,135	3.09	4.08	5.05
2009	18,035	3.01	3.74	4.49(5)
2010	18,131	3.28	4.63	6.08
Average	**18,042**	**3.19**	**---**	**---**
Maximum	**---**	**---**	**4.63**	**6.78**

(1) City population from Washington State Office of Financial Management plus additional population served outside the City limits.
(2) AAF = Average Annual Flow, the average flow in a calendar year.
(3) MMF = Maximum Month Flow, the flow for the month with the highest average flow in a calendar year.
(4) MDF = Maximum Day Flow, the flow for the day with the highest flow in a calendar year.
(5) Does not include flood event of January 2009.

Figure 4-1 presents the daily average influent flow for the years 2006-2010.

FIGURE 4-1

Daily Average Influent Flows to the WWTF, 2006-2010



As shown in Figure 4-1, the City had a significant flow event in January of 2009. Daily average flows increased from 3.60 MGD on January 7th to 11.55 MGD on January 8th, followed by 7.93, 5.03, and 4.45 MGD on the following three days. According to City staff, snow and ice melt blocked creeks in the City, flooding West Ellensburg and the West Interchange. This entire area was under water, which caused unusually high flows at the WWTF. The January 7th flow of 11.55 MGD is nearly double the next maximum day flow during the period 2006 through 2010, 6.78 MGD in 2006. It is unreasonable to estimate the maximum daily flow based on this type of unusual event in January 2009, therefore this flow data is considered an outlier and will not be used in this evaluation.

The City typically has peak flows that appear in both the winter and the summer. The City has inflow problems due to precipitation in the winter months, and infiltration in the summer due to the high groundwater from irrigation. Inflow and infiltration are discussed later in this chapter.

Twin City Foods (TCF), is the City's only significant industrial discharger. TCF has its own sprayfield treatment system that is operated between the months of April and October. In the winter TCF discharges to the City. According to the City records, monthly average TCF wastewater flow ranges from 36,000 gallons to 48,000 gallons per day. Through an agreement with the City (Appendix D), TCF is allowed to discharge up to 100,000 gpd. The strength of the discharge from Twin City Foods is significantly greater than typical domestic wastewater, and is discussed later in this chapter.

The City is home to Central Washington University. School is in session from the middle of September to the middle of June. It does not appear that the transient University population has significant impact on the flows to the WWTF. WWTF staff indicates that infiltration from irrigation is usually decreasing at the same time in the fall that students are returning to school and, therefore, there is no dramatic change in flows to the WWTF. Similarly in the spring when students are leaving campus, irrigation induced infiltration is just starting and there are no dramatic changes in flows to the WWTF.

HISTORICAL LOADINGS

The City's DMRs contain data on WWTF influent and effluent BOD_5 and TSS loadings. Annual summaries of influent loadings over the past five years are listed in Table 4-2. Additional DMR data can be found in Appendix C.

TABLE 4-2

Historical WWTF Influent Loadings, 2006-2010

Date	Avg. Ann. BOD_5 (lb/d)	Max Mo. BOD_5 (lb/d)	Avg. Ann. TSS (lb/d)	Max Mo. TSS (lb/d)
2006	2,900	3,237	3,077	3,612
2007	3,078	4,296	2,684	3,148
2008	3,504	4,864	2,689	4,448
2009	4,120	4,820[1]	3,171	3,379
2010	3,792	4,299	2,848	4,068
Average	**3,479**	**---**	**2,894**	**---**
Maximum	**---**	**4,864**	**---**	**4,448**

(1) Does not include high loading event of March 2009.

Figure 4-2 presents the average monthly BOD_5 loading for the years 2006-2010.

FIGURE 4-2

Average Monthly BOD_5 Loading, 2006-2010

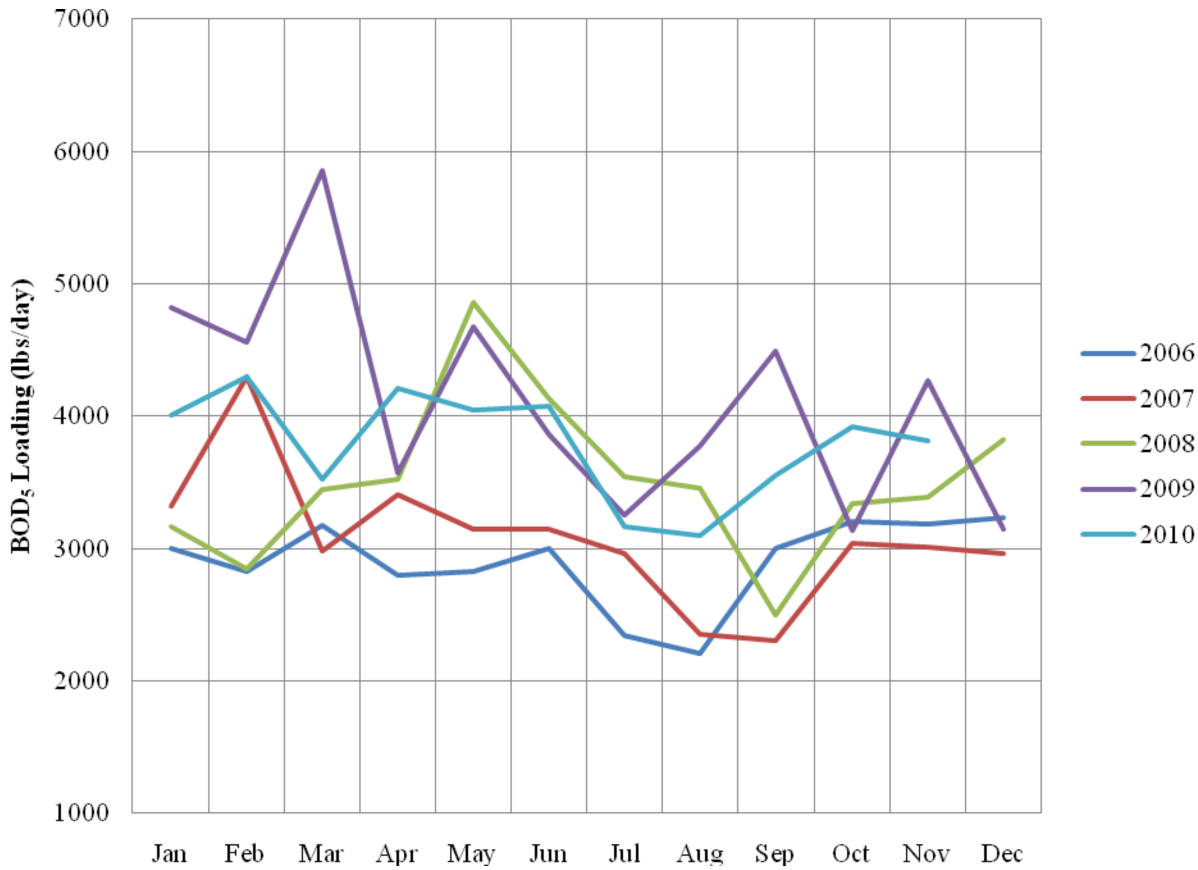
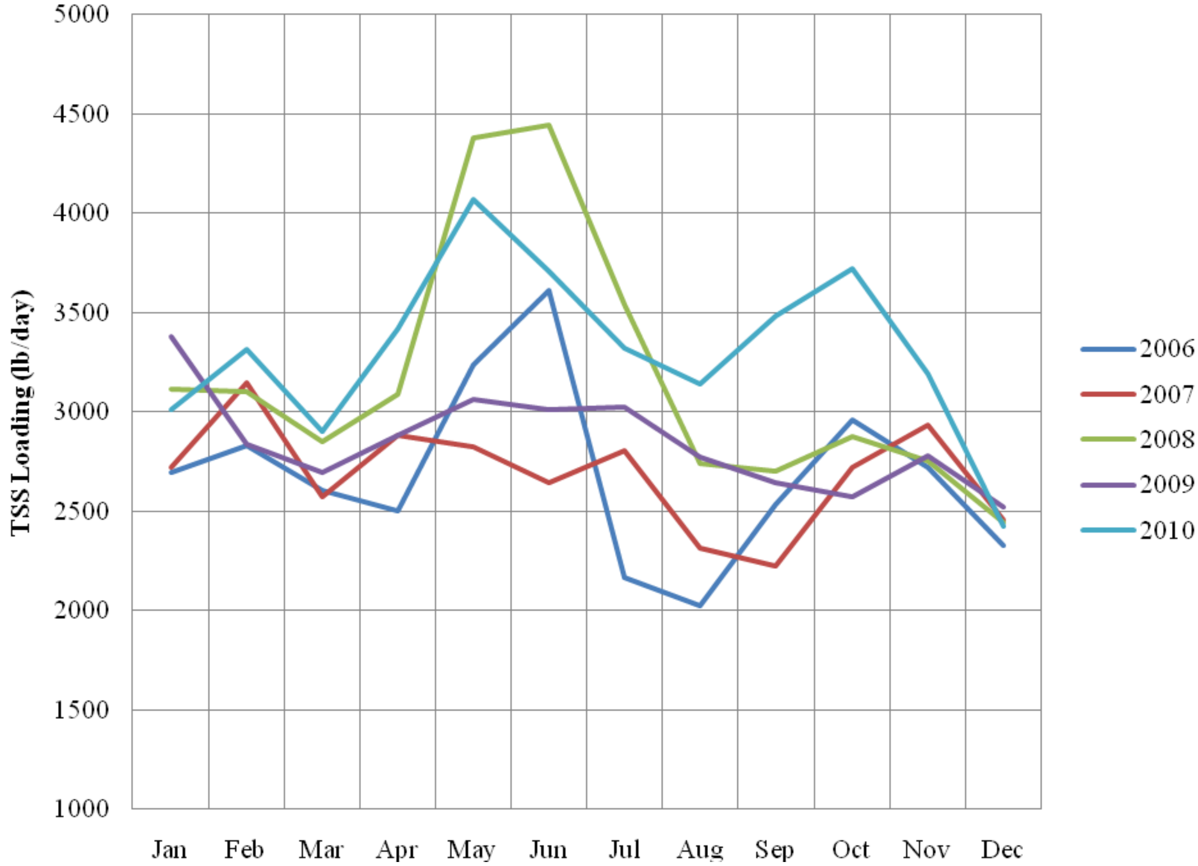


Figure 4-3 presents the average monthly TSS loading for the years 2006-2010.

FIGURE 4-3

Average Monthly TSS Loading, 2006-2010



As shown in Figure 4-2, the City had an unusually high BOD_5 loading event in March 2009. There was approximately a two-week period in March 2009 when loadings were extremely high, resulting in an average monthly BOD_5 loading that was 20 percent greater than the next highest monthly average BOD_5 loading during the period of record. City staff is unable to determine the cause of this unusual event; however, it is suspected that the high BOD_5 loadings were due to discharges from TCF. It is unreasonable to estimate the maximum monthly loading based on this type of unusual event in March 2009, therefore this BOD_5 loading data is considered an outlier and will not be used in this evaluation.

A review of the City's loadings shows that the BOD_5 is elevated in the winter. This elevated BOD_5 is likely attributed to discharges from TCF. The volume of wastewater that TCF discharges is relatively low; however the strength of the BOD_5 discharge is high. A review of the TCF data (submitted to the City for billing purposes) from 2006 to 2010 reveals concentrations as high as 2,020 mg/L and as low as 300 mg/L (domestic wastewater is typically around 250 mg/L). City staff has stated that discharges from TCF can increase loadings to the plant by as much as 1,000 lbs per day. Additional discussion regarding TCF is provided below.

Another contributor to higher BOD_5 loading in the winter would be the presence of students on the campus of CWU. Students arrive on campus at the end of September for fall semester and typically leave campus in the middle of June. The City's comprehensive plan and water system plan do not separately account for this University population and treat the student population (based on OFM) as the general population of the City. Discussions with the City's planning supervisor indicate the City does not believe that the transient population is significant enough to affect the City services and, therefore, it is not accounted for in their planning. WWTF operators do notice an increase in influent BOD_5 loading at the end of September and make operational changes to account for the additional treatment requirements. However, the additional load caused by the transient University population is not known.

In the summer there is a rise in the influent TSS loading to the WWTF. The infiltration at Ellensburg may create a situation where high flows flush out settled solids deposited in sewers during lower flows. The flushing action of high flows results in high TSS loading. A detailed review of the DMR data shows that it is not unusual for the City to experience high TSS during high flow months. Additional discussion on the City's infiltration and inflow problem is presented below.

AVERAGE BASE SANITARY FLOW

The use of equivalent residential units (ERUs) is a way to express the amount of water consumed or sewage discharged by non-residential customers such as the commercial, municipal and CWU customers as an equivalent number of residential customers.

Water consumption data can often be used as a surrogate to base sanitary wastewater flow production and can be used to developed wastewater ERUs. The wastewater ERU value is calculated based on residential winter water use since irrigation does not occur in the winter and the majority of the water consumed during the winter will enter the sewer and will ultimately end up at the treatment plant. During drier months, a large fraction of the water consumed will be for irrigation purposes and will not enter the wastewater collection system.

Based on previous experience at similar sized wastewater treatment plants, typically 80 to 100 percent of the winter water consumed will enter the wastewater collection system. For the City of Ellensburg, a conservative estimate of 90 percent of the residential winter water consumption is assumed to end up as influent to the WWTF.

Residential winter water consumption data was analyzed for the past five years. Winter residential water consumption for the year 2010 was approximately 1,026,953 gpd or 59 gallons per capita per day (gpcd) (1,026,953 gpd / 17,326 water system customer population). According to the City's 2008 Water System Plan Update (Gray & Osborne, 2008), the water system customer population is assumed to all reside within the City limits. As stated in Chapter 2 of this Plan, there are approximately 350 residences served by the sewer system outside of the City limits. Therefore, the water system customer population is different than the sewer system customer population. Also, it is assumed that water and sewer population data does not include those students housed on campus at CWU. The City's planning supervisor stated that the City assumes that population numbers obtained from the Census or OFM do not include on-campus housing residents because they are not considered permanent residents.

Multiplying the winter water consumption per capita rate of 59 gpcd by 2.3 persons per household (average persons per Ellensburg household per the 2000 Census), results in a residential winter water consumption of 136 gpd per ERU. Using the average daily winter water consumption for commercial, municipal and CWU customers in the City in the year 2010 (928,129 gpd) and dividing by the residential water consumption of 136 gpd per ERU results in a total of 6,824 water ERUs attributed to commercial, municipal and CWU customers. Water and wastewater ERUs are assumed to be the same for commercial, municipal and CWU customers.

Residential ERUs are calculated by dividing the City sewer service population, 18,443, by 2.3 persons per household, resulting in 8,019 wastewater ERUs. Adding the residential, commercial, municipal and CWU wastewater ERUs gives a total of 14,843 (6,824 + 8,019) existing wastewater ERUs for the City of Ellensburg.

Multiplying the water ERU rate of 136 gpd by 0.9 (the fraction of winter water entering the sewer), results in a wastewater discharge of 122 gpd per ERUs. Multiplying the wastewater ERU of 122 gpd by 14,843, the total ERUs in the sewer service area, results in a base sanitary flow to the WWTF of 1,810,000 gallons per day, or 1.81 MGD. This base sanitary flow, which does not include infiltration and inflow, agrees reasonably well with the low flow data for the WWTF, as presented in Figure 4-1. Note that this base flow does not include flows from TCF; further discussion of TCF's flows to the WWTF is provided later in this chapter.

PROJECTED SEWER SERVICE AREA POPULATIONS AND ERUS

Table 4-3 shows the projected City sewer population and the residential, commercial, municipal, and CWU wastewater ERUs over the next 20 years, using the expected population growth rate of 1.8 percent.

TABLE 4-3

Projected Wastewater ERUs, 2031 (1)

Year	Population(2)	Residential ERUs	Commercial/Municipal / CWU ERUs	Total Projected ERUs(3)
2011	18,443	8,019	6,824	14,843
2017	20,527	8,925	7,595	16,520
2031	26,351	11,457	9,750	21,207

(1) Growth is projected at 1.8 percent consistent with the City's 2006 Comprehensive Plan Update, As Amended through 2008, and the City's Water System Plan Update.
(2) From Table 2-1.
(3) Does not include TCF.

INFILTRATION AND INFLOW (I/I)

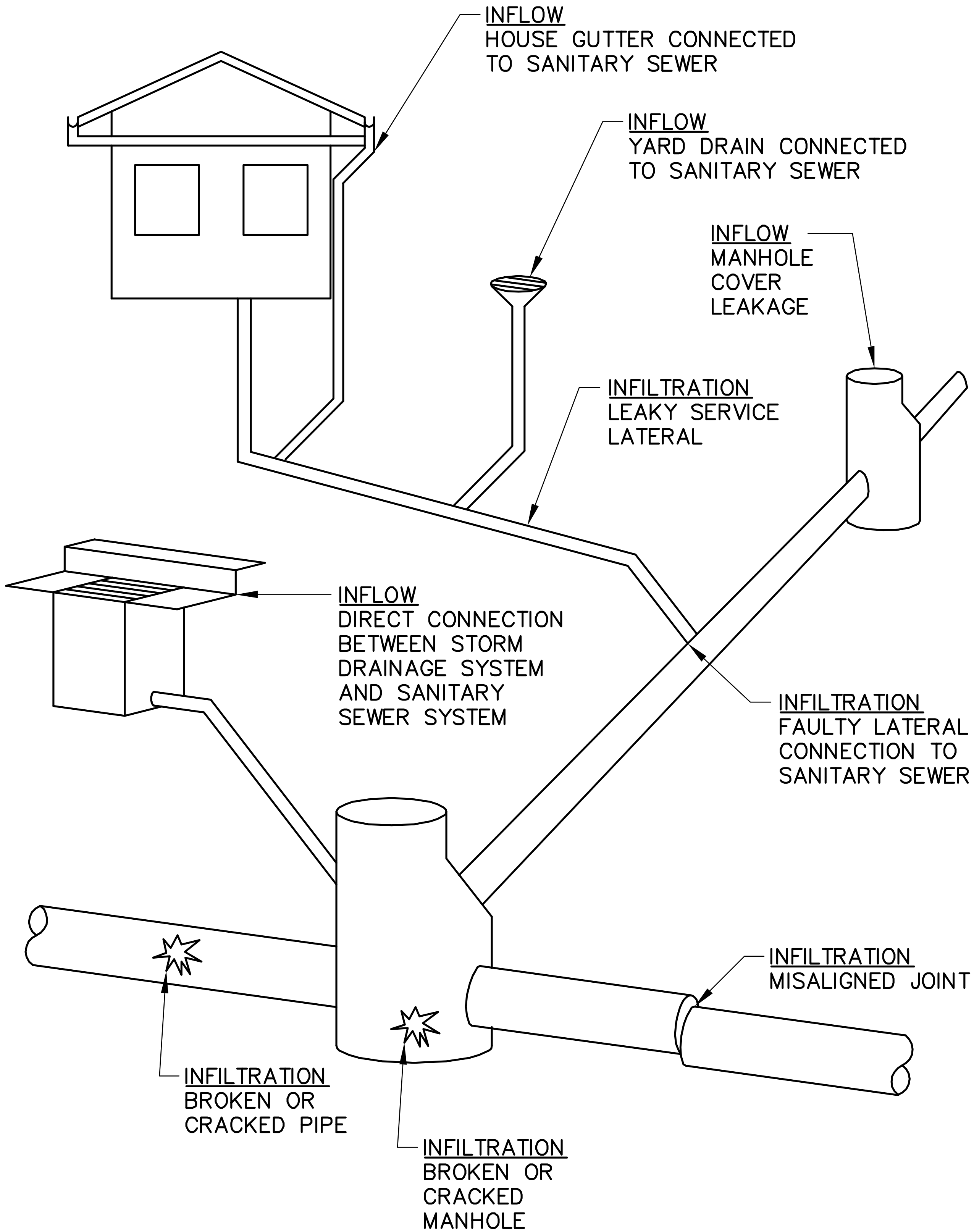
I/I consists of relatively clean ground, surface, or storm water that does not require treatment to the same levels that domestic sewage does. The inclusion of this relatively clean water with the domestic wastewater flows can produce the following detrimental effects:

- WWTF impacts including hydraulic overloading, reduced treatment efficiency, and violation of the National Pollutant Discharge Elimination System (NPDES) waste discharge permit.
- Additional costs for treating, transporting, and pumping the increased flow.
- Increased flows within the collection system, creating the need to construct additional sewer facilities or upgrade existing facilities.
- Surcharged manholes, sewage overflow, and bypasses to the environment in extreme cases.

For these reasons it is advantageous for municipalities to minimize the amount of I/I within their systems. Figure 4-4 presents a diagram of typical I/I sources in a collection system.

DEFINITION OF INFILTRATION

Infiltration is defined as ground water entering a sewer system by means of defective pipes and side sewers, pipe joints, and manhole walls. The infiltration rate is relatively constant day to day, although it may vary seasonally when the local ground water elevation fluctuates. Infiltration can be a constant problem, increasing daily operation costs for the collection and conveyance systems.



CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 4–4
TYPICAL I/I SOURCES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

DEFINITION OF INFLOW

Inflow is defined as surface water or runoff that enters the collection system through constructed openings such as manhole covers, cross-connections with storm sewers and combined sewers or direct connections such as yard, basement, or roof drains. Inflow is directly related to rainfall or flooding events and results in an immediate increase in sewage flows following the event. Inflow is an intermittent problem, causing an increase in sewage flows following the triggering event.

I/I FLOW CRITERIA

The United States Environmental Protection Agency (EPA) has determined specific quantitative guidelines for excessive I/I, as follows:

1. To determine if excessive *infiltration* is occurring, a threshold value of 120 gallons per capita per day (gpcd) is used. This threshold infiltration value is based on an average daily flow over a seven to fourteen day non-rainfall period during seasonal high groundwater conditions.

   For this report, flow for the summer months was evaluated and compared with precipitation records. A 14-day period was analyzed in July 2007 with zero precipitation and a maximum daily flow of 4.48 MGD. With a population of 18,025, this results in a system per capita flow of 249 gpd, which exceeds the EPA criteria for excessive infiltration. This calculation was repeated for each of the five years of data evaluated and it was found that the City had excessive infiltration each year.

2. To determine if excessive *inflow* is present in a collection system, the EPA uses a threshold value of 275 gpcd. If the average daily flow (excluding major commercial and industrial flows greater than 50,000 gpd each) during periods of significant rainfall exceeds 275 gpcd, the amount of inflow is considered excessive.

   For this report, precipitation for the winter months was evaluated and compared with WWTF flow records. November 2006 had 3.58 inches of precipitation, with a maximum daily flow of 3.06 MGD. With a population of 18,025, this results in a system per capita flow of 170 gallons, which is less than the EPA criteria for excessive inflow. This calculation was repeated for each of the five years of data evaluated and it was found that per capita flows were always less than 275 gpd, excluding the flood even of 2009. Therefore, inflow is not considered excessive by the EPA standards.

DETERMINATION OF I/I QUANTITIES

To determine the quantity of I/I in the Ellensburg collection system, the City's base sanitary flow is used. The base sanitary flow is the flow from residential, commercial, municipal (City owned facilities) and CWU customers to the WWTF, without I/I, and is assumed to be relatively constant on an average daily basis throughout the year. As discussed above, the base sanitary flow to the WWTF was determined to be 1.81 MGD.

To quantify I/I, DMRs were reviewed for the past five years. Using this DMR information and the base flow of 1.81 MGD enables the calculation of I/I quantity on an annual average, maximum monthly, maximum day, and peak hour basis. On an annual average basis the flow to the WWTF for the past five years was 3.19 MGD. Subtracting the base flow of 1.81 MGD results in annual average I/I of 1.38 MGD. Similar calculations were performed for maximum monthly and maximum daily I/I and the results are presented in Table 4-4. Peak hour I/I is calculated differently and is explained below.

The projected peak hour I/I cannot be based on just the base sanitary flow (1.81 MGD) because the short duration of the peak I/I flow (60-minutes) could theoretically occur during the same time as the diurnal peak base sanitary flow. Therefore, the base sanitary flow was increased by a peaking factor to determine the peak hour base sanitary flow, and this amount was subtracted from the historical wet month peak hour flow (12 MGD in May 2006) to estimate peak hour I/I flow.

The <u>Criteria for Sewage Works (Ecology, 2008)</u>, provides a formula to estimate the diurnal peaking factor:

$$PF = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where PF is the diurnal peaking factor (the ratio of daily peak hour flow to average annual flow), and P is the population in thousands. The 2010 population of 18,131 results in a diurnal peaking factor of 2.7. Therefore, the peak hour base flow is 4.9 MGD (2.7*1.81 MGD).

I/I per acre was determined based on current sewer mapping, which revealed 3,970 acres of existing sewered parcels. I/I per acre was calculated by dividing the I/I flow by the quantity of sewered acres. Dividing the annual average I/I of 1.38 MGD by 3,970 acres results in an annual average I/I per acre of 348 gpd. Similar calculations were performed for maximum monthly, maximum daily and peak hour flow and the results are also presented in Table 4-4.

Table 4-4 is a summary of I/I quantities based on the above analysis.

TABLE 4-4

Summary of I/I Quantities

Parameter	Average Flow	Maximum Month Flow	Max Day Flow	Peak Hour Flow
WWTF Flow, MGD(1)	3.19	4.63	6.78	12
Base Flow, MGD(2)	1.81	1.81	1.81	4.9 (8)
I/I, MGD(3)	1.38	2.82	4.97	7.1(9)
I/I ratio(4)	---	2.04	3.60	5.14
I/I per acre, gpd(5)	348	710	1,252	1,792
I/I per capita, gpd(6)	76	156	275	394
I/I %(7)	43%	61%	73%	59%

(1) Flow for from the years 2006-2010.
(2) Base sanitary flow = 122 gpd per * sewer ERUs, 14,843
(3) I/I = WWTF Flow - Base Flow
(4) I/I ratio = MMF:AAF; MDF:AAF; PHF:AAF
(5) I/I per acre = I/I / total existing sewered acres 3,970
(6) I/I per capita = I/I / average population sewered (18,042) during 2006-2010.
(7) I/I% = I/I / max month WWTF flow *100%
(8) PHF base = 1.81 MGD * 2.7 = 4.9 MGD
(9) PHF I/I = 12.0 MGD – (1.81 MGD * 2.7) = 7.1 MGD

PROJECTED FLOWS AND LOADINGS

Projected wastewater flows and loadings for the design year 2031 are based on historical flows and loadings per ERU and the population growth projections developed in Chapter 2. TCF must be considered separate from the residential, commercial, municipal and CWU customers due to the significant effect that TCF's BOD_5 loading has on the WWTF and because TCF's flow and loadings are not dependent on the City's population growth.

TWIN CITY FOODS

Twin City Foods (TCF) is a local frozen vegetable packing facility that is primarily a repack operation. A repack operation involves bringing already processed product into the facility in bulk and then repacking that product into consumer size packaging.

TCF is permitted by State Waste Discharge Permit No. ST-5507, which was issued in December 2006 and expires in January 2012. A copy of the permit is located in Appendix D. TCF operates a sprayfield treatment system in the summer and does not discharge to the Ellensburg WWTF during that period. The SWD permit includes sprayfield effluent limits and monitoring requirements. The permit allows TCF to discharge to the sprayfield April through October of each year.

TCF is allowed to discharge to the City's WWTF in the winter (November through March). The allowable limits for flow, BOD_5, TSS, and pH for discharge to the City and monitoring requirements are different than for the sprayfield and are established in the contract between the City of Ellensburg and TCF. The current contract was executed in 2001 and most recently amended in November 2010. The Contract is located in Appendix D of this report and states that surcharges are applied to TCF discharge concentrations over 750 mg/L for BOD_5 and 250 mg/L for TSS.

TCF samples their wastewater once a week at the discharge to the City sewer. The samples are analyzed at a local laboratory, Cascade Analytical Inc. in Yakima, and reported to the City for billing purposes.

The current contract amendment has discharge surcharge limits shown in Table 4-5.

TABLE 4-5

TCF Discharge Surcharge Limits per City Contract

Parameter	Average Monthly Limit
Total BOD_5	750 mg/L
TSS	250 mg/L
Chlorine	0.5 mg/L
Flow	100,000 gpd
pH	>5.5 and <9.0

Surcharges also apply to the discharge of ammonia. The contract amendment states that ammonia concentrations below 2.0 mg/L may be discharged to the City's WWTF upon notice to the City, and TCF effluent that contains ammonia above 2.0 mg/L may be discharged to the City's WWTF if this TCF ammonia load will not create an operational problem at the WWTF as determined by the City.

There are two different types of wastewater discharges from the TCF operation: pack water and defrost water. Pack water discharge originates from the repack operation, has significant BOD_5 loadings, and is subject to surcharges for high BOD_5 and TSS concentrations. Defrost water discharge is from the defrosting of the large warehouse freezers. Defrost water is discharged to the WWTF but is not subject to surcharges. Currently there is no sampling performed for TSS and there have been no surcharges applied to TCF for TSS.

Table 4-6 presents a summary of the TCF flows and BOD_5 concentrations for the period 2006 to 2010.

TABLE 4-6

Historical TCF Pack Water Discharge Flows and BOD_5 Concentrations, 2007-2010

Year	Avg. Ann. BOD_5 (mg/L)[(1)]	Max Avg. Month BOD_5 (mg/L)[(1)]	Avg. Ann. Pack Water (gal/month)	Avg. Ann. Pack Water (gpd)[(2)]	Max Avg. Month Pack Water (gal/month)	Max Avg. Month Pack Water (gpd)[(2)]
2007	679	1,350	598,833	29,942	708,000	35,400
2008	572	859	655,333	32,757	1,050,000	52,500
2009	502	760	858,333	42,917	1,160,000	58,000
2010	1,365	2,020	740,000	37,000	860,000	43,000
Average	**779**	**---**	**713,125**	**35,656**	**---**	
Max	**---**	**2,020**	**---**		**1,160,000**	**58,000**

(1) Only applies to the pack water.
(2) Based on discharging 20 days per month.

According to information from City staff, TCF generally operates 5 days per week and occasionally operates a second shift or additional shifts on the weekends. Based on operating 5 days per week and approximately 20 days per month, TCF's average annual discharge is 0.036 MGD and their average annual BOD_5 concentration is 780 mg/L.

The City does not anticipate TCF expanding operations. TCF has considered building winter storage lagoons and ceasing discharge to the City completely. However, for planning purposes it is assumed that TCF will continue to discharge to the City in the future. TCF's daily discharge is often well below the allotted contract amount. TCF is allowed to discharge up to 100,000 gpd to the City's WWTF by contract, and therefore it is assumed that the projected flow from TCF is 100,000 gpd on both an annual average and a maximum month basis.

As shown in Table 4-6, TCF's annual average concentration is above the surcharge limit of 750 mg/L for BOD_5. A review of the historical data shows that TCF consistently discharged wastewater with BOD_5 concentrations above 1,000 mg/L in 2010 with the exception of December when the discharge concentration was measured at 331 mg/L. If the 2010 data were excluded from the average calculation, the average BOD_5 concentration for the years 2007 through 2009 was 584 mg/L. Preliminary data for 2011 indicates that TCFs discharge average concentration is 770 mg/L BOD_5. It is unreasonable to calculate the average annual BOD_5 concentration based on one year where the average is nearly double all other years. It seems more reasonable that the average annual concentration be based on the surcharge limit of 750 mg/L, which appears to be consistent with the average discharge for most years.

TCF's maximum month average concentration for BOD_5 was 2,020 mg/L in 2010. Given the variability in TCF's data, it is more reasonable to base the maximum month concentration on the average of the three highest maximum average months in the past five years rather than a single data point. The three maximum average month concentration's (1,350, 859, and 2,020 mg/L) average 1,410 mg/L. This concentration will be used to determine maximum month BOD_5 discharges from TCF.

AVERAGE ANNUAL FLOW (AAF)

Average annual wastewater flow (AAF) is the average flow over a one-year period. This flow rate is used to estimate annual operation and maintenance costs for collection systems and treatment facilities, and is the basis for developing flow ratios used in collection and treatment system designs.

The following is the basic formula that will be used to determine the future annual average design flow to the WWTF:

Projected Flow = (Qty of ERU*Base Sanitary Flow ÷ ERU (122 gpd)) + Annual Average I/I+ Annual Average TCF Flow

As shown in Table 4-3, the 2031 wastewater ERUs are projected to be 21,207. Using this future ERU quantity and the base flow of 122 gpd/ERU, a future annual average design base sanitary flow of 2.59 MGD is projected.

As shown in Table 4-4, the existing annual average I/I per acre is estimated at 348 gpad for a service area of 3,970 acres, based on the estimated existing annual average I/I of 1.38 MGD. It is assumed that this amount of I/I from the existing sewer service area will remain constant in the future. It is also assumed that future annual average I/I for areas with new sewers will be approximately 50 percent of the existing I/I, or 174 gpad, since the new sewer materials and methods of construction should significantly reduce I/I. Based on information from City staff, the future area of development is approximately 1,322 acres. At 174 gpad and 1,322 acres, the future service area annual average I/I is projected to be 0.23 MGD. Therefore, projected future I/I is estimated as the existing and future service area annual average I/I and is 1.61 MGD (1.38 MGD +0.23 MGD)

Flow data from TCF indicates an average flow of 0.04 MGD. However, in the City's most recent agreement, TCF is allowed to discharge up to 100,000 gpd. Therefore, the average annual flow from TCF will be assumed at 100,000 gpd.

The total projected annual average flow for the year 2031 is then estimated to be 4.30 MGD (2.59 MGD + 1.61 MGD+0.1 MGD).

MAXIMUM MONTH FLOW (MMF)

The maximum month flow (MMF) is defined as the greatest single average monthly flow during the year. The individual average monthly flows and maximum daily flows for the previous five years are shown in Table 4-1. The maximum month flow is used to size most of the unit processes in a wastewater treatment facility, and is used as the critical flow in determining effluent limits for toxic substances (e.g., ammonia, chlorine, and heavy metals) on the basis of chronic toxicity for a surface water discharge. The maximum month flow is used by Ecology to establish the “permitted capacity” for the wastewater treatment facility. The permitted capacity is used to determine when 85 percent of the facility’s capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity.

The formula that will be used for projecting future maximum month flows is different than shown above for annual average flows. The future maximum month I/I component is be calculated based on the ratio between the existing maximum month I/I flow and the existing average I/I flow as shown in Table 4-4. For the maximum month I/I flow, this ratio is 2.04. As calculated above, the projected annual average I/I is 1.61 MGD; therefore, using a ratio of 2.04 for maximum month results in a projected maximum month I/I of 3.28 MGD. (2.04 * 1.61 MGD).

Due to its summer discharge to its own sprayfield, TCF does not contribute to the maximum month, maximum daily, or the peak hour flows at the Ellensburg WWTF. Maximum month, maximum day, and peak hour flows at the Ellensburg WWTF typically occur during May, June and July. During these months TCF is discharging to the sprayfield and not the City’s WWTF; therefore, TCF’s flow is not included in the design maximum month, maximum day, and peak hour flows.

The total projected maximum month flow for the year 2031 is calculated by adding the projected base sanitary annual average flow of 2.59 MGD to the projected maximum month I/I of 3.28 MGD, resulting in a total projected maximum month flow of 5.87 MGD.

MAXIMUM DAILY FLOW (MDF)

Maximum daily flow (MDF) is defined as the largest total flow over a 24-hour period occurring in a single year. The MDF is used to size processes that are affected by diurnal flow curves for proper performances (e.g. RAS pumps and equalization basins).

The formula that will be used for calculating maximum daily flow is similar to the formula used for the maximum month flow. The ratio of maximum daily I/I to annual average I/I is 3.60, resulting in a projected maximum daily I/I of 5.80 MGD (3.60 * 1.61 MGD).

The total projected maximum daily flow for the year 2031 is estimated by adding the projected base sanitary annual average flow of 2.59 MGD to the projected maximum day I/I of 5.80 MGD, resulting in a total projected maximum daily flow of 8.39 MGD. TCF flow is not included in this calculation, as discussed in the previous section.

PEAK HOUR FLOW (PHF)

Peak hourly flow (PHF) is the peak sustained flow rate occurring during a one-hour period in a single year. The peak hour flow is used for design of collection and interceptor sewers, pumping stations, piping, flow meters, and certain unit treatment processes such as grit chambers, disinfection systems, and sedimentation tanks.

The formula for calculating peak hour flow is similar to the formula used for maximum month flow. The ratio of peak hour I/I to annual average I/I per Table 4-4 is 5.14, resulting in a projected peak hour I/I of 8.28 MGD (5.14 * 1.61 MGD).

As previously explained, the diurnal peaking factor is used to calculate the base sanitary peak hour flow. Using the diurnal peaking factor of 2.7 and a base sanitary flow of 2.59 MGD results in a projected base sanitary peak hour flow of 7.0 MGD (2.7*2.59 MGD).

The total projected peak hour flow for the year 2031 is estimated to be 15.28 MGD (7.0 MGD + 8.28 MGD).

BOD_5 LOADING

The BOD_5 loading represents the number of pounds per day of oxygen-demanding material that enters the WWTF. BOD_5 loadings are used to design and size the WWTF biological treatment processes (i.e. activated sludge process) and BOD_5 loadings are used by Ecology to establish the "permitted capacity" for the WWTF. The permitted capacity is used to determine when 85 percent of the WWTF capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity. Because the permitted capacity applies to the maximum month, maximum month loadings are analyzed for design purposes. Annual average loading is important for determining biosolids production and operating costs and is also calculated. WWTF loadings for the years from 2006 to 2010 are shown in Table 4-2.

TCF is a significant contributor of BOD_5 to the WWTF. Due to the magnitude of TCF's BOD_5 loading on the WWTF, the base BOD_5 loading from TCF must be determined.

The average annual BOD_5 loading to the WWTF for the years 2006 through 2010 was 3,479 lbs/day. TCF's annual average BOD_5 discharge between 2006 and 2010 was 230 lbs/day. Subtracting the TCF average annual BOD_5 loading of 230 lbs/day from the total annual average BOD_5 loading to the WWTF results in a base average annual BOD_5 loading of 3,249 lbs/day. Dividing the base average annual loading by the average population for the period 2006 through 2010 (18,042) results in an average annual BOD_5 per capita loading of 0.18 lbs/day. Multiplying 0.18 lbs/day by the future design population of 26,351 results in a base average annual design BOD_5 loading of 4,743 lbs/d in the year 2031.

As previously stated, the average annual concentration of BOD_5 discharged from TCF will be assumed to be the surcharge limit of 750 mg/L. It is assumed that a discharge of concentrations up to 750 mg/L at the contracted maximum volume of 100,000 gpd could occur, resulting in a discharge of 625 lbs/day. Adding the loading attributed to TCF (625 lbs/day) to the base BOD_5 loading of 4,743 lbs/day results in a total projected average annual design BOD_5 loading of 5,370 lbs/day.

The maximum monthly BOD_5 loading to the WWTF for the years from 2006 through 2010 was 4,864 lbs/d. As estimated above, the maximum month concentration from TCF is assumed to be 1,410 mg/L at 100,000 gpd, or 1,175 lbs/day. Subtracting the TCF BOD_5 loading of 1,175 lbs/day results in a base maximum month BOD_5 loading of 3,689 lbs/day. Dividing the base maximum month average loading by the average population for this period (18,042) results in a maximum month average BOD_5 per capita loading of 0.2 lb/day. This value is the same as the typical per capita loading of 0.2 lbs/d found in the Criteria for Sewage Works, (Ecology 2008). Multiplying 0.20 lbs/d by the design population of 26,351, results in a base maximum monthly design BOD_5 loading of 5,270 lbs/d in the year 2031.

Adding the projected base maximum month BOD_5 loading of 5,270 lbs/day to the projected maximum month loading from TCF of 1,175 lbs/day results in a total projected maximum month BOD_5 of 6,445 lbs/day.

TSS LOADING

The TSS loading rate represents the number of pounds per day of suspended material that enters the WWTF. TSS loadings are used to design and size the biological treatment processes. In municipal wastewater, BOD_5 and TSS loadings are typically of similar magnitude. TSS loadings are used by Ecology to establish the "permitted capacity" for the WWTF. The permitted capacity is used to determine when 85 percent of the WWTF capacity has been reached, at which time Ecology requires the permittee to develop a formal plan to maintain adequate capacity. Because the permitted capacity applies to the maximum month, maximum month loadings are analyzed for design purposes. The maximum monthly loadings for the period 2006 to 2010 are shown in Table 4-2.

As stated earlier, TCF is a significant contributor of BOD_5 to the WWTF; however it is unknown if they are a significant contributor of TSS to the WWTF. The City does not require TCF to sample and report TSS in their discharge. Due to the lack of TCF data, the base TSS loading to the WWTF will be assumed to contain all TSS loadings to the WWTF.

The average annual TSS for the years 2006 to 2010 was 2,894 lbs/d, as shown in Table 4-2. Dividing by the average population for this period (18,042) results in an average annual TSS per capita loading of 0.16 lbs/d. Multiplying 0.16 lbs/d by the design population of 26,351, results in an average annual design TSS loading of 4,215 lbs/d in the year 2031.

The maximum monthly TSS for the years from 2006 to 2010 was 4,448 lbs/d, which occurred in June 2008. Dividing by the 2008 population of 18,138 results in a maximum monthly TSS per capita loading of 0.25 lbs/d. This value is higher than the typical per capita loading of 0.2 lb/d found in the Criteria for Sewage Works, (2008); which is typical of domestic sewage. Multiplying 0.25 lb/d by the design population of 26,351, results in a maximum month design TSS loading of 6,460 lb/d in the year 2031.

NITROGEN LOADING

Total nitrogen is comprised of organic nitrogen, ammonia, nitrite, and nitrate. Organic nitrogen is determined by the Kjeldahl method. Total Kjeldahl nitrogen (TKN) is the total of the organic and ammonia nitrogen. TKN loadings are used to design and size the ammonia and nitrogen removal processes at the facility.

Currently there are no measurements of influent TKN taken at the WWTF, but there are measurements for influent ammonia. Table 4-7 is a summary of the average annual and maximum monthly ammonia loading to the WWTF.

TABLE 4-7

Historical Ammonia Loading, 2006-2010 (1)

Year	Avg. Annual (lb/day)	Max Monthly (lb/day)
2006	401	482
2007	327	389
2008	394	639
2009	376	441
2010	421	543
Average Annual	**384**	**---**
Maximum Monthly	**---**	**639**

(1) From WWTF DMRs.

TCF does discharge some ammonia to the WWTF, however according to the City's records, typically the discharge concentrations are less than 1 mg/L. TCF did have one incident when they were servicing their compressors and discharged high levels of ammonia into the sewer system. Subsequent to this illegal discharge, Ecology took regulatory action towards TCF, and this event has not been repeated.

Despite the one high ammonia discharge incident, the effect of TCF's wastewater on the City's WWTF influent ammonia loading is minimal. Therefore, the nitrogen loading to the WWTF will be calculated based on the total historical ammonia load from all sources to the WWTF and will not be based on a separate base load from TCF.

Typical domestic wastewaters have an ammonia:TKN ratio of 5:6. This typical ratio will be used to project the design nitrogen load for the WWTF.

Applying the 5:6 ratio to the historical average annual ammonia loading yields an estimated average annual TKN loading of 461 lb/d or 0.026 lbs per person (based on the average population for the last five years, 18,042). Applying this ratio to the projected population of 26,351 results in a projected average annual TKN loading of 673 lbs/day.

Applying the 5:6 ratio to the historical maximum monthly ammonia loading yields an estimated maximum monthly TKN loading of 767 lb/d (maximum in 2008) or 0.042 lbs per person (population 2008, 18,135). Applying this ratio to the projected population of 26,351 results in a projected maximum monthly TKN loading of 1,107 lbs/day to the WWTF.

Another method to assist in verifying the calculations for projected TKN is to calculate the ratio of the projected BOD_5 loading to the projected TKN loading. Typical domestic wastewater has a BOD_5 to TKN ratio of 5:1. It is expected that the Ellensburg wastewater should have a similar ratio since the one large industrial source, TCF, does not discharge significant ammonia load. For this ratio calculation, the BOD_5 is the projected maximum month BOD_5 loading of 5,270 lbs/day. The ratio of projected maximum monthly base BOD_5 loading to the TKN loading (5,270/1,107) is 4.7, which is slightly more conservative than typical wastewater values. Therefore, a maximum monthly TKN loading of 1,107 lbs/day is a reasonable projection.

SUMMARY OF PROJECTED WASTEWATER FLOWS AND LOADINGS

A summary of the existing WWTF design criteria, the projected design criteria, and the recommended design criteria for the City of Ellensburg for the year 2031 is presented in Table 4-8. The existing design criteria were obtained from the City's NPDES permit.

The existing design maximum month flow, BOD_5 loading and TSS loading, as included in the NPDES permit, are greater than the 2031 projections shown in Table 4-8. The projected 2031 peak hour flow is projected to be slightly higher in the year 2031 than the existing design peak hour flow. The recommended design criteria for the 20-year planning period shown in Table 4-8 preserve the existing design loadings to provide reserve capacity for industrial and commercial growth. Since the existing design criteria do not include values for average annual flow, maximum day flow, average annual BOD_5, and average annual TSS, the recommended 2031 design criteria for these parameters were based on the ratio of average annual, or maximum day, to maximum month values in the projected design criteria. For example, the ratio of projected average annual flow (4.3 MGD) to the maximum month flow (5.87 MGD) is 0.73, therefore, the recommended average annual design flow is 0.73*8.0 = 5.86 MGD. This calculation was repeated to determine the recommended design maximum day flow, average annual BOD_5 loading and average annual TSS loading.

The NPDES permit does not contain existing design criteria for influent TKN loading. The projected design criteria for TKN was estimated using records of influent ammonia, as discussed above. First, the typical domestic ratio of ammonia: TKN of 5:6 was used to determine projected influent TKN loading in 2031. Next, the recommended design criteria for influent TKN loading was estimated using the design maximum month BOD_5 loading and the historical ratio of BOD_5 to TKN. However, the BOD_5 loading from TCF was subtracted from the projected design maximum month BOD_5 loading of 10,000 lbs/day because TCF does not significantly contribute TKN to the WWTF. Subtracting the TCF influent BOD_5 of 1,175 lbs/day from the existing influent BOD_5 design criteria of 10,000 lbs/day results in a base design maximum month influent BOD_5 loading of 8,825 lbs/day. The projected maximum month TKN loading of 1,107 lbs/day was then increased by the same ratio as the recommended base maximum month BOD_5 loading of 8,825 lbs/day to the projected base BOD_5 loading of 5,270 lbs/day, resulting in a recommended design maximum month TKN loading of 1,853 lbs/day (8,825/5,270 * 1,107 = 1,853 lbs/day). The recommended design average annual TKN loading is proportional to the recommended maximum month TKN loading by the same ratio as for the projected 2031 criteria.

It is recommended that any improvements identified in Chapter 5 be designed to provide a capacity equal to or greater than the design capacity in the NPDES permit. This approach will allow capacity for future commercial and industrial growth.

TABLE 4-8

Existing, Projected and Recommended
Design Criteria, Year 2031 (1)

Flow Criteria	Existing NPDES Permit Design Criteria	Projected 2031 Design Criteria	Recommended 2031 Design Criteria
Average Annual Flow (MGD)	NR	4.30	5.86
Maximum Month Flow (MGD)	8.0	5.87	8.0
Maximum Day Flow (MGD)	NR	8.39	11.43
Peak Hour Flow (MGD)	15.0	15.28	15.28
Loading Criteria	**Existing NPDES Permit Design Criteria**	**Projected Design Criteria**	**Recommended 2031 Design Criteria**
Annual Average BOD_5 Loading (lb/d)	NR	5,370	8,332
Maximum Month BOD_5 Loading (lb/d)	10,000	6,445	10,000
Annual Average TSS Loading (lb/d)	NR	4,215	5,220
Maximum Month TSS Loading (lb/d)	8,000	6,460	8,000
Average Annual TKN Loading (lb/d)	NR	673	1,139
Maximum Month TKN Loading (lb/d)	NR	1,107	1,853
Design Population	31,000	26,351	31,000

(1) Includes TCF flows and loadings.

CHAPTER 5

WWTF EVALUATION

CHAPTER 5

WWTF EVALUATION

GENERAL

The purpose of this chapter is to evaluate the existing WWTF with respect to capacity, reliability and redundancy, and to identify improvements to the WWTF to accommodate the design criteria as outlined in Chapter 4.

The City of Ellensburg owns and operates the wastewater treatment facilities that serve the sewer service area. The liquid treatment facilities include grit removal, screening, aeration basins, secondary clarifiers, UV disinfection system, and an outfall to the Yakima River. The solids treatment facilities include anaerobic digesters, gravity belt thickener, sludge storage lagoon, and sludge drying beds.

PROJECTED WASTEWATER FLOWS AND LOADINGS

Projected flows and loadings were developed in Chapter 4. The design maximum month flow, BOD_5 loading and TSS loading in the City's NPDES permit are greater than the 2031 projections shown in Table 4-8. The projected peak hour flow is projected to be slightly higher, in the year 2031, than the peak hour design flow in the NPDES permit.

The recommended design criteria provide a capacity equal to or greater than the existing design capacity in the NPDES permit. Any improvements recommended in this chapter will provide the capacity to meet the recommended design criteria. This approach will allow capacity for future commercial and industrial growth. Table 5-1 presents a summary of the design flows and loadings for the year 2031, the existing design criteria as found in the NPDES permit, the projected design flows and loadings for the year 2031, and the recommended design criteria for year 2031.

TABLE 5-1

Existing, Projected and Recommended Design Criteria, Year 2031(1)

Flow Criteria	Existing NPDES Permit Design Criteria	Projected 2031 Design Criteria	Recommended 2031 Design Criteria
Average Annual Flow (MGD)	NR	4.30	5.86
Maximum Month Flow (MGD)	8.0	5.87	8.0
Maximum Day Flow (MGD)	NR	8.39	11.43
Peak Hour Flow (MGD)	15.0	15.28	15.28
Loading Criteria	**Existing NPDES Permit Design Criteria**	**Projected 2031 Design Criteria**	**Recommended 2031 Design Criteria**
Annual Average BOD_5 Loading (lb/d)	NR	5,370	8,332
Maximum Month BOD_5 Loading (lb/d)	10,000	6,445	10,000
Annual Average TSS Loading (lb/d)	NR	4,215	5,220
Maximum Month TSS Loading (lb/d)	8,000	6,460	8,000
Average Annual TKN Loading (lb/d)	NR	673	1,139
Maximum Month TKN Loading (lb/d)	NR	1,107	1,853
Design Population	31,000	26,351	31,000

FUTURE PERMIT LIMITS

The City's current NPDES permit was issued in 2011 and will expire in 2016. At present the permit effluent limits for pH, BOD_5, and TSS are technology-based limits. Since the Yakima River is considered a primary contact recreation river, the fecal coliform effluent limit is based on limits in WAC 173-201A. The City's permit also has an effluent limit for ammonia; however, based on information in the NPDES Permit Fact Sheet, the basis for this limit is unknown. The ammonia limit is discussed further in this section.

An outfall mixing zone is defined as the area in the receiving water surrounding the discharge where wastewater mixes with receiving water. Within the mixing zone the pollutant concentration may exceed water quality numeric standards as long as the concentration does not interfere with the designated uses of the receiving water. The pollutant concentration outside of the mixing zone must meet water quality standards. For this report, a mixing zone study was performed to meet the requirements of 173-240-060 for an Engineering Report. The study and spreadsheets used in this analysis are provided in Appendix F. The mixing zone analysis establishes the chronic and acute dilution factors and evaluates the potential for pollutants to exceed water quality standards based on the projected effluent flows and loadings to the river.

The mixing zone study evaluated the potential to exceed water quality standards for pH, dissolved oxygen, ammonia and metals. The study used plant effluent and river water quality data from the City's NPDES Permit Fact Sheet and data collected at the WWTF. The mixing zone analysis did not find any potential to exceed water quality standards for pH, dissolved oxygen, ammonia or metals.

The City has a maximum daily effluent limit of 8.2 mg/L for ammonia. The existing NPDES Permit No. WA-002334-1 states:

> "The maximum daily effluent limit of 8.2 mg/L was established in the 1996 permit (see p.14 of the 1996 Fact Sheet). The Fact Sheet does not contain calculations, nor any further documentation, or how the limit was derived. This limit is retained in the proposed permit because the increased dilution factors established in the current permit results in a higher limit, which would constitute backsliding, contrary to State and Federal regulations."

The highest recorded ammonia nitrogen concentration in the WWTF effluent was 54.6 mg/L, which occurred in February 2009 when Twin City Foods drained its compressor system improperly. The next highest recorded ammonia concentration was 11.6 mg/L (in 2010), based on approximately 780 samples from five years of data (2005-2010). It is reasonable to discount the 54.6 mg/L sample as an outlier in the dataset as it represents a concentration more than 4.5 times the next highest recorded concentration and represents a one-time event due to an improper industrial discharge.

Even though no ammonia limit is necessary because the mixing zone study determined that there is no reasonable potential to exceed water quality standards for ammonia in the river, an effluent concentration that would result in the need for a limit was calculated based on future design flows and the most conservative effluent dilution acute and chronic dilution factors. Using the current sampling schedule of 151 effluent ammonia samples (approximately 13 samples per month for one year) as a basis for a dataset, an effluent limit would be triggered when the maximum effluent ammonia concentration is 35.8 mg/L. Since this concentration is significantly greater than historical discharge concentrations, it is recommended that the City request that Ecology remove the current ammonia limit from the permit.

Ecology has the ability to use their discretion in applying anti-backsliding restrictions for the effluent ammonia limits. Accepting the revised data and reasonable potential calculations as "new information" should allow Ecology to rescind or increase the permit limits for ammonia without backsliding, as noted in 40 CFR 122.62(a)(2).

The future permit limits for all pollutants are expected to be the same as the existing permit unless the City is successful in having Ecology remove the ammonia limit from its permit. The WWTF analysis presented below will be based on the existing permit effluent limits, including the existing ammonia limit, in the event that the ammonia limit is not removed from the permit. The projected future permit limits are presented in Table 5-2.

TABLE 5-2

Projected Future NPDES Permit Limits[1]

Parameter	Average Monthly	Average Weekly
Biochemical Oxygen Demand (5-day), BOD_5	30 mg/L; 1,500 lbs/day 85% removal	45 mg/L; 2,250 lbs/day
Total Suspended Solids (TSS)	30 mg/L; 1,200 lbs/day 85% removal	45 mg/L; 1,800 lbs/day
Fecal Coliform Bacteria	100/100 mL	200/100 mL
pH	Between 6.0 and 9.0 at all times	
Parameter	**Average Monthly**	**Maximum Daily**
Total Ammonia	N/A	8.2 mg/L; 547 lbs/day

(1) The projected future NPDES permit limits are equal to the existing permit limits.

Table 5-2 shows that the projected average monthly limit for BOD_5 is a concentration of 30 mg/L, or 1,500 lb/day, which is 15 percent of the influent BOD_5 loading (10,000 lb/day) and is the more stringent limit. Similarly, a projected average monthly limit for TSS is a concentration of 30 mg/L, or 1,200 lb/day, which is 15 percent of the influent TSS loading (8,000 lb/day) and is the more stringent limit. An average monthly effluent limit of 1,500 lbs/day results in an effluent BOD_5 concentration of 22 mg/L at the design flow of 8.0 MGD, and an average monthly TSS limit of 1,200 lbs/day results in an effluent TSS concentration of 17 mg/L.

EXISTING OPERATION

The Ellensburg Wastewater Treatment Facility utilizes the extended aeration activated sludge process to provide secondary treatment of wastewater. Raw wastewater from the 42-inch interceptor sewer enters the influent pump station. From the influent pump station wet well wastewater is pumped to the plant headworks. In the plant headworks the wastewater is degritted and screened to remove large particles that could damage downstream equipment. Grit and screenings are deposited in containers for off-site disposal at a sanitary landfill.

The screened and degritted wastewater enters the two aeration basins. Floating mechanical aerators provide air and mixing for the activated sludge process. Effluent from the aeration basin flows to the two secondary clarifiers where the activated sludge biomass is separated from the plant effluent. Secondary effluent receives disinfection by ultraviolet light prior to discharge to the Yakima River.

The solids that are wasted from the activated sludge process are thickened in either a dissolved air flotation thickener or a gravity belt thickener. Waste sludge is stabilized in the anaerobic digesters and stored in lagoons until it can be pumped to drying beds. The dried biosolids are stockpiled and subsequently hauled off site for beneficial reuse by land application.

A site plan, hydraulic profile and a process flow diagram are provided as Figures 5-1, 5-2 and 5-3, respectively.

WASTEWATER TREATMENT FACILITIES

INFLUENT PUMP STATION

Process Description
The influent pump station receives wastewater from a 42-inch concrete pipe gravity sewer line. The influent pump station consists of a below grade 26-foot diameter circular reinforced concrete wet well and dry well. The wet well is a section of the circular structure partitioned off from the dry well by a one-foot thick reinforced concrete wall. The above ground structure consists of a block building that houses the pump controls, electrical equipment and the standby generator for the WWTF.

Raw wastewater enters the influent pump station wet well and is pumped to the grit chamber by one or more of the three centrifugal pumps. Control of the pumps is automatic and utilizes an air bubbler level sensing system to measure wet well levels. Two of the pumps are equipped with 100-hp variable speed drives, and the system controls are designed to match the operating pump output with the influent flow rate of the wastewater entering the wet well. Controlling the pumps in this manner minimizes pump starts and reduces surges into the treatment facility. The third pump is a 60-hp variable speed pump. The smaller pump is utilized when flows are at a minimum.

Design criteria for the influent pump station are provided below.

Influent Pump Station	
Pumps	
Quantity	3
Type	vertical, non clog, centrifugal
Capacity Pumps No. 1 & 2 (each)	7,150 gpm, 34 feet TDH
Year Installed	2005
Motor	100 hp
Speed Control	VFD
Capacity Pump No. 3	4,550 gpm, 35 feet TDH
Year Installed	1972 (rebuilt 2005)
Motor	60 hp
Speed Control	VFD

Influent pumps No. 1 and 2 have a capacity of 7,150 gpm each at 35 feet TDH, and pump No. 3 has a capacity of 4,550 gpm at 34 feet TDH. The peak hour flow to the WWTF is projected to be 15.3 MGD, or 10,625 gpm. Criteria for Sewage Works Design (Ecology, 2008) requires pump stations to be capable of pumping PHF with the largest pump out of service. An analysis of the pump curves and system head shows that with one of the larger pumps out of service and pump No. 3 in service, the pump station has a capacity of 10,840 gpm. Therefore, the pump station has the capacity to pump the peak hour flow.

Presently, only pump No. 2 and pump No. 3 are connected to the generator. Criteria for Sewage Works Design (Ecology 2008) requires that, the backup power for the pump station shall be sufficient to operate all vital components during peak wastewater flows. Since the larger pumps are vital to the WWTF, backup power is required for both pump No. 1 and No. 2.

The pump station has sufficient capacity for the 20-year planning period but does not meet the Ecology requirements for reliability and redundancy. It is recommended that standby power be provided to all three influent pumps when the plant electrical system is upgraded.

The smaller influent pump was installed in 1972 and rebuilt in 2005. The pump is nearly 40-years old; however, WWTF staff believes the pump is sufficient for the 20-year planning period due to the most recent rebuild. The larger pumps were installed in 2005 and are adequate for the 20-year planning period.

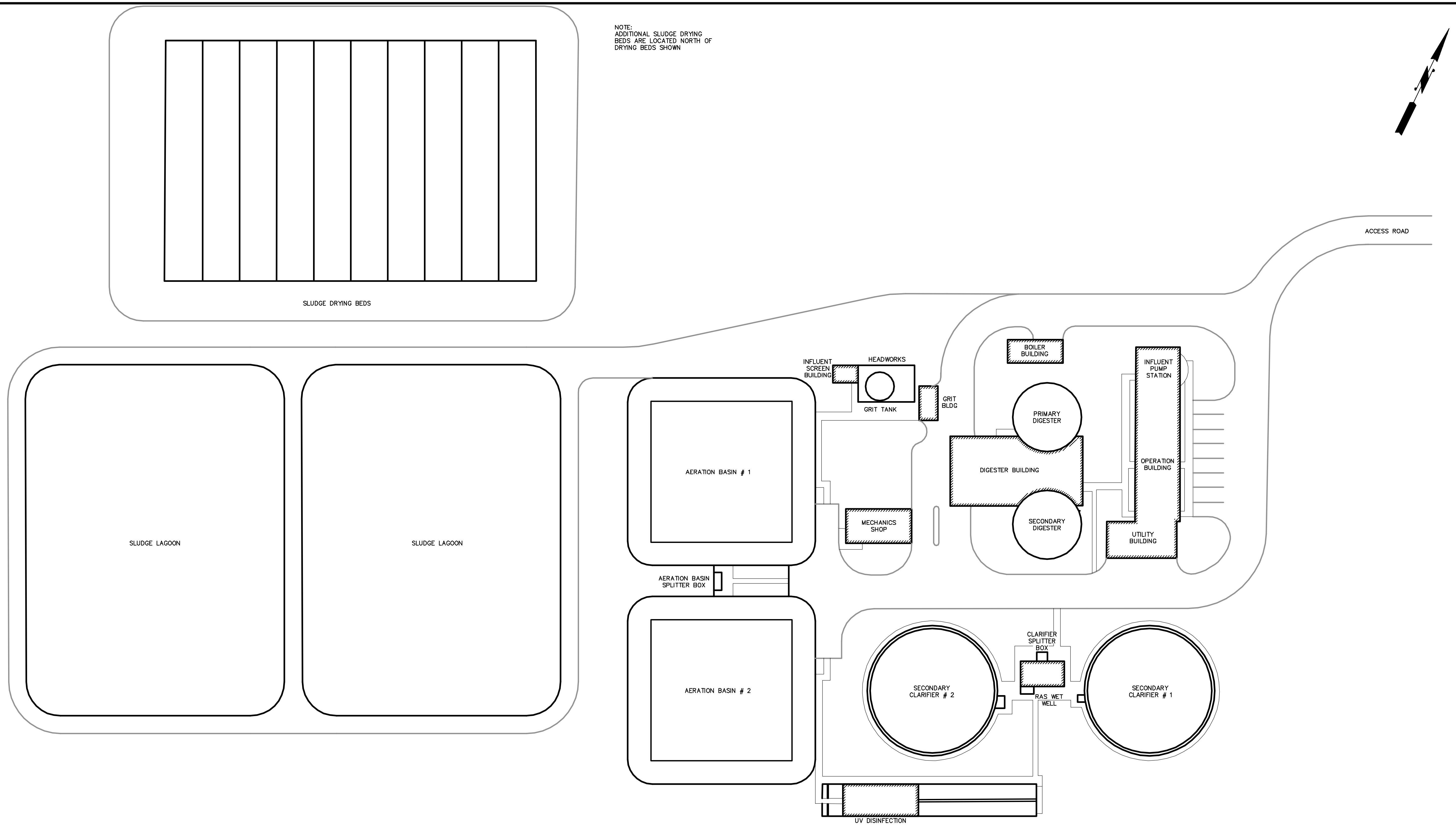
The current ventilation system at the influent pump station building does not meet the requirements of National Fire Protection Associations Standard 820 (NFPA 820), Standards for Fire Protection in Wastewater Treatment and Collection Facilities. The drywell is a classified space and is connected to the electrical room. According to NFPA this classification would require all electrical equipment to be rated explosion proof. To keep the drywell and the electrical space as unclassified (not rated explosion proof), the drywell must be ventilated at six air changes per hour. The current ventilation system does not meet this requirement. It is recommended that a new ventilation system be installed when the pump station is upgraded.

GRIT REMOVAL

Process Description

Raw wastewater arrives from the collection system containing sand, rocks, and other heavy inert solid materials, which are classified as grit. The primary reason for removing grit is to prevent excessive wear on the pumps and other downstream process equipment. Grit will also settle and accumulate in the aeration basin and digesters over time, reducing operational capacity.

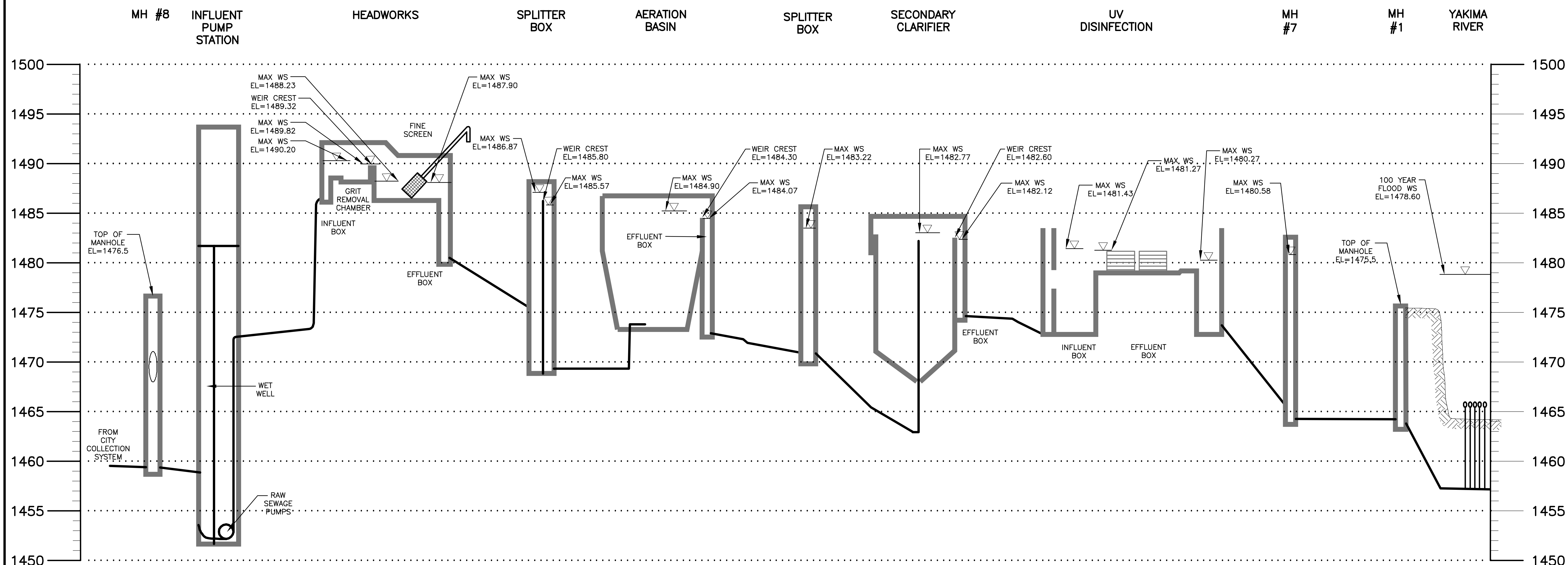
Grit removal at the Ellensburg WWTF is accomplished by a detritus tank. A detritus tank is a constant-level, short-detention settling tank. The tank is a circular shallow tank with a rotating scraper mechanism. As the grit settles the mechanism scrapes the grit toward the grit auger. A detritus tank is one of the earliest grit chambers developed and has a tendency to settle out heavy organics as well as grit. A double screw conveyor (grit washer) with water sprays is used to separate and remove inorganic grit and other readily settable material for disposal.



CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 5-1
EXISTING SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 5-1

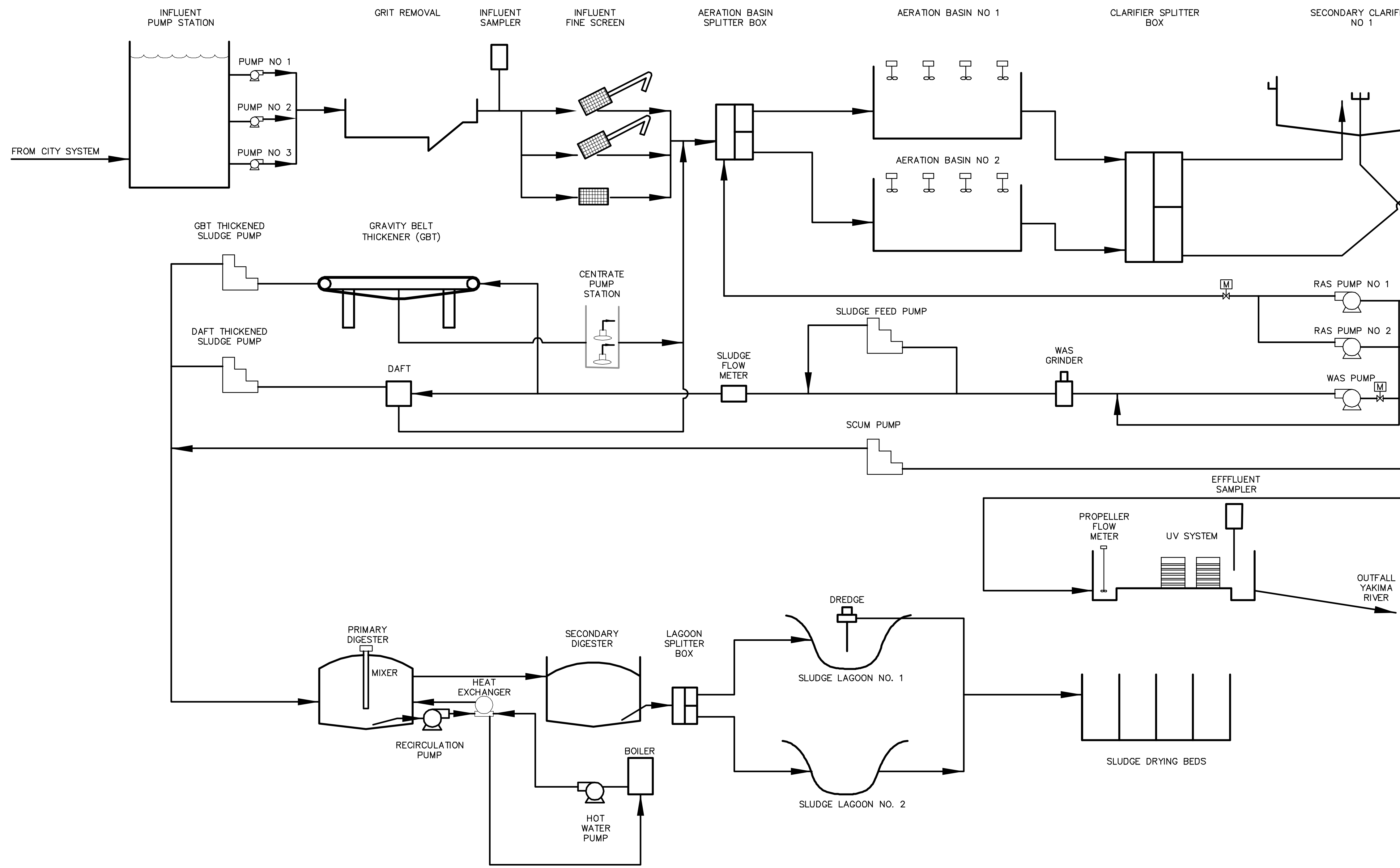


HYDRAULIC PROFILE

SCALE: NTS (H), 1"=10 (V)

CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 5-2
HYDRAULIC PROFILE

Gray & Osborne, Inc.
CONSULTING ENGINEERS



CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 5–3
PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 5–3

Design criteria for the grit removal system are provided below.

Grit Removal	
Grit Chamber	
Quantity	1
Dimensions	20 feet diameter, 1.5 feet SWD
Surface area	314 ft^2
Surface Overflow at MMF, 8.0 MGD	25,500 gpd/ft^2
Surface Overflow at PHF, 15.2 MGD	48,500 gpd/ft^2
Motor	1 hp
Year Installed	1972
Grit Auger	
Quantity	1
Type	double screw
Year Installed	1972

Detritus tanks are sized on an overflow rate basis governed by the grit particle size and density. Design considerations for tank depth selection include minimizing horizontal velocity and turbulence while maintaining a short detention time. Detention times in these tanks are typically less than one minute.

According to Manual of Practice No. 8, (WEF, 1998), to remove 65 mesh grit, a theoretical overflow rate of 46,300 gpd/ft^2 is desired. Based on the design criteria above, the detritus tank is slightly deficient in capacity for the peak hour flow. With this type of grit removal, a tank that is slightly too small will result in slightly lower grit removal performance but less organic solids capture, which is desired. One of the disadvantages of this type of grit removal is that at low flows, or if the tank is too large, significant quantities of organic material tend to settle with the grit. It is important that the grit washing is sufficient and organic material is minimized to allow the grit to be disposed of at a landfill.

According to Wastewater Engineering (Metcalf & Eddy, 2003), average daily grit quantities typically range from 0.53-5 ft^3 per million gallon of domestic wastewater. Grit quantities vary greatly due to the type of sewer system and the condition of the sewers. As show in Table 4-1, the current annual average flow at the Ellensburg WWTF is approximately 3.0 MGD, which should generate an estimate grit quantity of 1.59 to 15 ft^3 per day per typical production rates. WWTF staff stated that approximately 36 ft^3 of grit material is removed from the WWTF per week, or 5 ft^3 per day. During high flow periods, the dumpsters are filled with grit daily. It appears that the grit system removes a typical quantity of grit for the flow treated. The City recently emptied the primary digester and did not find an appreciable amount of grit, which further demonstrates that the detritus tank sufficiently removes influent grit at existing conditions.
The grit system is nearly 40-years old and is considered to be beyond the normal useful life for this equipment. However, staff has noted that the system is easy to operate and maintain, and therefore, staff would like the system retained. It is recommended that the

grit removal system be retained, however; it is recommended that the City plan to rebuild the grit removal mechanism within the 20-year planning period. The rebuild would include repainting the mechanism and replacing parts as needed.

INFLUENT FLOW METER

Currently there is no influent flow meter at the WWTF. Accurate flow measurement is necessary to ensure that monitoring requirements of the NPDES permit are met. Currently the City's permit requires only effluent flow measurement. However, influent flow measurement is recommended to assist in process control (DO control, RAS control) and to provide a historical record of influent flow characteristics. WWTF flows attenuate through the WWTF and therefore an effluent flow meter is not as accurate as an influent flow meter for process control. It is recommended that a new influent flow meter be installed at the influent pump station upstream of the aeration basin.

HEADWORKS SCREENS

Process Description

Influent wastewater flows from the grit chamber to two wedge-wire basket fine screens. The function of the fine screens is to screen plastics, rags, and other debris larger than 1/4 –inch in diameter that are present in the wastewater. There are two mechanical fine screens and a manual bypass bar screen, which is used if the mechanical fine screens are out of service or cannot pass all the influent flow. The mechanical screen is used to screen, convey, and dewater screenings carried in the wastewater flow stream. The dewatered screenings are then discharged into a receptacle for landfill disposal.

The mechanical screen operates based upon water level. During normal operation, screenings collect on the face of the screen, blinding the openings and raising the upstream water level. When the level upstream of the screen reaches a specified level, the screen automatically turns on, and the captured solids are collected by a scraper device and transported up the tube where they are compacted, washed and dewatered by an auger conveyor with water sprays. Free water drains through the perforated drainage area in the press zone and is captured in the drain housing. The drain water returns to the channel, while the solids are transported out the screen discharge and collected in a dumpster.

Design criteria for the headworks screens are provided below.

Headworks Screen	
Automated Fine Screen	
Quantity	2
Type	Perforate plate, spiral
Screen Opening Size	0.25 inches
Clean Screen Headloss	6 inches
Capacity, each	7.5 MGD
Motor	2 hp
Year Installed	1996
Manual Bar Screen	
Quantity	1
Opening Size	1-1/4-inch
Year Installed	1996

The peak hydraulic capacity with both screens in service is 15.0 MGD. The influent screens have sufficient capacity to accommodate all flows projected throughout the 20-year planning period except the very highest short-duration peak flow. In the event that the fine screens become overloaded, fail, or plug, the influent will overflow the stop gates and proceed to the manual bar screen channel. It is not expected that the short period of overflows will present operational problems downstream. The manual bar screen will provide some protection from large debris entering the aeration basin. City staff has noted that the biosolids are clean; which indicates good screening performance, and they believe that the screens are sufficiently removing debris from the influent wastewater.

The fine screens are 15-years old, are slightly undersized, and will be beyond their useful life within the 20-year planning period. The City is planning to replace the baskets of the screens in 2012 due to holes that have recently developed. It is recommended that the City plan to replace the fine screens within the 20-year planning period.

INFLUENT SAMPLING

The influent sampler is located at the fine screen building. The sampler is an automatic, refrigerated composite sampler operated daily. The sampler can be programmed to collect samples based on flow or time. Flow-paced sampling provides the most accurate sampling. The influent sampler is currently flow paced using a flow signal from the effluent flow meter. It is recommended that in the future the sampler should be flow paced from a new influent flow meter.

AERATION BASIN

Process Description

Flow from the plant headworks enters the aeration basin splitter box where it mixes with return sludge from the secondary clarifiers, is split over weirs, and then enters each of the two concrete-lined aeration basins through pipes that extend to the center. At the end of each pipe, there is a 4-point diffuser that extends in an "X" pattern from the center inlet point into the basins. In the aeration basins the microorganisms in the activated sludge utilize the raw waste as a food source. These microorganisms require four essentials for life: food, nutrients, water, and oxygen. Food, nutrients, and water are supplied by the influent. Oxygen is supplied from the air and is transferred to the biological mass by means of floating mechanical surface aerators in the aeration basins.

The plant utilizes a complete mix activated sludge system, where all of the raw incoming waste is mixed throughout the entire volume of the aeration basin as quickly as possible. This creates a nearly homogeneous condition in the aeration basin so that the oxygen required for treatment is the same in all portions of the aeration basin. This results in uniform oxygen transfer efficiency. Adverse effects due to slug organic and hydraulic loads are minimized because the incoming wastes are distributed throughout the entire volume of the aeration basin.

Each aeration basin effluent discharges over a weir into a 30-inch diameter pipe and the flows from each basin combine to flow together through a 42-inch diameter pipe to the secondary clarifier splitter box. The overflow weir in each outlet box controls the water level in the aeration basin. Most of the incoming waste organic matter is consumed in the growth of new organisms. The organisms that grow in the aeration basin flocculate into settleable masses that are removed by the secondary clarifier.

Design criteria for the aeration basins are provided below.

Aeration Basin	
Aeration Basin Structure	
Quantity	2
Dimensions	129 feet L x 129 feet W x12 feet SWD (floors are sloped at outer edges)
Volume, each	1.25 MG
HRT@ AAF, 4.30 MGD	14 hours
HRT@ MMF, 8.0 MGD	7.5 hours
Year Constructed	1972
Aerators	
Quantity	8 (4 each basin)
Type	Mechanical Surface
Motor	50 hp
Year Installed	2 Aerators replaced in 1999, 2 Aerators replaced in 2000, 2 Aerators replaced in 2001, 2 Aerators replaced in 2002

Aeration basin capacity requirements are dependent on three major design criteria. These criteria are solids retention time (SRT), net heterotrophic and autotrophic yields, and design mixed liquor suspended solids (MLSS) concentration. SRT is the criteria of greatest importance for nitrification. The City's permit effluent limits include a limit for ammonia and therefore nitrification is required. The net specific growth rate of the nitrifying biomass is an order of magnitude lower than that of carbon oxidizing bacteria and is therefore used as the basis for determining the SRT of the aeration basin. Also, the SRT used to calculate the required value for nitrification must be the aerobic SRT since nitrification only occurs under aerobic conditions. Calculation of the required design SRT for the Ellensburg WWTF is provided below.

<u>SRT Calculation</u>

The first step in determining the required design SRT is to calculate the maximum specific nitrifier growth rate ($\mu_{n,m}$), decay rate (k_{dn}), and ammonia half saturation coefficient (K_N) using the following equations. The winter design temperature of 10 ºC is based on historical WWTF records.

$$\mu_{n,m,10} = (\mu_{n,m}) \text{ x } (\theta^{t-20}) = (0.75/\text{d}) \text{ x } (1.072^{10-20}) = 0.374/\text{day}$$

$$k_{dn,10} = (k_{dn}) \text{ x } (\theta^{t-20}) = (0.08 \text{ mg/L}) \text{ x } (1.029^{10-20}) = 0.06/\text{day}$$

$$K_{N,10} = (K_N) \text{ x } (\theta^{t-20}) = (0.74 \text{ mg/L}) \text{ x } (1.053^{10-20}) = 0.44/\text{day}$$

$$k_{d,10} = (k_{n,max})(\theta^{t-20}) = (0.12/\text{d}) \text{ x } (1.04^{10-20}) = 0.081/\text{day}$$

The numerical values for the kinetic parameters above are typical for domestic wastewater.

Presently, the City is required by the NPDES permit to meet a maximum daily effluent ammonia concentration of 8.2 mg/L; to be conservative and provide a factor of safety, the design effluent ammonia concentration is assumed to be 5 mg/L. For the following calculations, a dissolved oxygen concentration (DO) of 2.0 mg/L and an oxygen half saturation coefficient (K_O) of 0.5 mg/L are used. The design nitrifier growth rate is calculated as follows:

$$\mu_n = (\mu_{n,m,10})\left(\frac{N}{K_N + N}\right)\left(\frac{DO}{K_O + DO}\right) - k_{dn,10} = (0.374/\text{d})\left(\frac{5.0}{0.44 + 5.0}\right)\left(\frac{2.0}{0.5 + 2.0}\right) - 0.06/\text{d}$$

This equation yields a net specific nitrifier growth rate of 0.215/d, which is then used to calculate the required SRT using the following equation:

$$\text{SRT} = 1/\mu_n = 4.7 \text{ days}$$

Applying a safety/peaking factor of 1.5 to this value, to account for daily fluctuations in ammonia loading, produces a required aeration basin SRT of 7 days.

In order to calculate the aerobic mass required for the design SRT, the net sludge production for the treatment system must first be estimated. Assuming a cell yield of 0.4

lb VSS/lb biodegradeable COD (bCOD), an influent wastewater and biomass VSS/TSS ratio of 0.85, and a design temperature of 10 ºC, the total sludge production can be determined using the following equation:

$$P_X = \left[\frac{(Y)(S-S_0)}{(1+(k_{d,t})(SRT))0.85}\right] + \left[\frac{(f_d)(k_d)(Y)(S-S_0)(SRT)}{(1+(k_{d,t})(SRT))0.85}\right] + \left[\frac{(Y_n)(NO_x)}{(1+(k_{dn,t})(SRT))0.85}\right] + X_{iVSS} + X_{iTSS}$$

Where:

P_X	= mass of waste activated sludge per day, lb/d (to be determined)
Y	= heterotrophic cell yield = 0.40 lb/lb bCOD (from above)
Y_n	= autotrophic cell yield = 0.12 lb/lb TKN (typical for domestic wastewater)
S	= mass influent bCOD, taken as 1.6 x influent BOD_5 = 16,000 lb/d (240 mg/L at 8.0 MGD)
S_0	= mass of effluent bCOD, taken as 1.6 x effluent $sBOD_5$ = 1,068 lb/d (10 mg/L at 8.0 MGD))
f_d	= fraction of cell mass remaining as cell debris = 0.15 lb/lb (typical for domestic wastewater)
$k_{d,t}$	= 0.081/d (from above)
$k_{dn,t}$	= 0.060 mg/L (from above)
SRT	= solids retention time = 7 days (from above)
X_{iVSS}	= volatile nonbiodegradable solids, volatile suspended solids (VSS) assumed as 85-percent TSS, volatile non biodegradable solids assumed as 40-percent VSS, 0.4 x 0.85 x influent TSS = 2,720 lb/d
X_{iTSS}	= influent nonvolatile suspended solids, assumed as 0.15 x influent TSS = 1,200 lb/d
t	= influent temperature = 10 ºC
NO_x	= amount of influent TKN oxidized to nitrate, assumed as 50 percent of the influent TKN, 0.5 x 1,853 = 927 lb/d

The sludge production can then be calculated as follows:

$$P_X = \left[\frac{(0.4)(16{,}000-1{,}068)}{(1+(0.081)(7))0.85}\right] + \left[\frac{(0.15)(0.081)(0.4)(16{,}000-1{,}068)(7)}{(1+(0.081)(7))0.85}\right]$$
$$+\left[\frac{(0.12)(927)}{(1+(0.06)(7))0.85}\right] + 2{,}720 + 1{,}200 = 9{,}011 \text{ lb/d}$$

This equation yields a total estimated waste sludge production of 9,011 lb/d. At the design SRT of 7 days, this waste sludge production results in a required total aerobic mass of 62,900 lbs. With a known aeration basin volume of 2,500,000 gallons, the required MLSS concentration is calculated to be 3,014 mg/L. It is therefore determined that if the aeration basin is operated at a mixed liquor suspended solids concentration of approximately 3,000 mg/L, the basin will operate at the desired aerobic mass and design SRT.

Aeration Requirements

To biologically oxidize the BOD_5 in the wastewater into bacteria and harmless end products, oxygen must be continuously added to the aeration basin. The required amount of oxygen consists of a carbonaceous oxygen demand and a nitrogenous oxygen demand.

The carbonaceous oxygen demand is calculated as follows:

$$Carbonaceous\,O_2 Demand = S - S_o - 1.42(P_{xbio})$$

Where:

- S = mass influent bCOD, 16,000 lb/d (from above)
- S_o = mass effluent bCOD, 1,068 lb/d (from above)
- P_{xbio} = biodegradable biological mass, 0.85(P_X- X_{iVSS} - X_{iTSS}) = 0.85(9,011 lb/d – 2,720 lb/d -1,200 lb/d) (P_X, X_{iVSS}, X_{iTSS} from above) = 4,328 lb/d

Therefore, the carbonaceous oxygen demand is 9,186 lb/d. The nitrogenous oxygen demand is calculated by first calculating the amount of nitrogen oxidized to nitrate:

$$Nitrogenous\,O_2 Demand = 4.33(TKN - NH_4 - 0.12(P_{xbio}))$$

Where:

- TKN = influent TKN, 1,853 lb/d (from above)
- NH_4 = effluent ammonia, 334 lb/d (assumed 5 mg/L concentration)
- P_{xbio} = 4,328 lb/d (from above)

Therefore, the nitrogenous oxygen demand is 4,330 lb/d. Therefore, the total oxygen demand is 13,516 lb/d, as determined below.

Total O_2 demand = Carbonaceous O_2 demand + Nitrogenous O_2 demand
= 9,186 lb/d + 4,330 lb/d = 13,516 lb/d

Applying a safety factor of 1.3 to account for fluctuations in diurnal loads, results in a design oxygen demand of 17,571 lb/d.

Oxygenation equipment is specified based upon standard oxygen transfer rate (SOTR), the oxygen transfer rate in clean, 20°C water with no suspended solids. The SOTR is calculated as follows:

$$AOTR = SOTR\left(\frac{\beta C_{S20} - C_O}{C_{S20}}\right)\left(1.024^{T-20}\right)\alpha$$

Where:

a	= oxygen transfer correction factor, 0.65 (typical for this treatment process)
b	= salinity surface tension factor, 0.95
C_{S20}	= dissolved oxygen concentration at 20 ^oC and 1 atm, 9.08 mg/L
C_O	= operating dissolved oxygen concentration, 2 mg/L
T	= 20 ^oC

The resulting SOTR is therefore 37,043 lb/d or 1,543 lb/hr.

There are eight 50-hp surface aerators in the aeration basin. According to the manufacturer, the aerators have an oxygen transfer rating of 2.8 lbs O_2/hp/hr. For eight 50-hp aerators, this rating results in a total oxygen transfer of 1,120 lbs O_2/hr. The manufacturer's rating of the aerators is high and not typical according to Wastewater Engineering (Metcalf & Eddy, 2003), which states typical rating for these types of aerators to be 1.8-2.3 O_2/hp/hr. It is typical for manufacturers to overstate the oxygen transfer capacities; therefore, a more conservative approach will be considered. At 2.0 lbs O_2/hp/hr, the total oxygen transfer would be 800 lbs O_2/hr.

The Criteria for Sewage Works Design, (Ecology, 2008) states in order to meet Ecology's reliability standards for a Reliability Class II facility, there must be a sufficient number of aerators to maintain the oxygen transfer with the largest aerator out of service. With one aerator out of service, the total oxygen transfer would be 980 lbs lbs O_2/hr based on the manufacturer's rating and would be 700 lbs O_2/hr using the more conservative approach.

In either case, the aeration system does not meet the requirements for the 20-year planning period. The inadequate aeration system is due to the change in treatment requirements following the addition of the ammonia effluent limit in 1996. The limit requires ammonia removal by biological nitrification which increases the oxygen demand. If the City was not required to nitrify the aeration system would be adequate.

It is recommended that the aeration capacity of the activated sludge system be increased. One area of Ellensburg WWTF where energy savings should be considered is the aeration system. A comparison of the existing aeration system and alternative energy-savings aeration systems is completed in Chapter 6.

Alkalinity Requirements

The stoichiometric reaction for the oxidation of ammonia nitrogen to nitrate shows that two moles of hydrogen are produced for every mole of ammonia nitrogen oxidized. In a wastewater treatment system, these hydrogen ions are neutralized by the wastewater's natural alkalinity (buffering capacity), preventing this acid condition from significantly reducing the pH within the treatment system. However, if the alkalinity present in the influent wastewater is not sufficient to neutralize the hydrogen ions released during nitrification, the pH within the system will begin to drop. This, in turn, can lead to low mixed liquor and effluent pH and a significant reduction in nitrification efficiency. An effluent pH value below 6 is a permit violation. Mixed liquor with pH readings outside the range from 7.2 to 8.0 can have an inhibitory effect on the nitrifying organisms.

The mass of TKN oxidized (nitrification) must be determined in order to calculate how much alkalinity is consumed in the process. Following is the equation to determine the quantity of nitrates denitrified:

$$\begin{aligned}\text{Consumption} &= (\text{Nitrification})\ (7.14\ \text{mg}\ CaCO_3) \\ &= (927\ \text{lbs/d TKN Oxidized})\ (7.14\ \text{mg}\ CaCO_3)\end{aligned}$$

The total alkalinity consumed is calculated at 6,618 lb/d or 99 mg/L at a maximum monthly flow of 8.0 MGD and a design loading of 1,853 lb/d TKN. An alkalinity of 80 mg/L is required in the aeration basin to maintain a pH of 7.2. The total required alkalinity is 179 mg/L (99 mg/L + 80 mg/L).

The WWTF staff recently performed some influent alkalinity testing. The data indicates that the WWTF's influent alkalinity has a concentration of approximately 152 mg/L. It appears that the WWTF has a slight deficiency in alkalinity, and consequently effluent pH violations might be a problem at greater loadings in the future. However, if there are alkalinity problems in the future, a caustic addition system could be installed to increase the pH. Also, some alkalinity could be recovered in the process if denitrification were included in the process, as is suspected to occur now in the aeration basins.

Currently, eight floating aerators are operated in a staggered "on/off" mode to save energy. Each aerator is on approximately 52 percent of the time, which means that the area around that aerator is anoxic approximately 48 percent of the time. Due to this mode of operation it is likely that some denitrification is occurring in the basin during the anoxic period or "off" time. Denitrification is the conversion of nitrates (formed in nitrification) to nitrogen gas. When the aeration is turned off, the tank essentially acts as an anoxic reactor as nitrate is used in lieu of oxygen for BOD_5 removal. Denitrification is typically employed in wastewater treatment facilities that have a total nitrogen limit. However, there are other benefits to denitrification including alkalinity recovery and reduced energy consumption. The nitrates are used for BOD removal rather than oxygen and therefore less aeration is required and less energy is consumed. During denitrification, alkalinity is recovered, thereby reducing the alkalinity requirements in the influent and reducing the need for a caustic addition system.

The Ellensburg WWTF does not have a total nitrogen limit and is therefore not required to employ denitrification. However, since the aerators are operated in an on/off manner, the process is probably seeing some benefits of denitrification. Alternatives to aeration are further discussed in Chapter 6.

SECONDARY CLARIFIERS

Process Description

Following treatment in the aeration basins, the mixed liquor flows by gravity to a splitter box on the north side of the RAS pump station. At the splitter box, flow is divided between two 85-foot diameters, rapid sludge removal secondary clarifiers. Here the biological solids formed in the aeration basins settle out and are separated from the plant effluent.

The majority of the biological solids (activated sludge) which have settled to the bottom of the clarifiers is removed through sludge withdrawal pipes attached to the rotating clarifier mechanisms and flows by gravity first to the sump at the center of the clarifier and then to the sludge recirculation (RAS) pump station. From the pump station the return sludge is pumped to the aeration basin inlet splitter box and mixed with the incoming wastewater from the headworks.

The settled biological solids that are not returned to the aeration basins are removed from the liquid treatment process as waste activated sludge. The waste activated sludge is normally removed from the bottom of the secondary clarifiers through a separate line and pumped to the gravity belt thickener or the dissolved air flotation thickener. The thickened sludge is then pumped into the heated anaerobic primary digester for further treatment.

Design criteria for the secondary clarifiers are provided below.

Secondary Clarifiers	
Quantity	2
Dimensions	85 feet diameter, 12 feet SWD
Surface Area, each	5,671 ft^2
Motor	¾ hp
Surface Overflow Rate @ 4.0 MGD (50% of the MMF)	705 gpd/ ft^2
Surface Overflow Rate @ 7.7 MGD (50% of the PHF)	1,357 gpd/ ft^2
Solids Loading Rate @ 6.0 MGD (50% MMF + RAS Flow), MLSS 2,600 mg/L(1)	23 lb/ft^2/day
Solids Loading Rate @ 9.7 MGD (50% PHF + RAS Flow), MLSS 2,600 mg/L(1)	37 lb/ft^2/day
Year Installed	1972

(1) RAS flow assumed as 50% of maximum month design flow to the clarifier.

Wastewater Engineering (Metcalf & Eddy, 2003) recommends a maximum surface loading rate of 400-700 gpd/ft^2 at maximum month flow and 1,000-1,600 gpd/ft^2 at peak hour flow for properly designed and operated clarifiers. As noted in the Criteria for Sewage Works Design (Ecology, 2008), in order to meet Ecology's reliability standards for a Reliability Class II facility, one secondary clarifier must be capable of treating 50 percent of the design flow when the largest clarifier is out of service. As shown in the design criteria table above, the design surface overflow rate at the maximum month flow is 705 gpd/ft^2, which is slightly over the standard. The overflow rate at peak hour flow meets the recommended design criteria.

In addition to recommendations for surface loading rates, Wastewater Engineering (Metcalf & Eddy, 2003) recommends maximum solids loading rates of 19.2 -28.9 lb/ft^2/d at maximum month flow and 38.4 lb/ft^2/d at peak hour flow. The design solids loading rates meet the design criteria. Therefore, the secondary clarifiers meet the design criteria for surface overflow and solids loading rates for the 20-year planning period.

The clarifiers have historically had poor settling sludge as a result of the composition of the bacterial population in the aeration basin. Typically a well-settling sludge has a sludge volume index (SVI) of between 80 mg/L to 150 mg/L, where SVI is a measure of the settling characteristics of the sludge. A review of WWTF records indicates the SVIs range from 130 to 450 mL/g. These high SVIs indicate the presence of filamentous bacteria, or poor settling sludge.

In the aeration basin, there are many varieties of bacteria, including both floc-forming and filamentous types. Floc-forming bacteria typically produce dense flocs that have high settling velocities and compact well. Filamentous bacteria are generally long and thin with many branches. At the high concentrations typical of activated sludge, filamentous bacteria form flocs that are not tightly compacted, partially due to the protruding filaments that increase the surface area and volume of the floc but do not increase the mass. Therefore, the density of the resulting filamentous bacteria flocs are low compared to those of floc-forming bacteria. Since settling velocity is dependent upon density, the settling velocity of filamentous bacteria is less than that of floc-forming bacteria. Consequently, the mixed liquor solids settle slowly and do not compact well. The completely mixed conditions in the Ellensburg aeration basin promote the formation of a high concentration of filamentous bacteria.

A common approach to control filamentous bacteria growth is the use of a bioselector upstream of the aeration basin. A bioselector is a series of small, highly-loaded mixed tanks in which the RAS and influent are combined in an environment favorable to the growth of floc-forming bacteria. Adding bioselectors to the WWTF upstream of the aeration basin will lower the SVI and cause the sludge to settle more rapidly and thicken at the bottom of the clarifiers, resulting in a higher quality effluent and increased clarifier capacity. Similarly, the thicker sludge will improve the performance at the gravity belt thickener, which should increase digester capacity. For these reasons, it is recommended that bioselectors be constructed as part of the WWTF improvements.

The feedwells at the clarifiers are small by current standards. According to Wastewater Engineering (Metcalf & Eddy, 2003), the feedwell should be 30-35 percent of the diameter of the tank. Therefore, the 85-foot diameter clarifiers should have a feedwell diameter of 25 to 30 feet. The current feedwells are approximately 10 feet in diameter.

The feedwell helps to dissipate the currents created as the wastewater enters the clarifier. It is recommended that the feedwells be replaced with larger diameter units.

Although the clarifier mechanism is nearly 40-years old, City staff have reported minimal problems with the mechanism. The City has inspected, sandblasted, and painted the mechanism several times in the past 40 years. It is recommended that the mechanisms be rehabilitated and larger feedwells be installed as part of the WWTF improvements. Rehabilitation would include sandblasting, painting, and replacement of any damaged or worn structural members.

RETURN ACTIVATED SLUDGE SYSTEM

Process Description

The return activated sludge (RAS) pump station building is located in the center of the plant between the two clarifiers, with the pump station wet well located on the south side of this building. RAS flows by gravity from the center of the clarifiers to the wet well and is pumped back to the aeration basins.

Although most of the solids that settle out in the secondary clarifiers are returned to the aeration basins in the RAS, some of the settled solids are removed from the liquid treatment processes as waste activated sludge (WAS). The waste sludge is thickened and pumped to the digestion process. Scum that is skimmed from the clarifiers and from the final settling tank (abandoned chlorine contact tank) can be pumped directly to the digesters or to the thickening processes.

The RAS system consists of two constant-speed centrifugal pumps operated continuously and a pneumatically operated butterfly control valve to control RAS flow. The rate of sludge return is established by manually adjusting the level settings in the controller for the butterfly valve, which is installed in the common recirculation pump discharge line. This controller automatically adjusts the valve position as required to maintain a constant wet well level. The wet well level is measured by a bubbler system. This level, subsequently, determines the RAS flow from the clarifiers to the wet well by establishing the head differential between the water surface is the RAS sump at the center of the clarifier and the wet well water surface. The individual valves (slide plates) on the sludge withdrawal lines on the clarifier mechanisms can be manually adjusted to obtain a uniform withdrawal rate of the sludge flowing into the center sludge sump.

Design criteria for the RAS system are provided below.

RAS Pump Station	
Wet Well	
Dimensions	12 feet 4 feet x14 feet
Volume	5,000 gallons
RAS Pumps	
Quantity	2
Type	vertical, centrifugal
Capacity, each	1,400 gpm @ 20 feet TDH
Motor	15 hp
Year Installed	1972

The secondary clarifiers at Ellensburg are rapid sludge removal clarifiers. The goal of a rapid removal clarifier is that the sludge is removed before septic conditions develop. The drawback to the design is that the concentration of the RAS is very low, resulting in a high required RAS pumping rate. A review of the WWTF records indicates RAS concentrations between 2,400 and 5,500 mg/L. Typically, RAS concentrations would be over 10,000 mg/L. Contributing to this low RAS concentration are the poor sludge settling characteristics discussed previously.

The current RAS pumps are each rated at 1,400 gpm, or 2.0 MGD. To determine if the RAS pumps have sufficient capacity for the 20-year planning period, a mass balance around the clarifiers was performed. The mass sent to the clarifiers in the plant flow from the aeration basin must be equal to the mass returned in the RAS to the aeration basin, assuming that the effluent TSS concentration is negligible. The flow to the clarifiers is equal to the influent and RAS flows. At a design MMF of 8.0 MGD (4.0 MGD to each clarifier) and a MLSS of 3,000 mg/L (as required for nitrification), the mass balance determined that the RAS concentration must be at least 9,000 mg/L if the RAS pump operates at maximum capacity (2.0 MGD each).

Therefore, at the existing lower RAS concentrations, the pumps do not have sufficient capacity for the 20-year planning period. The poor settling sludge also significantly impacts the ability of the RAS pumps to return enough solids to the basin to maintain the required biomass to adequately treat the wastewater.

Another problem with the RAS system is the fact that the two clarifier RAS systems are hydraulically tied together, and therefore, do not operate independent of each other. Each clarifier has multiple suction pipes that withdraw sludge from the clarifier floor to the center sump, and the sump discharges by gravity to a central RAS pump station wet well that serves both clarifiers. The RAS flows by gravity from each clarifier to the RAS pumping wet well, and there is no hydraulic break between the two clarifiers. As a result, the RAS flow may become unbalanced between the wet well and the clarifier RAS sumps. The RAS pipe from clarifier No. 1 is longer than the RAS line from clarifier No. 2; consequently, the RAS flow rate from clarifier No. 1 could be less than the RAS from clarifier No. 2 due to the additional head loss in the longer pipe. Additionally, if one of the clarifiers has sludge that is thicker and the RAS line becomes plugged, flow in the RAS gravity line of that clarifier will tend to decrease. This problem could cause the clarifier to fill with sludge and solids washout may occur. To solve this problem, it is recommended that each clarifier have an independent sludge recirculation wet well with a dedicated, separate sludge pump, allowing separate control of each RAS flow.

RAS pumping is often best controlled based on the influent flow to regulate the inventory of solids between the aeration basin and the clarifiers. With the current RAS control scheme, the RAS rate is a fixed flow rate based on the manually set level set point at the wet well. As a result, at night when the flows to the WWTF are lower and less sludge is conveyed to the clarifiers from the aeration basin, sludge accumulates in the aeration basin and the clarifiers are emptied of solids, producing low RAS and WAS concentrations. As flows increase in the morning, the sludge inventory in the clarifier increases, tending to increase the RAS and WAS concentrations, and eventually redistributing the sludge inventory in the system. These large swings in the RAS, WAS, and MLSS concentrations will decrease the performance of the activated sludge system and efficiency of the gravity belt thickener.

The current RAS pumps are nearly 40-years old and nearing the end of their useful life. They may not have adequate capacity for the 20-year planning period, dependent upon the future sludge settling characteristics in the clarifier and the concentration of the RAS. Therefore, it is recommended that the RAS pumps be replaced within the 20-year planning period.

The current RAS pumping scheme does not allow for hydraulic independence of the clarifier RAS systems, which could compromise clarifier performance. It is recommended that each clarifier be provided with its own RAS wet well and separate pump. Finally, it is recommended that the RAS pump controls be replaced with an influent flow-based control system.

EFFLUENT FLOW METER

Effluent from the secondary clarifiers flows to the entrance of the former chlorine contact tank via a 36-inch pipe. At the end of the pipe is a propeller meter. Propeller meters are not recommended for wastewater applications due to the possibility of rags and other debris interfering with the propeller. Also, the accuracy of the type of flow meter is inadequate for the primary flow meter at the plant.

Accurate flow measurement is necessary to ensure that monitoring requirements of the NPDES permit are met. Presently the City’s permit requires only effluent flow measurement. However, influent flow measurement is recommended to assist in process control (DO control, RAS control) and to provide a historical record of influent flow characteristics. WWTF flows attenuate through the WWTF and therefore an effluent flow meter is not as accurate as an influent flow meter for process control.

It is recommended that a magnetic flow meter be installed at the influent pump station and on the influent to the chlorine contact tank after the secondary clarifier. Magnetic flow meters are accurate, low maintenance, and non-intrusive.

DISINFECTION

Process Description

Secondary effluent flows to the final settling tanks and the ultraviolet (UV) disinfection system located in the former chlorine disinfection area. The UV building was constructed over a portion of the former chlorine contact tank. The remainder of the tank is used as a settling tank and has been provided with an aluminum cover to prevent the growth of nuisance algae.

Effluent disinfection is the reduction in the concentration of pathogenic (disease causing) microorganisms to protect water quality in the receiving stream. A receiving stream may become contaminated with pathogenic microorganisms from treatment plant effluent that has not been adequately disinfected. Adequate disinfection of the Ellensburg treatment plant effluent is defined in the NPDES permit as the ability to reduce the fecal coliform bacteria concentration to 100 organisms per 100 milliliters on a monthly geometric mean and no single sample to exceed 200 organisms per 100 milliliters. The UV disinfection process exposes the microorganisms in the effluent to ultraviolet light at a wavelength of 254 nanometers. Exposure to this light damages the DNA of the organisms preventing reproduction.

The UV system is a Trojan 3000 low-pressure system. After flowing through the covered final settling tanks the flow enters the UV building. The UV bulbs are suspended into the flow channels horizontally and parallel to the flow. After passing through UV disinfection, the treated effluent discharges to the Yakima River via a single outfall pipe.

Design criteria for the UV disinfection system are provided below.

UV Disinfection System	
Quantity of Channels	2
Type	low pressure-low intensity
Banks per Channel	2
Modules per Bank	19
Lamps per Module	8
Total Lamps per Channel	304
Total Lamps	608
Capacity	15.0 MGD @ 43,000 uW-sec/cm^2 18.0 MGD @35,000 uW-sec/cm^2
Disinfection Standards	100 MPN/100 mL on a monthly geometric mean, no single sample to exceed 200 MPN/100 mL
Year Installed	1991

The UV disinfection system was installed in 1991. At that time the fecal coliform limits were 200 organisms per 100 milliliters (200 MPN/100 mL) on a monthly geometric mean and 400 MPN/100 mL on an average weekly basis. Revisions to the permit during the last permit cycle by Ecology reduced the effluent fecal coliform limits to 100 MPN/100 mL on a monthly geometric mean and no single sample to exceed 200 MPN/100 mL. This permit revision was a result of a change in the surface water quality requirements of WAC 173-201A. The Yakima River in the area of Ellensburg is considered "primary contact recreation" and therefore Ecology imposed lower limits. Historically the lower limits have been met and therefore the disinfection system was not modified to accommodate the lower limits.

For this Report, the manufacturer, Trojan Technologies, Inc., was consulted to determine if the lower limits can be met reliability despite the fact that the effluent limits for the WWTF have changed. Trojan indicated that at a UV transmittance of 65 percent, with all lamps in service, the system could treat up to 18.0 MGD at a dose of 35,000 uW-sec/cm^2 and meet the disinfection standards. At 15.0 MGD a UV dose of 43,000 uW-sec/cm^2 could be achieved and meet the disinfection limits. Trojan noted that this performance is based upon Trojan brand lamps being used. Trojan indicated that the reason the system can still meet the requirements is that the lamps today are more efficient than in 1991 and have a higher UV output as well as a better end of lamp life versus the lamps that were used when the project was originally sized in 1991. This lamp improvement results in a higher dosage. Trojan brand lamps are used and typically the effluent UV transmittance is above 70 percent. Based on the analysis performed by Trojan, the UV disinfection system has the capacity for the 20-year planning period.

The UV system is 20-years old, but the City reports minimal problems with it. It is anticipated that it is adequate for the next 20 years. Consequently, there are no improvements to the UV disinfection system recommended at this time.

EFFLUENT SAMPLING

The effluent sampler is located at the UV disinfection system. The sampler is an automatic, refrigerated composite sampler operated daily. The sampler can be programmed to collect samples based on flow or time. Flow-paced sampling provides the most accurate sampling.

The effluent sampler appears to work properly and there are no improvements to the effluent sampler recommended at this time.

OUTFALL

Process Description

The outfall pipe is buried in the bed of the Yakima River and extends out from shore approximately 48 feet. The section from the last manhole to the outfall diffuser is constructed of 48-inch diameter corrugated metal pipe and is covered with a concrete cap. The pipe terminates in a diffuser section comprised of six vertical steel pipes on four-foot centers extending to just above the bottom of the river and pointing downstream. Each 14-inch diameter diffuser pipe ends in a 10-inch diameter orifice. The minimum water depth over the diffuser is approximately 10 feet.

Outfall	
Outfall Pipe Diameter	48-inch
Pipe Material	Corrugated Metal
Diffuser	14-inch diameter pipes, 10-inch orifice

A mixing zone analysis was performed as a part of the Engineering Report and found that there are no reasonable potential to exceed surface water quality criteria at the projected flows and loadings. The mixing zone analysis is provided in Appendix F.

SOLIDS TREATMENT FACILITIES

The WWTF's solids treatment facilities consist of a waste activated sludge pump, sludge feed pump, gravity belt thickener, dissolved air flotation thickener (DAFT), primary anaerobic digester, secondary anaerobic digester, sludge lagoon and drying beds. Class B biosolids are achieved using anaerobic digestion. Anaerobic digestion is designated by WAC 173-308 as a process to significantly reduce pathogens (PSRP) that is capable of meeting Class B pathogen reduction requirements if the mean cell resident time (MCRT) within the digester exceeds 15 days at 35 to 55^{o}C. Vector attraction reduction requirements are satisfied if the concentration of the volatiles solids in the biosolids is reduced by at least 38 percent during the digestion process.

Recently the City completed a number of projects related to the solids treatment facilities including the installation of the gravity belt thickener (GBT). This project included a new gravity belt thickener, new thickened waste sludge pump, new controls and a new MCC. Prior to the gravity belt thickener installation, the City used a centrifuge for thickening waste activated sludge. The City has retained the DAFT unit for redundancy. The DAFT was installed as part of the original WWTF and is used when the gravity belt thickener is out of service. As part of the belt thickener installation project, the primary digester was emptied and cleaned and a new draft tube mixer was installed to replace the compressed gas mixing system.

Recently, the digester heating and sludge recirculation system was replaced. This project included a new boiler building that houses the new recirculation pump, boiler and heat exchanger. This project was completed in 2011.

An analysis of the solids handling treatment facilities is presented below.

WASTE ACTIVATED SLUDGE

Process Description

To maintain the desired SRT and MLSS in the aeration basin, it is necessary to periodically remove a portion of the activated sludge from the process. The portion removed is referred to as waste activated sludge (WAS). Sludge wasting is performed by either using the waste activated sludge pump in the recirculation pump station or by using the sludge feed pump in the thickening room to pump to the GBT or DAFT. A flow meter is located in the thickening room to measure the WAS flow.

A sludge grinder is located in a vault outside the thickening room in the WAS line. The grinder consists of two counter rotating shafts with intermeshing cutters. The sludge grinder is interlocked with both the waste activated sludge pump and the sludge feed pump. When the wasting cycle is activated, the sludge grinder grinds all sludge coming from the activated sludge system to help ensure the thickening equipment is protected.

The scum pumping process is manually controlled. The scum accumulated at the secondary clarifiers and at the abandoned chlorine contact tank is pumped from the scum pits directly to the primary digester on a daily basis.

Design criteria for the waste activated sludge system and scum pump are provided below.

Waste Activated Sludge	
WAS Grinder	
Quantity	1
Motor	2 hp
Year Installed	1982
WAS Feed Pump	
Quantity	1
Type	Vertical Centrifugal
Capacity	300 gpm @ 34-feet TDH
Motor	7.5 hp
Year Installed	2010
Sludge Feed Pump	
Quantity	1
Type	Progressing Cavity
Capacity	470 gpm @ 450 rpm
Motor	20 hp
Year Installed	1982
Flow Meter	
Quantity	1
Type	Magnetic Flow Meter
Size	4-inch
Capacity	8-1,920 gpm
Scum Pump	

Quantity	1
Type	Plunger Pump
Capacity	94 gpm
Motor	5 hp
Year Installed	1972

The WAS feed pump and the sludge feed pump serve the same purpose of wasting sludge from the activated sludge system to either the GBT or the DAFT. The WAS feed pump was installed in 2010 as part of the GBT upgrade and the sludge feed pump was installed when the centrifuge was installed in 1982. Both pumps have sufficient capacity to feed the thickening equipment. WWTF staff have reported minimal problems with the pumps. There are no recommended improvements to either the WAS feed pump or the sludge feed pump.

The scum pump is nearly 40-years old and may be nearing the end of its useful life. However, staff have reported minimal problems with the pump. The staff stated that the pump is easy to maintain and parts are readily available. Despite the age of the pump, the staff would like the scum pump retained.

SLUDGE THICKENING

Process Description

Thickening is required to decrease the volume of sludge sent to the anaerobic digesters and thus reduce the required digester volume and heating requirements. The anaerobic digestion process stabilizes the sludge by decreasing pathogenic bacteria in the sludge, reducing sludge odors, and further reducing the sludge volume.

The sludge is pumped by either the WAS pump or the sludge feed pump to the GBT or the DAFT. Prior to entering the GBT or DAFT a dilute polymer solution is mixed with the waste sludge to enhance sludge flocculation and thickening.

The GBT thickens sludge by gravitational force, which pulls the separated free water though a porous belt. The thickened sludge drops into a hopper where the GBT thickened sludge pump, which is located in the thickening room, removes the thickened sludge to the digester system. The filtrate liquid discharges to the centrate pump station where it can either gravity overflow to the aeration basins or be pumped to the aeration basins by the centrate pumps.

The DAFT is used as a backup to the GBT. The DAFT uses the phenomena of pinpoint bubble formation. Air is dissolved in water in the reaeration tank and released into the DAFT along with waste sludge. A reaeration pump circulates the water through the reaeration tank several times to insure air saturation. Upon release to atmospheric pressure in the DAFT tank the dissolved air can no longer stay in solution and forms countless microscopic bubbles. These bubbles cling to the sludge particles and float them to the surface, where they form a dense mat. A surface scraper continually removes the mat to the thickened sludge wet well at the end of the thickener. The thickened sludge from the DAFT unit is pumped by the DAFT thickened sludge pump located in the lower level of the digester building, to the primary digester. The water leaving the DAFT flows by gravity to the aeration basin.

Design criteria for the sludge thickening system are provided below.

Sludge Thickening	
Gravity Belt Thickener	
Quantity	1
Capacity	1,000 lbs dry solids/hr
Motor	3 hp
Year Installed	2010
Dissolved Air Flotation	
Quantity	1
Surface Area	200 ft^2
Capacity	48 lbs dry solids/ft^2/day 400 lbs dry solids/hr
Year Installed	1972
Centrate Pump	
Quantity	2
Type	Submersible Centrifugal
Capacity	200 gpm
Motor	2 hp
Year Installed	1982
GBT Thickened Sludge Pump	
Quantity	1
Type	Progressing Cavity
Capacity	300 gpm
Motor	15 hp
Speed Control	VFD
Year Installed	2010
DAFT Thickened Sludge Pump	
Quantity	1
Type	Plunger Pump
Capacity	110 gpm
Motor	5 hp
Year Installed	1972
Polymer System	
Polymer Mixer	
Quantity	2
Motor	½ hp
Year Installed	1982
Polymer Feed Pump	
Quantity	1

Motor	½ hp
Year Installed	1982

As calculated in previous sections, the waste sludge production is 8,852 lbs/day, or 61,964 lbs/week, based on the 20-year projected flows and loadings. The gravity belt thickener has a capacity of 1,000 lbs dry solids/hr, resulting in operation of the gravity belt thickener at design WAS production 62 hours per week, or 9 hours per day.

The GBT and GBT thickened sludge pump are new and should be suitable for the 20-year planning period. There are no recommended improvements to the GBT or the GBT thickened sludge pump.

The remaining equipment including the DAFT, DAFT thickened sludge pump, centrate pumps, and polymer system are considerably older. Staff reported minimal problems with this equipment and stated that they would like to retain it due to the ease of maintenance.

ANAEROBIC DIGESTERS

Process Description

The anaerobic digesters are used to treat waste sludge that has been thickened in either the GBT or the DAFT unit and scum from the secondary clarifiers. It is noted that there is no primary sludge due to the absence of primary clarifiers at Ellensburg.

The primary digester is mixed by a roof mounted draft tube mixer to keep the solids in the tank well mixed and in suspension. Sludge is drawn into the mixer at the top and distributed at the bottom of the tank. As fresh sludge is pumped into the primary digester, it displaces an equal volume of the mixed contents, which flows to the secondary digester. The secondary digester is not mixed or heated and the solids that were kept in suspension in the primary digester are given a chance to settle out. The secondary digester essentially acts as storage and settling tank, though a small amount of digestion occurs in the tank.

Sludge flowing into the secondary digester displaces an equal volume of the liquid in the upper portion of the tank, which overflows into the supernatant return line to the aeration basin inlet box. The displaced liquid is referred to as digester supernatant. It contains appreciable concentrations of nitrogen, phosphorous, and suspended solids, and has a relatively high oxygen demand. The sludge solids accumulated in the secondary digester constitute the end product of the digestion process and are either conveyed by gravity or pumped to the sludge lagoon. Originally a sludge grinder was installed to grind sludge that was discharged to the sludge lagoon. The inert solids in the influent wastewater would accumulate in the digester sludge and would often cause problems by plugging pipes. At this time the grinder is not used. Since the fine screens were installed in 1991 at the headworks, the amount of inert solids in the sludge significantly decreased and the pipes no longer plug. The staff found that it is unnecessary to further grind the sludge, and the grinder is costly to maintain.

Gas produced during the digestion process is collected in the floating storage dome of the secondary digester and provides fuel for the boiler system, which supplies hot water to the sludge heat exchanger. The heat exchanger is used to maintain a constant temperature of about 35°C in the primary digester to maintain the anaerobic digester process. Gas produced in excess of the boiler heating requirements is burned in a waste gas burner.

Design criteria for the anaerobic digesters are provided below.

Anaerobic Digesters	
Primary Digester	
Quantity	1
Dimensions	45 feet diameter, 26 feet SWD
Volume	309,000 gallons
Year Installed	1972
Cover	fixed
Secondary Digester	
Quantity	1
Dimensions	45 feet diameter, 25.33 feet SWD
Volume (at max water depth)	301,300 gallons
Year Installed	1972
Cover	floating
Digester Mixing	
Quantity	1
Type	Roof Mounted, Draft Tube
Capacity	10,400 gpm
Motor	10 hp
Year Installed	2010
Digester Recirculation Pump	
Quantity	1
Type	centrifugal chopper
Capacity	300 gpm
Motor	5 hp
Year Installed	2011
Digester Boiler	
Quantity	1
Type	Unknown
Capacity	Unknown
Year Installed	2011

Digester Heat Exchanger	
Quantity	1
Type	tube-in-tube
Capacity	700,000 BTU/hr
Year Installed	2011
Digested Sludge Pump	
Quantity	1
Type	Plunger Pump
Capacity	Unknown
Motor	5 hp
Year Installed	1972

Mixing Capacity

Anaerobic digester treatment capacity depends on the solids concentration, digester temperature and mixing system performance. The current average solids concentration of the sludge fed to the digester, based on plant records, is 1.71 percent, with 74 percent volatile. In the digester, an average temperature of 93°F (34°C) is maintained based on the digester temperature records. According to Wastewater Engineering (Metcalf & Eddy, 2003), under these conditions, conservative design requires a design solids retention time (SRT) of 15 days in the primary digester. Per Table 14-29 in this reference, the volatile solids reduction under these conditions should be approximately 56 percent. For a conservative analysis, volatile solids reduction at the Ellensburg WWTF will be estimated at 45 percent based on design conditions discussed below and actual performance at similar facilities.

The active volume of the digester depends on the performance of the mixing system. Mixing in the primary digester is provided by a 10 hp internal roof mounted draft tube mixer rated for 10,400 gal/min. Wastewater Engineering recommends a mechanical mixing system with 0.024-0.04 hp/1,000 gallon of digester volume. For Ellensburg, at 10 hp and a digester volume of 309,000 gallons, the mixing energy is 0.032 hp/1,000 gallons of digester volume. Therefore, the mixing is adequate for the 20-year planning period.

Volume

The sludge treatment capacity of the primary anaerobic digester is determined using volatile solids loading factors. Wastewater Engineering recommends a maximum volatile solids loading rate of 0.15 lbs VS/ft^3/day for a sludge concentration of 5 percent and a 15 day retention time and 0.18 lbs VS/ft^3/day for a sludge concentration of 6 percent.

A GBT is used at Ellensburg to thicken waste activated sludge. At this time the WAS is thickened to only about 4 percent due to the low feed concentrations and the limitations of the recirculation pump. The existing recirculation pump cannot pump solids that are thicker than 4 percent. The recirculation pump is being replaced as part of the most recent improvement project. It is expected that the WAS will be thickened to 5 - 6 percent once that project is complete.

Using a maximum loading rate of 0.18 lbs VS/ft^3/day and an active volume of 309,000 gallons, or 41,310 ft^3, the maximum recommended volatile solids loading to the primary digester is 7,400 lbs VS/day. With an assumed 74-percent volatile fraction, maximum allowable total solids loading to the primary digester is 10,000 lbs TS/day. Based on the calculations performed for the aeration basin, 9,011 lbs/day of waste sludge will be produced at design conditions. Therefore, at this loading rate the WWTF has sufficient digester volume for the 20-year planning period.

Due to the poor settling sludge and low WAS feed concentration; the GBT produces a relatively low thickened sludge concentration. The more efficient the GBT, the greater the digester feed solids concentration and the lower the feed volume into the digester. Therefore, better GBT performance will increase digester service life. Another benefit of the bioselector is that the GBT system should be more effective in thickening the WAS since the lower SVI improves sludge dewatering.

For the calculated total design solids loading to the digester of 9,011 lbs/day and based on 74 percent volatile solids content, the digester will produce 6,668 lbs VS/day at design conditions. Assuming that 45 percent of the volatile solids are destroyed in the digester, and then 3,000 lbs of solids are destroyed, resulting in 6,011 lbs of total solids that are discharged to the sludge lagoon per day at design conditions.

<u>Heating Capacity</u>

The current project at the WWTF will replace the digester heating and recirculation pumping system. The project includes a new boiler, heat exchanger and new recirculation pump installed in a new building north of the primary digester. According to the construction documents, the heat exchanger has a capacity of 700,000 BTUs/hr. The heat requirements of digesters consist of the energy needed to raise the incoming sludge to digestion tank temperatures and to compensate for heat losses through the walls, floor, and roof.

In computing the energy necessary to heat the incoming sludge, the specific heat of sludge is assumed to be the same as water. The following equation is used to determine the heat requirements for the incoming sludge:

$$q = Px * (T_1 - T_2) * U_{sludge}$$

Where:

- Px = sludge wasted per day, 9,011 lbs/day (calculated above)
- T_1 = digester temperature, obtained from plant records, 93 ^oF
- T_2 = influent sludge temperature, obtained from plant records, 50 ^oF
- U_{sludge} = specific heat of sludge, 1 BTU/lb*^oF (assumed to be the same as water)

This calculation results in a heat requirement of 387,473 BTU/day, or 16,144 BTU/hr at design conditions. The energy loss through the walls, floor and roof of the primary digester must also be determined. The following equation determines heat loss through the structure:

heat loss through structure = $q_w + q_f + q_r$

Where:

$q_{w,f,r}$ = $UA(T_1\text{-}T_2)$
q_w = heat loss through wall, BTU/hr
q_f = heat loss through floor, BTU/hr
q_r = heat loss through roof, BTU/hr
A = cross section area through which heat loss is occurring, ft^2
    Walls = 3,763 ft^2
    Floor = 1,589 ft^2
    Roof = 1,589 ft^2
T_1 = digester temperature, obtained from plant records, 93°F
T_2 = exterior temperature, °F (ambient average air temperature for January in Ellensburg, 21 °F)
    Walls = 21 °F
    Floor = 41 °F
    Roof = 21 °F
U = overall coefficient of heat transfer, BTU/ft^2*hr*°F (typical values obtained from Wastewater Engineering)
    Walls = 0.85 BTU/ft^2*hr*°F
    Floor = 0.5 BTU/ft^2*hr*°F
    Roof = 0.85 BTU/ft^2*hr*°F

Heat loss calculations through the structure at design conditions are calculated to be a total of 368,865 BTU/hr. The total design heat requirement for the digester is the sum of the sludge heating requirements and the heat loss through the structure, 385,009 BTU/hr (16,144 BTU/hr + 368,865 BTU/hr). There are some heat losses in the process piping, however those losses are considered negligible.

The proposed heat exchanger will be rated for 700,000 BTU/hr which is sufficient for the 20-year planning period.

The primary anaerobic digester system has sufficient volume, mixing, and heating for the 20-year planning period. Current and recent projects include the replacement of the digester mixing system, recirculation system and heating system. It is anticipated that these systems will be sufficient for the 20-year planning period.

SLUDGE STORAGE LAGOONS & SLUDGE DRYING BEDS

Biosolids that are removed from the anaerobic digestion process are conveyed to one of two sludge lagoons by gravity or by pumping. The lagoons act as a storage facility for biosolids and allow for additional stabilization and liquid solids separation. The clarified liquid or supernatant from the lagoons is returned to the plant influent. The solids are removed using a dredge and pumping to the drying beds. Originally a sludge grinder was installed to grind solids going to the drying beds. At this time, the grinder is not used. Since the installation of the fine screens in 1991, the amount of inert solids in the lagoons has significantly decreased with time. The City has found that it is unnecessary to further grind the solids and the grinder is costly to maintain.

Dredging of the sludge lagoons is a continuous, weather-dependent activity. Typical operation is to fill one lagoon for a year while emptying the other lagoon. The WWTF staff rotates filling and dredging of the lagoons on a yearly basis. The lagoon levels are controlled by an adjustable telescoping valve located in the decant structure. Supernatant flows to the influent pump station.

Sludge that is dredged from the sludge storage lagoon is conveyed to the sludge drying beds for final drying and eventual disposal. The sludge drying beds consist of concrete walls and a paved floor. Ten beds were constructed in 1982 and an additional 2 beds were constructed in 1993. Some of the beds were originally constructed with drains, however the drains have been removed from service. The primary purpose of the sludge drying beds is to further dewater the sludge and dry it under natural conditions, thus reducing the volume and cost of disposal for the solids. The drying beds are not required to meet the class B biosolids requirements. Class B biosolids requirements are met with the anaerobic digestion process.

Design criteria for the sludge lagoons and drying beds are provided below.

Sludge Lagoons	
Lagoons	
Quantity	2
Dimensions	140 feet x 202 feet x 12 feet SWD (sloped lagoon, slope not included volume)
Volume (each)	2,538,000 gallons
Year Installed	1979
Biosolids Dredge	
Quantity	1
Capacity	1,100 gpm @60 feet TDH
Motor	50 hp
Year Installed	1993

Sludge Drying Beds	
Quantity	12
Dimensions	10 beds – 171’L x26’ W x 18” SWD 2 beds – 211’L x 235’W x 18” SWD
Total Area	127,180 ft^2
Year Installed	1982 & 1993

As calculated above, it is estimated that 6,011 lbs/day of sludge will be discharged from the secondary digester to the sludge lagoons at design conditions. Despite the fact that the lagoons are not aerated or mixed, some additional volatile solids destruction will occur over the course of a year of storage. According to plant records, the secondary digester discharges sludge with approximately 70 percent VSS to the lagoons.

At design conditions, approximately 2,194,015 lbs of solids are discharged annually to the sludge lagoons. At 70 percent volatile, this amount totals 1,535,810 lbs VSS. Volatile solids reduction in the lagoons can be estimated from Wastewater Engineering (Metcalf & Eddy, 2003), which provides volatile solids reduction curves for aerobic digesters as a function of time and temperature. Assuming an ambient temperature of 10 ^{o}C, and a sludge age of 6 months, or 180 days, the curve indicates a VSS reduction of 53 percent. Since the lagoons are neither mixed nor aerated, it is reasonable to derate the curve by 50 percent, which results in a VSS reduction of 40 percent. At a VSS reduction of 40 percent, the total solids sent to the drying beds at design conditions is 1,075,067 lbs/yr. This amount results in a sludge drying bed loading of 9 lbs/ft^2 (1,075,067 lbs/127,180 ft^2 drying beds).

The Criteria for Sewage Works Design (Ecology, 2008), recommends a loading rate of 15 lbs/ft^2 for drying bed design. Although the beds are not required to dry the sludge to meet Class B requirements, the loading rates are within acceptable ranges for the 20-year planning period.

There are no recommended improvements to the sludge lagoons or drying beds at this time. However, the City has a desire to produce Class A biosolids in an attempt to reduce the disposal costs of Class B biosolids. This Class A biosolids process will be evaluated in Chapter 6.

The lagoon dredge is 18-years old and WWTF staff expects that the dredge will reach the end of its useful life within the 20-year planning period. The dredge operates in a corrosive environment, which has decreased the longevity of this equipment. It is recommended that the dredge be replaced within the 20-year planning period.

ELECTRICAL SERVICE

The original service installed in 1972 is rated for 2,000 amps and serves the entire facility with the exception of the new boiler building. In the most recent project associated with the digester heating system, a separate 200 amp service that serves the digester boiler, recirculation pump, digester mixer and building loads for the boiler building was installed.

The original electrical service gear is nearly 40-years old and will reach the ends of its useful life within the 20-year planning period. The power distribution equipment is currently located in the operations building and there is no physical space in the panel board for additional breakers, the equipment is difficult to modify, and sections cannot be added. The equipment does not meet current electrical code for clearance requirements. The existing power distribution does not meet reliability criteria which require each of the plant critical loads be connected to redundant busses in order to prevent a single point of failure in the electrical distribution system. It is recommended that the existing electrical service and distribution system be replaced as part of the 20-year capital improvement plan.

There are five motor control centers (MCCs) that serve the following areas: influent pump station, aeration basin (chlorine building), digester building, recirculation pump station and the thickening room. The MCC equipment is old, and parts are expensive and difficult to find. Some of the MCCs are in unsuitable environments where corrosion is promoted such as the aeration basin (chlorine building) or areas that are classified such as the digester building. The life of the electrical gear will be reduced more quickly in the case of the aeration basin MCCs and digester building MCCs. It is recommended that the MCCs be replaced, and in the case of the aeration basin and the digester building, the MCCs be moved out of corrosive and hazardous environments.

The existing WWTF is equipped with a 250-kw, 277/480V generator with an automatic transfer switch. The current NPDES permit requires the City to maintain a Reliability Class II level at the WWTF. According to the permit, this classification requires a backup power source sufficient to operate all vital components, critical lighting, and ventilation during peak wastewater flow. Vital components used to support the secondary processes (i.e., mechanical aerators) need not be operable to full levels of treatment, but must be sufficient to maintain the biota. Currently, the only processes that are powered by the generator are two of the three pumps at the influent pump station and the UV disinfection system. The activated sludge system is not powered by the backup generator and therefore during a power outage the City cannot maintain the biota. The existing generator is not large enough to accommodate all of the required loads at the WWTF. It is recommended that a new generator and transfer switch that meets the requirements of the NPDES permit be installed.

SCADA SYSTEM

The supervisory control and data acquisition (SCADA) system is limited and consists primarily of a hardware dialer that allows for operator notification of process problems such as influent pump station high wet well level. Most of the control and monitoring systems were installed as part of the original WWTF construction in 1972, including the plant monitoring panel located in the operations building. There have been some small control additions throughout the years to the WWTF, including an upgrade to the controls at the influent pump station. However, most of the SCADA system is 40-years old, is beyond its useful life, and provides limited control, data and alarms.

It is recommended that a new SCADA system be installed. It is also recommended that the collection system pump stations be incorporated into the new SCADA system as noted in Chapter 7 of this Report.

OPERATIONS BUILDING

The existing operations' building includes a laboratory, electrical room, locker room, bathroom, lunchroom, and an office. The building was built in 1972 and was expanded to increase the size of the lab in the early 1990's. Most recently, the City replaced the HVAC system in 2011.

WWTF staff have expressed the need for additional space in the lunchroom. This room is often used for meetings and does not have adequate space. It is recommended that the size of the lunch room be increased by expanding the building south towards the utility building. This expansion would be similar to the lab expansion that occurred on the north side of the building.

SUMMARY OF EXISTING DEFICIENCIES

Based on the analysis above, a summary of the deficiencies at the Ellensburg WWTF is provided below.

1. **Influent Pump Station**
   a. The pump station does not have adequate reliability and redundancy for emergency power.
   b. The pump station HVAC system is not adequate to meet current fire protection standards.
2. **Influent Flow Meter**
   a. There is no influent flow meter.
3. **Grit Removal**
   a. The grit removal mechanism is nearly 40-years old and nearing the end of its useful life.
4. **Headworks Screens**
   a. The headworks screens are slightly deficient in capacity for peak hour flows.
   b. The headworks screens are 15-years old and will reach the end of their useful life within the 20-year planning period.
5. **Influent Sampling**
   a. The influent sampler is flow paced based on the effluent flow meter.
6. **Aeration Basin**
   a. The aeration system does not have adequate capacity for the 20-year planning period.

b. The aeration system does not have adequate reliability and redundancy.

7. **Secondary Clarifiers**
    a. The sludge has historically had poor settling performance in the clarifiers.
    b. The mechanisms are nearly 40 years old and nearing the end of their useful life.
    c. The feedwells are small in comparison to current design standards.
8. **Return Activated Sludge System**
    a. The RAS pumps are 40-years old and nearing the end of their useful life.
    b. The RAS pumps have insufficient capacity for the 20-year planning period due to the low sludge concentration.
    c. The clarifier RAS collection systems are not hydraulically independent, and therefore the RAS flow may be unbalanced between the clarifiers.
    d. The RAS pump controls are not flow paced.
9. **Effluent Flow Meter**
    a. The propeller meter is inaccurate for wastewater flow measurements.
    b. An effluent flow meter is inadequate for process controls such as RAS pumping and influent sampling, which should be based on an output from an influent flow meter.
10. **Sludge Storage Lagoons and Sludge Drying Beds**
    a. The lagoon dredge is 18-years old and will reach the end of its useful life within the 20-year planning period.
11. **Electrical Service**
    a. The electrical service equipment is 40-years old and beyond its useful life.
    b. Many of the MCCs are 40-years old and beyond their useful life, are in unsuitable environment, and require spare parts that are obsolete or difficult to find.
    c. Critical process equipment cannot be powered by the generator.
    d. The generator is too small to power critical process equipment.
    e. Critical process equipment is not on separate electrical busses.
12. **SCADA System**
    a. The SCADA system is 40-years old, out-dated and beyond its useful life.
    b. Critical process alarms are not available to the operators.
13. **Operations Building**
    a. The operation building lacks adequate space for meetings.

CHAPTER 6

CAPITAL IMPROVEMENT PLAN

CHAPTER 6

CAPITAL IMPROVEMENT PLAN

INTRODUCTION

The purpose of this chapter is to identify and describe recommended improvements to the existing facilities based on the deficiencies identified in Chapter 5. The goal of this chapter is to provide improvements that are reliable, cost effective, provide adequate capacity for projected growth, and meet the requirements of the City's NPDES permit. A new site plan, hydraulic profile and a process flow diagram showing the improvements are provided as Figures 6-1, 6-2 and 6-3, respectively.

WASTEWATER TREATMENT FACILITIES

INFLUENT PUMP STATION

As identified in Chapter 5, the influent pump station does not have adequate reliability and redundancy to satisfy Ecology's design standards. Presently only pump No. 3 and pump No. 2 are connected to the emergency generator. To fulfill the reliability and redundancy requirements, all three pumps should be connected to the generator.

As described later in this chapter, the original 1972 electrical service should be replaced and a new generator installed. As part of this electrical upgrade, a new pump station electrical service should be installed and connected to the new generator. This will ensure that the electrical system reliability and redundancy requirements for the influent pump station are met.

The current HVAC system at the influent pump station does not meet current fire protection standards. As part of the electrical upgrade, the HVAC should be replaced with a new system. The system would be required to have continuous ventilation at six air changes per hour in the dry well in order to make the entire space unclassified and, therefore, eliminate the need for explosion proof equipment.

The HVAC unit should include an energy recovery unit, which is a type of air-to-air heat exchanger. Throughout the cooling season (hot weather), the system works to cool and dehumidify the incoming, outside air. This is accomplished by the system taking the rejected heat and sending it into the exhaust airstream. Then, this air cools the condenser coil at a lower temperature than if the rejected heat had not entered the exhaust airstream. During the heating seasons, the system works in reverse. Instead of discharging the heat into the exhaust airstream, the system draws heat from the exhaust airstream in order to pre-heat the incoming air. With this type of system it is normal, during the cooling seasons, for the exhaust air to be cooler than the ventilation air and, during the heating seasons, warmer than the ventilation air. It is because of this heat recovery design that the system works very efficiently and effectively.

INFLUENT FLOW METER

Presently the plant only has an effluent flow meter. It is recommended that an influent flow meter be installed to accurately measure and record influent flows, to flow pace the influent sampler and to use in process control such as for RAS pumping. Since there is not enough space to place a meter on the plant influent line, it is recommended that a magnetic flow meter be installed on each of the three pump discharge pipes. Magnetic flow meters have low pressure drop, are reliable, and provide high accuracy. The meters would be installed in the influent pump station dry well, and measured flows from operating pumps would be additive in the SCADA system.

Design criteria for the influent flow meter are provided below.

Influent Flow Meter	
Quantity	3
Type	Magnetic
Capacity (range)	118 to 30,700 gpm
Size	16 inch

GRIT REMOVAL

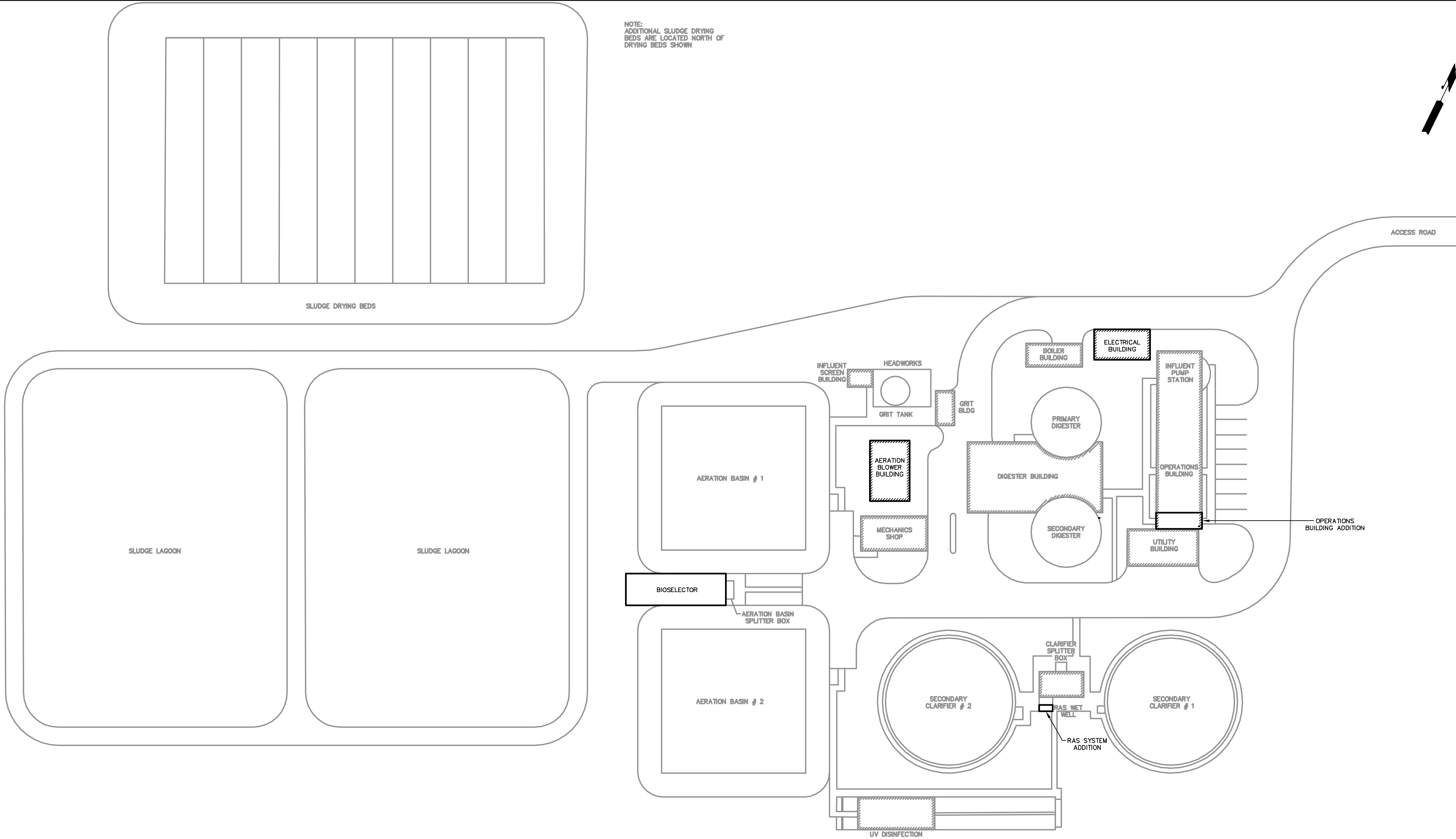
The existing grit removal system (detritus tank) appears to be working adequately. The system is simple to operate and has adequate capacity for the 20-year planning period. Despite the age of the equipment, the City staff would like to retain the system. It is recommended that the City plan to rebuild the mechanism as part of the 20-year capital improvement plan. The rebuild would include sandblasting and painting the mechanism, replacing the drive, and evaluating the structural members to ensure they are sound.

HEADWORKS SCREENS

The headworks screens are 15-years old and have recently developed holes in the screening basket. The City plans to replace the baskets in 2012 as part of their regular maintenance program. It is recommended that the City plan to replace the screens within the 20-year planning period; however with the replacement of the baskets, the life of the screens will be extended and may last another 15 years.

The screens are a spiral, perforated plate drum type with auger conveyor that screens, conveys, and compacts all with one drive motor. The stainless steel screen basket is automatically cleaned by brushes attached to a one-piece shaftless spiral auger. The shaftless auger transports the screenings up the collection tube where they are compacted and dewatered. WWTF staff have reported that the screens perform well and the screenings are clean.

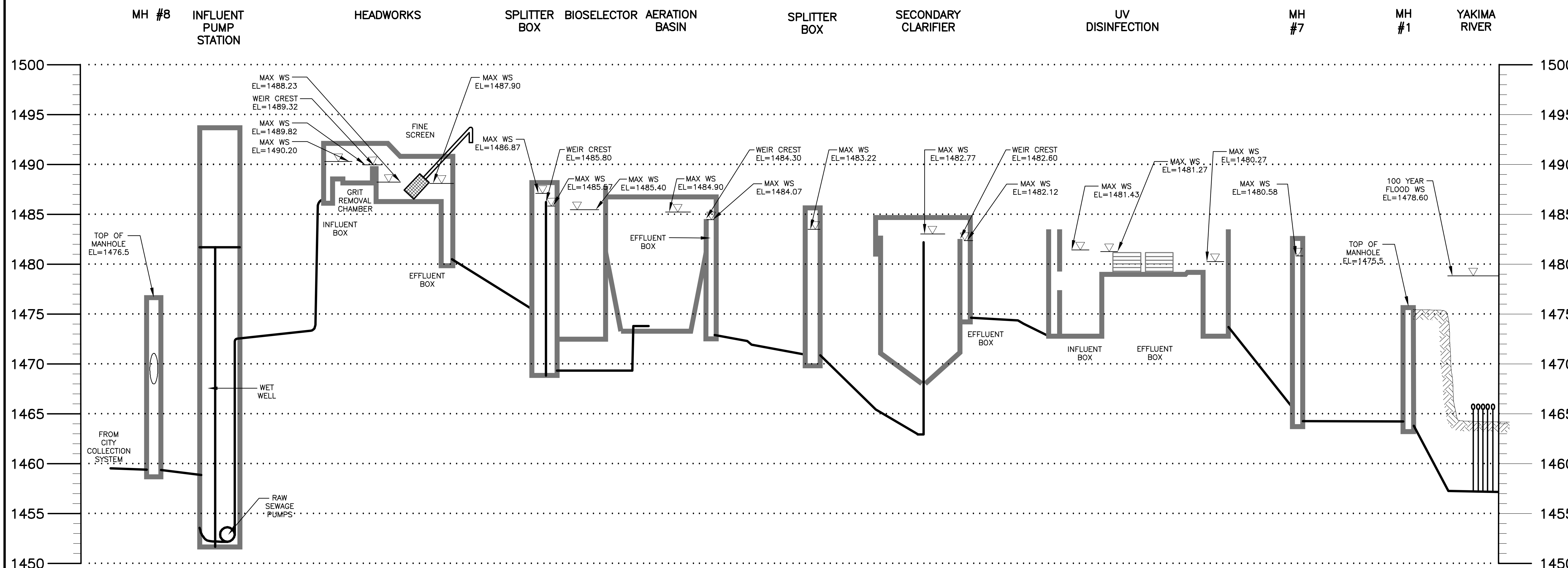
There are several other types of screening technology available including perforated plate screens and drum screens; however, because the City has had a good experience with the



CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 6-1
PROPOSED NEW SITE PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 6-1



HYDRAULIC PROFILE

SCALE: NTS (H), 1"=10 (V)

CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 6-2
PROPOSED NEW HYDRAULIC PROFILE

Gray & Osborne, Inc.
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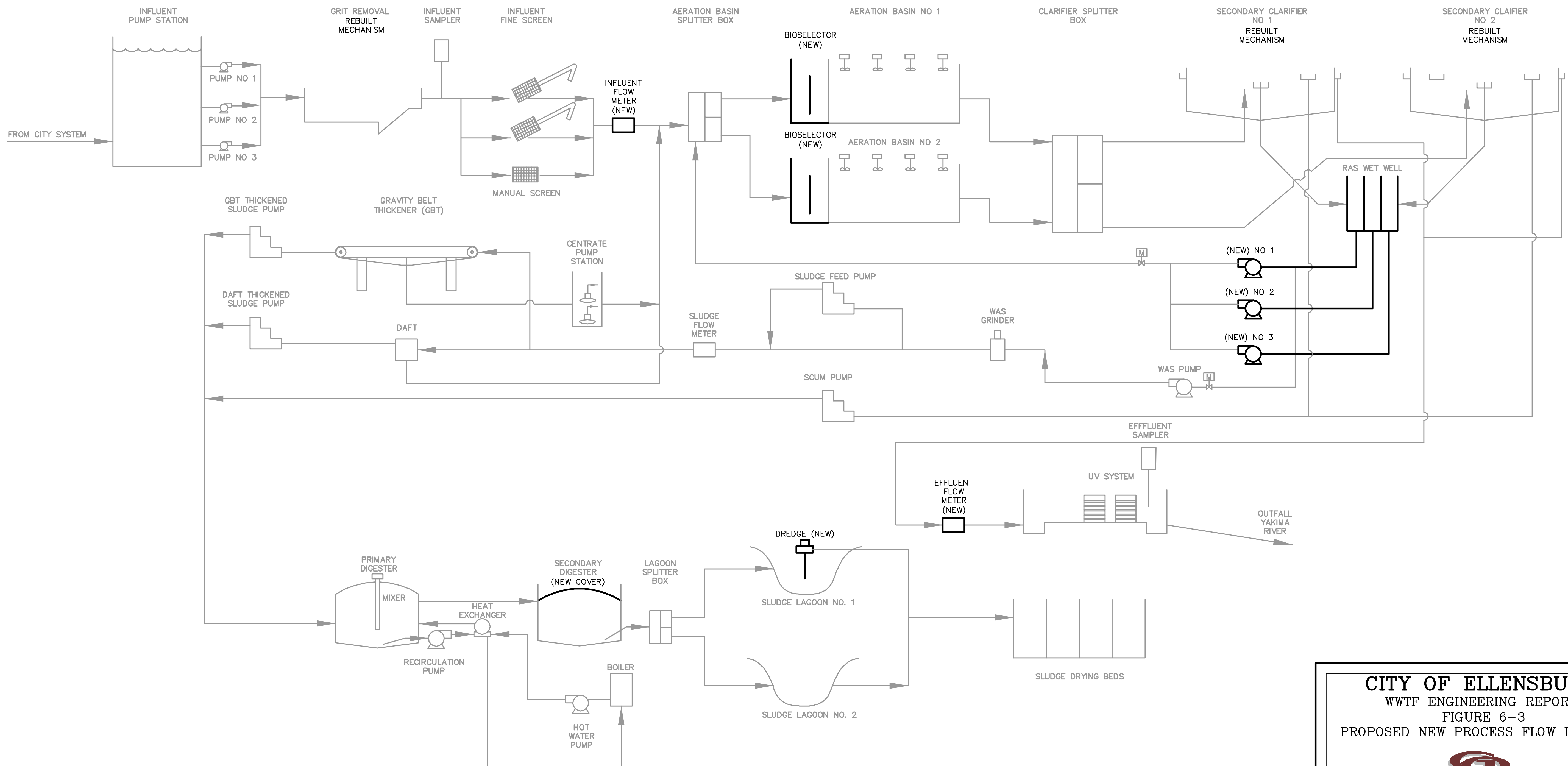
L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 6-2



CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 6–3
PROPOSED NEW PROCESS FLOW DIAGRAM

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 6–3

spiral screens, it is recommended that the same type of screen be installed when it is finally replaced. This replacement will minimize modifications to the building and channels to accommodate a new screen.

The new screens should be specified to have a combined hydraulic capacity equal to or exceeding the projected peak hour flow of 15.28 MGD. Presently the screens have a combined hydraulic capacity of 15.0 MGD, which is slightly less than the peak hour flow. In the rare event that flows exceed 15.0 MGD, the wastewater will overflow the bypass channel stop gates and will pass through the manual bar screen.

Design criteria for the new headworks screens are provided below.

Headworks Screen	
Automated Fine Screen	
Quantity	2
Type	Perforate drum, spiral
Screen Opening Size	0.25 inches
Clean Screen Headloss	9 inches
Minimum Capacity, each	8.0 MGD
Motor	2 hp

BIOSELECTORS

In the previous chapter, it was identified that the completely mixed conditions of the aeration basin promote the formation of a high concentration of filamentous bacteria. As a result the sludge does not have good settling characteristics, which results in reduced secondary clarifier capacity and low concentrations of RAS and WAS. These low sludge concentrations cause increased RAS and WAS pumping rates and problems with thickening at the gravity belt thickener.

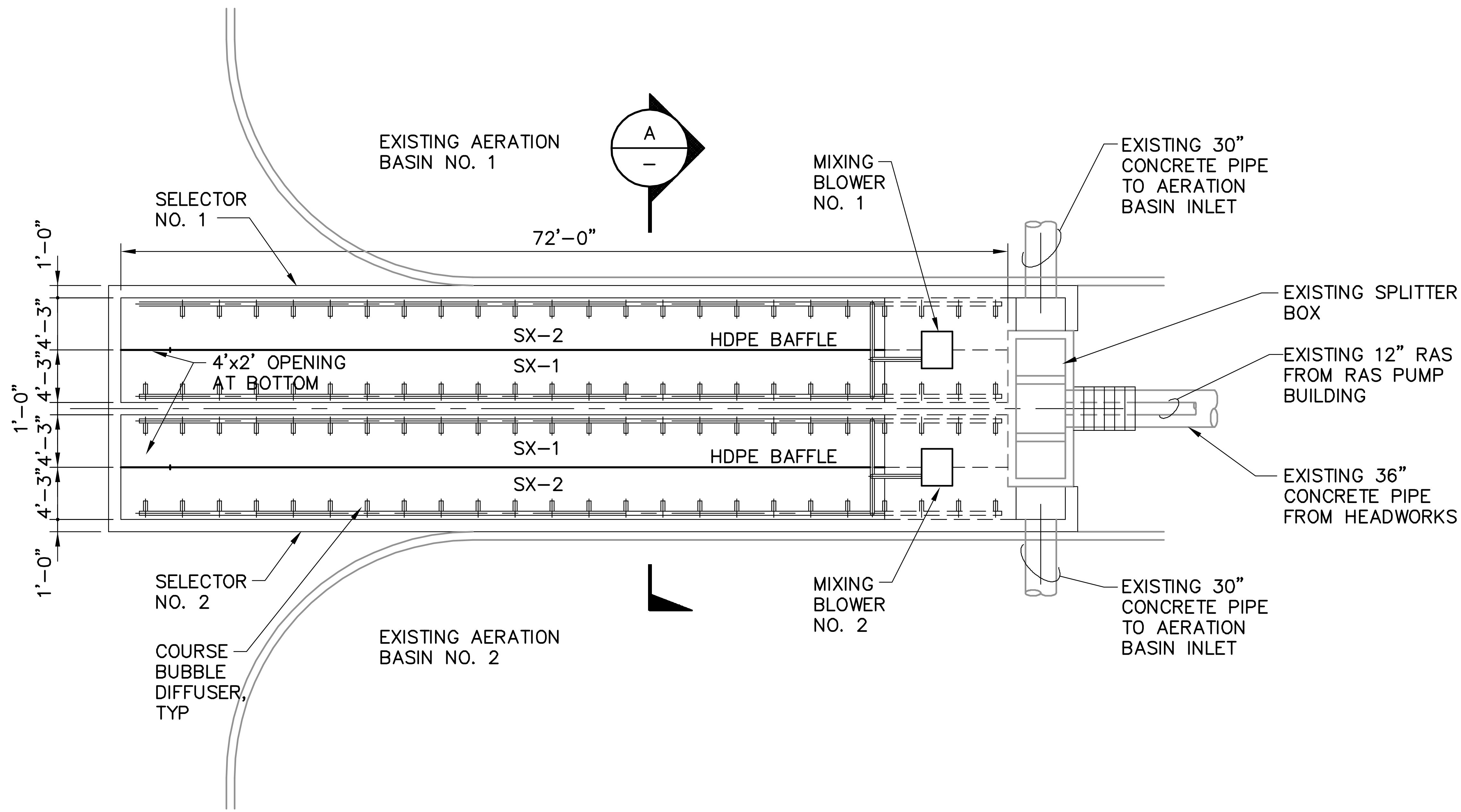
A common approach to control filamentous bacteria is the use of bioselectors upstream of the aeration basin. A bioselector is a series of small, mixed tanks in which the RAS and influent are combined at a high food to mass ratio, resulting in an environment favorable to the growth of floc-forming bacteria. Adding bioselectors to the WWTF upstream of the aeration basin will cause the sludge to settle more rapidly and thicken at the bottom of the clarifiers. This will increase clarifier capacity and reliability and produce a higher quality effluent.

The proposed bioselectors would be located immediately upstream of the existing two aeration basins. The bioselectors would consist of two trains (tanks), one for each aeration basin, with each train consisting of two stages, or compartments, in series. The first stage would provide a high food to microorganism (F/M) ratio of 8 lb BOD_5 /lb MLSS/day at design loading conditions. The bioselectors should maintain an activated sludge SVI of less than 150 mL/g.

The bioselectors would be located between the aeration basins on the west side of the splitter box. The overflow from the existing aeration basin inlet box would be diverted to the selectors. Flow from the bioselectors would connect to the existing inlet pipes to the aeration basins. Figures 6-4 and 6-5 present the plan and section, respectively, of the proposed bioselectors.

Each bioselector train would have dimensions of 72 feet long, 8.5 feet wide and 13 feet side water depth. The first stage and second stage selectors will be separated by HDPE baffle walls. The baffle walls will be supported by structural steel columns. The bioselectors would be constructed adjacent to the existing aeration basins. Since the walls of the aeration basins are only 2-3 feet below the grade, the construction of the deeper bioselector structure would include the use of sheet piles to protect the existing aeration basin walls.

The selectors would be equipped with coarse bubble diffusers and blowers for mixing. Each selector train would have a dedicated blower. The aeration required in the anoxic selectors for mixing is calculated as approximately 160 scfm using a requirement of 20 scfm/1000 ft^3 and the total selector volume. The low volume of air and use of coarse bubble diffusers, which exhibit low oxygen transfer efficiency, would create the desired low dissolved oxygen environment in the selectors. Each blower would be located adjacent to the bioselector structure and housed in a weather-proof, acoustical enclosure. As discussed later in this chapter, the City may decide to install fine bubble aeration in the aeration basin in lieu of the existing surface aerators. It may be possible that the aeration basin blowers can provide the air required for mixing in the bioselectors, in which case the dedicated selector blowers would not be required.



BIOSELECTOR PLAN

SCALE: 1"=10'–0"

CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 6–4
BIOSELECTOR PLAN

Gray & Osborne, Inc.
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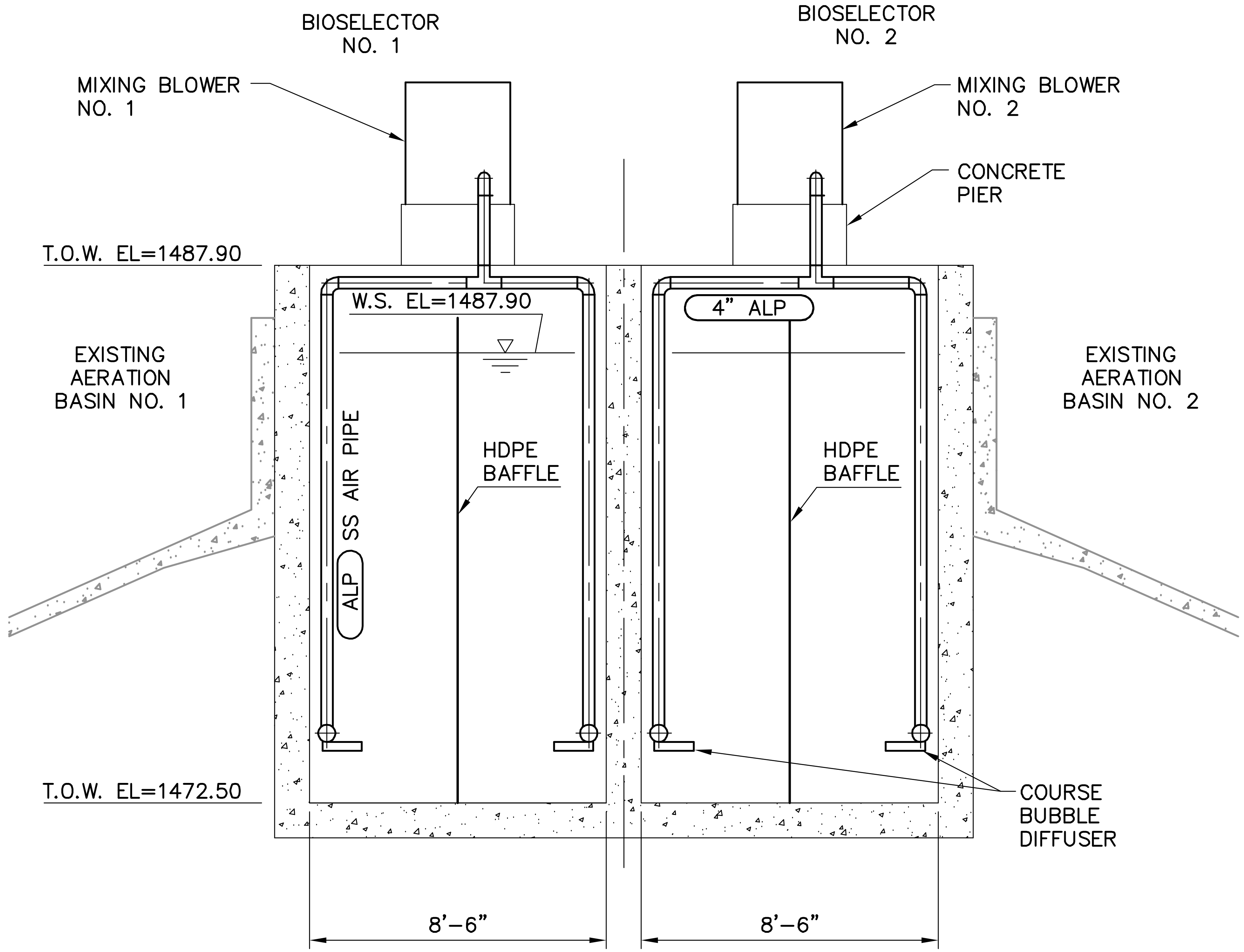
L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 6–4



SECTION
SCALE: 1/4"=1'-0"
A
–

CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 6-5
BIOSELECTOR SECTION

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L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 6-5

Design criteria for the bioselectors are provided below.

Bioselector	
Bioselector Basins	
Quantity	2
Dimensions, each	72 feet L x 8.5 feet W x 13 feet SWD
Volume, each Selector Train	58,400 gallons
Volume, each Selector Zone	29,200 gallons
Biomass, lb @ MLSS 2600 mg/L	S_{x-1} = 635 lbs S_{x-1} + S_{x-2} = 1,270 lbs
Food/Mass (at 5,000 lbs BOD_5/d per basin)	S_{x-1} = 8 lb BOD_5/lb MLSS/day S_{x-1} + S_{x-2} = 4 lb BOD_5/lb MLSS/day
Bioselector Mixing	
Type	Coarse Bubble Diffused Air
Blower Type	Positive Displacement Blower
Quantity	2
Capacity, each	160 scfm, 6.0 psi
Motor	3 hp
Speed Control	VFD

AERATION BASIN

According to the calculations shown in Chapter 5, the existing aeration basin would have to operate at a MLSS concentration of 3,000 mg/L and an SRT of 7 days to treat the projected flows and loadings for the 20-year planning period and remain in compliance with the NPDES permit limits. It was also determined that the aeration system would have to provide 1,543 lb/hr of oxygen at design loads in order to meet the treatment requirements. Presently, the aeration system does not have sufficient capacity and does not meet reliability and redundancy requirements. The Criteria for Sewer Works Design, (Ecology, 2008) states that in order to meet Ecology's reliability standards for a Reliability Class II facility, there must be sufficient number of aerators to maintain the required oxygen transfer at design conditions with the largest aerator out of service. With one aerator out of service, the total oxygen transfer would be 980 lb O_2/hp/hr, based on the aerator manufacturer's rating and 700 lb O_2/hp/hr using a more conservative design approach that derates the manufacturer's rating. The inadequate aeration system capacity is due to the change in treatment requirements following the addition of the ammonia effluent limit in 1996. The limit requires ammonia removal by biological nitrification, which increases the oxygen demand. If the City was not required to nitrify, the aeration system capacity would be adequate capacity. If the City's flows and loadings increase as projected, the City would be deficient in aeration capacity in 5-7 years.

There are two reasonable options to increase aeration capacity. The first option would be the installation of additional surface aerators and the purchase of an uninstalled aerator as a spare unit to meet reliability and redundancy criteria. Using the more conservative design rating for aerator oxygen transfer (2.0 lbs O_2/hp/hr), this option would require the purchase and installation of ten new 50-hp aerators. This option provides the City with 1,700 lb/hr of aeration capacity with one aerator out of service. This option meets the aeration demands and Ecology's requirements for reliability and redundancy.

The second option to increase aeration would provide significant energy savings, but will require a larger capital improvement project to replace the entire aeration system with blowers and fine bubble diffusers.

Fine bubble diffusion is a subsurface form of aeration in which air is introduced in the form of very small bubbles. These systems have high oxygen transfer efficiency. Smaller bubbles result in more bubble surface area per unit volume and therefore greater oxygen transfer efficiency. The diffusion system consists of a grid of air piping and membrane diffusers placed on the basin floor to deliver the air in the form of fine bubbles. Compressed air is delivered to the diffusers using blowers and air distribution piping.

The blower and fine bubble diffuser option would include the installation of a grid of fine bubble diffusers in each basin, air pipe header and laterals, and three new blowers. The new blowers would be high-speed turbo blowers equipped with VFDs. Turbo blowers use a bearing design that allows for very high impeller speeds. These blowers are more efficient than a conventional multi-stage centrifugal or positive displacement blower and have greater turndown capabilities. It is proposed that the blowers would be installed in the old chlorine handling room along with the new electrical equipment. VFDs are provided integral to the blowers by the blower manufacturer. The blowers would be controlled based on dissolved oxygen concentration in the aeration basin, with blower motor speed increasing to meet higher oxygen demand and slowing down for lower demand. Ideally, the basin would be maintained at about 2.0 mg/L at all times for maximum energy savings while meeting the oxygen demand of the biological treatment process.

Due to the potential for energy savings by converting to fine bubble air diffusion, Energy Smart Industrial (ESI) was consulted to verify the energy rebate opportunities that may be offered the City. ESI is a program that has been created by Bonneville Power Administration (BPA) to consult with utility customers to identify cost-effective energy efficiency savings in the industrial sector. ESI is a consultant that is dedicated to assisting municipalities by identifying energy savings in water and wastewater infrastructure. According to ESI, BPA will give rebates of $0.25 per kilowatt hour (kWh) saved over one year up to 75 percent of the total project cost.

To evaluate the potential energy savings of a new fine bubble diffuser system at Ellensburg, a review of the electrical consumption records for the WWTF between February 2010 and August 2011 was performed. On average the WWTF consumes 2,363,000 kWh per year at an average cost of $133,982 per year. Approximately half of this power use is consumed by the existing surface aerators at the aeration basin.

Table 6-1 shows the current energy consumption associated with the existing surface aerators and the estimated energy consumption using fine bubble diffusers and turbo blowers.

TABLE 6-1

Aeration Energy Consumption Estimates

Aeration System	Brake Horsepower Required	kWh/year	Estimated Cost per Year(1)
Surface Aerators	187 hp	1,226,400	$69,500
Diffused Aeration	94 hp	612,105	$34,700

(1) Assumes electrical rate of $0.0567 per kWh.

Surface aeration is less efficient than diffused air because the oxygen transfer is less effective for splash aeration, and surface aerators, when running must operate at 100-percent speed and the only control is the manually adjusted on-off operation timer. The surface aerators cannot be precisely controlled to supply oxygen in response to diurnal fluctuations in the influent load. However, the oxygen supply from a diffused air system can be controlled precisely by using a dissolved oxygen sensor and a VFD to automatically adjust the blower motor speed. Based on the signal from the dissolved oxygen meter, the VFD increases and decreases the blower motor speed as the plant load and oxygen demand changes, resulting in an efficient aeration system and power savings. Therefore, the diffused air system saves energy by employing a more effective oxygen transfer mechanism and by more closely matching the energy use to the process demand.

Based on the preliminary conversations with ESI, the City would be eligible for $153,574 in rebates from BPA ((1,226,400 kWh -612,100 kWh) * $0.25/kWh) to offset the cost of installing the new diffused air system. Another funding program for energy conservation that the City may qualify to receive grant assistance is the Department of Ecology's Green Project Reserve program.

Green Project Reserve (GPR) is a category of projects or project elements that focuses on green infrastructure, water or energy efficiencies and environmentally innovative activities. Congress, in the most recent Clean Water Act appropriation, directed that at least 20 percent of the State Revolving Fund capitalization grant be dedicated to GPR. Ecology makes available half of the GPR funding in the form of forgivable principal loans (grants) and the remaining in standard loans. A forgivable principal loan means that a portion of the loan is not required to be paid back by the borrower, which makes the loan equivalent to a grant. Ecology may continue to offer GPR funding if Congress continues to authorize this type of appropriation. However, there is no guarantee that this program will be offered each year.

In order to qualify for GPR funding, the project must qualify for one of four categories of GPR eligible projects: green infrastructure, water efficiency, energy efficiency, and environmentally innovative activities. The City's aeration project would qualify as an energy efficiency project. Projects that achieve a 20-percent reduction in energy consumption are categorically eligible for energy efficiency GPR funding. Based on previous funding offers from Ecology, the City could be eligible for up to 50-percent forgivable principal loan and 50-percent standard loan (2.6%, 20-year term). Applicants receiving a forgivable principal loan must also accept the standard loan.

Ecology funding will require significantly more administrative effort than standard bond financing or City financing. A portion of the money Ecology receives each year is from the federal government through the EPA and is therefore subject to federal financing requirements. When projects are funded with federal money often the environmental review is more stringent, there is more administrative paperwork and the City would be required to pay federal prevailing wages. The cost estimates below describe the additional expense involved in the administration of Ecology funding.

Capital cost estimates were prepared for the two options of additional surface aerators and the diffused aeration system. Details of these cost estimates are included in Appendix E. Table 6-2shows the cost of the diffused aeration system with only a BPA rebate, and with both a BPA rebate and a GPR forgivable loan.

TABLE 6-2

Capital Cost Summary

	Expansion of Existing Surface Aerator System	**New Diffused Aeration w/ BPA Rebate Only(1)**	**New Diffused Aeration w/ BPA Rebate & GPR(2)**
Capital Cost	$650,000	$1,006,000	$1,087,000(3)
BPA Rebate(4)	N/A	$153,600	$153,600
Ecology Forgivable Principal Loan(5)	N/A	---	$543,500
Ecology Loan Interest(6)	N/A	—	$160,383
Energy Cost(7)	$69,500	$34,800	$34,800

(1) This option assumes that the City would only qualify for a rebate from BPA.
(2) This option assumes the City qualifies for a rebate from BPA and that the project is eligible for GPR financing.
(3) Assumes additional costs associated with the administration of Ecology funding.
(4) Assumes that the City receives a rebate from BPA. The rebate is based on $0.25 per kWh saved in Table 6-1.
(5) Assumes that the City receives a 50-percent forgivable principle loan (grant) from Ecology.
(6) Assumes that the City has to accept a standard loan for the remainder of the project. The standard loan is based on 2.6 percent interested for a 20-year term.
(7) Based on the current cost of $0.056 per kWh

Subsequent to the development of this Report, the City's Energy Services Department requested additional analysis to be performed regarding the 20-year present worth and the

Energy Conservation rebates that Energy Services may be eligible to receive. The analysis concluded that any rebate over $437,000 would reduce the loan required for the fine bubble diffused air system to less than the loan required for the surface aerators and thus payback would be instant even without an annual energy savings. The final analysis is included as Appendix G.

There are other process-related benefits to diffused aeration. Mechanical aerators such as surface aerators are known to cause floc shear and degrade solids settling performance in the secondary clarifiers. When the floc is broken, the suspended solids do not settle rapidly, resulting in reduced hydraulic and solids loading capacity in the clarifiers. Mechanical aerators also cause cooling of the wastewater due to the heat loss when the water is thrown in the air. When the wastewater temperature decreases, the biological activity in the aeration basin is reduced and treatment performance is reduced.

Generally, surface aerators are more difficult and less desirable to operate and maintain because they are installed outdoors and are exposed to the weather, they are noisy, and the wastewater splashing creates aerosols which present an operator health and safety issue. Fine-bubble air diffusion has the advantage that it does not cause floc shear and, therefore, clarifier performance is more reliable. Diffused aeration also does not lower the temperature of the wastewater; since the compressed air has an elevated temperature and therefore does not have the cooling effect experienced with mechanical aerators.

It is recommended that the City install a diffused aeration system to increase their aeration capacity.

Design criteria for the diffused aeration system are provided below.

Aeration Basin	
Aeration Basin Structure	
Quantity	2
Dimensions	129 feet L x 129 feet W x12 feet SWD (floors are sloped at outer edges)
Volume, each	1.25 MG
HRT@ AAF, 4.30 MGD	14 hours
HRT@ MMF, 8.0 MGD	7.5 hours
Diffused Aeration	
Quantity of Blowers	3
Type	High Speed Turbo
Motor	200 hp
Capacity	7,500 scfm at 7.0 psig

SECONDARY CLARIFIERS

The secondary clarifiers are adequately sized for the 20-year planning period. It is recommended that the City plan to rehabilitate the clarifier mechanism, including replacement of the feedwell with a larger diameter unit. The new feedwell should be 30 feet in diameter to meet current design standards. A larger feedwell would help dissipate high-velocity currents that are created when the wastewater enters the clarifiers. When the feedwell is replaced, it is recommended that the clarifier steel components be sandblasted and painted and structural members be inspected to ensure they are sufficient for the 20-year planning period.

RETURN ACTIVATED SLUDGE SYSTEM

The current RAS pumps are nearly 40-years old and are nearing the end of their useful life. Dependent upon the sludge settling characteristics and the concentration of the RAS, the pumps may not have adequate capacity for the 20-year planning period. In addition to the deficiencies of old age and inadequate capacity, the RAS pumps are not paced based on the influent flow to the plant. This lack of flow control can result in an imbalance of mixed liquor suspended solids inventory between the aeration basin and clarifiers, potentially compromising treatment. Therefore, it is recommended that the RAS pump controls be modified to include influent flow-paced pumping.

The clarifiers are rapid sludge withdrawal clarifiers. Each clarifier has suction pipe withdrawal of sludge from the clarifier floor to the center sump, and the sump discharges by gravity to a central RAS pump station wet well that serves both clarifiers. The RAS from each clarifier flows by gravity to the RAS pumping wet well, and there is no hydraulic break between the two clarifiers. As a result, the flow may become unbalanced between the two clarifiers. The RAS pipe from clarifier No. 1 is longer than the RAS pipe from clarifier No. 2. Consequently, the RAS flow from clarifier No. 1 would be less than the RAS flow from clarifier No. 2 due to the greater head loss in the longer line. Also, if one of the clarifiers has sludge that is thicker, if the RAS pipe becomes partially plugged, or if water surface elevation in the center sump is set lower, RAS flow in the gravity line will tend to decrease for that clarifier. This imbalance could cause the clarifier to fill with sludge and could potentially result in solids washout.

To eliminate this hydraulic problem, the RAS pumping wet well should be divided into two compartments, one dedicated to each of the two clarifiers. The compartments would be separated by a new divider wall. Each RAS pump would be dedicated to pump RAS from one clarifier. The existing RAS pumps would be replaced, and a new redundant, third RAS pump would be installed to pump RAS from either clarifier. All three RAS pumps would be equipped with variable frequency drives (VFD) for flow pacing based on influent flow.

The new third RAS pump would be located in the existing RAS pump station dry well. The suction pipe to the new RAS pump would be connected to the suction lines of both the existing RAS pumps. The pump discharge pipe would be connected to the existing RAS pump discharge line located on the west side of the RAS pump station. New magnetic flow meters will be installed on the discharge lines of the RAS pumps and will be used to control the pump speed based on an operator set point, as entered at the human machine interface (HMI).

Design criteria for the new RAS system are provided below.

RAS Pump Station	
Wet Well	
Quantity	2 compartments
Dimensions, total	12 feet x 4 feet x 14 feet
Volume, total	5,000 gallons
RAS Pumps	
Quantity	3
Type	vertical, centrifugal
Capacity, each	1,500 gpm @ 20 feet TDH
Motor	15 hp
Speed Control	VFD
RAS Flow Meter	
Quantity	3
Type	Magnetic Flow Meter
Capacity	1920 gpm
Size	4 inch

EFFLUENT FLOW METER

It is recommended that a new effluent flow meter be installed on the pipeline between the secondary clarifiers and the UV disinfection system. The current effluent flow meter is a propeller meter that is inaccurate and not suitable for use in wastewater. The new effluent flow meter would be a magnetic flow meter. Magnetic flow meters have low pressure drop, are reliable, and provide high accuracy. The meter would be installed in a vault south of the clarifiers.

Design criteria for the effluent flow meter are provided below.

Effluent Flow Meter	
Type	Magnetic
Capacity, range	118 to 30,700 gpm
Size	16 inch

SOLIDS TREATMENT FACILITIES

The solids handling system consists of a waste activated sludge pump, sludge feed pump, gravity belt thickener, DAFT unit, primary digester, secondary digester, sludge lagoons and sludge drying beds. Recently, a number of projects related to the solids handling system were completed, including the installation of a new waste activated sludge pump, the gravity belt thickener system, and new mixing, heating, and recirculation equipment at the primary digester.

SLUDGE STORAGE LAGOONS & SLUDGE DRYING BEDS

The primary purpose for the sludge lagoons and sludge drying beds is to further stabilize and dewater the sludge, thus reducing the cost of disposal for the solids. Since the digesters provide treatment to produce Class B biosolids, the drying beds are used for dewatering and volume reduction and they are not designed to further treat the biosolids. The lagoons and drying beds are in satisfactory condition and are adequately sized for the planning period.

The lagoon dredge is 18 years old and operates in a corrosive environment. As a result, the equipment is in deteriorated condition. It is recommended that the lagoon dredge be replaced as part of the capital improvement plan.

Design criteria for the lagoon dredge are provided below.

Lagoon Dredge	
Quantity	1
Capacity	1,100 gpm @ 60 feet TDH
Motor	50 hp

The City desires to produce Class A biosolids for the benefits of flexibility in disposal and potential reuse within the community. Presently the City produces Class B biosolids by anaerobic digestion, dries the solids in the drying beds and pays approximately $14,000 per year for contract disposal of those solids by land application outside the City through Natural Selection Farms.

Biosolids are categorized as Class A or Class B depending on the level of pathogenic organisms in the material. Class A biosolids contain minute levels of pathogens and can be land applied without any pathogen related restrictions. Class B biosolids have less stringent standards for treatment and contain small but compliant quantities of bacteria. Class B requirements ensure that pathogens in biosolids have been reduced to levels that protect public health and the environment, and include certain restrictions for crop harvesting, grazing animals and public contact for all forms of Class B biosolids. Class A biosolids would give the City considerably more flexibility in disposal and would potentially allow the City to sell the biosolids to the public.

There are several ways to meet the Class A requirements; generally, this involves heating, composting, or increasing pH that reduces pathogens to below detectable levels. The City is interested in a compost operation. According to WAC 173-308 composting can either be met with in-vessel composting or static aerated pile composting. In-vessel composting requires that the temperature of the biosolids must be maintained at 55 ^{o}C or higher for three consecutive days in the compost container. The second option is to use static aerated pile, or windrow composting, a process in which the temperature of the biosolids must be maintained at 55 ^{o}C or higher for 15 days or longer. During the period when the compost is maintained at 55 ^{o}C or higher, there must be a minimum of five turnings of the windrow.

The City has experimented with a small amount of composting using the windrow method, which is their preferred method. The City did not use any bulking agent and used a front-end load tractor to turn the windrow and measure temperature daily. The City was successful in meeting Class A standards.

In order for the City to implement the windrow composting option, a windrow turner would be purchased and temperature probes would be purchased to monitor the temperature of the compost piles. If bulking agent were included in the process, a compost screen would be included to remove the bulking agent and produce a high quality product. A pole building near the drying beds would be constructed for finished product storage and to house the compost screen. The capital cost for this investment is estimated to be $201,000. This cost assumes that the City would not be using bulking agent, and therefore this cost does not include a compost screen.

The estimated 20-year present worth costs of the existing biosolids disposal method and the Class A windrow composting alternative are presented below in Table 6-3. If the City were required to purchase bulking agent, the operational and capital costs for producing Class A biosolids by composting would increase. This analysis did not include possible revenue the City may generate from the sales of Class A Biosolids.

TABLE 6-3

Biosolids Disposal Methods, 20-Year Present Worth

Parameter	Class A Windrow(1)	Existing Disposal(2)
Capital Cost	$201,000	---
O&M Cost(3)	$21,000	$22,000
20-Year Present Worth	$505,000	$186,000

(1) Assumes that no bulking agent is required.
(2) Assumes that the current operation would be retained as is. Cost includes labor required to manage the drying beds and disposal through Natural Selection Farms.
(3) Does not include possible sales or revenue from the sale of Class A biosolids.

The table shows that the 20-year present worth of composting to produce Class A biosolids is significantly greater than the cost of the existing disposal method. If the City could sell biosolids and offset the O&M costs, the return on investment is approximately 20 years.

One factor that is not considered in this cost analysis is the environmental benefits of producing Class A biosolids and the biosolids management program flexibility it offers the City. Presently, the City is required to seek a permitted land applicator for Class B biosolids, which makes the City reliant upon an outside contractor. If the City were to produce Class A biosolids, the City would not be dependent upon an outside contractor and would have the flexibility to distribute the solids to local farms or the public. It is difficult to estimate the costs associated with this flexibility. Due to the expense of the composting option, it is not recommended that the City pursue production of Class A biosolids unless the benefits of flexibility and self-sufficiency outweigh the costs. The ability of the City to develop a market for the sale of biosolids could also affect the decision to implement a Class A biosolids program.

Another option that the City may want to consider is to have the State Biosolids Coordinator and the EPA approve the existing drying bed operation as a method to achieve Class A biosolids. The City of Wenatchee has been working for nearly four years to seek this type of approval. Their solids treatment process is similar to the Ellensburg process, including anaerobic digesters and sludge drying beds. Wenatchee's approval process has included the submittal and approval of a sampling and analysis plan and years of sampling to characterize their biosolids. If the City of Wenatchee is successful, this alternative may provide a blueprint for the City of Ellensburg to seek similar approval. Based on the amount that the City of Wenatchee has spent to go through this approval process, it is estimated that the cost of the work at Ellensburg to demonstrate production of Class A biosolids by the current system would be $110,000.

ELECTRICAL SERVICE

Most of the existing electrical service is nearly 40 years old and will reach the end of its useful life within the 20-year planning period. A new separate 200-amp service was installed as part of the recent digester project.

An upgrade of the existing electrical system will be expensive and complicated due to the need to keep the existing facilities in operation while the construction is performed. It is recommended that the City complete an Electrical Upgrade Predesign Report, prior to embarking on the design of an upgrade. This report would look at the existing installation in detail, determine if the systems are code compliant and detail options for improving the reliability and redundancy and expanding the capacity of the system. This report would provide the City with options and scenarios for possibly phasing the upgrades in a cost effective manner and reusing spaces and equipment where possible.

Based on the existing information known about the system, a capital improvement plan was developed for purposes of this Report. This capital improvement plan provides the City with a better understanding of the magnitude of the electrical upgrade if a conservative approach is considered. The final capital improvement plan would be determined as part of the Electrical Upgrade Predesign Report.

The existing power service and distribution equipment cannot be expanded at its existing location, and the equipment does not meet the current electrical code. A new electrical building should be constructed to house the new electrical service and distribution equipment. The building would be approximately 1,200 ft^2 and located between the new boiler building and the influent pump station.

The new electrical building would house two new automatic transfer switches and a new engine generator. It is recommended that the new power system be constructed with two separate electrical busses (two automatic transfer switches). This arrangement will provide redundancy by providing the facility with two separate electrical services to serve process units. In the event of a buss failure, or if a buss needs to be removed from service for maintenance, half of the wastewater treatment facility can still be powered if two separate services are provided.

The new engine generator would be sized to provide standby power to the influent pump station MCC, the aeration basin MCC, the UV disinfection system, the RAS pump station and any additional building heating loads that may be required to prevent freezing conditions. This design will enable the plant to meet the Reliability Class II requirements for power supply.

The MCCs are 40 years old, and it is expensive and difficult to find parts for them. It is recommended that new MCCs be installed at the influent pump station, aeration basin, RAS pump station and digester building. These MCCs would be set up for dual busses and have the required reliability and redundancy.

There are two options for a new location for the aeration basin MCCs. One option is to install the electrical equipment in a portion of the mechanics shop. A second option is to install the new equipment in a new building that would be constructed for the new aeration system.

The digester MCC is currently in a hazardous classified area per the current fire protection standards. Therefore, it is recommended that the new MCC be installed in a new room constructed within the existing digester building. This new electrical room would have to have a gas-tight wall and a ventilation system that would allow the room to be unclassified.

As stated above, this electrical system capital improvement plan is for planning purposes only and provides the City with a conservative cost estimate. The final capital improvement plan for the electrical system will be determined as part of the recommended Electrical Upgrade Predesign Report.

SCADA SYSTEM

As part of the recommended WWTF improvements, a new Supervisory Control and Data Acquisition (SCADA) system would be installed to automatically monitor and report plant operating conditions. The system will allow automatic control and monitoring of the activated sludge process, including the RAS pumping system and the sludge wasting system. The SCADA system should also incorporate the two collection system pump stations.

It is recommended that two dialer systems be installed. One dialer system would report detailed alarms that allow the operator to remotely receive information on process failures and problems at the WWTF. A second dialer would be included to provide a backup system in the event of a total power failure (commercial and generator), controls failure or HMI failure. The SCADA system will give a level of reliability and redundancy that will ensure adequate treatment is provided at all times. The system will incorporate the two collection system pump stations.

OPERATIONS BUILDING

WWTF staff have expressed a need for additional office space to hold meetings at the WWTF. Presently the staff uses the lunch room, which provides only about 200 ft^2 for meetings and a lunch room. As part of the capital improvement project, it is recommended that the lunch room be extended south toward the utility building. This extension would be similar to the lab extension at the opposite end of the building that was completed in the 1990’s. This additional space would add approximately 450 ft^2 to the building. The City may want to consider a sliding divider wall to allow the space to be portioned off for multi-purpose use.

SUMMARY

The recommended improvements described above are divided into four levels of priority, with Level I priority indicating immediate need. The improvements are prioritized based on regulatory requirements, reliability and redundancy needs, operations and maintenance considerations, and City preference. The recommended prioritization and phasing of these projects and their respective cost estimates, are shown in Table 6-4 below. Implementation schedules for these recommended improvements will be determined by the City based on priority level, costs, and available funding. Capital cost estimates have been prepared for each capital improvement, and the detailed cost estimates are in Appendix E. Each cost estimate includes contingency, sales tax, administration, legal, and engineering.

TABLE 6-4

Estimated Capital Improvements Costs

Priority Level I	**Estimated Cost**
Electrical Improvements Predesign Report	$40,000
Priority Level II	
Electrical Service(1)	$2,411,000
Biological Selectors	$786,000
Influent Flow Meter	$166,000
SCADA	$514,000
Priority Level III	
RAS System	$355,000
Lagoon Dredge (2)	$83,000
Aeration System	$1,087,000
Priority Level IV	
Effluent Flow Meter	$69,000
Operations Building	$153,000
Secondary Clarifier Rehabilitation	$226,000
Grit Rehabilitation	$79,000
Headworks Screen	$510,000
Total Capital Improvement Plan	**$6,479,000**

(1) The final estimate capital cost of the electrical upgrade will be determined as part of the Electrical Improvements Predesign Report noted under Priority Level I. This line item provides a conservative estimate that assumes the complete rebuild and relocation of the main electrical services and the rebuild and relocation of most of the MCCs.

(2) Assumes this would be competitive equipment procurement without engineering services.

DO NOTHING ALTERNATIVE

The City is required to analyze a "do nothing" alternative to satisfy Ecology's requirements. If the City did not proceed with any improvements, the eventual failure of key components would cause the City to violate its NPDES permit and risk damage to the existing facilities. For example, the largest improvement shown in Table 6-4 is the replacements of the electrical system. The system has several deficiencies including the fact that the system is 40 years old and reaching the end of its useful life. In addition the system has only a single buss and therefore lacks redundancy in the event of a buss failure. If the City chooses to do nothing eventually this equipment will fail and it will cause the City to violate its NPDES permit, as well as cause significant damage and the emergency repairs would be costly.

Many of the other upgrades that are recommended in Table 6-4 are similar. Many of the upgrades are required due to the age of the equipment or the lack of redundancy and reliability. As this equipment continues to age the risk of failure increases and becomes eminent.

The do nothing alternative is not a viable option for the City of Ellensburg due to the age of the WWTF and the lack of reliability and redundancy.

CHAPTER 7

SEWER COLLECTION SYSTEM

CHAPTER 7

SEWER COLLECTION SYSTEM

INTRODUCTION

The purpose of this Chapter is to provide a preliminary overview of the collection system and recommend capital improvements and costs for the collection system. The scope of the work for this Report was limited to the following and is not intended to fulfill the requirements of a General Sewer Plan:

- Acquire an inventory of the system from the City that includes manholes, pipe diameters, pipe age, and materials of construction.
- Provide a discussion of the condition of the existing system through review of existing maintenance records and information provided by the City. Identify existing system deficiencies based on review of the City's previous planning documents and listing of needed improvements, information from City regarding improvements made, and current and future needs as known by the City.
- Prepare Capital Improvement Plan (CIP) based on the results of the above work and develop estimates of probable project cost.

SEWER COLLECTION SYSTEM

The sewer collection system consists of approximately 77 miles of sanitary sewer and two pump stations. Much of the existing collection system was constructed of vitrified clay pipe in the 1930's. From 1960 to 1980 most of the pipe installed was asbestos cement pipe or concrete pipe, and most pipe since the 1980's has been PVC pipe. There are approximately 12 blocks of downtown service area that have combined sewers. Through the years the City has worked to separate the sanitary sewer system from the storm water collection system, but there are several areas where the sewers are still combined.

The City's collection system inventory includes 1,750 feet of wood stave pipe. According to City staff, this pipe is the interceptor sewer that conveyed wastewater to the original WWTF on Wilson creek. This portion of the system was abandoned when the City discontinued using the original WWTF during high flow events.

Figure 2-4 presents a map of the sewer system and is enclosed at the back of this Report. Table 7-1 presents an inventory of collection system pipe.

TABLE 7-1

Collection System Pipe Inventory

Dia.	Length (ft) by Material											Total Feet	Total Miles	% Total
	Conc	**PVC**	**VC**	**AC**	**CI**	**DI**	**L***	**ABS**	**Wood**	**HDPE**	**C900**			
4"	0	0	0	0	0	0	0	0	0	0	1,260	**1,260**	**0.24**	**<1**
6”	7,488	1,485	16,690	1,930	0	0	0	0	0	0	0	**27,593**	**5.23**	**7**
8"	50,840	105,409	23,205	33,890	120	102	730	1,670		0	0	**215,966**	**40.90**	**53**
10"	5,795	36,072	7,830	11,035	335	40	700	0	0	0	325	**62,132**	**11.77**	**15**
12"	1,855	12,826	14,340	10,230	0	78	0	0	0	175	0	**39,504**	**7.48**	**10**
14"	0	0	1,725	4,143	143	0	0	0	0	0	0	**6,011**	**1.14**	**1**
15"	3,320	5,770	3,315	0	0	0	3,145	0	0	200		**15,750**	**2.98**	**4**
18"	1,685	1,345	2,500	0	0	0	0	0	0	0	0	**5,530**	**1.05**	**4**
21"	45	0	0	0	0	0	0	0	0	0	0	**45**	**0.01**	**<1**
24"	0	0	5,075	0	125	0	365	0	0	0	0	**5,565**	**1.05**	**1**
36"	7,720	0	0	0	0	0	0	0	560	0	0	**8,280**	**1.57**	**2**
42"	3,307	0	0	0	0	0	0	0	1,190	0	0	**4,497**	**0.85**	**1**
TC	14,673	0	0	0	0	0	0	0	0	0	0	**14,673**	**2.78**	**4**
Total	**96,728**	**162,907**	**74,680**	**61,228**	**723**	**220**	**4,940**	**1,670**	**1,750**	**375**	**1,585**	**406,806**	**77**	**100**

Conc = concrete, PVC = Polyvinyl Chloride, VC = Vitrified Clay, AC= Asbestos Concrete, CI = Cast Iron, DI = Ductile Iron, L = Lined Pipe, ABS = Pressure Pipe, Wood = Wood Stave, HDPE = High Density Polyethylene, C900 = PVC Pressure Pipe (force mains)

GENERAL SEWER PLAN

The Wastewater-Storm Sewer Study (HDR Engineering, February 2001) included modeling of the sewer collection system. The Study included an evaluation of 11 drainage basins including capacities and future service plans. Based on conversations with City staff and their concerns regarding the age of pipes, the development that has occurred in the past 10 years and the development that is planned for the next 20 years, it is recommended that the City complete a General Sewer Plan as part of the 6-year capital improvement plan.

The City has several maintenance issues that need to be prioritized and addressed; however, it is not recommended that the City address all the maintenance issues until additional sewer planning can be completed and capacities are determined.

The City has two lift stations that will need to be replaced within the 20-year planning period. Alternately, the City has discussed eliminating those lift stations with the addition of new gravity interceptor sewers. A detailed evaluation of these proposals needs to be completed as part of a General Sewer Plan to indentify which alternatives are most financially viable for the City.

As determined in Chapter 4, the City has excessive infiltration that is largely due to the age of the collection system piping. The City needs to prioritize repair and replacement of this piping by performing an I/I investigation, which would include video inspection and smoke testing of the collection system. This will aid the in prioritizing of the pipe replacement program that is further described below.

At a minimum, the General Sewer Plan should include the following studies:

1. Computer modeling of the system for capacity evaluation of trunk and interceptor lines. The modeling would also include scenarios for future growth and system expansion.
2. I/I reduction evaluation which would include TV inspection and smoke testing. This will help the City determine which pipes are in the most need of repair and determine where storm sewers need to be separated.
3. Evaluation of the elimination or replacement of the 1st Avenue Pump Station.
4. Evaluation of the elimination or replacement of the Cora Street Pump Station.

The estimated cost of the General Sewer Plan is variable depending on the level of TV inspection and smoke testing included and specific scope of work identified. The cost of the Plan could range from $125,000 to $250,000.

SEWER COLLECTION SYSTEM MAINTENANCE

The Wastewater-Storm Sewer Study (HDR Engineering, February 2001) identified 14 wastewater collection system capital improvements. Table 7-2 is a list of the previously identified pipes that required replacement due to root intrusion, adverse grades, and pipe deterioration. Projects identified in previous studies were either completed or were not performed because maintenance requirements have decreased and the project is no longer a priority.

TABLE 7-2

Previously Identified Pipe Replacement Projects

No.	Location	Improvement	Project Status
CS-1	MH65-181 to MH65-160	Replace 870LF, 15-inch	Done
CS-2	MH56-183 to MH 56-194	Replace 336LF of 8-inch	Done
CS-3	MH55-121 to MH 55-202	Replace 360 LF of 8-inch	Not Done
CS-4	MH 46-186 to MH 46-188	Replace 362 LF of 10-inch	No Longer Issue
CS-5	MH 56-158 to MH 56-157	Replace 60 LF with 8inch pipe, or line first 60-feet existing	Not Done
CS-6	MH56-194 to 56-193	Replace 168 LF of 8-inch pipe	No Longer Issue
CS-7	MH 76-197 to 77-170	Root saw 8-inch pipe	Not done
CS-8	MH57-242 to dead end	Replace with 747 LF of 8-inch pipe	Partially done.
CS-9	MH55-132 to 55-131	Replace with 120 LF of 8-inch pipe	No Longer Issue
CS-10	MH55-195 to 55-194	Replace 400 LF of 8-inch pipe	No Longer Issue
CS-11	MH 57-195 to 57-196	Line or pipe burst 164 OLF of 8-inch pipe	No Longer Issue
CS-12	MH 65-239 to 65-181	Replace 15-inch pipe between MH64-120 and 64-121.	Done
CS-13	MH57-176 to MH57-178	Replace 212-feet 6-inch VC	Done

Many of the sewer system maintenance issues identified by City staff were related to root intrusions, deteriorating pipes, and groundwater. Staff also expressed concern over inadequate sewer conveyance capacity in several areas of the City. Table 7-3 presents a summary of maintenance problem areas, their locations and the priority in which they should be corrected. Figure 7-1 shows the location of the maintenance areas.

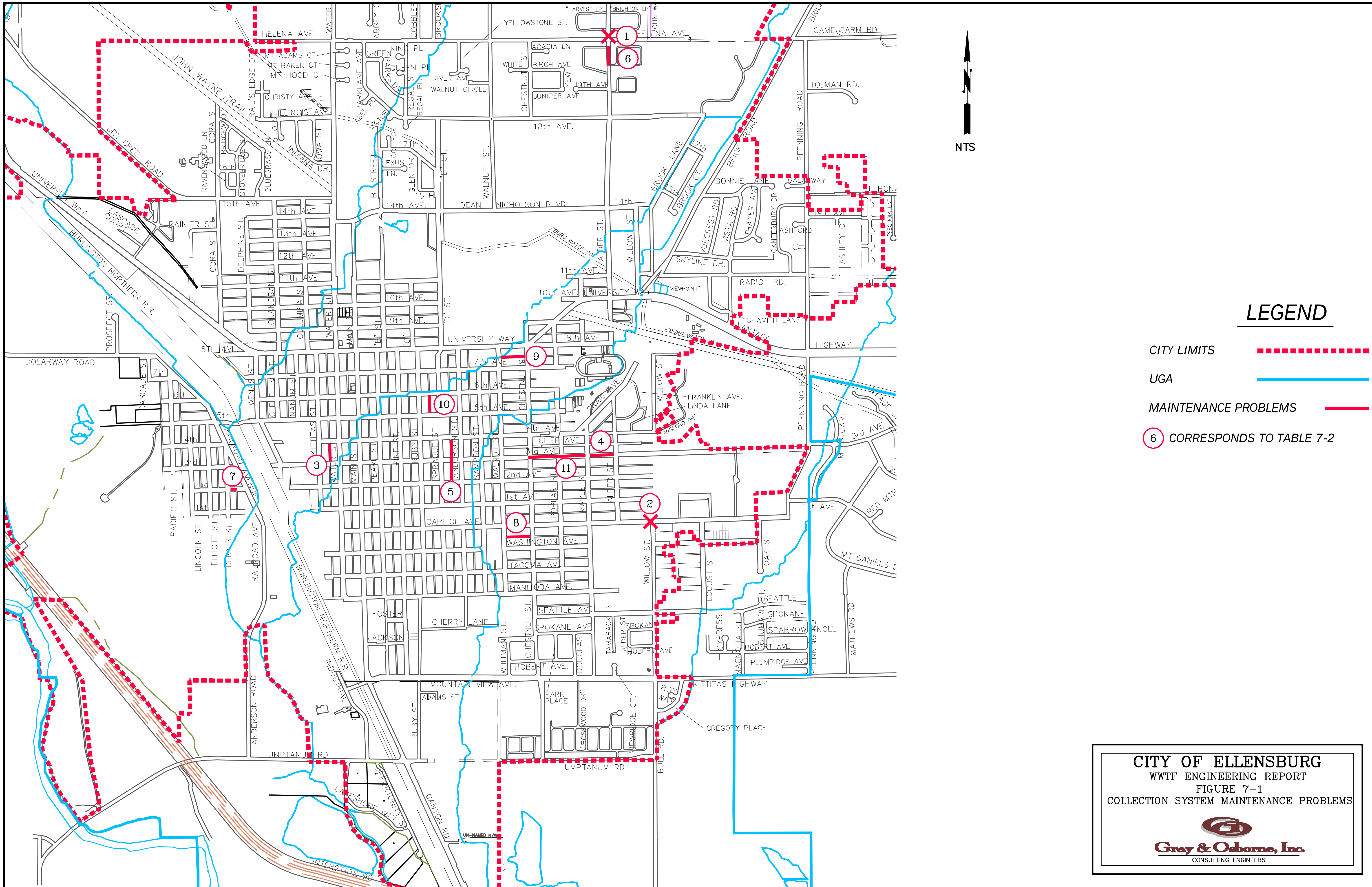
NTS
LEGEND
CITY LIMITS
UGA
MAINTENANCE PROBLEMS
6 CORRESPONDS TO TABLE 7-2
CITY OF ELLENSBURG
WWTF ENGINEERING REPORT
FIGURE 7-1
COLLECTION SYSTEM MAINTENANCE PROBLEMS
Gray & Osborne, Inc.
CONSULTING ENGINEERS
L:\ELLENSBURG\10062.00 FACILITY PLAN\FIGURES\FIG 7-1

TABLE 7-3

Current Pipe Maintenance Problems Areas

Priority	Location	Manhole ID	Pipe Length/Type
1[(1)]	Intersection Helena Ave. and Walnut St.	MH 87-100 to MH 86-209	Development Pressure
2[(1)]	Intersection Capital Ave. and Willow Street	MH 47-299	Development Pressure
3	Between Kittitas and Water St.; between 3rd and 4th Ave.	MH 55-193 to MH 55-194	342 feet, 10-inch VC
4	On 3rd Ave; between Maple and Alder St.	MH 57-245 to MH 57-173	501 feet, 8-inch VC
5	Between Sprague and Anderson St.; between 2nd and 4th Ave.	MH 56-172-MH 56-174E	295 feet 9-inch VC, 396 feet 8-inch VC
6[(2)]	On Walnut St.; between Helena and 18th Ave.	MH 76-197 to 77-170	64 feet, 8-inch Conc
7[(2)]	Between Dennis and Elliott St.; between 1st and 2nd Ave.	MH 55-121 to MH 55-202	320 feet, 8-inch VC,
8	Between Walnut and Chestnut St.; between Capital and Washington Ave.	MH 47-118 to MH47-182	418 feet, 6-inch VC
9	Between Chestnut and Walnut St.; between 7th and 8th Ave.	MH57-119 to MH 57-291	425 feet, 6-inch VC
10 [(2)]	Between Ruby and Sprague St.; between 5th and 6th Ave.	MH 56-158 to MH 56-157	60 feet, 8-inch VC
11	On 3rd Ave; between Chestnut and Maple St.	MH 57-242 to MH 57-244 to the end	486 feet, 6-inch VC

(1) Should be further evaluated as part of the General Sewer Plan prior to completion.
(2) This was a maintenance problem identified in the 1997 Study, but the problem has not been corrected. (CS-7, CS-3, CS-5)

The City has been spending approximately $100,000 per year on the sewer collection system to correct problem areas and to try and eliminate I/I. Most of the work has included using cured-in-place (CIP) technology to reline pipes and has involved pipe lengths of between 300 and 600 linear feet.

It is recommended that budget be provided to correct two maintenance projects per year based on the priorities identified above. It is recommended that those areas identified as having sewer conveyance deficiencies due to development be evaluated and improvements recommended as part of the General Sewer Plan.

SEWER COLLECTION SYSTEM PUMP STATIONS

The City owns and operates two pump stations: the Cora Street Pump Station and the First Avenue Pump Station. There are also several privately owned and operated pump stations. Table 7-4 presents information on the two City owned and operated pump stations.

TABLE 7-4

Pump Station Information

Characteristic	Cora Street Pump Station	First Avenue Pump Station
Pump Manufacturer	Hydromatic S4HVX	Ecodyne 6B3 Smith & Loveless
Quantity of Pumps	2	2
Type	Submersible, Centrifugal	Dry Pit, Centrifugal
Capacity at TDH	650gpm	1200 gpm @10.5 ft
Motor	10 hp	5 hp
Power	230V/3-phase	460V/3-phase
Standby Generator	None	None

CORA STREET PUMP STATION

The Cora Street Pump Station is located at the intersection of Cora Street and University Way. The pump station was constructed in the early 1980's and has not had any major upgrades with the exception of a pump replacement. The pump station serves a small area in the northwest section of the City. The pump station consists of two submersible centrifugal pumps that are controlled by floats. The pumps and float switches are accessed at a platform 10-feet below grade via a manhole and ladder from grade level to the platform.

The pump station has a capacity of 650 gpm. Criteria for Sewage Works (Ecology, 2008) requires pump stations to be capable of pumping PHF with the largest pump out of service. This pump station has the capacity to pump 0.936 MGD in this drainage basin. At this time the projected peak hour flow in this drainage basin is unknown. This information would be development as part of the recommended General Sewer Plan.

The pump station does not have a standby generator. According to the Criteria for Sewage Works (Ecology, 2008), all pump stations should be designed with emergency power in case the primary electrical feed is lost. For small pump stations, a portable generator that can be plugged into an electrical power supply pigtail at the pump station is commonly used; large pump stations should have permanently mounted generators. Currently, in the event of power loss, the City uses a vactor truck and trailer-mounted pump to bypass the pump station. Given the small size of the Cora Street pump station and the small area in which it serves, this bypass is acceptable for emergency service.

In order to service the pumps or the float switches at the pump station, maintenance personnel must enter the pump station, which is a confined space requiring confined space safety practices. There is no exhaust fan in the pump station; it is recommended that a fan be installed.

The pump station control panel is mounted above grade adjacent to the wet well. The original control panel was replaced with a spare that the City moved from another pump station. The pump station telemetry is limited to a blinking alarm light at the top of the control panel. The pump station is about 15 feet off of the road in the City right-of-way, but is not fenced. The main power disconnect is mounted on a local power pole and it is not locked or protected. The pump station does not have a source of water supply, as recommend by the Criteria for Sewage Works (Ecology, 2008).

Previous studies have proposed that the Cora Street Pump Station be eliminated by the installation of new gravity trunk sewers that would reroute the sewer and eliminate the need for pumping. This evaluation and recommendation was included as part of the capital improvement plan in the City's Wastewater-Storm Sewer Study (HDR Engineering, February 2001). The pump station elimination, capacity and deficiencies, should be re-evaluated as part of the recommended General Sewer Plan. The pump station is old, and if retained, the City would have to consider replacement as part of the 20-year capital improvement plan. It is estimated that if the pump station were replaced with a similar facility, the replacement cost would be $525,000, including contingency, tax, and engineering.

FIRST AVENUE PUMP STATION

The First Avenue Pump Station is located on First Avenue between Railroad Avenue and Dennis Street. The pump station serves the area west of Mercer Creek towards the commercial area at I-90 Exit 105. The pump station was constructed in the early 1970's and has not had a major upgrade. The pump station is a wet well/dry well packaged pump station (Smith & Loveless, Inc). The drywell, which is located approximately 20 feet below grade, is accessed via a ladder in a manhole. The drywell contains two centrifugal pumps.

Criteria for Sewage Works (Ecology, 2008) requires lifts stations to be capable of pumping PHF with the largest pump out of service. This pump station has a rated capacity of 1.7 MGD in this drainage basin. At this time the peak hour flow is in this drainage basin is unknown. This information would be developed as part of the General Sewer Plan recommended above.

The pump station is not equipped with a standby generator. According to the Criteria for Sewage Works (Ecology, 2008), all pump stations should be designed with emergency power in case the primary electrical feed is lost. For small pump stations, a portable generator that can be plugged into an electrical power supply pigtail at the pump station is commonly used; large pump stations should have permanently mounted generators. At the First Avenue pump station, in the event of a power outage the pump station can gravity flow to a downstream manhole. The City has experienced outages of several days where the pump station continued to gravity flow without emergency power or portable pumping required.

In order to service the pumps or the float switches at the pump station, maintenance personnel must enter the pump station, which is a confined space requiring confined space safety practices. There is an exhaust fan to ventilate the dry well; however, the fan no longer works and should be replaced.

The pump station control panel is mounted above grade adjacent to the wet well. The pump station telemetry is limited to a blinking alarm light at the top of the control panel. The pump station is not fenced and the main power disconnect is mounted on a local power pole; it is not locked or protected. The pump station does not have a source of water supply, as recommend by the Criteria for Sewage Works (Ecology, 2008).

The 1st Avenue pump station is 40-years old and nearing the end of its useful life. It has been proposed that the City eliminate the 1st Avenue Pump Station by the installation of new gravity trunk sewers that would reroute sewer and eliminate the need for pumping. This proposal has never been fully analyzed and has not been included in any of the City's previous planning documents. The pump station elimination, capacity and deficiencies should be evaluated as part of the General Sewer Plan. The pump station is old, and if retained, the City would have to consider replacement as part of the 20-year capital improvement plan.

It is estimated at this time that if the pump station were replaced with a similar facility, the cost would be $486,000, including contingency, tax, and engineering.

At a minimum, in the short term the City should replace the ventilation fan to ensure all safety measures provided are working properly.

CONCRETE AND CLAY PIPE REPLACEMENT

Approximately 50 percent of the City's collection system is old concrete or vitrified clay pipe. The clay and concrete pipes were installed from 1930 to 1980, which means that the pipes are 30 to 80 years old. Clay and concrete pipes have an expected structural life expectancy of 75 to 100 years depending on the amount of hydrogen sulfide corrosion in the sewer system. Clay and concrete pipes have a serviceability life expectancy of 50 to 75 years. Serviceability life expectancy is based on service issues such as amount of I/I, root intrusion and other maintenance issues. Based on the significant amount of I/I in the system, most of the concrete and clay pipe is at or nearing its service life.

The City should replace all of its clay and concrete pipes prior to the end of their 75-year service lives to minimize I/I and other maintenance issues. The City should replace approximately 4,500 feet of sewer pipe per year. Replacing 4,500 feet of sewer pipe per year results in an annual capital investment of nearly $900,000 if using conventional, open-trench installation methods. Trenchless technologies or cured-in-place technology, which have been previously used by the City, could reduce these costs by as much as 50 percent, potentially reducing pipe replacement costs to about $450,000 per year.

The City has been spending approximately $100,000 per year on cured-in-place rehabilitation in the past, and it may not be practical for the City to budget a larger amount each year for sewer repair and replacement. It is recommended that the City prioritize which sewer system sections to replace or line based on the I/I reduction evaluation included as part of the General Sewer Plan. It is anticipated that the Plan will focus on the maintenance problems identified in Table 7-3 as priorities and will add to that list based on the I/I investigations.

SUMMARY AND CONCLUSIONS

It is recommended that the City complete a General Sewer Plan and address the specific maintenance problems noted in Table 7-3 in the next 6 years. The General Sewer Plan will assist the City in determining where the City's financial resources are best invested. Projects that will be better identified and prioritized include the elimination or replacement of the Cora Street Pump Station, and 1st Avenue Pump Station and development of a program for replacement of the concrete and clay pipes.

Table 7-5 presents a summary of the recommended sewer system capital projects, including estimated costs and implementation schedule.

TABLE 7-5

Recommended Sewer System Capital Projects

Capital Project	Estimated Cost	2012	2013	2014	2015	2016	2017	2018-2031
General Sewer Plan and I/I Investigation	$125,000-$250,000	**X**						
Maintenance Issues & Concrete & Clay Pipe Replacement	$100,000 per year	**X**	**X**	**X**	**X**	**X**	**X**	
Concrete & Clay Pipe Replacement	$450,000 per year							**X**
First Avenue Pump Station(1)(2)	$525,000							**X**
Cora Street Pump Station(1)	$486,000							**X**

(1) Assumes the City does not eliminate the pump station and upgrades the existing station.
(2) At a minimum the City should replace or repair the vent fan at the 1st Avenue Pump Station within the next year.

CHAPTER 8

WATER RECLAMATION AND REUSE EVALUATION

CHAPTER 8

WATER RECLAMATION AND REUSE EVALUATION

As required by RCW 90.48.112, this Report evaluates the "opportunities for the use of reclaimed water". Reclaimed water is defined in RCW 90.46.010 as "effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for a beneficial use or a controlled use that would not otherwise occur, and is no longer considered wastewater."

Key differences between the requirements for water reuse and those for effluent disposal are the levels of reliability required within the treatment process, distribution, and use areas. The State of Washington's reuse treatment standards call for continuous compliance, meaning that the treatment standards must be met on a constant basis or the treated water cannot be used as reclaimed water.

ALLOWABLE USES FOR RECLAIMED WATER

The Washington State Water Reclamation and Reuse Standards describe several allowable uses of reclaimed water, including:

- Agricultural irrigation;
- Landscape irrigation;
- Impoundments and wetlands;
- Groundwater recharge;
- Streamflow augmentation;
- Industrial and commercial uses; and
- Municipal uses.

Depending upon its end use, there are four categories of reclaimed water: Class A, Class B, Class C, and Class D. Class A has the highest degree of effluent treatment. In general when unlimited public access to the reclaimed water is involved or when irrigation of crops for human consumption is the intended end use, the criteria will require Class A reclaimed water.

REUSE EVALUATION

Factors that could lead a wastewater treatment provider to pursue reclaimed water include the following:

- Regulatory Requirements. Regulatory conditions are such that making reclaimed water is a viable option compared to continuing to discharge secondary effluent, particularly when there is no viable secondary effluent discharge option.

- Water Rights. The ability to make and reuse reclaimed water could benefit the City's water rights situation, such as substitution of reclaimed water for previous potable water uses.
- Environmental Benefits. There can be environmental benefits in the right circumstances to making reclaimed water versus secondary effluent, a diversion of pollutants from receiving waters.
- Cost Effectiveness. The cost to make and reuse reclaimed water can be lower than the cost to develop new water rights and potable water supply when water sources are limited.

An evaluation of how each of these factors relates to the City's wastewater treatment utility is provided in the following sections.

REGULATORY REQUIREMENTS

At this time, the City is not having difficulty meeting its NPDES permit requirements and continued discharge of secondary effluent to the Yakima River remains a viable and cost effective means of disposition. The City has not had any consent orders or notices of violation in the past five years. The improvements listed in Chapter 6 will correct WWTF operational problems and projected equipment capacity deficiencies within the 20-year planning period.

Current regulatory requirements do not make reclaimed water a more viable option that continuing to produce secondary effluent.

WATER RIGHTS

RCW 90.46.120 states that the owner has exclusive right to any reclaimed water generated by the wastewater treatment facility. Consequently, reclaimed water has the potential to benefit water purveyors who are water right deficient. However, the City determined in its 2008 Water System Plan (Gray & Osborne, 2008) that its water rights situation is secure and water rights are not an issue at this time.

RCW 90.46.130 states that the facilities that reclaim water shall not impair existing downstream water rights unless the impaired water right holder is compensated or mitigated. The WWTF discharges to the Yakima River and the Yakima River is fully allocated for water rights. Large numbers of water right holders are downstream of the discharge point and could be impaired by the removal of the WWTF effluent from the Yakima River. The requirement to mitigate or compensate all of these water right holders if the effluent were removed from the river would place an undue burden on the City.

Therefore, it will not be feasible for the City to remove the discharge from the Yakima River due to the potential impairment impacts to downstream water right holders.

The City could conceivably conserve potable water used by industry and for irrigation. However, the City does not have any large industrial users of water that would be capable of utilizing reclaimed water effectively. Twin City Foods is the largest industrial user, and accounts for approximately 8.5 percent of the City's water use on an annual basis per the 2008 Water System Plan (Gray & Osborne, 2008), but reclaimed water cannot be used for food processing. The City uses 10 percent of its water for irrigation on an annual basis, but irrigation is a seasonal use, and the City does not have another use for reclaimed water during the months of the year where irrigation is not utilized. There are few water conservation benefits in utilizing reclaimed water to replace this irrigation demand.

ENVIRONMENTAL BENEFITS

The existing discharge to the Yakima River is diluted about 100:1 by the existing river flow. Producing effluent with a higher water quality, as reclaimed water, for discharge to the river, or diverting secondary effluent for upland use as reclaimed water will not significantly benefit the Yakima River. The significant capital cost, on-going operational cost, and higher energy usage of a water reclamation facility would not be outweighed by the minor water quality improvement the upgrade or removal of the City's small discharge would provide to the Yakima River. The additional electricity required to produce reclaimed water would actually increase the WWTF's carbon footprint and create a negative environmental benefit.

COST EFFECTIVENESS

If water reclamation and reuse is to be seriously considered, it must be cost effective and affordable for its customers. However, there are two substantial cost factors that make it unlikely that water reclamation would be economically attractive on its own without a substantial benefit – such as regulatory compliance – to balance its considerable costs.

The first major cost factor is that the City's secondary WWTF would require significant improvements in addition to those already outlined in Chapter 6 with regard to disinfection, filtration, and SCADA systems. Additional improvements would be required to the activated sludge facility to provide the process control required to reliably produce reclaimed water. This is particularly true if use of the reclaimed water would include human contact, a condition that would require the facility to produce Class A reclaimed water. It is estimated that these costs would be at least $8.3 million. In addition, a reclaimed water facility would increase operation and maintenance costs by at least $75,000 per year. The costs do not include the construction costs of a reclaimed water distribution system.

The second cost factor is that there is very little need for a reclaimed water utility since the City has adequate potable water supplies, there are no industries in the City that use a substantial amount of water and could make use of reclaimed water, and landscape irrigation does not account for a significant amount of the water use in the City. The City cannot financially sustain a reclaimed water system for summer irrigation. Most of the reclaimed water would be discharged to the Yakima River, which as stated above, would provide minor environmental benefit in comparison to the capital and operations and maintenance costs and resource consumption of a reclamation facility.

SUMMARY

Based on the evaluation of the potential advantages of water reclamation and reuse, there currently are no significant regulatory, environmental, economic, or water right benefits to water reclamation and reuse for the City. The costs of constructing and operating a water reclamation system are much too great to consider water reuse as being a cost effective alternative to the existing wastewater treatment and disposal system. Consequently, it is not recommended that the City pursue the construction of water reclamation and reuse facilities at this time.

CHAPTER 9

FINANCING

CHAPTER 9

FINANCING

INTRODUCTION

This chapter presents a plan for financing the capital improvements recommended in Chapter 6. This chapter includes a review of the City's current financial status, available revenue sources, allocation of revenues, and the impact of the recommended capital improvement plan on sewer rates.

EXISTING SERVICE RATES AND CONNECTION CHARGES

The City collects revenue through connection charges (Plant Investment Fees) and service rates that are established by Ellensburg Municipal Code. The City has eight classifications of customers: residential single family, residential multi-family, low income elderly, commercial/industrial, CWU, multi family, municipal and non profit.

There are two types of multi-family charges. One charge is based on a customer charge per day plus additional fees dependent on the total number of dwelling units. The other charge is a customer charge per day plus additional fees based on volume. According to the municipal code, customers in single-family or multi-unit structures shall have the privilege of receiving service under either the residential single-family rate, the residential multiple-family rate or the multi-family rate. However, once the customer has selected a rate under which to receive service, the customer's selection shall be in effect for at least 12 months.

The City has scheduled sewer rate increases for the next three years at an increase of approximately 5-6 percent per year. Table 9-1 presents the 2010 sewer service rates for the City.

TABLE 9-1

2010 Sewer Service Rates

Classification	Base Rate	Consumption Unit
Residential Single Family	$0.9079	Flat Rate/Day
	$0.8952	Each/First Four Units/Day
Residential Multi-Family	$0.6708	Each Additional Unit/Day
Low Income Elderly	$0.3509	Flat Rate/Day
	$0.8824	Customer Charge/Day
	$2.8392	Per 1,000 Gallons of Water Use
	$0.2288	Per lb BOD Surcharge > 750 mg/L
Commercial/Industrial	$0.2288	Per lb TSS Surcharge > 250 mg/L

Classification	Base Rate	Consumption Unit
	$0.8952	Customer Charge/Day
	$3.0279	Per 1,000 Gallons of Water Use
	$0.2321	Per lb BOD Surcharge > 200 mg/L
CWU	$0.2321	Per lb TSS Surcharge > 250 mg/L
	$0.8952	Customer Charge/Day
	$2.8802	Per 1,000 gallons of water use
	$0.2321	Per lb BOD Surcharge > 200 mg/L
Multi-Family	$0.2321	Per lb TSS Surcharge > 250 mg/L
	$0.8952	Customer Charge/Day
Municipal	$3.0279	Per 1,000 Gallons of Water Use
	$0.4412	Customer Charge/Day
Nonprofit	$1.4196	Per 1,000 Gallons of Water Use

Table 9-2 presents the sewer system connection charge or Plant Investment Fee.

TABLE 9-2

Sewer Service Connection Charges

Water Meter Size	PIF Charge
¾ inch or smaller	$ 2,180
1 inch	$ 3,641
1.5 inch	$ 7,259
2 inch	$ 11,619
3 inch	$ 21,800
4 inch	$ 36,341
6 inch	$ 72,659
8-inch	$116,259

HISTORICAL OPERATIONS

Sewer utility revenues, expenditures, and the resulting effects on cash and investments for the years 2008-2010 are summarized in Table 9-3. The revenues have exceeded expenses every year, with the exception of 2010, and the sewer fund has a beginning fund balance of approximately $6,900,000 at the end of year for 2010. The City has one bond debt for $5.8 million; this bond will not retire until 2029. This bond funded the most recent upgrades to the solids handling system at the WWTF.

TABLE 9-3

Historical Revenues and Expenditures

	2008	2009	2010
Beginning Fund Balance	$ 7,037,765	$11,510,416	$6,900,000
Total Revenue	$ 2,619,236	$ 3,321,294	$5,072,288
Total Expenditures	$ 2,579,337	$ 2,773,257	$5,420,527
Revenues-Expenditures	$ 39,899	$ 548,037	$(348,239)
Fund Balance	**$ 7,077,664**	**$12,058,453**	**$6,551,761**

CAPITAL IMPROVEMENT PROGRAM

Chapters 6 and 7 of this Report detailed recommended capital improvement plans for both the WWTF and the sewer collection system based on immediate needs and priorities.

The recommended 20-year capital improvement plan for the WWTF includes a total of $6,479,000 of improvements. The highest priority project is the replacement of the existing electrical system. Therefore, it is recommended that an Electrical Improvements Predesign Report be completed within the next year to prepare a more detailed plan and cost estimates for this work. This report is estimated to cost approximately $40,000 and will be funded from the City sewer fund. The City does not intend to fund any other capital improvement projects over the next three years. Once the Electrical Improvements Predesign Report is completed, a schedule for electrical improvements will be established.

The recommended 20-year capital improvement plan for the sewer collection system starts with completion of a General Sewer Plan. There are several needs concerning maintenance and the repair and replacement of old concrete and clay pipe. The City currently spends approximately $100,000 per year in major repairs or replacement of problem sewer system components within the City. The General Sewer Plan will assist the City in determining where the City's financial resources are best invested. Projects that will be better identified and prioritized include the elimination of the Cora Street Pump Station, replacement of the 1st Avenue Pump Station and development of a program for replacement of the concrete and clay pipes. It is estimated that a General Sewer Plan will cost between $125,000-$250,000, dependent upon the level of field work and modeling performed. The City plans to complete the General Sewer Plan within the next three years and will fund the report from the City sewer fund. The City does not intend to fund any other sewer system capital improvement projects over the next three years.

APPENDICES

APPENDIX A

NPDES PERMIT

Issuance Date: January14, 2011
Effective Date: March 1, 2011
Expiration Date: February 28, 2016

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT NO. WA-002434-1

State of Washington
DEPARTMENT OF ECOLOGY
Yakima, Washington 98902

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 1342 et seq.

CITY OF ELLENSBURG
PUBLICLY-OWNED TREATMENT WORKS
2415 CANYON ROAD
ELLENSBURG, WA 98926

is authorized to discharge in accordance with the Special and General Conditions that follow.

Treatment Plant Location: Same as above

Receiving Water Body & I.D. No. (Outfall 001):	Discharge Location:
Yakima River, River Mile 151.6	Latitude: 46.5745
ID# 1192269462537	Longitude: -120.5478

Receiving Water Body I.D. No. (Outfall 002):	Discharge Location:
Wilson Creek	Latitude: 46.9883
ID # 1204996469262	Longitude: -120.5378
Outfall 002 to be used for emergency bypass only.	

Plant Type:
Class III, Activated Sludge, Complete Mix Aeration, Secondary Clarification, Ultraviolet Disinfection and Anaerobic Digestion.

Charles McKinney
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions of this permit for additional submittal requirements. The following table is for quick reference only. Enforceable submittal requirements are contained in the permit narrative.

Permit Section	Submittal	Frequency	First Submittal Date
S3.	Discharge Monitoring Report	Monthly	**April 15, 2011**
S4.D.	Notification of New or Altered Sources	As necessary	
S4.E.3.	Infiltration and Inflow Evaluation	Annually	**October 1, 2011**
S4.F.1.	Wasteload Assessment	1/permit cycle	**September 1, 2014**
S5.G.1.	Operations and Maintenance Manual	As necessary	
S5.G.2.	Operations and Maintenance Manual Review or Update	Annually	
S5.H.	Collection System Exfiltration Prevention Plan	1/permit cycle	**June 1, 2012**
S8.B.10	Acute Toxicity Report	1/permit cycle	**January 15, 2014**
S9.B.10	Chronic Toxicity Report	1/permit cycle	**January 15, 2014**
S10.B.	Update of CSO Reduction Plan	1/permit cycle	**February 28, 2015**
S11.A.	Additional Chemical Analysis of Effluent	1/permit cycle	**January 15, 2014**
S12.	Application for Permit Renewal	1/permit cycle	**February 28, 2015**
G1.	Signatory Requirements	As necessary	
G4.	Reporting Planned Changes	As necessary	
G5.	Plan Review Required	As necessary	

SPECIAL CONDITIONS

In this permit, the word "must" denotes an action that is mandatory and is equivalent to the word "shall" used in previous permits.

S1. DISCHARGE LIMITS

A. Effluent Limits

All discharges and activities authorized by this permit must comply 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 violates the terms and conditions of this permit.

Beginning on **March 1, 2011** and lasting through **February 28, 2016**, the Permittee may discharge municipal wastewater to the Yakima River and to Wilson Creek, in emergencies, at the permitted locations subject to compliance with the following limits:

EFFLUENT LIMITS: OUTFALL # 001 & OUTFALL #002		
Parameter	**Average Monthly** [a]	**Average Weekly** [b]
Biochemical Oxygen Demand (5 day) (BOD_5)	30 mg/L; 1,500 lbs/day 85% removal of influent BOD	45 mg/L; 2,250 lbs/day
Total Suspended Solids (TSS)	30 mg/L; 1,200 lbs/day 85% removal of influent TSS	45 mg/L; 1,800 lbs/day
Fecal Coliform Bacteria [c]	100/100 mL (monthly geometric mean)	200/100 mL (7-day geometric mean)
pH	Between 6.0 and 9.0 at all times	
Parameter	**Average Monthly**	**Maximum Daily** [b]
Total Ammonia (as NH_3-N)	NA	8.2 mg/L; 547 lbs/day
a-The average monthly and weekly effluent limits 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 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.		
c-Ecology gives directions to calculate the monthly and the 7-day geometric mean in publication No. 04-10-020, *Information Manual for Treatment Plant Operators* available at: http://www.ecy.wa.gov/pubs/0410020.pdf		

B. Mixing Zone Authorization

The following paragraph defines the maximum boundaries or flow-volume restriction of the mixing zones:

> The length of the chronic and acute mixing zones extends downstream no greater than 300.5 and 30.0 feet, respectively. The chronic mixing zone shall extend upstream no greater than 100 feet from the centerpoint of the outfall's discharge opening. The width of the chronic and acute mixing zones is no more than 36.2 feet and 25.1 feet, respectively. The dilution factors for the chronic and acute mixing zones are approximately 38 and 4.0, respectively.

S2. MONITORING REQUIREMENTS

A. Monitoring Schedule

The Permittee must monitor in accordance with the following schedule and must use the laboratory method, and meet the detection level (DL), and quantitation level (QL) specified in Appendix A. The Permittee may use alternative methods included in 40 CFR Part 136 if the DL and QL are equivalent to those specified in Appendix A or if the alternative method's DL and QL are low enough to detect the parameter:

Parameter	Units	Sample Point	Minimum Sampling Frequency	Sample Type
(1) Wastewater Influent				
Wastewater Influent means the raw sewage flow. Sample the wastewater entering the headworks of the treatment plant excluding any side-stream returns from inside the plant.				
BOD_5	mg/L	Influent composite sampler	3/week [a]	24-hr. composite [b]
BOD_5	lbs/day	--	3/week	Calculation [c]
TSS	mg/L	Influent composite sampler	3/week	24-hr. composite
TSS	lbs/day	--	3/week	Calculation
(2) Final Wastewater Effluent				
Final Wastewater Effluent means wastewater, which is exiting, or has exited, the last treatment process or operation. Typically, this is after or at the exit from the chlorine contact chamber or other disinfection process. The Permittee may take effluent samples for the BOD5 analysis before or after the disinfection process.				
Flow	MGD	Effluent Parshall Flume	Continuous [d]	Measurement
BOD_5	mg/L	"	3/week	24-hr. composite
BOD_5	lbs/day	"	3/week	Calculation
BOD_5	% Removal	"	monthly	Calculation [e]
TSS	mg/L	"	3/week	24-hr. composite
TSS	lbs/day	"	3/week	Calculation
TSS	% Removal	"	monthly	Calculation
Total Ammonia	mg/L	"	1/week [f]	24-hr. composite
Total Ammonia	lbs/day	"	1/week	Calculation
Dissolved Oxygen	mg/L	"	Daily	Grab [h]
pH	Standard Units	"	5/week	Grab
Temperature [g]	^{o} C	"	Continuous	Measurement
Fecal Coliform Bacteria	# colonies/ 100ml	"	3/week	Grab
Total Hardness	mg/L as $CaCO_3$	"	4/year [i]	24-hr. composite

[a] 3/week means three (3) times during each calendar week and on a rotational basis throughout the days of the week, except weekends and holidays.
[b] 24-hour composite means a series of individual samples collected over a 24-hour period into a single container, and analyzed as one sample.
[c] Calculation" means figured concurrently with the respective sample, using the following formula: Concentration (in mg/L) X Flow (in MGD) X Conversion Factor (8.34) = lbs/day.
[d] Continuous means without interruption throughout the operating and discharging hours of the Permittee's facility, except for infrequent shutdowns for maintenance.
[e] Calculate the Percent (%) removal of BOD and TSS using the following algorithm (concentrations in mg/L): (Average Monthly Influent Concentration - Average Monthly Effluent Concentration)/Average Monthly Influent Concentration.
[f] 1/week means collected once each calendar week, on a rotational basis throughout the days of the week, and may exclude weekends and holidays.
[g] Temperature grab sampling must occur when the effluent is at or near its daily maximum temperature, which is usually in the late afternoon. If temperature is measured continuously, the Permittee must determine and report a daily maximum from half-hour measurements in a 24-hour period. To determine the daily average, use the temperature on the half-hour from the chart for the twenty-four (24) hour period and calculate the average of the values. Continuous monitoring instruments must achieve an accuracy of 0.2 degrees C and the Permittee must verify accuracy annually.
[h] Grab means an individual sample collected over a fifteen (15) minute, or less, period.
[i] "4/year" means once each quarter of the year. The quarters are defined as January through March, April through June, July through September, and October through December.

(3) CSO to Wilson Creek (Emergencies Only)

Parameter	Units	Sample Point	Minimum Sampling Frequency	Sample Type
Flow	Total Gallons	Outfall	1 per event	Calculation
BOD_5	mg/L	“	“	Grab
TSS	mg/L	“	“	Grab
Fecal Coliform Bacteria	# colonies/ 100ml	“	“	Grab

(4) Permit Application Requirements – Final Wastewater Effluent

Parameter	Units	Minimum Sampling Frequency	Sample Type
Dissolved Oxygen	mg/L	Once per year [a]	Grab
Total Kjeldahl Nitrogen	mg/L	Once per year	24-hr. composite
Nitrate plus Nitrite N	mg/L	Once per year	24-hr. composite
Oil and Grease	mg/L	Once per year	24-hr. composite
Phosphorus (Total)	mg/L	Once per year	24-hr. composite
Total Dissolved Solids	mg/L	Once per year	24-hr. composite
EPA Priority Pollutant Scan	Sampling and timing must be consistent with the conditions outlined in Special Condition S11. of this permit.		24-hr. composite

[a] Sampling events must rotate through the seasons; 2011 in the spring, 2012 in summer, 2013 fall and 2013 winter and so on.

B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136.

C. Flow Measurement, Field Measurement and Continuous Monitoring Devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement, and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.
3. If the Permittee uses micro-recording temperature devices known as thermistors it must calibrate the devices using protocols from Ecology's Quality Assurance Project Plan Development Tool (*Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends*). This document is available online at http://www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod6%20Ecology%20SOPs/Protocols/ContinuousTemperatureSampling.pdf . Calibration as specified in this document is not required if the Permittee uses recording devices which are certified by the manufacturer.
4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Calibrate these devices at the frequency recommended by the manufacturer.
6. Calibrate flow monitoring devices at a minimum frequency of at least one calibration per year.
7. Maintain calibration records for at least three years.

D. Laboratory Accreditation

All monitoring data required by Ecology must be prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters. Crops and soils data are process control parameters, which do not require preparation by an accredited laboratory. However, the Permittee must obtain this data from a reputable agricultural test lab that is an active participant in a nationally recognized agricultural laboratory proficiency-testing program.

E. Request for Reduction in Monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request through a permit modification or when it reissues the permit.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. REPORTING AND RECORDING REQUIREMENTS

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

A. Reporting

The first monitoring period begins on **March 1, 2011**. The Permittee must:

1. Submit monitoring results each month.
2. Summarize, report, and submit monitoring data obtained during each monitoring period on a Discharge Monitoring Report (DMR) form provided, or otherwise approved, by Ecology.
3. Submit DMR forms monthly whether or not the facility was discharging. If the facility did not discharge during a given monitoring period, submit the form as required with the words "NO DISCHARGE" entered in place of the monitoring results.
4. Ensure that DMR forms are **postmarked or received by** Ecology no later than the 15th day of the month following the completed monitoring period, unless otherwise specified in this permit.
5. Submit priority pollutant analysis data no later than forty-five (45) days following the monitoring.

6. Send report(s) to Ecology at:

    Permit Coordinator
    Department of Ecology
    Central Regional Office
    15 West Yakima Avenue, Suite 200
    Yakima, WA 98902

All laboratory reports providing data for organic and metal parameters must 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. Analytical results from samples sent to a contract laboratory must include information on the chain of custody, the analytical method, QA/QC results, and documentation of accreditation for the parameter.

B. Records Retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must 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. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

C. Recording of Results

For each measurement or sample taken, the Permittee must 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.
6. The results of all analyses.

D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition S2 of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR.

E. Reporting Permit Violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

a. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
b. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

1. Immediate Reporting

The Permittee must report any failure of the disinfection system or use of Outfall 002 to Wilson Creek **immediately** to the Department of Ecology's Regional Office 24-hr. number listed below:

Central Regional Office	509-575-2490

The Permittee must report any failure of the disinfection system, any collection system overflows, or any plant bypass discharging to a waterbody used as a source of drinking water immediately to the Department of Ecology and the Department of Health, Drinking Water Program at the numbers listed below:

Central Regional Office	509-575-2490
Department of Health,	360-521-0323 (business hours)
Drinking Water Program	360-481-4901 (after business hours)
Kittitas County Public Health	509-962-7515 (business hours)

2. Twenty-four-hour Reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

a. Any noncompliance that may endanger health or the environment, unless previously reported under subpart 1, above.
b. Any unanticipated **bypass** that exceeds any effluent limitation in the permit (See Part S4.B., “Bypass Procedures”).
c. Any **upset** that exceeds any effluent limitation in the permit (See G.15, “Upset”).
d. Any violation of a maximum daily or instantaneous maximum discharge limitation for any of the pollutants in Section S1.A of this permit.

e. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limitation in the permit.

3. Report Within Five Days

The Permittee must also provide a written submission within five days of the time that the Permittee becomes aware of any event required to be reported under subparts 1 or 2, above. The written submission must contain:

a. A description of the noncompliance and its cause.
b. The period of noncompliance, including exact dates and times.
c. The estimated time noncompliance is expected to continue if it has not been corrected.
d. Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.
e. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

4. Waiver of Written Reports

Ecology may waive the written report required in subpart 3, above, on a case-by-case basis upon request, if a timely oral report has been received.

5. All Other Permit Violation Reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in paragraph E.3, above. 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.

6. Report Submittal

The Permittee must submit reports to the address listed in S3.

F. Other Reporting

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and chapter 173-303-145. You can obtain further instructions at the following website:
http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm.

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 Ecology, it must submit such facts or information promptly.

The Permittee must submit a new application or supplement at least one hundred eighty (180) days prior to commencement of discharges, resulting from the activities listed below, which may result in permit violations. These activities include: any facility expansions, production increases, or other planned changes, such as process modifications, in the permitted facility.

G. Maintaining a Copy of This Permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. FACILITY LOADING

A. Design Criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Parameter	Design Quantity
Monthly average flow (max. month)	8 MGD
Instantaneous peak flow	15 MGD
BOD_5 influent loading	10,000 lbs/day
TSS influent loading	8,000 lbs/day
Design population equivalent	31,000 persons

B. Plans for Maintaining Adequate Capacity

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.
2. The projected increase would reach design capacity within five years.

The plan and schedule for continuing to maintain capacity must be sufficient to achieve the effluent limits and other conditions of this permit. This plan must identify any of the following actions or any other actions necessary to meet the objective of maintaining capacity.

a. 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.
b. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
c. Limitation on future sewer extensions or connections or additional waste loads.
d. Modification or expansion of facilities necessary to accommodate increased flow or waste load.
e. 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 Ecology prior to any construction.

If the Permittee intends to apply for state or federal funding for the design or construction of a facility project, the plan may also need to meet the environmental review requirements as described in 40 CFR 35.3040 and 40 CFR 35.3045 and it may also need to demonstrate cost effectiveness as required by WAC 173-95-730. The plan must specify any contracts, ordinances, methods for financing, or other arrangements necessary to achieve this objective.

C. Duty to Mitigate

The Permittee must 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

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the POTW is proposed which:

   a. Would interfere with the operation of, or exceed the design capacity of, any portion of the POTW;
   b. Is not part of an approved general sewer plan or approved plans and specifications; or
   c. Would be subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.

2. This notice must 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 must conduct annual infiltration and inflow evaluations. 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
   or at
   http://www.ecy.wa.gov/programs/wq/permits/guidance.html .

   The Permittee may use plant monitoring records to assess measurable infiltration and inflow.

2. The Permittee must prepare a report which summarizes any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the previous report based on equivalent rainfall, the report must contain a plan and a schedule for:

   a. Locating the sources of infiltration and inflow; and
   b. Correcting the problem.

3. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions by **October 1, 2011 and annually thereafter**.

F. Wasteload Assessment

1. The Permittee must conduct an assessment of its influent flow and waste load and submit a report to Ecology by **September 1, 2014**.
2. The report must contain the following: an indication of compliance or noncompliance with the permit effluent limits; 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 change in these parameters since the previous report.
3. The report must 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.

4. Ecology may modify the interval for review and reporting if it determines that a different frequency is sufficient.

S5. OPERATION AND MAINTENANCE

The Permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems 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 III plant must operate this permitted facility. This operator must be in responsible charge of the day-to-day operation of the wastewater treatment plant. An operator certified for at least a Class II plant must be in charge during all regularly scheduled shifts.

B. O & M Program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.
2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.
3. Make maintenance records available for inspection at all times.

C. Short-term Reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out in a manner approved by Ecology.
If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.
2. Detail 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 its obligations under this permit.

D. Electrical Power Failure

The Permittee must ensure that adequate safeguards 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. Adequate safeguards include, but are not limited to: alternate power sources, standby generator(s), or retention of inadequately treated wastes.

For Reliability Class II - The Permittee must maintain Reliability Class II (EPA 430/9-74-001) at the wastewater treatment plant. Reliability Class II requires a backup power source sufficient to operate all vital components and critical lighting and ventilation during peak wastewater flow conditions. Vital components used to support the secondary processes (i.e., mechanical aerators or aeration basin air compressors) need not be operable to full levels of treatment, but must be sufficient to maintain the biota.

E. Prevent Connection of Inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

F. Bypass Procedures

This permit prohibits a bypass, which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

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 limits or other conditions of this permit, or adversely affect public health as determined by Ecology prior to the bypass. The Permittee must 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. No feasible alternatives to the bypass exist, such as:

      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Stopping production.
      - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
      - Transport of untreated wastes to another treatment facility or preventative maintenance), or transport of untreated wastes to another treatment facility.

   c. Ecology is properly notified of the bypass as required in condition S3.E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain

      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
      - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
      - The minimum and maximum duration of bypass under each alternative.
      - A recommendation as to the preferred alternative for conducting the bypass.
      - The projected date of bypass initiation.
      - A statement of compliance with SEPA.

- A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
- Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

- If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
- If feasible alternatives to bypass exist, 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.
- If the Permittee planned and scheduled the bypass 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, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

G. Operations and Maintenance Manual

The Permittee must:

1. Review the O&M Manual at least annually.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

In addition to the requirements of WAC 173-240-080 (1) through (5), the O&M Manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
3. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
4. The treatment plant process control monitoring schedule.
5. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.
6. Specify other items on case-by-case basis such as O&M for collection system pump stations, lagoon liners, etc.

H. Collection System Exfiltration Prevention Plan

The Permittee must prepare a plan to prevent exfiltration of wastewater from collection system sewers into critical areas, such as surface waters, ground water, or wellhead protection areas. The plan must address potential exfiltration from sewer pipes:

1. Identified in segments of the collection system which are routed under surface water.
2. Adjacent to (within 100 yards) surface water.
3. Placed over wellhead protection areas.
4. That operate at greater than atmospheric pressure.
5. Within 50 feet above the ground water table.

The Permittee must present this plan to Ecology for approval no later than **June 1, 2012**.

S6. PRETREATMENT

A. General Requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

B. Duty to Enforce Discharge Prohibitions

1. Under 40 CFR 403.5(a), the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC-173-216-060.

2. The Permittee must 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 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, 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. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:

   a. Noncontact 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 must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

C. Wastewater Discharge Permit Required

The Permittee must not allow any significant industrial users (SIUs) to discharge wastewater to the Permittee's sewer system until such user has received a wastewater discharge permit from Ecology in accordance with chapter 90.48 RCW and chapter 173-216 WAC.

D. Identification and Reporting of Existing, New, and Proposed Industrial Users

1. The Permittee must 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 sewer system (see Appendix B of the Fact Sheet for definitions).
2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be an SIU, the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.
3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

S7. SOLID WASTES

A. Solid Waste Handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

The final use and disposal of biosolids shall be done in accordance with Chapter 173-308 WAC ("Biosolids Management"), 40 CFR Part 503, and under coverage of the State general permit for biosolids management, as applicable.

B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. ACUTE TOXICITY

A. Effluent Testing

The Permittee must:

1. Conduct acute toxicity testing on final effluent during spring of 2013 and fall of 2013 (once in the last summer and once in the last winter prior to submission of the application for permit renewal).
2. Submit the results to Ecology with the permit renewal application.
3. Conduct acute toxicity testing on a series of at least five concentrations of effluent, including 100% effluent, and a control.
4. Use each of the following species and protocols for each acute toxicity test:

Acute Toxicity Tests	Species	Method
Fathead minnow 96-hour static-renewal test	*Pimephales promelas*	EPA-821-R-02-012
Daphnid 48-hour static test	*Ceriodaphnia dubia*, *Daphnia pulex*, or *Daphnia magna*	EPA-821-R-02-012

B. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing in accordance with the most recent version of Department of Ecology Publication No. WQ-R-95-80, Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.

3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Department of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in Subsection C and the Department of Ecology Publication No. WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in Subsection A or pristine natural water of sufficient quality for good control performance.
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing 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 **acute critical effluent concentration (ACEC)**. **The ACEC equals 25% effluent.**
8. All whole effluent toxicity tests, effluent screening tests, and rapid screening tests that involve hypothesis testing must comply with the acute statistical power standard of 29% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.
9. Reports of individual characterization or compliance test results must be submitted to Ecology within sixty (60) days after each sample date.
10. The Acute Toxicity Summary Report must be submitted to Ecology by **January 15, 2014.**

S9. CHRONIC TOXICITY

A. Effluent Testing

The Permittee must:

1. Conduct chronic toxicity testing on the final effluent once during spring 2013 and once during fall 2013.
2. Submit a written report to Ecology within sixty (60) days after each sample date.
3. Conduct chronic toxicity testing during effluent characterization on a series of at least five concentrations of effluent and a control. This series of dilutions must include the acute critical effluent concentration (ACEC). **The ACEC equals 25% effluent.**

The Permittee must conduct the following two chronic toxicity tests on each sample:

Freshwater Chronic Test	Species	Method
Fathead minnow survival and growth	*Pimephales promelas*	EPA-821-R-02-013
Water flea survival and reproduction	*Ceriodaphnia dubia*	EPA-821-R-02-013

B. Sampling and Reporting Requirements

1. The Permittee must submit all reports for toxicity testing 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*. Reports must contain bench sheets and reference toxicant results for test methods. If the lab provides the toxicity test data in electronic format for entry into Ecology's database, then the Permittee must send the data to Ecology along with the test report, bench sheets, and reference toxicant results.
2. The Permittee must collect 24-hour composite effluent samples for toxicity testing. The Permittee must cool the samples to 0 - 6 degrees Celsius during collection and send them to the lab immediately upon completion. The lab must begin the toxicity testing as soon as possible but no later than 36 hours after sampling was completed.
3. The laboratory must conduct water quality measurements on all samples and test solutions for toxicity testing, as specified in the most recent version of Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*.
4. All toxicity tests must meet quality assurance criteria and test conditions specified in the most recent versions of the EPA methods listed in subsection C. and the Department of Ecology Publication # WQ-R-95-80, *Laboratory Guidance and Whole Effluent Toxicity Test Review Criteria*. If Ecology determines any test results to be invalid or anomalous, the Permittee must repeat the testing with freshly collected effluent.
5. The laboratory must use control water and dilution water meeting the requirements of the EPA methods listed in subsection C. or pristine natural water of sufficient
6. The Permittee must conduct whole effluent toxicity tests on an unmodified sample of final effluent.
7. The Permittee may choose to conduct a full dilution series test during compliance testing 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 CCEC and the ACEC. The CCEC and the ACEC may either substitute for the effluent concentrations that are closest to them in the

dilution series or be extra effluent concentrations. **The ACEC equals 25% effluent**. **The CCEC equals 2.6% effluent.**

8. All whole effluent toxicity tests that involve hypothesis testing must comply with the chronic statistical power standard of 39% as defined in WAC 173-205-020. If the test does not meet the power standard, the Permittee must repeat the test on a fresh sample with an increased number of replicates to increase the power.
9. Reports of individual characterization or compliance test results must be submitted to Ecology within 60 days after each sample date.
10. The Chronic Toxicity Summary Report must be submitted to Ecology by **January 15, 2014.**

S10. COMBINED SEWER OVERFLOWS

A. Discharge Locations

The following outfalls are authorized to discharge combined sewer overflows (CSOs), which are occasional point sources of pollutants as a result of precipitation events. Discharges from these sites are prohibited except as a result of and during precipitation events. No authorization is given by this permit for discharge from a CSO that causes adverse impacts that threaten characteristic uses of the receiving water as identified in the Water Quality Standards, Chapter 173-201A WAC.

DISCHARGE NO.	LOCATION	RECEIVING WATER
001	Latitude: 46.5745 Longitude: -120.5478	Yakima River
002	Latitude: 46.9883 Longitude: -120.5378	Wilson Creek (emergencies only)

B. CSO Reduction Plan Update

In conjunction with the next application for permit renewal, the Permittee shall submit an amendment of its CSO Reduction Plan Ecology for review and approval by **February 28, 2015**. The updated plan must describe progress made to reduce the potential for a CSO event and any revisions made to the CSO Reduction Plan. The amendment must comply with the requirements of WAC 173-245-090(2).

S11. ADDITIONAL CHEMICAL ANALYSIS OF EFFLUENT

A. General Requirements

The Permittee must conduct one priority pollutant scan of an effluent sample collected from the wastewater treatment system in accordance with protocols, monitoring requirements, and QA/QC procedures specified in this section.

The effluent sampling must be timed to coincide with sampling of the effluent chronic toxicity in the fall of 2013. A written report shall be submitted to Ecology by **January 15, 2014.**

B. Monitoring Requirements

1. The sample effluent must be a representative composite consisting of continuous sampling or 6 grab samples equally spaced over a 24-hour period.

C. Analysis Requirements

1. A complete priority pollutant scan must consist of all of the analyses listed in Table II and Table III under 40 CFR Part 122, Appendix D.
2. Samples for the analysis of acid and base/neutral extractable compounds and metals must be 24-hour composites. Samples for the analysis of volatile organic compounds must be collected using grab sampling techniques at equal intervals for the total of 4 grab samples per day.
3. Cyanide, phenols and fats, oil and grease (FOG) must be taken as grab samples. FOG shall be hexane soluble or equivalent.
4. In addition to all priority pollutants, a reasonable attempt should be made to identify all other substances and quantify all pollutants shown to be present by gas chromatograph/mass spectrometer (GC/MS) analysis per 40 CFR 136, Appendix A, Methods 624 and 625. Determinations of pollutants should be attempted for each fraction which produces identifiable spectra on total ion plots (reconstructed gas chromatograms). Determinations should be attempted from all peaks with responses of 5 percent or greater than the nearest internal standard. The 5 percent value is based on internal standard concentrations of 30 μg/l, and must be adjusted downward if higher internal standard concentrations are used or adjusted upward if lower internal standard concentrations are used. Non-substituted aliphatic compounds may be expressed as total hydrocarbon content. Identification shall be attempted by a laboratory whose computer data processing programs are capable of comparing sample mass spectra to a computerized library of mass spectra, with visual confirmation by an experienced analyst. For all detected substances which are determined to be pollutants, additional sampling and appropriate testing shall be conducted to determine concentration and variability, and to evaluate trends.

D. Protocols

The Permittee must have all final effluent samples handled, prepared, and analyzed by GC/MS in accordance with the EPA Methods 624 and 625

(October 26, 1984). All other tests not applicable to analysis by GC/MS must be analyzed in accordance with the applicable protocols of 40 CFR Part 136.

E. Quality Assurance/Quality Control Procedures

The Permittee shall follow the quality assurance procedures of 40 CFR Part 136.

S12. APPLICATION FOR PERMIT RENEWAL

The Permittee must submit an application for renewal of this permit by **February 28, 2015**.

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

A. All applications, reports, or information submitted to Ecology must be signed and certified.

1. In the case of corporations, by a responsible corporate officer.

   For the purpose of this section, a responsible corporate officer means:

   (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or

   (ii) The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

2. In the case of a partnership, by a general partner.

3. In the case of sole proprietorship, by the proprietor.

4. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

B. All reports required by this permit and other information requested by Ecology must 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 Ecology.
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 Ecology 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 must 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 must allow an authorized representative of Ecology, 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 Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 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.
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.
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. Ecology 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. When cause exists for termination for reasons listed in A1 through A7 of this section, and Ecology determines that modification or revocation and reissuance is appropriate.
   2. When Ecology 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 PLANNED CHANGES

The Permittee must, as soon as possible, but no later than sixty (60) days prior to the proposed changes, give notice to Ecology 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, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, 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.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must 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 must be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit must be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

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 Ecology 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. Ecology 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.

G8. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, must 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.

G9. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology 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 must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. PAYMENT OF FEES

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must 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 will 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 is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. UPSET

Definition – "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits 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 limits if the requirements of the following paragraph are met.

A Permittee who wishes to establish the affirmative defense of upset must 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 S4.C of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must 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.

G18. TOXIC POLLUTANTS

The Permittee must 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.

G19. 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 must, 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 must 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.

G20. 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 must be submitted no later than fourteen (14) days following each schedule date.

G21. CONTRACT REVIEW

The Permittee must submit to Ecology any proposed contract for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW. In the event that Ecology does not comment within a thirty (30)-day period, the Permittee may assume consistency and proceed with the contract.

FACT SHEET FOR NPDES PERMIT
NO. WA-002434-1

CITY OF ELLENSBURG POTW
October 6, 2010

PURPOSE OF THIS FACT SHEET

This fact sheet explains and documents the decisions Ecology made in drafting the proposed National Pollutant Discharge Elimination System (NPDES) permit for Ellensburg Publicly-Owned Treatment Works (POTW).

This fact sheet complies with Section 173-220-060 of the Washington Administrative Code (WAC), which requires Ecology to prepare a draft permit *and accompanying fact sheet* for public evaluation before issuing an NPDES permit.

Ecology makes the draft permit and fact sheet available for public review and comment at least thirty (30) days before issuing the final permit. Copies of the fact sheet and draft permit for the Ellensburg POTW, NPDES Permit No. WA-002434-1, are available for public review and comment from **November 17, 2010** until **December 17, 2010**. For more details on preparing and filing comments about these documents, please see **Appendix A - Public Involvement**.

The City of Ellensburg reviewed the draft permit and fact sheet for factual accuracy. Ecology corrected any errors or omissions regarding the facility's location, history, discharges, or receiving water.

After the public comment period closes, Ecology will summarize substantive comments and provide responses to them. Ecology will include the summary and responses to comments in this Fact Sheet as **Appendix D - Response to Comments**, and publish it when issuing the final NPDES permit. Ecology will not revise the rest of the fact sheet, but the full document will become part of the legal history contained in the facility's permit file.

Richard Marcley prepared the permit and this fact sheet.

SUMMARY

The City is seeking reissuance of its National Pollutant Discharge Elimination System (NPDES) permit for its Publicly Owned Treatment Works (POTW). The POTW consists of approximately 66 miles of sewers, three pump stations and a wastewater treatment plant. Wastewater receives secondary-level treatment in a complete mix aeration process with ultraviolet disinfection, and is then discharged through a submerged outfall into the Yakima River.

The City has requested, and will receive in the proposed permit, coverage for one combined sewer overflow discharge per year. Approximately ten percent of the collection system is comprised of combined sanitary-storm sewers. The City has dedicated resources, on a continuing basis, to removing storm water catchment basins from the sanitary sewer system.

Storm water catchment basins disconnected from sanitary sewer system are connected to the separate storm water collection system maintained by the City. In June 2005 the Association of Washington Cities awarded the City a Certification of Excellence for its well-managed sewer inspection and maintenance program.

This permit requires: compliance with effluent limitations; implementation of the self-monitoring program; and, submittal of a Combined Sewer Overflow Reduction Plan Update. The City must also evaluate the infiltration and inflow (I&I) into its collection system annually and assess loadings to its treatment plant once during the upcoming permit cycle. In addition, the City is required to carry out whole effluent toxicity testing in the third year of the permit cycle. This permit also requires the City to characterize its effluent for EPA priority pollutants.

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INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later amendments in 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One mechanism for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System (NPDES), administered by the federal Environmental Protection Agency (EPA). The EPA authorized the State of Washington to manage the NPDES permit program in our state. Our state legislature accepted the delegation and assigned the power and duty for conducting NPDES permitting and enforcement to Ecology. The legislature defined Ecology's authority and obligations for the wastewater discharge permit program in 90.48 RCW (Revised Code of Washington).

The following regulations apply to municipal NPDES permits:

- Procedures Ecology follows for issuing NPDES permits (chapter 173-220 WAC)
- Technical criteria for discharges from municipal wastewater treatment facilities (chapter 173-221 WAC)
- Water quality criteria for surface waters (chapter 173-201A WAC) and for ground waters (chapter 173-200 WAC)
- Sediment management standards (chapter 173-204 WAC)
- Submission of Plans and Reports for Construction of Wastewater Facilities (Chapter 173-240 WAC)

These rules require any treatment facility operator to obtain an NPDES permit before discharging wastewater to state waters. They also help define the basis for limits on each discharge and for requirements imposed by the permit.

Under the NPDES permit program and in response to a complete and accepted permit application, Ecology must prepare a draft permit and accompanying fact sheet, and make them available for public review before final issuance. Ecology must also publish an announcement (public notice) telling people where they can read the draft permit, and where to send their comments, during a period of thirty days (WAC 173-220-050). (See **Appendix D *Public Involvement*** for more detail about the public notice and comment procedures). After the public comment period ends, Ecology may make changes to the draft NPDES permit. Ecology will summarize the responses to comments and any changes to the permit in **Appendix D.**

BACKGROUND INFORMATION

GENERAL FACILITY INFORMATION

Applicant:	City of Ellensburg
Facility Name and Address:	City of Ellensburg Publicly-Owned Treatment Works 2415 Canyon Road Ellensburg, WA 98926
Type of Treatment:	Activated Sludge, Aeration Basins, Secondary Clarification and Ultraviolet Disinfection
Discharge Locations:	Yakima River, Approximate River Mile 151.6 Latitude: 46.9635 Longitude: -120.5478 Wilson Creek, Approximate Creek mile 3 Latitude: 46.9883 Longitude: 120.5378
Waterbody ID Numbers:	Yakima River ID# 1192269462537 Wilson Creek ID# 1204996469262 For emergency use only

Figure 1: Facility Location Map

FACILITY DESCRIPTION

History

Prior to 1974, the wastewater treatment facility only provided primary-level treatment. In 1974 the City of Ellensburg took the original primary treatment facility out of normal service and began operation of a secondary treatment facility. At that time the City modified the wastewater collection system so that in the event of a major storm, and if flow to the secondary treatment plant reached plant capacity, it would divert excess flows at an overflow structure to the primary treatment plant. In 2001, the City isolated the overflow structure from the sanitary sewer system by permanently sealing the influent pipe with cement. The proposed permit and fact sheet do not further address the sealed overflow structure.

In June 1991, the City retained HDR Engineering, Inc. to comprehensively assess the POTW (wastewater collection and treatment system). The final report, *The City of Ellensburg Wastewater-Storm Sewer Study*, August 1992, forecasted growth for the period 1992 through 2011 and the associated demands on the POTW. The study was used to prepare a Capital Improvement Program, which identified necessary system improvements and ways to fund these improvements.

The study focused on several areas of concern including: compliance with the low (0.1 mg/L) residual chlorine effluent limit established in the just-issued NPDES permit; high infiltration and inflow (I&I) rates; and, sludge management. The City dealt with the stringent residual chlorine effluent limits by installing an ultraviolet (UV) light disinfection system. High I&I rates are being addressed with an ongoing program of identifying sources of I&I and reducing or eliminating those sources.

The City submitted an updated *Wastewater-Storm Sewer Study* to Ecology in February 2001. The updated study was not required by Ecology and has not been formally approved, but Ecology encourages the proactive planning typical of the City. The updated study identified system improvements to address deficiencies for five year period from 2002 to 2007, and improvements to accommodate anticipated growth through 2020. The study assessed the sanitary and storm water collection systems and the wastewater treatment plant. Recommendations included the development and implementation of a local stormwater management program.

Approximately six years ago the POTW replaced all eight of its 50-HP surface aerators in the activated sludge basins during the course of the previous permit term. The POTW hopes to replace its electrical panels that control the aerators in the near future.

Collection System Status

The City of Ellensburg wastewater collection system serves an area of approximately 4,254 acres. Much of the collection system was constructed in the 1930's. The pipes in the older sections consist of vitrified clay pipe or concrete pipe with unsealed or mortar joints. Additions to the system constructed from approximately 1960 to 1980 are either asbestos cement pipe or concrete pipe with modern compression-type pipe gaskets. Most additions to the system since 1980 are of polyvinyl chloride (PVC) pipe material with compression gaskets.

The City owns and operates three pumping stations in the collection system. In addition, there are a number of privately owned and operated pumping facilities, which are connected to the collection system.

Historically, the collection system has had significant infiltration and inflow. During the last ten years the City has worked hard to reduce the problem. Infiltration occurs when the water table rises during the spring and summer months due to irrigation in the surrounding agricultural areas. Inflow occurs primarily during storm events.

The City has an ongoing program of corrective and preventive maintenance to reduce infiltration and inflow (I&I) to the collection system. Sections of the collection system that become blocked are water-jetted clear and closely monitored for further blockages. Preventative measures include routine inspection of pipes with television equipment. In addition, each year the City budgets some funds for replacement of sewers to eliminate excess infiltration and removal of the direct connections of catch basins to the sanitary sewer.

During the current permit cycle the City submitted annual I&I Evaluations. Summary data contained in the 2009 evaluation illustrates the City's progress. The data are presented in the following table. Data reflect 12-month periods from June 1st to the following May 31st.

Table 2: Summary of City of Ellensburg I&I

Year, June 1st to May 31st	1997	2006	2007	2008	2009
Daily Average Flow, in MGD	4.1	3.2	3.3	3.02	3.15
"Non-excessive" flow, in MGD (based on population)	1.63	2.14	2.23	2.05	2.08
Annual Average I&I, in MGD	2.47	1.10	1.10	0.97	1.07

Non-excessive flow is the product of the estimated population multiplied by 125 gallons per capita per day (gpcd), the threshold flow volume EPA has established as excessive I&I. While the non-excessive flow value may not reflect the actual per capita hydraulic loading to the treatment plant, the City has used this benchmark value for many years, so the resulting value provides a relative measure of flows. The stable or declining flow data in the table should be taken in the context that the population of the City has increased by approximately 3,700 people since the 2000 census.

Combined Sewer Collection System

Portions of the Ellensburg downtown area collection system, built in the 1930s, are served by combined sewers that convey surface water and wastewater flows to the sanitary sewer. Approximately 12 square blocks of the downtown area contain combined sewers. Replacement of these sewers because of their location, depth, and overlaying modern underground service lines, is extremely costly. Ellensburg is committed to replacing these lines as money becomes available. The treatment plant has proven capable of handling the flow from these lines, which receives full treatment prior to discharge to the Yakima River.

Treatment Processes

The main treatment plant utilizes an extended aeration-activated sludge process, which provides secondary treatment for the City of Ellensburg's wastewater. Treatment processes consist of a headworks with grit removal and fine screening, two (2) aeration basins, two (2) secondary clarifiers, sludge return facilities, primary and secondary anaerobic digesters, centrifuge, lagoons for supernatant from anaerobic digesters, sludge drying beds, ultraviolet disinfection, outfall line with diffuser, and process control buildings.

Discharge Outfalls

Outfall 001

According to the 2001 Ellensburg Wastewater Treatment Plant Operation and Maintenance Manual, the treatment plant discharges treated and disinfected effluent from the facility's ultraviolet disinfection chamber via a 2,800-foot long, 48-inch diameter outfall pipe to the Yakima River, at River Mile 151.6. The outfall pipe is terminated by a 20-foot long diffuser array of (6) 14-inch diameter diffuser pipes arranged 4-foot on center with each pipe ending with a 10-inch diameter orifice. All ports are pointing downstream. The diffuser array extends approximately 48 feet into the river. The minimum water depth over the diffuser is approximately 10 feet.

Outfall 002

Outfall 002 begins at manhole #8, which is located just upstream of the raw sewage pump station, and discharges to Wilson Creek, adjacent to the main treatment plant. Outfall 002 allows for the emergency discharge of combine sewer wastewater. The outfall is manually gate controlled and has not been used since 1996. A storm event in February 1996 caused the City to attempt to discharge via outfall #2, however at that time the creek was at bank full which caused the wastewater to flow back into the system. The City quickly closed the gate after approximately 15 minutes. A more recent storm event in September 2010, which delivered 1.5-inch of rain in 20 minutes, did not cause the City to resort to an emergency outfall. The wastewater treatment plant has a peak capacity of 15 MGD and coupled with considerable collection system storage capacity an emergency discharge is unlikely given consistent improvements to the collection system to reduce I&I.

Solid Wastes

The treatment facilities remove solids during the treatment of the wastewater at the headworks (grit and screenings), and at the secondary clarifiers, in addition to incidental solids (rags, scum, and other debris) removed as part of the routine maintenance of the equipment. Grit, rags, scum and screenings are drained and disposed of as solid waste at the local landfill. Solids removed from the secondary clarifier are treated by anaerobic digestion and land applied at Natural Selection Farms. In 2008 the POTW installed a gravity belt sludge thickener system to aid in the handling of the biosolids.

PERMIT STATUS

Ecology issued the previous permit for this facility on October 21, 2005. The previous permit placed effluent limits on BOD_5, TSS, fecal coliform bacteria and pH.
The City of Ellensburg submitted an application for permit renewal on November 30, 2009. Ecology accepted it as complete on December 1, 2009.

SUMMARY OF COMPLIANCE WITH PREVIOUS PERMIT ISSUED

Ecology staff last conducted a non-sampling compliance inspection on July 19, 2010.

The Ellensburg POTW has largely complied with the effluent limits and permit conditions throughout the duration of the permit issued on October 21, 2005**.** Ecology assessed compliance based on its review of the facility's discharge monitoring reports (DMRs) and on inspections conducted by Ecology.

The three violations associated with effluent monitoring occurred in 2008. The POTW failed to monitor fecal coliform bacteria on two occasions. The city only monitored twice in weeks where the permit requires three a week. A third violation occurred when an operator error at Twin City Foods caused an exceedance of the ammonia limit of 8.2 mg/L.

From February 20, 2009 through the 24^{th}, Twin City Foods illegally discharged ammonia to the POTW while draining its anhydrous ammonia tanks improperly. This caused the POTW to violate its permit for ammonia. In April of 2009, a problem with the programmable logic controller caused a discharge of non-disinfected wastewater to the Yakima River. One other ammonia violation occurred in January 2009.

During the course of the current permit Ellensburg experienced six sewer over flows, four of which occurred in 2008 and two occurring in 2009.

WASTEWATER CHARACTERIZATION

Influent

BOD and TSS loadings to the POTW for the calendar period January 2007 through May 2010 were reported in DMRs submitted to Ecology and are compared with the applicable design criteria as follows:

Table 3: Influent Characterization for January 2007 through May 2010

Parameter	Characterization		Design Criteria
	Average	Highest Average Monthly	Monthly Average for the Maximum Month
BOD_5, in lbs/day	3177	11,723 [a]	10,000
TSS, in lbs/day	3235	11,658 [b]	8,000

[a] Occurred in May 2009 the design exceedance did not cause an effluent violation.
[b] Occurred in January of 2008 the design exceedance did not cause an effluent violation.

Effluent

The concentration of pollutants in the discharge during calendar period January 2007 through May 2010 was reported in the NPDES application and in DMRs.

Conventional Parameters

The existing permit regulates BOD_5, TSS and Fecal Coliform Bacteria in the discharge with average monthly and average weekly effluent limits and Ammonia with a maximum daily limit. The effluent is characterized for BOD, TSS, Ammonia, pH, dissolved oxygen, summer effluent temperature and Fecal Coliform Bacteria in the following table. The effluent limits in the existing permit are provided for context.

Table 4: January 2007 thru May 2010 Conventional Parameters Effluent Characterization

Parameter	Characterization			Existing Permit Limits	
	Average	Highest Average Monthly	Highest Average Weekly	Average Monthly	Average Weekly
BOD_5, in mg/L	4.1	6.1	12.5	30	45
TSS, in mg/L	4.5	8.0	18.0	30	45
Fecal Coliform Bacteria, in #colonies/100 mL	2.8	10.0 (highest monthly geometric mean)	43.0 (highest 7-day geometric mean)	100	200
Dissolved Oxygen Minimum mg/L	4.8	5.8	8.5	No Limit	
Temperature (Summer Max) ° C	13.5	18	20	No Limit	
Total Ammonia, in mg/L	4.24	54.6 [a]		Average Monthly 8.2 mg/L	
pH Standard Units	Maximum 7.7 Minimum 6.7			Between 6.0 and 9.0 at all times	

[a] The highest daily value occurred in February 2009 during the Twin City Foods ammonia discharge.

As the data presented in the table show, the effluent quality discharged from the treatment plant continues to be excellent. BOD_5 and TSS removal rates are typically between 95% and 99%.

Chloride

In early July 2005, after the permit application was accepted, the City allowed a local food processor to discharge pea brine wastewater to the treatment plant on a trial basis. Historically, the pea brine water has been discharged by the company to its leased sprayfield near the treatment plant, but the discharge has contributed to exceedances of the ground water quality criteria for dissolved solids.

The City noted a negative impact upon treatment at the plant and decided to allow its industrial user to use one of its sludge drying beds for disposal of the pea brine water. The pea brine water is dried and removed to a land fill. No pea brine water is discharged to the POTW or to the sprayfield.

DESCRIPTION OF THE RECEIVING WATER

The Ellensburg POTW discharges to the Yakima River at approximately river mile 153. There are no other nearby point source dischargers. Significant nearby non-point potential sources of pollutants include agricultural fields, the Twin City Foods industrial sprayfield, and storm water runoff.

The ambient background data used for this permit includes the following from the previous permit factsheet.

Table 5: Ambient Background Data

Parameter	Value used
7Q10 low flow	792 cfs
Velocity	1 ft/sec
Depth	5 feet
Width	120 feet
Slope	0.035 ft/ft
Temperature	18.5^{o} C
pH (high)	7.5
Dissolved Oxygen	8.0 mg/L

No water quality impairments are listed for the Yakima River in the Ellensburg area. The Yakima does, however, have numerous total maximum daily loads (TMDLs) and 303d listings beginning at the City of Yakima. The creeks feeding the Yakima River in the Ellensburg area are impaired to various degrees. The Yakima River and associated creek impairment is directly linked to agricultural activities. These impairments included pesticide contamination of fish tissue, fecal coliform bacteria, pH, turbidity and nutrient enrichment.

Metals

The current permit required the City of Ellensburg to conduct a study of the metallic constituents contained in the effluent and receiving water in order to assess reasonable potential for the Ellensburg effluent to violate water quality criteria. Table 6 contains the maximum and average values of the total recoverable metals studied based on 8 samples conducted July 2007 through April 2009.

Arsenic in both the organic and the more toxic inorganic form is naturally occurring in the region.

Table 6: Total Recoverable Metal Concentrations in Effluent and Total Dissolved River Concentrations from April 2007 through April 2009

Parameter	Maximum Concentration		Average Concentration	
	River	Effluent	River	Effluent
Chromium, in µg/L	0.7	2.74	0.34	0.65
Nickel, in µg/L	2.24	2.01	1.14	1.29
Copper, in µg/L	0.59	7.09	0.34	5.58
Zinc, in µg/L	0.72	47.4	0.44	29.39
Arsenic Filtered, in µg/L	0.44	0.9	0.26	0.73
Arsenic Non-Filtered, in µg/L	0.42	0.97	0.31	0.74
Selenium, in µg/L	ND	ND	ND	ND
Cadmium, in µg/L	ND	0.11	ND	0.05
Silver, in µg/L	ND	0.10	ND	0.07
Lead, in µg/L	0.05	0.46	0.05	0.19
Mercury, in ηg/L	10.9	2.74	2.62	1.93

SEPA COMPLIANCE

Regulation exempts reissuance or modification of any wastewater discharge permit from the SEPA process as long as the permit contains conditions are no less stringent than state rules and regulations. The exemption applies only to existing discharges, not to new discharges.

PROPOSED PERMIT LIMITS

Federal and state regulations require that effluent limits in an NPDES permit must be either technology- or water quality-based.

- Technology-based limits are based upon the treatment methods available to treat specific pollutants. Technology-based limits are set by the EPA and published as a regulation, or Ecology develops the limit on a case-by-case basis (40 CFR 125.3, and chapter 173-220 WAC).
- Water quality-based limits are calculated so that the effluent will comply with the Surface Water Quality Standards (chapter 173-201A WAC), Ground Water Standards (chapter 173-200 WAC), Sediment Quality Standards (chapter 173-204 WAC) or the National Toxics Rule (40 CFR 131.36).
- Ecology must apply the most stringent of these limits to each parameter of concern. These limits are described below.

The limits in this permit reflect information received in the application and from supporting reports (engineering, hydrogeology, etc.). Ecology evaluated the permit application and determined the limits needed to comply with the rules adopted by the state of Washington. Ecology does not develop effluent limits for all reported pollutants**.** Some pollutants are not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation.

Nor does Ecology usually develop limits for pollutants that were not reported in the permit application but that may be present in the discharge. The permit does not authorize discharge of non-reported pollutants. If significant changes occur in any constituent of the effluent discharge, the City of Ellensburg is required to notify Ecology (40 CFR 122.42(a)). The City of Ellensburg may be in violation of the permit until Ecology modifies the permit to reflect additional discharge of pollutants.

DESIGN CRITERIA

Under WAC 173-220-150 (1)(g), flows and waste loadings must not exceed approved design criteria. The design criteria for this treatment facility are taken from the Ecology approved 1992 *Wastewater-Storm Sewer Study*, an engineering report prepared by HDR Engineering, Inc., and are as follows:

Table 7: Design Criteria for the Ellensburg POTW

Parameter	Design Quantity
Maximum Month Design Flow (MMDF)	8 MGD
Peak Instantaneous Design Flow (PIDF)	15 MGD
BOD_5 loading for maximum month	10,000 lbs/day
TSS loading for maximum month	8,000 lbs/day
Design population equivalent	31,000 persons

TECHNOLOGY-BASED EFFLUENT LIMITS

Federal and state regulations define technology-based effluent limits for municipal wastewater treatment plants. These effluent limits are given in 40 CFR Part 133 (federal) and in chapter 173-221 WAC (state). These regulations are performance standards that constitute all known, available, and reasonable methods of prevention, control, and treatment (AKART) for municipal wastewater.

Chapter 173-221 WAC lists the following technology-based limits for pH, fecal coliform, BOD_5, and TSS:

Table 8: Technology-based Limits.

Parameter	Limit
pH:	The pH must measure within the range of 6.0 to 9.0 standard units.
Fecal Coliform Bacteria	Monthly Geometric Mean = 200 organisms/100 mL Weekly Geometric Mean = 400 organisms/100 mL
BOD_5 (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L
TSS (concentration)	Average Monthly Limit is the most stringent of the following: - 30 mg/L - may not exceed fifteen percent (15%) of the average influent concentration Average Weekly Limit = 45 mg/L

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b).

<u>BOD_5</u>

The monthly average effluent mass loadings (lbs/day) were calculated as:

10,000 lbs/day (monthly design loading) x 0.85 (% removal requirement) = **<u>1,500 lbs/day</u>.**

The weekly average effluent mass loadings were calculated as:

1.5 x monthly loading = **<u>2,250 lbs/day</u>.**

<u>TSS</u>

The monthly average effluent mass loadings (lbs/day) were calculated as:

8,000 lbs/day (monthly design loading) x 0.85 (% removal requirement) = **<u>1,200 lbs/day</u>.**

The weekly average effluent mass loadings were calculated as:

1.5 x monthly loading = **<u>1,800 lbs/day</u>.**

SURFACE WATER QUALITY-BASED EFFLUENT LIMITS

The Washington State Surface Water Quality Standards (chapter 173-201A WAC) are designed to protect existing water quality and preserve the beneficial uses of Washington's surface waters. Waste discharge permits must include conditions that ensure the discharge will meet the surface water quality standards (WAC 173-201A-510). Water quality-based effluent limits may be based on an individual waste load allocation or on a waste load allocation developed during a basin wide total maximum daily load study (TMDL).

Numerical Criteria for the Protection of Aquatic Life and Recreation

Numerical water quality criteria are listed in the water quality standards for surface waters (chapter 173-201A WAC). They specify the maximum levels of pollutants allowed in receiving water to protect aquatic life and recreation in and on the water. Ecology uses numerical criteria along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limits, the discharge must meet the water quality-based limits.

Numerical Criteria for the Protection of Human Health

The U.S. EPA has published 91 numeric water quality criteria for the protection of human health that are applicable to dischargers in Washington State (EPA 1992). These criteria are designed to protect humans from exposure to pollutants linked to cancer and other disease, based on consuming fish and shellfish and drinking contaminated surface waters. The water quality standards also include radionuclide criteria to protect humans from the effects of radioactive substances.

Narrative Criteria

Narrative water quality criteria (e.g., WAC 173-201A-240(1); 2006) limit the toxic, radioactive, or other deleterious material concentrations that the facility may discharge to levels below those which have the potential to:

- Adversely affect designated water uses.
- Cause acute or chronic toxicity to biota.
- Impair aesthetic values.
- Adversely affect human health.

Narrative criteria protect the specific designated uses of all fresh waters (WAC 173-201A-200, 2006) and of all marine waters (WAC 173-201A-210,; 2006) in the State of Washington.

Antidegradation

The purpose of Washington's Antidegradation Policy (WAC 173-201A-300-330; 2006) is to:

- Restore and maintain the highest possible quality of the surface waters of Washington.
- Describe situations under which water quality may be lowered from its current condition.
- Apply to human activities that are likely to have an impact on the water quality of surface water.
- Ensure that all human activities likely to contribute to a lowering of water quality, at a minimum, apply all known, available, and reasonable methods of prevention, control, and treatment (AKART).
- Apply three tiers of protection (described below) for surface waters of the state.

Tier I ensures existing and designated uses are maintained and protected and applies to all waters and all sources of pollutions. Tier II ensures that waters of a higher quality than the criteria assigned are not degraded unless such lowering of water quality is necessary and in the overriding public interest. Tier II applies only to a specific list of polluting activities. Tier III prevents the degradation of waters formally listed as "outstanding resource waters," and applies to all sources of pollution.

This facility must meet Tier I requirements.

- Dischargers must maintain and protect existing and designated uses. Ecology must not allow any degradation that will interfere with, or become injurious to, existing or designated uses, except as provided for in chapter 173-201A WAC.

Ecology’s analysis described in this section of the fact sheet demonstrates that the existing and designated uses of the receiving water will be protected under the conditions of the proposed permit.

Mixing Zones

A mixing zone is the defined area in the receiving water surrounding the discharge port(s), where wastewater mixes with receiving water. Within mixing zones the pollutant concentrations may exceed water quality numeric standards, so long as the discharge doesn’t interfere with designated uses of the receiving water body (for example, recreation, water supply, and aquatic life and wildlife habitat, etc.) The pollutant concentrations outside of the mixing zones must meet water quality numeric standards.

State and federal rules allow mixing zones because the concentrations and effects of most pollutants diminish rapidly after discharge, due to dilution. Ecology defines mixing zone sizes to limit the amount of time any exposure to the end-of-pipe discharge could harm water quality, plants, or fish.

The state's water quality standards allow Ecology to authorize mixing zones for the facility's permitted wastewater discharges only if those discharges already receive all known, available, and reasonable methods of prevention, control, and treatment (AKART). Mixing zones typically require compliance with water quality criteria within a specified distance from the point of discharge and use no more than 25% of the available width of the water body for dilution. Ecology uses modeling to estimate the amount of mixing within the mixing zone. Through modeling Ecology determines the potential for violating the water quality standards at the edge of the mixing zone and derive any necessary effluent limits. Steady-state models are the most frequently used tools for conducting mixing zone analyses. Ecology chooses values for each effluent and for receiving water variables that correspond to the time period when the most critical condition is likely to occur (see Ecology's *Permit Writer's Manual*). Each critical condition parameter, by itself, has a low probability of occurrence and the resulting dilution factor is conservative. The term "reasonable worst-case" applies to these values.

The mixing zone analysis produces a numerical value called a dilution factor (DF). A dilution factor represents the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. For example, a dilution factor of 10 means the effluent is 10% and the receiving water is 90% of the total volume of water at the boundary of the mixing zone. Ecology uses dilution factors with the water quality criteria to calculate reasonable potentials and effluent limits. Water quality standards include both aquatic life-based criteria and human health-based criteria. The former are applied at both the acute and chronic mixing zone boundaries; the latter are applied only at the chronic boundary. The concentration of pollutants at the boundaries of any of these mixing zones may not exceed the numerical criteria for that zone.

Each aquatic life **acute** criterion is based on the assumption that organisms are not exposed to that concentration for more than one hour and more often than one exposure in three years. Each aquatic life **chronic** criterion is based on the assumption that organisms are not exposed to that concentration for more than four consecutive days and more often than once in three years.

The two types of human health-based water quality criteria distinguish between those pollutants linked to non-cancer effects (non-carcinogenic) and those linked to cancer effects (carcinogenic). The human health-based water quality criteria incorporate several exposure and risk assumptions. These assumptions include:

- A 70-year lifetime of daily exposures.
- An ingestion rate for fish or shellfish measured in kg/day.
- An ingestion rate of two liters/day for drinking water
- A one-in-one-million cancer risk for carcinogenic chemicals.

This permit authorizes a small acute mixing zone, surrounded by a chronic mixing zone around the point of discharge (WAC 173-201A-400). The water quality standards impose certain conditions before allowing the discharger a mixing zone:

1. **Ecology must specify both the allowed size and location in a permit.**

   The proposed permit specifies the size and location of the allowed mixing zone. For this discharge, the percent volume restrictions of the water quality standards resulted in a lower dilution factor than the distance and width restrictions. Therefore, the dilution factor calculated at a 10-year low flow was used to determine reasonable potential to exceed water quality standards.

2. **The facility must fully apply "all known, available, and reasonable methods of prevention, control and treatment" (AKART) to its discharge.**

   Ecology has determined that the treatment provided at Ellensburg POTW meets the requirements of AKART (see "Technology based Limits").

3. **Ecology must consider critical discharge conditions.**

   Surface water quality-based limits are derived for the waterbody's critical condition (the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or designated waterbody uses). The critical discharge condition is often pollutant-specific or waterbody-specific.

   Critical discharge conditions are those conditions that result in reduced dilution or increased effect of the pollutant. Factors affecting dilution include the depth of water, the density stratification in the water column, the currents, and the rate of discharge. Density stratification is determined by the salinity and temperature of the receiving water. Temperatures are warmer in the surface waters in summer. Therefore, density stratification is generally greatest during the summer months. Density stratification affects how far up in the water column a freshwater plume may rise. The rate of mixing is greatest when an effluent is rising. The effluent stops rising when the mixed effluent is the same density as the surrounding water. After the effluent stops rising, the rate of mixing is much more gradual. Water depth can affect dilution when a plume might rise to the surface when there is little or no stratification. Ecology's *Permit Writer's Manual* describes additional guidance on criteria/design conditions for determining dilution factors. The manual can be obtained from Ecology's website at: http://www.ecy.wa.gov/biblio/92109.html.

   Ecology used the following critical conditions to model the discharge:

- The seven-day-average low river flow with a recurrence interval of ten years (7Q10) 792 cfs.
- River depth of 5 feet at the 7Q10 period.
- River velocity of 1.0 ft per second.
- Manning roughness coefficient 0.035.
- Channel width of 120 feet.
- MAX Effluent temperature of 18.0 degrees C.

Ambient data at critical conditions in the vicinity of the outfall was taken from the previous fact sheet that accompanied the permit issued in October 2005.

4. Supporting information must clearly indicate the mixing zone would not:

- **Have a reasonable potential to cause the loss of sensitive or important habitat.**
- **Substantially interfere with the existing or characteristic uses.**
- **Result in damage to the ecosystem.**
- **Adversely affect public health.**

Ecology established Washington State water quality criteria for toxic chemicals using EPA criteria. EPA developed the criteria using toxicity tests with numerous organisms and set the criteria to generally protect the species tested and to fully protect all commercially and recreationally important species.

EPA sets acute criteria for toxic chemicals assuming organisms are exposed to the pollutant at the criteria concentration for one hour. They set chronic standards assuming organisms are exposed to the pollutant at the criteria concentration for four days. Dilution modeling under critical conditions generally shows that both acute and chronic criteria concentrations are reached within minutes of being discharged.

The discharge plume does not impact drifting and non-strong swimming organisms because they cannot stay in the plume close to the outfall long enough to be affected. Strong swimming fish could maintain a position within the plume, but they can also avoid the discharge by swimming away. Mixing zones generally do not affect benthic organisms (bottom dwellers) because the buoyant plume rises in the water column. Ecology has additionally determined that the effluent will not exceed 33 degrees C for more than two seconds after discharge; and that the temperature of the water will not create lethal conditions or blockages to fish migration.

Ecology evaluates the cumulative toxicity of an effluent by testing the discharge with whole effluent toxicity (WET) testing.

Ecology reviewed the above information, the specific information on the characteristics of the discharge, the receiving water characteristics and the discharge location. Based on this review, Ecology concluded that the discharge does not have a reasonable potential to cause the loss of sensitive or important habitat, substantially interfere with existing or characteristics uses, result in damage to the ecosystem, or adversely affect public health if the permit limits are met.

5. The discharge/receiving water mixture must not exceed water quality criteria outside the boundary of a mixing zone.

Ecology conducted a reasonable potential analysis, using procedures established by the EPA and by Ecology, for each pollutant and concluded the discharge/receiving water mixture will not violate water quality criteria outside the boundary of the mixing zone if permit limits are met.

6. The size of the mixing zone and the concentrations of the pollutants must be minimized.

At any given time, the effluent plume uses only a portion of the acute and chronic mixing zone, which minimizes the volume of water involved in mixing. The plume rises through the water column as it mixes, therefore much of the receiving water volume at lower depths in the mixing zone is not mixed with discharge. Similarly, because the discharge may stop rising at some depth due to density stratification, waters above that depth will not mix with the discharge. Ecology determined it is impractical to specify in the permit the actual, much more limited volume in which the dilution occurs as the plume rises and moves with the current.

Ecology minimizes the size of mixing zones by requiring dischargers to install diffusers when they are appropriate to the discharge and the specific receiving waterbody. When a diffuser is installed, the discharge is more completely mixed with the receiving water in a shorter time. Ecology also minimizes the size of the mixing zone (in the form of the dilution factor) using design criteria with a low probability of occurrence. For example, Ecology uses the expected 95^{th} percentile pollutant concentration, the 90^{th} percentile background concentration, the centerline dilution factor, and the lowest flow occurring once in every ten years to perform the reasonable potential analysis.

Because of the above reasons, Ecology has effectively minimized the size of the mixing zone authorized in the proposed permit.

7. Maximum size of mixing zone.

The authorized mixing zone does not exceed the maximum size restriction.

8. Acute Mixing Zone.

- **The discharge/receiving water mixture must comply with acute criteria as near to the point of discharge as practicably attainable.**

  Ecology determined the acute criteria will be met at 10% of the distance of the chronic mixing zone at the ten year low flow.

- **The pollutant concentration, duration, and frequency of exposure to the discharge will not create a barrier to migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem.**

  As described above, the toxicity of any pollutant depends upon the exposure, the pollutant concentration, and the time the organism is exposed to that concentration. Authorizing a limited acute mixing zone for this discharge assures that it will not create a barrier to migration. The effluent from this discharge will rise as it enters the receiving water, assuring that the rising effluent will not cause translocation of indigenous organisms near the point of discharge (below the rising effluent).

- **Comply with size restrictions.**

  The mixing zone authorized for this discharge complies with the size restrictions published in chapter 173-201A WAC.

9. Overlap of Mixing Zones.

This mixing zone does not overlap another mixing zone.

DESIGNATED USES AND SURFACE WATER QUALITY CRITERIA

Applicable designated uses and surface water quality criteria are defined in chapter 173-201A WAC. In addition, the U.S. EPA set human health criteria for toxic pollutants (EPA 1992). Criteria applicable to this facility's discharge are summarized below in Table 5.

- Aquatic Life Uses are designated based on the presence of, or the intent to provide protection for, the key uses. All indigenous fish and non-fish aquatic species must be protected in waters of the state in addition to the key species. The Aquatic Life Uses for this receiving water are identified below.

Table 9: Aquatic Life Uses & Associated Criteria

Salmonid Spawning, Rearing, and Migration	
Temperature Criteria – Highest 7DAD MAX	1-DMax Yakima River Temperature 21° C Ambient >21° C than increase no greater than 0.3 ° C and no increase > t= 34/(T+9) anytime.
Dissolved Oxygen Criteria – Lowest 1-Day Minimum	8.0 mg/L
Turbidity Criteria	• 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU
Total Dissolved Gas Criteria	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection
pH Criteria	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units

- The recreational uses are primary contact recreation. The recreational uses for this receiving water are identified below.

Table 10: Recreational Uses and Associated Criteria

Recreational Use	Criteria
Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies /100 mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies /100 mL

- The **water supply uses** are domestic, agricultural, industrial, and stock watering.
- The **miscellaneous freshwater uses** are wildlife habitat, harvesting, commerce and navigation, boating, and aesthetics.

EVALUATION OF SURFACE WATER QUALITY-BASED EFFLUENT LIMITS FOR NUMERIC CRITERIA

Pollutants in an effluent may affect the aquatic environment near the point of discharge (near-field) or at a considerable distance from the point of discharge (far-field). Toxic pollutants, for example, are near-field pollutants—their adverse effects diminish rapidly with mixing in the receiving water. Conversely, a pollutant such as biological oxygen demand (BOD) is a far-field pollutant whose adverse effect occurs away from the discharge even after dilution has occurred.

Thus, the method of calculating surface water quality-based effluent limits varies with the point at which the pollutant has its maximum effect.

With technology-based controls (AKART), predicted pollutant concentrations in the discharge exceed water quality criteria. Ecology therefore authorizes a mixing zone in accordance with the geometric configuration, flow restriction, and other restrictions imposed on mixing zones by chapter 173-201A WAC.

Chronic Mixing Zone

WAC 173-201A-400(7)(a) specifies that mixing zones must not extend in a downstream direction from the discharge ports for a distance greater than 300 feet plus the depth of water over the discharge ports or extend upstream for a distance of over 100 feet, not utilize greater than **25%** of the flow, and not occupy greater than **25%** of the width of the water body.

The horizontal distance of the chronic mixing zone is 300 feet in the downstream direction and 30 feet in the upstream direction. The mixing zone extends from the river bottom to the water surface. The width of the chronic mixing zone is approximately 36 feet.

Acute Mixing Zone

WAC 173-201A-400(8)(a) specifies that in rivers and streams a zone where acute toxics criteria may be exceeded must not extend beyond 10% of the distance towards the upstream and downstream boundaries of the chronic zone, not use greater than **2.5%** of the flow and not occupy greater than **25%** of the width of the water body.

The horizontal distance of the acute mixing zone is 30 feet in the downstream direction and 3 feet in the upstream direction. The width of the acute mixing zone is approximately 25 feet. The mixing zone extends from the river bottom to the water surface. The dilution factor is based on this distance.

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition as explained earlier in this fact sheet (see Mixing Zones). The dilution factors have been determined to be (from Appendix C):

Table 11: Dilution Factors (DF)

Criteria	Acute	Chronic
Aquatic Life	4.0	38.2
Human Health, Carcinogen		38.2
Human Health, Non-carcinogen		38.2

Ecology determined the impacts of dissolved oxygen deficiency, temperature, pH, fecal coliform, ammonia, metals, nutrients and other toxics as described below, using the dilution factors in the above table. The derivation of surface water quality-based limits also takes into account the variability of pollutant concentrations in both the effluent and the receiving water.

BOD_5--With technology-based limits, this discharge results in a small amount of BOD loading relative to the large amount of dilution in the receiving water at critical conditions. Technology-based limits will ensure that dissolved oxygen criteria are met in the receiving water.

Temperature--The state temperature standards (WAC 173-201A-200-210 and 600-612) include multiple elements:

- Annual summer maximum threshold criteria (June 15 to September 15)
- Supplemental spawning and rearing season criteria (September 15 to June 15)
- Incremental warming restrictions
- Protections against acute effects

Ecology evaluates each criterion independently to determine reasonable potential and derive permit limits.

- Annual summer maximum and supplementary spawning/rearing criteria
  Each water body has an annual maximum temperature criterion [WAC 173-201A-200(1)(c), 210(1)(c), and Table 602]. These threshold criteria (e.g., 12, 16, 17.5, 20°C) protect specific categories of aquatic life by controlling the effect of human actions on summer temperatures.

  Some waters have an additional threshold criterion to protect the spawning and incubation of salmonids (9°C for char and 13°C for salmon and trout) [WAC 173-201A-602, Table 602]. These criteria apply during specific date-windows.
  The threshold criteria apply at the edge of the chronic mixing zone. Criteria for most fresh waters are expressed as the highest 7-Day average of daily maximum temperature (7-DADMax). The 7-DADMax temperature is the arithmetic average of seven consecutive measures of daily maximum temperatures. Criteria for marine waters and some fresh waters are expressed as the highest 1-Day annual maximum temperature (1-DMax).

- Incremental warming criteria

  The water quality standards limit the amount of warming human sources can cause under specific situations [WAC 173-201A-200(1)(c)(i)-(ii), 210(1)(c)(i)-(ii)]. The incremental warming criteria apply at the edge of the chronic mixing zone.

At locations and times when background temperatures are cooler than the assigned threshold criterion, point sources are permitted to warm the water by only a defined increment. These increments are permitted only to the extent doing so does not cause temperatures to exceed either the annual maximum or supplemental spawning criteria.

At locations and times when a threshold criterion is being exceeded due to natural conditions, all human sources, considered cumulatively, must not warm the water more than 0.3°C above the naturally warm condition.

When Ecology has not yet completed a TMDL, our policy allows each point source to warm water at the edge of the chronic mixing zone by 0.3°C. This is true regardless of the background temperature and even if doing so would cause the temperature at the edge of a standard mixing zone to exceed the numeric threshold criteria. Allowing a 0.3°C warming for each point source is reasonable and protective where the dilution factor is based on 25% or less of the critical flow. This is because the fully mixed effect on temperature will only be a fraction of the 0.3°C cumulative allowance (0.075°C or less) for all human sources combined.

The highest single discharge temperature reported by the City during the 2007 to May 2010 was 18ºC, which complies with the 21ºC criterion without the benefit of dilution.

Therefore, no effluent limitation for temperature was placed in the proposed permit.

- Temperature Acute Effects

Instantaneous lethality to passing fish: The upper 99th percentile daily maximum effluent temperature must not exceed 33°C; unless a dilution analysis indicates ambient temperatures will not exceed 33°C 2-seconds after discharge.

General lethality and migration blockage: Measurable (0.3°C) increases in temperature at the edge of a chronic mixing zone are not allowed when the receiving water temperature exceeds either a 1DMax of 23°C or a 7DADMax of 22°C.

Lethality to incubating fish: Human actions must not cause a measurable (0.3°C) warming above 17.5°C at locations where eggs are incubating.

General lethality and migration blockage: The receiving water conditions are listed in Page 17 of the fact sheet. Yakima River near Ellensburg does not exceed a 1DMax of 23°C or a 7DADMax of 22°C.

pH--Compliance with the technology-based limits of 6.0 to 9.0 will assure compliance with the water quality standards of surface waters because of the high buffering capacity of marine water.

Fecal Coliform-- The single highest fecal coliform bacteria count reported to Ecology from January 2007 through May 2010 was 12 colonies, which complies with the criteria without the benefit of dilution. Therefore, the technology-based effluent limitation for fecal coliform bacteria was placed in the proposed permit.

Toxic Pollutants--Federal regulations (40 CFR 122.44) require Ecology to place limits in NPDES permits on toxic chemicals in an effluent whenever there is a reasonable potential for those chemicals to exceed the surface water quality criteria. Ecology does not exempt facilities with technology-based effluent limits from meeting the surface water quality standards.

The following toxic pollutants are present in the discharge: ammonia, arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. Ecology conducted a reasonable potential analysis (See Appendix C) on these parameters to determine whether it would require effluent limits in this permit.

Ammonia's toxicity depends on that portion available in the unionized form. The amount of unionized ammonia depends on the temperature and pH in the receiving freshwater. To evaluate ammonia toxicity, Ecology used the available receiving water information for ambient.

Ecology determined that arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc pose no reasonable potential to exceed the water quality criteria at the critical condition using procedures given in EPA, 1991 (Appendix C) and as described above. Ecology's determination assumes that this facility meets the other effluent limits of this permit.

The maximum daily effluent limit of 8.2 mg/L was established in the 1996 permit (See p.14 of the 1996 fact sheet). The fact sheet does not contain calculations, nor any further documentation, of how the limit was derived. This limit is retained in the proposed permit because the increased dilution factors established in the current permit results in a higher limit, which would constitute backsliding, contrary to State and Federal regulations.

Whole Effluent Toxicity

The water quality standards for surface waters forbid discharge of effluent that causes toxic effects in the receiving waters. Many toxic pollutants cannot be measured by commonly available detection methods. However, laboratory tests can measure toxicity directly by exposing living organisms to the wastewater and measuring their responses. These tests measure the aggregate toxicity of the whole effluent, so this approach is called whole effluent toxicity (WET) testing. Some WET tests measure acute toxicity and other WET tests measure chronic toxicity.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water acute toxicity. The proposed permit will not impose an acute WET limit. Ellensburg must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. Ellensburg may demonstrate to Ecology that effluent toxicity has not increased, by performing additional WET testing after the process or material changes have been made.

WET testing conducted during effluent characterization showed no reasonable potential for effluent discharges to cause receiving water chronic toxicity. The proposed permit will not impose a chronic WET limit. Ellensburg must retest the effluent before submitting an application for permit renewal.

- If this facility makes process or material changes which, in Ecology's opinion, increase the potential for effluent toxicity, then Ecology may (in a regulatory order, by permit modification, or in the permit renewal) require the facility to conduct additional effluent characterization.
- If WET testing conducted for submittal with a permit application fails to meet the performance standards in WAC 173-205-020, Ecology will assume that effluent toxicity has increased. Ellensburg may demonstrate to Ecology that effluent toxicity has not increased by performing additional WET testing after the process or material changes have been made.

HUMAN HEALTH

Washington’s water quality standards include 91 numeric human health-based criteria that Ecology must consider when writing NPDES permits. These criteria were established in 1992 by the U.S. EPA in its National Toxics Rule (40 CFR 131.36). The National Toxics Rule allows states to use mixing zones to evaluate whether discharges comply with human health criteria.

Ecology evaluated the discharge's potential to violate the water quality standards as required by 40 CFR 122.44(d) by following the procedures published in the *Technical Support Document for Water Quality-Based Toxics Control* (EPA/505/2-90-001) and Ecology's *Permit Writer's Manual* to make a reasonable potential determination. Two constituents present in the City's discharge have human health criteria: bis(2-ethylhexyl) pthalate and toluene. The evaluation showed that the discharge has no reasonable potential to cause a violation of water quality standards, and an effluent limit is not needed. However, the existing priority pollutant data is over five years old. The proposed permit requires the facility to submit the results of two priority pollutant scans with its application for permit renewal.

Naturally occurring inorganic arsenic is often found in drinking water at levels above the Washington State human health criteria of 0.018µg/L. There are no industrial users in Ellensburg that use or are likely to discharge inorganic arsenic. For the above stated reasons, inorganic arsenic was not analyzed, nor will the permit consider arsenic in the inorganic form.

SEDIMENT QUALITY

The aquatic sediment standards (chapter 173-204 WAC) protect aquatic biota and human health. Under these standards Ecology may require a facility to evaluate the potential for its discharge to cause a violation of sediment standards (WAC 173-204-400). You can obtain additional information about sediments at the Aquatic Lands Cleanup Unit website.
http://www.ecy.wa.gov/programs/tcp/smu/sediment.html

Through a review of the discharger characteristics and of the effluent characteristics, Ecology determined that this discharge has no reasonable potential to violate the sediment management standards.

GROUND WATER QUALITY LIMITS

The ground water quality standards (chapter 173-200 WAC) protect beneficial uses of ground water. Permits issued by Ecology must not allow violations of those standards (WAC 173-200-100).
Ellensburg does not discharge wastewater to the ground. No permit limits are required to protect ground water.

COMPARISON OF EFFLUENT LIMITS WITH THE PREVIOUS PERMIT ISSUED ON OCTOBER 21, 2005

There are no changes to the permit limits in the proposed permit.

MONITORING REQUIREMENTS

Ecology requires monitoring, recording, and reporting (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and that the discharge complies with the permit's effluent limits.

The monitoring schedule is detailed in the proposed permit under Condition S.2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequency is consistent with agency guidance given in the current version of Ecology's *Permit Writer's Manual* (Publication Number 92-09) for a facility with activated sludge, aeration basins, secondary clarification and ultraviolet disinfection.

Monitoring of sludge quantity and quality is necessary to determine the appropriate uses of the sludge. Biosolids monitoring is required by the current state and local solid waste management program and also by EPA under 40 CFR 503.

The monitoring schedule is detailed in the proposed permit under Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring. The required monitoring frequencies are less than recommended in the current version of Ecology's *Permit Writer's Manual* (July 1994) for an activated sludge plant with a design flow of greater than (>) 5 MGD. For instance, the manual recommends BOD and TSS in the effluent be tested five times per week; however, the existing and proposed permits require only three times per week. In addition, a municipal discharger categorized as a 'major' would usually be required to carry out a more intensive monitoring program for toxics in the influent and effluent. The required monitoring program has been reduced because (1) the treatment plant has only one industrial facility discharging to it, and (2) historically, the City has had an exemplary record of compliance. The industrial user discharges repack process water and non-contact cooling water without chemical additives. The second largest discharger to the POTW is Central Washington University and its associated laboratories.

Additional monitoring for EPA Priority Pollutants is required in order to further characterize the effluent. These monitored pollutants could have a significant impact on the quality of the surface water.

LAB ACCREDITATION

Ecology requires that facilities must use a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories* to prepare all monitoring data (with the exception of certain parameters). Ecology accredited the laboratory at this facility for:

Table 12: Ellensburg Wastewater Laboratory Accreditations

General Chemistry		
parameter name	**method**	**matrix ***
Ammonia as N	SM 18 4500-NH3 F	N
Biochemical Oxygen Demand	SM 5210 B	N
Oxygen, dissolved	SM 4500-O G	N
pH	SM 4500-H	N
Residue-nonfilterable (TSS)	SM 2540 D	N
Solids, Total Suspended	SM 2540 D	N
Microbiology		
parameter name	**method**	**matrix ***
Fecal coliform-count	SM 9222 D	N
Fecal coliforms	SM 9222 D	N
Physical		
parameter name	**method**	**matrix ***
pH	SM 4500-H	N
* Matrix key: D = drinking water; N = non-potable water; S = solids/chem materials; A = air		

OTHER PERMIT CONDITIONS

REPORTING AND RECORD KEEPING

Ecology based permit condition S3 on our authority to specify any appropriate reporting and record keeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require Ellensburg to take the actions detailed in proposed permit requirement S.4 to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Condition S.4 restricts the amount of flow.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains Condition S.5 as authorized under RCW 90.48.110, WAC 173-220-150, chapter 173-230 WAC, and WAC 173-240-080. Ecology included it to ensure proper operation and regular maintenance of equipment, and to ensure that Ellensburg takes adequate safeguards so that it uses constructed facilities to their optimum potential in terms of pollutant capture and treatment.

The City submitted an updated O&M Manual to Ecology for review in February 2001. Ecology approved the manual in June 2001. The treatment plant processes have not been substantially modified since 2001. In the event significant physical or operational modifications are implemented at the plant during the permit cycle, the Ellensburg is required to submit updates to the manual to reflect the changes. Otherwise, Ellensburg is required to certify, in writing, with the application for permit renewal, that changes to the O&M Manual were not necessary.

The Ellensburg POTW is required to submit a Collection System Exfiltration Prevention Plan and Testing Report. This report must address areas of the collection system that are either over a well protection area, lie 50 feet above the groundwater table, operate under pressure, are adjacent to surface water (within 100 yards), or are located under water.

PRETREATMENT

The City of Ellensburg has not been delegated pretreatment authority because the POTW has only one significant industrial user (SIU) discharging to it, and on a seasonal basis only. The SIU is Twin City Foods, a vegetable processor, which discharges approximately 38,000 gallons per day of non-contact cooling water to the treatment plant during the winter months. Historically, this relatively small volume of cooling water has not adversely impacted treatment processes at the plant. However, the City is required to comply with the general pretreatment requirements detailed in Special Condition S6. of the permit.

Duty to Enforce Discharge Prohibitions

This provision prohibits the publicly owned treatment works (POTW) from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer.

- The first section of the pretreatment requirements prohibits the POTW from accepting pollutants which causes “Pass-through” or “Interference”. This general prohibition is from 40 CFR §403.5(a). Appendix B of this fact sheet defines these terms.
- The second section reinforces a number of specific State and Federal pretreatment prohibitions found in WAC 173-216-060 and 40 CFR §403.5(b). These reinforce that the POTW may not accept certain wastes, which:

    - Are prohibited due to dangerous waste rules.
    - Are explosive or flammable.
    - Have too high or low of a pH (too corrosive, acidic or basic).
    - May cause a blockage such as grease, sand, rocks, or viscous materials.

- Are hot enough to cause a problem.
- Are of sufficient strength or volume to interfere with treatment.
- Contain too much petroleum-based oils, mineral oil, or cutting fluid.
- Create noxious or toxic gases at any point.

40 CFR Part 403 contains the regulatory basis for these prohibitions , with the exception of the pH provisions which are based on WAC 173-216-060.

- The third section of pretreatment conditions reflects state prohibitions on the POTW accepting certain types of discharges unless the discharge has received prior written authorization from Ecology. These discharges include:

    - Cooling water in significant volumes.
    - Stormwater and other direct inflow sources.
    - Wastewaters significantly affecting system hydraulic loading, which do not require treatment.

Federal and State Pretreatment Program Requirements

Ecology administers the Pretreatment Program under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986) and 40 CFR, part 403. Under this delegation of authority, Ecology issues wastewater discharge permits for significant industrial users (SIUs) discharging to POTWs which have not been delegated authority to issue wastewater discharge permits. Ecology must approve, condition, or deny new discharges or a significant increase in the discharge for existing significant industrial users (SIUs) (40 CFR 403.8 (f)(1)(i) and(iii)).

Industrial dischargers must obtain a permit from Ecology before discharging waste to the Ellensburg POTW (WAC 173-216-110(5)). Industries discharging wastewater that is similar in character to domestic wastewater do not require a permit.

Routine Identification and Reporting of Industrial Users

The permit requires non-delegated POTWs to take "continuous, routine measures to identify all existing, new, and proposed significant industrial users (SIUs) and potential significant industrial users (PSIUs)" discharging to their sewer system. Examples of such routine measures include regular review of water and sewer billing records, business license and building permit applications, advertisements, and personal reconnaissance. System maintenance personnel should be trained on what to look for so they can identify and report new industrial dischargers in the course of performing their jobs. The POTW may not allow SIUs to discharge prior to receiving a permit, and must notify all industrial dischargers (significant or not) in writing of their responsibility to apply for a State Waste Discharge Permit. The POTW must send a copy of this notification to Ecology.

SOLID WASTE CONTROL

To prevent water quality problems the facility is required in permit Condition S7 to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and state water quality standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under chapter 70.95J RCW, chapter 173-308 WAC "Biosolids Management," and chapter 173-350 WAC "Solid Waste Handling Standards." The disposal of other solid waste is under the jurisdiction of the Kittitas County Health Department.

COMBINED SEWER OVERFLOWS

In accordance with RCW 90.48.480 and Chapter 173-245 WAC, proposed permit Special **Condition S11 requires** the Permittee to update its Combined Sewer Overflow (CSO) reduction plan at the time of permit renewal. Special Condition S4.E requires the City to submit annual I&I Evaluations, that includes updates of the City's ongoing efforts to reduce I&I, separate the storm and sanitary collection systems, and remove storm water catch basins from the sanitary collection system.

GENERAL CONDITIONS

Ecology bases the standardized General Conditions on state and federal law and regulations. They are included in all individual municipal NPDES permits issued by Ecology.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

Ecology may modify this permit to impose numerical limits, if necessary to comply with water quality standards for surface waters, with sediment quality standards, or with water quality standards for ground waters, based on new information from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

Ecology may also modify this permit to comply with new or amended state or federal regulations.

PROPOSED PERMIT ISSUANCE

This proposed permit meets all statutory requirements for Ecology to authorize a wastewater discharge. The permit includes limits and conditions to protect human health and aquatic life, and the beneficial uses of waters of the state of Washington. Ecology proposes to issue this permit for a term of 5 years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)

1992. *National Toxics Rule.* Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. *Technical Support Document for Water Quality-based Toxics Control*. EPA/505/2-90-001.

1988. *Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling.* USEPA Office of Water, Washington, D.C.

1985. *Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water*. EPA/600/6-85/002a.

1983. *Water Quality Standards Handbook.* USEPA Office of Water, Washington, D.C.

Tsivoglou, E.C., and J.R. Wallace.

1972. *Characterization of Stream Reaeration Capacity*. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

2006. *Permit Writer's Manual.* Publication Number 92-109 (http://www.ecy.wa.gov/biblio/92109.html)

Laws and Regulations (http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information (http://www.ecy.wa.gov/programs/wq/wastewater/index.html)

Water Pollution Control Federation.

1976. *Chlorination of Wastewater.*

Wright, R.M., and A.J. McDonnell.

1979. *In-stream Deoxygenation Rate Prediction.* Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A—PUBLIC INVOLVEMENT INFORMATION

Ecology proposes to reissue a permit to the Ellensburg POTW. The permit includes wastewater discharge limits and other conditions. This fact sheet describes the facility and Ecology's reasons for requiring permit conditions.

Ecology will place a Public Notice of Draft on November 17, 2010 in the Ellensburg Daily Record to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet.

The notice –

- Tells where copies of the draft permit and fact sheet are available for public evaluation (a local public library, the closest regional or field office, posted on our website).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Asks people to tell us how well the proposed permit would protect the receiving water.
- Invites people to suggest fairer conditions, limits, and requirements for the permit.
- Invites comments on Ecology's determination of compliance with antidegradation rules.
- Urges people to submit their comments, in writing, before the end of the comment period.
- Tells how to request a public hearing about the proposed NPDES permit.
- Explains the next step(s) in the permitting process.

NOTICE: **ANNOUNCEMENT OF AVAILABILITY OF DRAFT PERMIT**

PERMIT NO.: **WA-002434-1**

APPLICANT: **CITY OF ELLENSBURG**
2415 CANYON ROAD
ELLENSBURG, WA 98926

has applied for renewal of National Pollutant Discharge Elimination System (NPDES) Permit No.WA-002434-1 in accordance with the provisions of Chapter 90.48 Revised Code of Washington (RCW), Chapter 173-220 Washington Administrative Code (WAC), and the Federal Clean Water Act.

Following evaluation of the application and other available information, a draft permit has been developed which would allow the discharge of municipal wastewater to a monthly maximum of 8 million gallons per day to the Yakima River at River Mile 151.6 from its facility located at 2415 Canyon Road, Ellensburg. All discharges to be in compliance with the Department of Ecology's Water Quality Standards for a permit to be issued.

A tentative determination has been made to reissue this permit based on the effluent limitations and special permit conditions that will prevent and control pollution. A final determination will not be made until all timely comments received in response to this notice have been evaluated.

PUBLIC COMMENT AND INFORMATION
The draft permit and fact sheet may be viewed at the Department of Ecology (Department) website: http://www.ecy.wa.gov/programs/wq/permits/central_permits.html. The application, fact sheet, proposed permit, and other related documents are also available at the Department's Central Regional Office for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m., weekdays. To obtain a copy or to arrange to view copies at the Central Regional Office, please call Cindy Huwe at 509/457-7105, e-mail cynthia.huwe@ecy.wa.gov, or write to the address below.

Interested persons are invited to submit written comments regarding the proposed permit. All comments must be submitted by December 17, 2010 (within 30 days of the final date of publication of this notice) to be considered for the final determination. Comments should be sent to: Department of Ecology, Central Regional Office, 15 West Yakima Avenue, Suite 200, Yakima, WA 98902, Attention: Cindy Huwe. E-mail comments should be sent to Cindy Huwe at cynthia.huwe@ecy.wa.gov.

Any interested party may request a public hearing on the proposed permit within 30 days of the publication date of this notice. The request for a hearing shall state the interest of the party and the reasons why a hearing is necessary. The request should be sent to the above address. The Department will hold a hearing if it determines that there is significant public interest. If a hearing is to be held, public notice will be published at least 30 days in advance of the hearing date. Any party responding to this notice with comments will be mailed a copy of a hearing public notice. Please bring this public notice to the attention of persons who you know would be interested in this matter. The Department is an equal opportunity agency. If you have a special accommodation needs, please contact Cindy Huwe at 509/457-7105 or TTY (for the speech and hearing impaired) at 1-800-833-6388.

Publication date of this Notice is November 17, 2010.

Ecology has published a document entitled *Frequently Asked Questions about Effective Public Commenting* which is available on our website at http://www.ecy.wa.gov/biblio/0307023.html. You may obtain further information from Ecology by telephone, 509-457-7105, or by writing to the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

The primary author of this permit and fact sheet is Richard Marcley.

APPENDIX B—GLOSSARY

1-DMax or **1-day maximum temperature -** The highest water temperature reached on any given day. This measure can be obtained using calibrated maximum/minimum thermometers or continuous monitoring probes having sampling intervals of thirty minutes or less.

7-DADMax or **7-day average of the daily maximum temperatures -** The arithmetic average of seven consecutive measures of daily maximum temperatures. The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date.

Acute Toxicity—The lethal effect of a compound on an organism that occurs in a short period of time, usually 48 to 96 hours.

AKART – The acronym for "all known, available, and reasonable methods of prevention, control and treatment." AKART is a technology-based approach to limiting pollutants from wastewater discharges which requires an engineering judgment and an economic judgment. AKART must be applied to all wastes and contaminants prior to entry into waters of the state in accordance with RCW 90.48.010 and 520, WAC 173-200-030(2)(c)(ii), and WAC 173-216-110(1)(a).

Ambient Water Quality—The existing environmental condition of the water in a receiving water body.

Ammonia—Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Annual Average Design Flow (AADF)—The average of the daily flow volumes anticipated to occur over a calendar year.

Average Monthly Discharge Limit—The average of the measured values obtained over a calendar month's time.

Best Management Practices (BMPs)—Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the state. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5—Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in receiving waters after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass—The intentional diversion of waste streams from any portion of a treatment facility.

Chlorine—Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity—The effect of a compound on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)—The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Compliance Inspection - Without Sampling—A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling—A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations. In addition it includes as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Ecology may conduct additional sampling.

Composite Sample—A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite" (collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity—Clearing, grading, excavation, and any other activity which disturbs the surface of the land. Such activities may include road building; construction of residential houses, office buildings, or industrial buildings; and demolition activity.

Continuous Monitoring—Uninterrupted, unless otherwise noted in the permit.

Critical Condition—The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor (DF)—A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the percent effluent fraction, for example, a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report—A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report must contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria—Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample—A single sample or measurement taken at a specific time or over as short a period of time as is feasible.

Industrial Wastewater—Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business; from the development of any natural resource; or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Major Facility—A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limit—The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Maximum Day Design Flow (MDDF)—The largest volume of flow anticipated to occur during a one-day period, expressed as a daily average.

Maximum Month Design Flow (MMDF)— The largest volume of flow anticipated to occur during a continuous 30-day period, expressed as a daily average.

Maximum Week Design Flow (MWDF)— The largest volume of flow anticipated to occur during a continuous 7-day period, expressed as a daily average.

Method Detection Level (MDL)—The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the pollutant concentration is above zero and is determined from analysis of a sample in a given matrix containing the pollutant.

Minor Facility—A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone—An area that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in state regulations (chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)—The NPDES (Section 402 of the Clean Water Act) is the federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the state of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both state and federal laws.

pH—The pH of a liquid measures its acidity or alkalinity. It is the negative logarithm of the hydrogen ion concentration. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Peak Hour Design Flow (PHDF)—The largest volume of flow anticipated to occur during a one-hour period, expressed as a daily or hourly average.

Peak Instantaneous Design Flow (PIDF)—The maximum anticipated instantaneous flow.

Quantitation Level (QL)— The smallest detectable concentration of analyte greater than the Method Detection Limit (MDL) where the accuracy (precision &bias) achieves the objectives of the intended purpose.

Reasonable Potential — A reasonable potential to cause a water quality violation, or loss of sensitive and/or important habitat.

Responsible Corporate Officer—A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or the manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures (40 CFR 122.22).

Technology-based Effluent Limit—A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)—Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to receiving waters may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Solid waste -- All putrescible and non-putrescible solid and semisolid wastes including, but not limited to, garbage, rubbish, ashes, industrial wastes, swill, sewage sludge, demolition and construction wastes, abandoned vehicles or parts thereof, contaminated soils and contaminated dredged material, and recyclable materials.

State Waters—Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater—That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Upset—An exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits 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, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit—A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into receiving waters.

APPENDIX C—TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on Ecology's homepage at http://www.ecy.wa.gov/programs/eap/pwspread/pwspread.html.

Calculation of Proposed Dilution Factors

Potential dilution factors were calculated using the mass-balance and RIVPLUME5 methodologies. The mass-balance calculations are presented on this page and the Department's standard RIVPLUME5 spreadsheet appears on the following page.

Mass-balance Calculations

Algorithm: DF = (Qa + Qe)/Qe

where: DF = Dilution factor

Qa = Ambient flow volume of Yakima River, 7Q10 (low flow) value = 792 cfs

Qe = Effluent flow volume.

Acute

Qa = 2.5% of 7Q10 = 19.8 cfs

Qe = 6.61 cfs (Highest reported maximum daily flow)

DFa = (19.8 + 6.61)/6.61 = 3.995, rounded to 4

Chronic

Qa = 25% of 7Q10 = 198 cfs

Qe = 5.32 cfs (Highest reported average monthly flow)

DFc = (198 + 5.32)/5.32 = 38.2

Spread of a plume from a point source in a river with boundary effects from the shoreline
based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.
Revised 22-Feb-96

DILUTION FACTORS	Acute	Chronic
INPUT		
1. Effluent Discharge Rate (cfs): Max daily & max monthly discharges, both in June 2004	6.61	5.32
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft): Conservative estimate from direct observation	5.00	5.00
Stream Velocity (fps): Estimate from direct observation	1.00	1.00
Channel Width (ft): Estimate from direct observation	120.00	120.00
Stream Slope (ft/ft) or Manning roughness "n": Estimate	0.035	0.035
0 if slope or 1 if Manning "n" in previous cell:	0	0
3. Discharge Distance From Nearest Shoreline (ft): From 2001 wastewater study	20	20
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	30	310
Distance From Nearest Shoreline (ft):	40	40
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0
OUTPUT		
1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	661.00	532.00
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	2.374	2.374
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming		
hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec):	2.374	2.374
3. Transverse Mixing Coefficient (ft2/sec):	7.121	7.121
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.* , 1979)		
Co	1.10E+00	8.87E-01
x'	1.48E-02	1.53E-01
y'o	1.67E-01	1.67E-01
y' at point of interest	3.33E-01	3.33E-01
Solution using superposition equation (Fischer eqn 5.9)		
Term for n= -2	8.91E-128	5.11E-13
Term for n= -1	4.42E-35	5.11E-04
Term for n= 0	6.41E-01	1.62E+00
Term for n= 1	3.42E-17	2.97E-02
Term for n= 2	2.26E-90	2.15E-09
Upstream Distance from Outfall to *Effective Origin* of Effluent Source (ft)	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	30.00	310.00
x' Adjusted for *Effective Origin*	1.48E-02	1.53E-01
C/Co (dimensionless)	1.48E+00	1.19E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	1.64E+00	1.05E+00
Unbounded Plume Width at Point of Interest (ft)	82.684	265.791
Unbounded Plume half-width (ft)	41.342	132.895
Distance from near shore to discharge point (ft)	20.00	20.00
Distance from far shore to discharge point (ft)	100.00	100.00
Plume width bounded by shoreline (ft)	61.34	120.00
Approximate Downstream Distance to Complete Mix (ft):	562	562
Theoretical Dilution Factor at Complete Mix:	90.772	112.782
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	46.401	112.782
Calculated Dilution Factor at Point of Interest:	61.143	94.811

Results of the City of Ellensburg Metals Effluent and Receiving Water Study

Chromium	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	Average
River Total	0.83	0.35	0.65	0.8	0.72	0.32	0.69	4.04	1.05
River Dissolved	0.7	0.22	0.24	0.23	0.42	0.26	0.26	0.36	0.33625
Effluent Total	2.74	0.38	0.42	0.38	0.26	0.38	0.28	0.36	0.65
Effluent Dissolved	0.27	0.35	0.35	0.32	0.27	0.35	0.2	0.35	0.3075
Nickel	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	1.41	0.66	2.33	2.17	2.18	0.8	1.84	8.18	2.44625
River Dissolved	2.24	0.55	1.21	1.04	1.62	0.62	1.04	0.83	1.14375
Effluent Total	1.12	0.29	1.97	1.3	2.01	0.85	1.91	0.88	1.29125
Effluent Dissolved	1.17	0.23	1.88	1.31	1.95	0.81	1.84	0.86	1.25625
Copper	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	0.27	0.41	0.51	0.8	0.46	0.37	0.77	2.69	0.785
River Dissolved	0.43	0.31	0.22	0.44	0.31	0.28	0.47	0.59	0.38125
Effluent Total	3.45	4.41	5.94	6.18	7.09	5.77	5.35	6.42	5.57625
Effluent Dissolved	4.56	3.28	4.27	5.37	6.41	4.89	4.68	5.65	4.88875
Zinc	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	0.3	0.27	0.7	1.31	0.76	0.41	1.02	7.87	1.58
River Dissolved	0.58	ND	ND	0.72	0.42	0.21	0.29	0.44	0.443333
Effluent Total	17.3	26.9	27.1	29.8	47.4	32.3	27.2	27.1	29.3875
Effluent Dissolved	19.4	24.6	25.2	28.7	47.8	27.3	26	26.3	28.1625
Arsenic	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	0.32	0.31	0.28	0.26	0.38	0.27	0.21	0.42	0.30625
River Dissolved	0.44		0.22	0.19	0.33	0.24	0.21	0.22	0.264286
Effluent Total	0.54	0.75	0.77	0.77	0.7	0.65	0.97	0.75	0.7375
Effluent Dissolved	0.56		0.8	0.77	0.7	0.71	0.9	0.69	0.732857
Selenium	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	ND	ND	ND	ND	ND	ND	ND	ND	ND
River Dissolved	ND	ND	ND	ND	ND	ND	ND	ND	ND
Effluent Total	ND	ND	ND	ND	ND	ND	ND	ND	ND
Effluent Dissolved	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadnium	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	ND	ND	ND	ND	ND	ND	ND	ND	ND
River Dissolved	ND	ND	ND	ND	ND	ND	ND	ND	ND
Effluent Total	0.031	0.041	0.029	0.056	0.106	0.04	0.063	0.055	0.052625
Effluent Dissolved	0.033	0.034	ND	0.05	0.109	0.039	0.057	0.053	0.053571
Mercury	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	ŋg/L
River Total	0.93	1.21	1.33	2.5	0.92	1.38	1.75	10.9	2.615
River Dissolved	1.15								1.15
Effluent Total	1.93	1.73	2.74	2.41	1.93	1.51	1.48	1.73	1.9325
Effluent Dissolved	1.7								1.7
Lead	July-07	Oct-07	Jan-08	Apr-08	Jul-08	Oct-08	Jan-09	Apr-09	
River Total	ND	ND	0.097	0.121	0.048	ND	0.084	0.576	0.1852
River Dissolved	0.05	ND	ND	ND	ND	ND	ND	ND	0.05
Effluent Total	0.082	0.198	0.154	0.135	0.46	0.199	0.1106	0.148	0.185825
Effluent Dissolved	0.11	0.142	0.106	0.115	0.451	0.149	0.083	0.124	0.16

		REASONABLE POTENTIAL				CALCULATIONS			state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)								
				State Water Quality Standard		Max concentration at edge of...											
Parameter	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Conc (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samp	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n			
				Criteria Influenced by Total Hardness Value													
Copper	1.00	1.00	0.59	10.85	7.54	3.81	0.93	NO	0.95	0.69	7.09	0.60	0.55	8.00	1.90	4.00	38.00
Zinc	0.95	0.95	0.72	76.33	69.70	21.91	2.95	NO	0.95	0.69	47.40	0.60	0.55	8.00	1.90	4.00	38.00
Nickel	1.00	1.00	2.240	104.90	74.00	5.04	2.534	NO	0.95	0.69	7.09	0.60	0.55	8.00	1.90	4.00	38.00
Lead	0.47	0.47	0.05	104.90	74.00	0.14	0.06	NO	0.95	0.69	0.46	0.60	0.55	8.00	1.90	4.00	38.00
Chromium (HEX)	0.98	0.96	0.700	15.00	10.00	1.81	0.814	NO	0.95	0.69	2.76	0.60	0.55	8.00	1.90	4.00	38.00
Silver	0.85	0.85	0.000	1.52	na	0.04	0.004	NO	0.95	0.69	0.10	0.60	0.55	8.00	1.90	4.00	38.00
Cadmium	1.00	1.00	0.000	3.70	1.03	0.05	0.005	NO	0.95	0.69	0.11	0.60	0.55	8.00	1.90	4.00	38.00
							No Hardness Influence										
Arsenic Filtered	1.00	1.00	0.260	360.00	190.00	0.54	0.290	NO	0.95	0.69	0.73	0.60	0.55	8.00	1.90	4.00	38.00
Arsenic Non Filtered - Filtered	1.00	1.00	0.020	360.00	190.00	0.05	0.023	NO	0.95	0.69	0.07	0.60	0.55	8.00	1.90	4.00	38.00
Mercury	1.00	1.00	0.001	2.10	0.01	0.00	0.001	NO	0.95	0.69	0.00	0.60	0.55	8.00	1.90	4.00	38.00

		REASONABLE POTENTIAL TO VIOLATE HUMAN HEALTH WATER QUALITY CRITERIA														
Revised 3/00																
Parameter	Ambient Concentration (Geometric Mean)	Water Quality Criteria for Protection of Human Health	Max concentration at edge of chronic mixing zone.	LIMIT REQ'D?	Expected Number of Compliance Samples per Month	AVERAGE MONTHLY EFFLUENT LIMIT	MAXIMUM DAILY EFFLUENT LIMIT	Estimated Percentile at 95% Confidence		Max effluent conc. measured	Coeff Variation		# of samples from which # in col. K was taken	Multiplier	AVG USED INSTEAD of Calculated 50th percentile Effluent Conc. (When n>10)	Dilution Factor
	ug/L	ug/L	ug/L			ug/L	ug/L		Pn	ug/L	CV	S	n			
BIS(2-ETHYLHEXYL) PHTHALATE 117817 13B	0.0	1.80	0.04	NO	0.03	NONE	NONE	0.50	0.05	1.70	0.60	0.6	1	2.49	1.70	38.0
Toluene	0.0	6800.00	0.01	NO	0.03	NONE	NONE	0.50	0.05	0.30	0.60	0.6	1	2.49	0.30	38.0
Mercury	0.0018	0.14	0.0018	NO	0.03	NONE	NONE	0.50	0.69	0.0027	0.60	0.6	8	0.76	0.0018	38.0
Nickel	1.8	610.00	1.83	NO	0.03	NONE	NONE	0.50	0.69	1.97	0.60	0.6	8	0.76	2.00	38.0

APPENDIX D—RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.

APPENDIX B

SEPA

DEPARTMENT OF COMMUNITY DEVELOPMENT
501 North Anderson Street, Ellensburg WA 98926

July 31, 2012

John Akers
Department of Public Works
501 N Anderson
Ellensburg, WA 98926

Re: FINAL DETERMINATION OF NON-SIGNIFICNANCE (DNS)
SEPA Checklist S12-03
Wastewater Treatment Facility (WWTF) Engineering Report

On July 11, 2012 the City issued a SEPA Determination of Non-Significance (DNS) for this non-project application. The comment period for that DNS ended on July 25, 2012 and there were two comments received. The WA Department of Ecology is requesting that a designation be made for the destination of any dredged materials resulting from future projects. KVFR commented that adequate emergency vehicle access needs to be maintained as future development occurs.

The City has reviewed the SEPA Checklist, initial Threshold Determination, existing environmental documents adopted, comments from agencies and the public, and has made a determination that the DNS issued on July 11, 2012 is now a Final Determination of Non-Significance.

If you have any questions in this regard please contact me at (509) 962-7108.

Sincerely,

Lance Bailey
Planning Supervisor

RECEIVED
APR 1 8 2012
COMMUNITY DEVELOPMENT

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:

Wastewater Treatment Facility (WWTF) Engineering Report

2. Name of applicant:

City of Ellensburg

3. Address and phone number of applicant and contact person:

John Akers
501 North Anderson Street
Ellensburg, WA 98926
(509) 962-7204

4. Date checklist prepared:

April 12, 2012

5. Agency requesting checklist:

City of Ellensburg

6. Proposed timing or schedule (including phasing, if applicable):

Construction of improvements to the wastewater treatment facility would occur over the next 20 year period.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

No, the improvements to the wastewater treatment facility are designed for the 20 year planning period.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

No environmental information has been prepared. Future environmental work will depend on the City's funding sources.

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.

There are no known applications pending governmental approval directly affecting this project.

10. List any government approvals or permits that will be needed for your proposal, if known.

1. **Department of Ecology Engineering Report Approval**
2. **Department of Ecology Design Approval**
3. **Building Permit for the construction**

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.)

Improvements to the wastewater treatment utility would include upgrades and/or replacement of the electrical system, lagoon dredge, aeration system, flow meters, headwork screens, grit removal, SCADA system, and operations building. Additions to the WWTF will include construction of new biological selectors. The facility improvements will occur mainly within the existing footprint of the wastewater treatment facility with the replacement of the collection system occurring throughout the City of Ellensburg.

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 proposed project site is located in Kittitas County, Washington within the City of Ellensburg. The Wastewater Treatment Facility is situated approximately one half mile south of the City center along Canyon Road. (See vicinity and topo maps). The treatment facility collection system comprises 77 miles of pipe throughout the City of Ellensburg.

B. ENVIRONMENTAL ELEMENTS

1. **Earth**

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other . . . . . .

b. What is the steepest slope on the site (approximate percent slope)?

The site generally slopes 0.5 percent. The steepest slope on the existing site is approximately 50 percent along Canyon Road in areas of the road shoulder.

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.

According to the NRCS Soil Survey map for the area, the site is composed entirely of loams including ashy loam, silt loam, and clay loam. Slopes are generally in the range of 0 to 2 percent. See attached NRCS soils maps.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

There is no history of unstable soils in the vicinity.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate Source of fill.

Soil will be excavated for the construction of the structures with the following quanities:
- **Excavation approximately 3,500 cubic yards**
- **Wall backfill with native soils approximately 1,200 cubic yards**
- **Waste haul offsite approximately 2,300 cubic yards.**

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

No. Construction work would include practices to prevent the possible minor erosion problems that may occur at that time.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

The existing site is approximately 50 percent covered in impervious area. The new site will be approximately 50 percent impervious.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

Construction Contract Documents will require erosion control features which will follow the Washington State Department of Ecology's *Stormwater Management Manual for Eastern Washington*.

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 emissions from construction equipment will occur during construction. Dust may be emitted during excavation and backfill operations. No new odor sources will be added to the WWTF.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

There are no off-site sources of emissions of odor that may affect the project.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

The Contract Documents will contain provisions for dust control during construction, to include moistening of exposed soil. The Contractor will be required to be in compliance with WAC 173-400-040, which notes that fugitive dust from the construction site shall be controlled. In addition, dust and exhaust from the project site shall not become a nuisance to neighboring residents.

These measures will be enforced during construction. The Contractor will also be required to keep construction equipment in proper working order to minimize exhaust emissions during construction.

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.

The Yakima River flows one-quarter mile to the southwest of the proposed project area. The Yakima River flows into the Columbia River. Wilson Creek flows along the west and south side of the site within 100-feet of the major plant process units and 60-feet from the drying beds. Wilson Creek flows into the Yakima River.

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 project *will not* require work over or in the water. The existing WWTF site lies within 200-feet of Wilson Creek; the Creek is located on the west and south side of the site. There will be no major ground disturbing activities within 200-feet of the Creek.

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.

Does not apply.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

The proposal will not require surface water withdrawals or diversions.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

According to the FEMA Flood Insurance Rate Map, certain areas of the proposed project area lie within zones A, B, and C of the 100 year flood plain. Work occurring at the existing WWTF will not occur within the 100 year flood plain. See attached FIRM Map.

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 existing WWTF, discharges to the Yakima River with NPDES permit WA-002064-8 and the upgraded WWTF will continue to discharge to the Yakima River. The existing permit expiration date is February 28, 2016.

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.

During construction deeper excavations will require ground water pumping to allow excavations to occur in the dry. No long term ground water withdrawal will occur.

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.

There will be no material discharged into the ground as a result of this project. There will be no new chemicals used on site.

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.

The existing WWTF runoff flows to drywells or trench drains for infiltration. Water flowing onto new tanks or structures will be included and treated with the wastewater. Most new impervious area will be structures or tanks and thus stormwater will be treated with the wastewater. Any new impervious area will be collected and treated with drywells or trench drains for infiltration as is currently practiced.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Storm water runoff will enter groundwater thru drywells and or trench drains.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

Best management practices as required by Washington State Department of Ecology's *Stormwater Management Manual for Eastern Washington.*

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

X_____ grass

______ pasture

X_____ 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?

There will be minimal vegetation removal involving only landscaping vegetation and grasses.

c. List threatened or endangered species known to be on or near the site.

According to the Washington Department of Fish and Wildlife Priority Habitat and Species maps, there are no known threatened or endangered plant species on or near the project site. See attched PHS Map.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

All disturbed areas not part of the gravel, asphalt, or concrete surface will be receive hydroseeding or grass sod for erosion control.

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:

fish: bass, salmon, trout, herring, shell fish, other:
birds: hawk, heron, eagle, songbirds, other:
mammals: deer, bear, elk, beaver, other: coyote, small mammals such as mice

b. List any threatened or endangered species known to be on or near the site.

There are no known threatened or endangered species on or near the project site. However the Yakima River is ¼ mile away and it has endangered species of salmon and bull trout. See attached PHS Map.

c. Is the site part of a migration route? If so, explain.

The Yakima River which is ¼ mile away is utilized for migration of fish species.

d. Proposed measures to preserve or enhance wildlife, if any:

Not applicable.

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.

No additional electrical energy will be utilized as a result of the upgrades to the WWTF.

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 efficient pumps, blowers, and motors will be selected. The aeration system will employ variable frequency drives, oxygen sensors and a control algorithm to minimize the use of electrical power by the blowers.

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.

There are no environmental health hazards that could occur as a result of this project. There are no new chemicals that will be used on site.

1) Describe special emergency services that might be required.

No special emergency services will be required.

2) Proposed measures to reduce or control environmental health hazards, if any:

No new chemicals are required for the operation of the WWTF.

The only hazardous materials associated with the proposed project would be fuels, lubricants, and coolants used in construction equipment.

The Contractor will be required to generate a Spill Prevention, Control, and Countermeasures Plan (SPCC) prior to starting construction to address potential health hazards during the course of construction. In addition, construction equipment will be fitted with spill containment/response kits and crews will be trained in their use.

b. **Noise**

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

No foreseeable noises exist in the area that would affect the project.

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.

There would be short-term heavy equipment use during construction. Construction activities would be limited to normal daytime working hours. No noise would be created on a long-term basis.

3) Proposed measures to reduce or control noise impacts, if any:

Construction work would occur during daylight hours only.

8. **Land and shoreline use**

a. What is the current use of the site and adjacent properties?

The current use of the project site is a municipal waste water treatment facility. The WWTF is surrounded by City owned farmland.

b. Has the site been used for agriculture? If so, describe.

No.

c. Describe any structures on the site.

The existing structures on-site include a pumping station, headworks, aeration basin, clarifiers, sludge pump station, solids handling building, digester, sludge lagoon, drying bed, operations building, and UV disinfection facility.

d. Will any structures be demolished? If so, what?

No.

e. What is the current zoning classification of the site?

The existing WWTF is zoned Public Reserve and the adjacent land is unincorporated. The rest of the site throughout the City is a mix of Residential, Commercial, and Industrial zoning.

f. What is the current comprehensive plan designation of the site?

The designation is UGA (Urban Growth Area).

g. If applicable, what is the current shoreline master program designation of the site?

Not applicable.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

No.

i. Approximately how many people would reside or work in the completed project?

Seven people will work at the site.

j. Approximately how many people would the completed project displace?

No one will be displaced by this project.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Not applicable.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

N/A.

9. **Housing**

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

No housing units will be provided.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

No housing units will be eliminated.

c. Proposed measures to reduce or control housing impacts, if any:

There will be no impacts to housing associated with this project, therefore no measures are proposed.

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?

The tallest new structure might be six feet high.

b. What views in the immediate vicinity would be altered or obstructed?

No views in the immediate vicinity would be altered or obstructed as a result of this project.

c. Proposed measures to reduce or control aesthetic impacts, if any:

There will be no impacts to aesthetics associated with this project, therefore no measures are proposed.

11. **Light and glare**

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

None.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No.

c. What existing off-site sources of light or glare may affect your proposal?

No existing off-site sources of light or glare will affect this proposal.

d. Proposed measures to reduce or control light and glare impacts, if any:

There will be no impacts to light and glare associated with this project, therefore no measures are proposed.

12. **Recreation**

a. What designated and informal recreational opportunities are in the immediate vicinity?

None

b. Would the proposed project displace any existing recreational uses? If so, describe.

The proposed project would not displace any existing recreational uses.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

There will be no impacts to recreation and recreation opportunities associated with this project, therefore no measures are proposed.

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.

No.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

Not Applicable.

c. Proposed measures to reduce or control impacts, if any:

If necessary, a cultural and historic review meeting Executive Order 05-05 will be conducted.

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.

The streets serving the project site is Canyon Road (See attached maps).

There will be no modifications to existing street access as a result of this project. A site map is attached.

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

No. Approximately one half mile.

c. How many parking spaces would the completed project have? How many would the project eliminate?

No additional parking spaces will be required. No parking spaces will be eliminated.

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 new roads or streets will be created. No improvements to existing roadways will be required.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The project will be in the vicinity of the Pacific Northern railroad approximately 1 mile to the south.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

No additional vehicular trips would be generated.

g. Proposed measures to reduce or control transportation impacts, if any:

Not applicable.

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.

There will be no impact to public services as a result of the project.

16. **Utilities**

a. Circle utilities currently available at the site: **electricity**, natural gas, water, **refuse service**, **telephone**, sanitary sewer, ~~septic system~~, **other**.

b. 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.

Utilities will remain the same as the current utility providers. City of Ellensburg – sewer, water, electricity; Cascade Natural Gas – natural gas.

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: ......4-18-12..

D. SUPPLEMENTAL SHEET FOR NONPROJECT 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 of the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity of 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?

   There will be no increase in the discharge, emission, or production of hazardous substances or noise.

   Proposed measures to avoid or reduce such increases are:

   Outfall modeling was completed which shows that the wastewater discharged will meet water quality standards.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

   There will be no affect.

   Proposed measures to protect or conserve plants, animals, fish, or marine life are:

   The WWTF improvements will contribute to improved treated effluent quality thereby reducing the effects to aquatic life. In addition, the WWTF improvements will enable the facility to meet current NPDES discharge limits, reliably meet oxygen limits, and will remove nitrogen which might be limited in future permits. The water quality criteria for the Yakima River protects aquatic life therefore the effluent discharged will also not affect aquatic life including endangered species in the Yakima River.

3. How would the proposal be likely to deplete energy or natural resources?

   The WWTF improvements will not deplete energy or natural resources. The improvements will reduce energy and natural resource use.

   Proposed measures to protect or conserve energy and natural resources are:

   Energy efficient pumps, blowers and motors will be selected. The new aeration system will have variable frequency drives, oxygen sensors and a control algorithm to minimize the use of electrical power in the blowers.

4. 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?

   Will not affect sensitive areas.

   Proposed measures to protect such resources or to avoid or reduce impacts are:

   Not applicable.

ow would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or horeline uses incompatible with existing plans?

Vill not affect shoreline areas.

roposed measures to avoid or reduce shoreline and land use impacts are:

t applicable.

w would the proposal be likely to increase demands on transportation or public services and utilities?

ill not increase demand on transportation, public services, or utilities. The WWTF improvements ill not increase the utility demands.

oposed measures to reduce or respond to such demand(s) are:

nergy efficient blowers and motors will be selected. The new aeration system will have variable equency drives, oxygen sensors and a control algorithm to minimize the use of electrical power in the owers.

ntify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection the environment.

ill not conflict with local, state or federal laws.

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USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:3,280 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

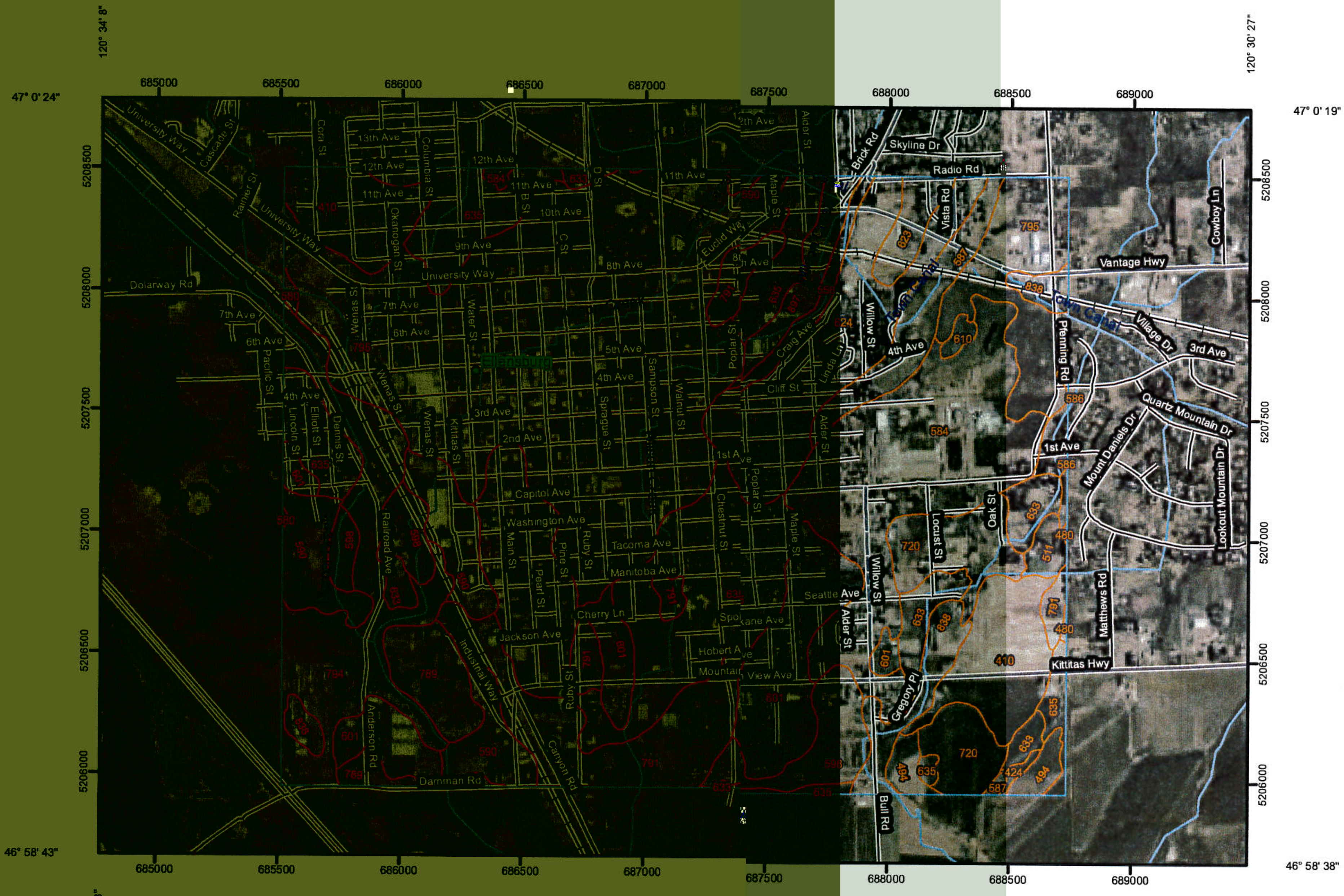
Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 3, Jun 15, 2009

Date(s) aerial images were photographed: 7/16/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kittitas County Area, Washington (WA637)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
580	Woldale clay loam, 0 to 2 percent slopes	0.7	1.7%
598	Zillah silt loam, 0 to 2 percent slopes	0.9	2.4%
633	Nack ashy loam, 0 to 2 percent slopes	1.9	4.7%
706	Kayak gravelly ashy loam, 0 to 2 percent slopes	0.3	0.9%
715	Weirman gravelly sandy loam, 0 to 2 percent slopes	0.2	0.5%
720	Nanum ashy sandy clay loam, 0 to 2 percent slopes	18.6	47.1%
838	Nosal ashy silt loam, 0 to 2 percent slopes	16.9	42.8%
Totals for Area of Interest		**39.4**	**100.0%**



Map Scale: 1:22,300 if printed on A size (8.5" x 11") sheet.

Meters: 0, 300, 600, 1,200, 1,800

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:22,300 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 10N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

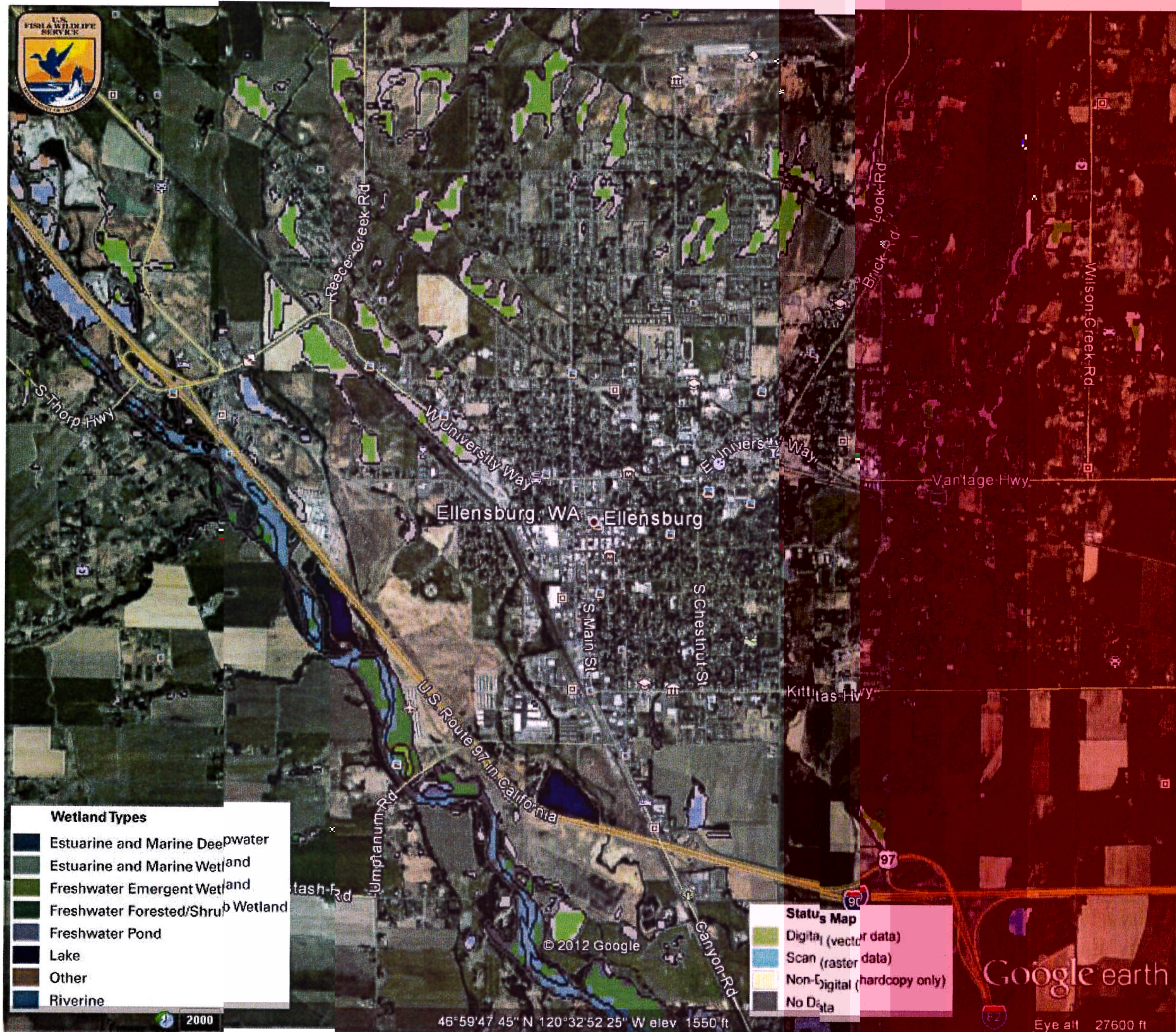
Soil Survey Area: Kittitas County Area, Washington
Survey Area Data: Version 3, Jun 15, 2009

Date(s) aerial images were photographed: 7/16/2006

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kittitas County Area, Washington (WA637)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
410	Tanaha ashy loam, 0 to 2 percent slopes	97.6	4.8%
424	Cleman very fine sandy loam, 0 to 2 percent slopes	2.1	0.1%
480	Nanum ashy loam, 0 to 2 percent slopes	0.8	0.0%
494	Caliralls silt loam, 10 to 15 percent slopes	15.7	0.8%
511	Vantage-Clerf complex, 15 to 30 percent slopes	8.1	0.4%
558	Argixerolls-Durixerolls complex, 30 to 70 percent north slopes	12.6	0.6%
580	Woldale clay loam, 0 to 2 percent slopes	2.2	0.1%
584	Varodale clay, 0 to 2 percent slopes	178.0	8.8%
586	Vanderbilt ashy loam, moderately wet, 0 to 2 percent slopes	7.6	0.4%
587	Argixerolls, 15 to 30 percent slopes	38.8	1.9%
590	Brickmill-Nanum complex, 0 to 5 percent slopes	85.2	4.2%
598	Zillah silt loam, 0 to 2 percent slopes	57.2	2.8%
601	Brickmill gravelly ashy loam, 0 to 2 percent slopes	115.0	5.7%
610	Ackna ashy loam, 2 to 5 percent slopes	3.5	0.2%
623	Manastash loam, 2 to 5 percent slopes	16.9	0.8%
624	Manastash loam, 5 to 10 percent slopes	110.4	5.4%
633	Nack ashy loam, 0 to 2 percent slopes	43.4	2.1%
635	Opnish ashy loam, 0 to 2 percent slopes	293.9	14.5%
720	Nanum ashy sandy clay loam, 0 to 2 percent slopes	61.2	3.0%
789	Deedale clay loam, 0 to 2 percent slopes	39.4	1.9%
791	Mitta ashy silt loam, drained, 0 to 2 percent slopes	113.1	5.6%
794	Kayak-Weirman complex, 0 to 2 percent slopes	113.9	5.6%
795	Nack-Opnish complex, 0 to 2 percent slopes	552.3	27.2%
838	Nosal ashy silt loam, 0 to 2 percent slopes	39.7	2.0%
897	Nanum ashy loam, flooded, 0 to 2 percent slopes	23.2	1.1%
Totals for Area of Interest		**2,031.8**	**100.0%**


U.S. FISH & WILDLIFE SERVICE
Wetland Types
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
2000
S Thorp Hwy
Reecer Creek Rd
W University Way
E University Way
Ellensburg, WA
Ellensburg
S Main St
S Chestnut St
Kittitas Hwy
Look Rd
Brick Rd
Wilson Creek Rd
Vantage Hwy
U.S. Route 97 in California
Umptanum Rd
Canyon Rd
© 2012 Google
Status Map
Digital (vector data)
Scan (raster data)
Non-Digital (hardcopy only)
No Data
97
90
82
Google earth
46°59'47.45" N 120°32'52.25" W elev 1550 ft
Eye alt 27600 ft

APPENDIX C

DMR DATA

Average Monthly Flows (MGD)

	2006	2007	2008	2009	2010
Jan	3.96	3.18	2.64	3.59	3.20
Feb	3.30	3.46	4.08	2.60	3.49
Mar	2.73	3.38	2.65	2.77	2.91
Apr	2.82	3.50	2.67	2.87	3.12
May	4.51	4.00	3.82	3.74	4.39
Jun	3.72	3.76	3.63	3.30	4.63
Jul	2.79	3.61	3.24	3.12	3.49
Aug	2.96	3.14	3.32	3.21	3.09
Sep	3.02	2.54	3.03	2.93	3.48
Oct	3.16	2.80	3.11	2.64	3.12
Nov	2.97	2.88	2.61	2.64	2.42
Dec	3.13	3.23	2.28	2.64	2.07

Average Monthly BOD_5 (lbs/day)

	2006	2007	2008	2009	2010
Jan	2999	3317	3171	4820	4009
Feb	2825	4296	2845	4564	4299
Mar	3180	2980	3452	5861	3522
Apr	2798	3411	3527	3575	4209
May	2830	3149	4864	4678	4044
Jun	2997	3151	4133	3862	4078
Jul	2342	2964	3547	3254	3165
Aug	2205	2350	3461	3778	3101
Sep	3003	2301	2501	4492	3554
Oct	3202	3040	3340	3136	3920
Nov	3187	3013	3392	4269	3811
Dec	3237	2964	3821	3147	

Average Monthly TSS (lbs/day)

	2006	2007	2008	2009	2010
Jan	2695	2725	3118	3379	3014
Feb	2830	3148	3104	2837	3315
Mar	2607	2576	2848	2695	2901
Apr	2500	2884	3089	2884	3416
May	3237	2826	4382	3061	4068
Jun	3612	2643	4448	3009	3706
Jul	2165	2809	3542	3025	3323
Aug	2027	2316	2743	2774	3140
Sep	2535	2228	2705	2645	3485
Oct	2959	2720	2877	2571	3720
Nov	2719	2935	2756	2781	3193
Dec	2327	2456	2443	2519	2426

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
1-Jan	3.58	2.74	2.62	2.13	2.13
2-Jan	3.48	2.80	2.57	2.12	2.23
3-Jan	3.02	3.09	2.68	2.18	2.17
4-Jan	3.65	3.27	2.74	2.19	2.32
5-Jan	3.39	3.13	2.74	2.20	2.43
6-Jan	3.59	3.10	2.09	2.33	2.74
7-Jan	3.80	3.08	2.73	2.38	3.07
8-Jan	3.97	4.09	2.69	3.60	2.85
9-Jan	3.85	5.27	2.82	11.55	2.77
10-Jan	4.20	4.15	2.50	7.93	2.74
11-Jan	5.33	3.92	2.58	5.03	2.72
12-Jan	5.11	3.57	2.49	4.45	2.76
13-Jan	5.05	3.60	2.49	4.27	2.78
14-Jan	4.67	3.24	2.61	4.11	2.93
15-Jan	4.40	3.10	2.38	3.84	2.93
16-Jan	4.21	3.15	2.42	3.83	2.96
17-Jan	4.32	3.16	2.45	3.75	2.91
18-Jan	4.32	2.97	2.60	3.43	2.96
19-Jan	3.45	3.03	2.77	3.23	3.72
20-Jan	4.01	2.95	2.69	3.16	3.95
21-Jan	3.83	2.90	2.65	3.23	3.81
22-Jan	3.68	2.91	2.90	3.31	3.81
23-Jan	3.71	2.97	2.91	3.01	3.84
24-Jan	4.06	3.10	2.77	3.13	3.60
25-Jan	3.21	2.76	2.84	3.01	3.49
26-Jan	3.41	2.89	2.77	2.89	3.46
27-Jan	3.47	2.69	2.71	2.85	4.08
28-Jan	4.65	2.76	2.65	2.87	3.89
29-Jan	3.44	2.54	2.72	3.03	3.74
30-Jan	4.12	2.76	2.67	2.74	3.73
31-Jan	3.94	2.87	2.54	2.77	3.92
1-Feb	3.93	2.63	2.62	2.80	3.99
2-Feb	3.92	2.74	2.57	2.70	3.83
3-Feb	3.83	2.55	2.57	2.67	3.75
4-Feb	3.93	2.47	2.51	2.87	3.71
5-Feb	3.94	2.56	2.63	2.82	3.74
6-Feb	3.84	2.70	2.65	2.60	3.83
7-Feb	3.92	2.74	2.69	2.83	3.87
8-Feb	3.68	2.85	2.90	2.60	3.74
9-Feb	3.47	3.14	3.18	2.60	3.57
10-Feb	3.59	3.99	3.19	2.63	3.66
11-Feb	3.44	3.58	3.55	2.73	3.50
12-Feb	3.40	4.32	3.71	2.71	3.45
13-Feb	3.19	4.10	4.08	2.73	3.46
14-Feb	2.48	4.08	3.92	2.77	3.52

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
15-Feb	3.16	3.81	3.79	2.67	3.40
16-Feb	3.09	3.90	3.17	2.44	3.37
17-Feb	3.20	3.97	3.60	1.52	3.47
18-Feb	3.03	3.84	3.51	1.52	3.50
19-Feb	2.84	3.74	3.66	2.58	3.46
20-Feb	2.82	3.89	3.69	2.55	3.52
21-Feb	2.95	3.83	3.54	2.61	3.32
22-Feb	3.00	3.74	3.45	2.56	3.17
23-Feb	2.95	3.52	3.45	2.58	3.20
24-Feb	2.84	3.62	3.36	2.60	3.11
25-Feb	2.84	3.53	3.41	2.94	3.14
26-Feb	2.82	3.80	3.50	2.85	3.09
27-Feb	2.89	3.71	3.15	2.79	3.10
28-Feb	3.31	3.59	2.73	2.66	3.79
1-Mar	3.32	3.78	2.84	2.61	3.55
2-Mar	3.06	3.42	3.16	2.39	3.39
3-Mar	3.07	3.44	3.18	2.55	3.43
4-Mar	2.97	3.32	3.32	2.74	3.44
5-Mar	2.88	3.29	3.10	4.13	3.41
6-Mar	2.90	3.31	3.14	4.49	3.22
7-Mar	2.93	3.41	2.89	3.91	3.21
8-Mar	2.89	3.42	2.96	3.54	3.16
9-Mar	2.88	3.20	2.84	3.16	3.15
10-Mar	2.92	3.39	2.68	3.13	3.24
11-Mar	2.85	3.10	2.76	3.15	3.15
12-Mar	2.74	3.30	2.74	3.08	3.13
13-Mar	2.79	3.45	2.70	2.99	3.02
14-Mar	2.94	3.76	2.75	2.99	2.99
15-Mar	2.65	3.50	2.73	2.99	2.77
16-Mar	2.69	3.28	2.69	2.93	2.86
17-Mar	2.93	3.27	2.45	2.87	2.89
18-Mar	2.69	3.25	2.36	2.89	2.94
19-Mar	2.52	3.30	2.38	2.91	2.91
20-Mar	2.46	3.30	2.11	2.84	2.82
21-Mar	2.37	3.30	2.29	2.79	2.84
22-Mar	2.69	3.59	2.29	2.64	2.40
23-Mar	2.11	3.24	2.34	1.73	2.46
24-Mar	2.40	3.21	2.29	1.66	2.62
25-Mar	2.47	3.18	2.13	2.26	2.52
26-Mar	2.41	3.46	2.40	1.71	2.47
27-Mar	2.58	3.53	2.54	1.56	2.50
28-Mar	2.66	3.57	2.52	1.85	2.54
29-Mar	2.79	3.51	2.54	2.44	2.55
30-Mar	2.44	3.38	2.78	2.38	2.63
31-Mar	2.56	3.45	2.65	2.55	2.76

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
1-Apr	2.75	3.33	2.59	2.72	2.86
2-Apr	2.91	3.43	2.66	2.78	2.84
3-Apr	2.85	3.41	2.62	2.80	2.94
4-Apr	2.86	3.43	2.62	2.81	3.13
5-Apr	2.89	3.33	2.55	2.79	2.82
6-Apr	2.85	3.31	2.59	2.87	2.84
7-Apr	2.80	3.26	2.32	2.30	3.05
8-Apr	2.85	3.14	2.44	2.66	2.92
9-Apr	2.94	3.10	2.51	2.64	2.94
10-Apr	2.96	3.40	2.47	2.65	2.97
11-Apr	3.16	3.43	2.56	2.66	2.85
12-Apr	3.05	3.53	2.50	2.61	2.71
13-Apr	3.07	3.50	2.46	2.45	2.73
14-Apr	3.07	3.55	2.36	2.81	2.72
15-Apr	3.04	3.47	2.47	2.31	2.74
16-Apr	2.93	3.52	2.49	2.87	2.75
17-Apr	2.86	3.47	2.55	2.82	2.87
18-Apr	2.97	3.56	2.52	2.91	2.88
19-Apr	3.11	3.52	2.64	2.96	2.85
20-Apr	2.93	3.49	2.61	2.83	2.93
21-Apr	3.00	3.52	2.64	2.79	3.12
22-Apr	3.05	3.47	2.71	2.88	3.64
23-Apr	2.03	3.48	2.75	2.93	3.62
24-Apr	2.47	3.58	2.95	3.08	3.59
25-Apr	2.44	3.63	3.04	3.16	3.68
26-Apr	2.14	3.60	2.97	3.25	3.53
27-Apr	2.49	3.84	2.90	3.00	3.44
28-Apr	2.21	3.81	2.83	3.17	3.64
29-Apr	2.90	3.84	3.13	3.49	3.66
30-Apr	2.97	3.98	3.13	3.46	3.64
1-May	3.29	4.05	3.03	3.47	3.61
2-May	3.51	4.31	3.06	3.36	3.57
3-May	3.55	4.32	3.12	3.34	3.46
4-May	3.61	4.01	3.20	3.30	3.75
5-May	3.80	4.09	3.10	3.41	3.84
6-May	3.76	3.60	3.35	3.87	3.83
7-May	3.50	3.75	3.43	3.77	3.81
8-May	3.65	3.90	3.59	3.75	3.80
9-May	4.01	3.88	3.57	3.69	3.88
10-May	3.57	3.93	3.55	3.51	3.77
11-May	3.30	4.09	3.36	3.40	3.60
12-May	3.54	4.08	3.35	3.56	3.82
13-May	3.65	4.18	3.48	3.76	3.76
14-May	3.47	4.19	3.52	3.70	3.69
15-May	3.51	4.29	3.61	3.73	3.75

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
16-May	4.02	4.35	3.83	3.76	3.77
17-May	4.19	4.08	3.86	3.73	3.83
18-May	4.58	4.13	3.92	3.58	4.02
19-May	5.52	4.14	3.92	3.80	4.32
20-May	6.00	3.95	4.19	3.64	5.03
21-May	5.98	4.46	4.30	3.99	5.56
22-May	6.55	4.40	4.39	3.95	5.69
23-May	6.78	4.24	4.32	4.07	5.46
24-May	6.51	3.98	4.20	4.07	5.17
25-May	6.18	2.06	4.07	4.06	5.03
26-May	5.83	3.88	4.50	3.44	4.96
27-May	5.48	3.79	4.96	3.92	4.85
28-May	5.04	3.82	5.05	4.08	5.69
29-May	4.71	4.05	1.99	3.86	5.37
30-May	4.52	4.02	4.74	4.12	5.30
31-May	4.34	4.05	4.41	3.94	4.94
1-Jun	4.62	4.15	4.40	3.75	4.65
2-Jun	4.81	3.97	4.04	4.00	5.03
3-Jun	5.03	4.01	4.29	4.00	5.06
4-Jun	4.77	4.04	4.04	3.94	4.92
5-Jun	5.08	4.12	4.54	3.85	5.22
6-Jun	4.75	4.14	4.15	3.83	5.64
7-Jun	4.30	3.93	3.94	3.83	5.30
8-Jun	4.18	3.89	4.01	3.64	5.59
9-Jun	4.15	3.69	3.75	3.68	5.44
10-Jun	3.86	3.78	3.70	3.70	5.94
11-Jun	3.80	3.66	3.67	3.66	6.08
12-Jun	3.71	3.72	3.66	3.48	5.73
13-Jun	3.96	3.69	3.60	3.52	5.49
14-Jun	3.88	3.61	3.71	3.47	5.18
15-Jun	3.94	3.58	3.67	3.33	4.91
16-Jun	3.43	3.71	3.51	3.20	4.78
17-Jun	3.44	3.53	3.64	3.19	4.52
18-Jun	3.51	4.45	3.49	3.15	4.27
19-Jun	3.17	3.43	3.50	3.05	4.14
20-Jun	3.26	3.45	3.59	3.05	4.20
21-Jun	3.63	3.33	3.41	3.05	4.11
22-Jun	2.82	3.37	3.68	2.88	4.02
23-Jun	2.91	3.46	3.53	2.90	4.02
24-Jun	2.70	3.41	3.52	2.91	3.87
25-Jun	3.21	3.71	3.39	2.91	3.85
26-Jun	3.15	3.76	3.27	2.81	3.62
27-Jun	2.76	3.78	3.13	2.77	3.64
28-Jun	3.29	3.71	3.26	2.72	3.48
29-Jun	2.89	3.85	3.06	2.78	3.52

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
30-Jun	2.74	3.80	3.03	2.91	3.72
1-Jul	2.88	3.78	3.16	2.91	3.59
2-Jul	3.09	3.80	3.28	2.99	3.48
3-Jul	2.78	3.87	3.14	2.89	3.49
4-Jul	2.76	3.62	3.17	2.83	3.55
5-Jul	2.69	3.50	3.15	2.83	3.37
6-Jul	2.53	3.71	3.08	2.74	3.30
7-Jul	2.95	3.59	3.09	2.84	3.44
8-Jul	3.39	3.41	3.31	3.05	3.45
9-Jul	3.15	3.53	3.36	3.23	3.52
10-Jul	2.61	3.51	3.36	3.22	3.59
11-Jul	2.92	3.63	3.45	3.15	3.61
12-Jul	2.98	3.60	3.34	3.20	3.45
13-Jul	2.96	3.74	3.32	3.09	3.49
14-Jul	3.03	3.59	3.19	3.07	3.56
15-Jul	2.92	3.59	3.23	3.18	3.46
16-Jul	2.67	3.68	3.24	3.10	3.47
17-Jul	2.65	3.61	3.11	3.09	3.56
18-Jul	2.94	3.93	3.24	3.23	3.45
19-Jul	3.00	3.44	3.32	3.27	3.57
20-Jul	2.87	4.48	3.42	3.17	3.50
21-Jul	2.73	3.50	3.27	3.00	3.52
22-Jul	2.88	3.43	3.36	3.06	3.52
23-Jul	2.75	3.57	3.31	3.10	3.47
24-Jul	2.78	3.61	3.21	3.06	3.50
25-Jul	2.52	3.49	3.25	3.14	3.65
26-Jul	2.77	3.44	3.21	3.23	3.34
27-Jul	2.11	3.53	3.23	3.13	3.45
28-Jul	2.40	3.54	3.10	3.20	3.50
29-Jul	2.35	3.41	3.18	3.25	3.48
30-Jul	2.61	3.43	3.19	3.37	3.45
31-Jul	2.88	3.41	3.24	3.39	3.49
1-Aug	2.56	3.32	3.19	3.46	3.51
2-Aug	2.85	3.22	3.18	3.42	3.44
3-Aug	3.32	3.18	3.21	3.21	3.33
4-Aug	3.37	3.13	3.13	3.35	3.47
5-Aug	3.31	3.28	3.18	3.34	3.36
6-Aug	3.13	3.42	3.27	3.27	3.29
7-Aug	3.30	3.48	3.19	3.17	3.26
8-Aug	3.30	3.19	3.24	3.21	3.33
9-Aug	3.17	3.07	3.22	3.27	3.16
10-Aug	3.37	3.11	3.48	3.20	3.25
11-Aug	3.42	3.27	3.13	3.23	3.18
12-Aug	3.42	3.05	3.16	3.29	3.25
13-Aug	3.42	3.16	3.20	3.38	3.34

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
14-Aug	3.49	3.29	3.32	3.45	3.28
15-Aug	3.35	3.40	3.20	3.42	3.07
16-Aug	3.31	3.33	3.30	3.28	2.97
17-Aug	3.33	3.38	3.34	3.20	3.06
18-Aug	3.33	3.28	3.50	3.10	3.08
19-Aug	2.82	3.13	3.35	3.22	3.05
20-Aug	2.19	3.31	3.41	3.16	2.77
21-Aug	2.18	3.50	3.68	3.24	2.91
22-Aug	2.86	3.25	3.55	3.10	2.97
23-Aug	2.98	2.98	3.48	3.20	2.83
24-Aug	2.68	2.98	3.36	3.06	2.94
25-Aug	2.46	2.92	3.35	3.14	2.96
26-Aug	2.55	2.76	3.48	3.15	2.92
27-Aug	2.40	2.89	3.48	3.09	2.88
28-Aug	2.43	2.97	3.29	3.03	2.94
29-Aug	2.53	2.67	3.32	3.13	3.05
30-Aug	2.77	2.73	3.32	3.06	2.75
31-Aug	2.26	2.79	3.38	2.96	2.86
1-Sep	3.03	2.84	3.29	3.13	2.90
2-Sep	3.43	2.81	3.13	2.99	2.88
3-Sep	2.66	2.74	3.05	2.88	2.80
4-Sep	2.85	2.71	3.02	3.01	2.77
5-Sep	2.76	2.67	3.09	3.09	2.60
6-Sep	2.88	2.61	3.02	3.15	2.59
7-Sep	2.41	2.65	3.07	3.38	2.61
8-Sep	2.57	2.64	2.94	3.29	2.68
9-Sep	2.51	2.54	2.93	3.19	3.49
10-Sep	2.20	2.51	2.99	3.12	4.10
11-Sep	2.53	2.56	2.97	3.06	3.64
12-Sep	1.86	2.55	2.99	2.94	3.42
13-Sep	0.66	2.51	2.99	2.88	3.24
14-Sep	2.20	2.41	3.03	2.75	3.27
15-Sep	2.43	2.48	2.97	2.85	3.18
16-Sep	4.11	2.49	3.02	2.82	3.14
17-Sep	3.67	2.57	3.04	2.85	3.13
18-Sep	3.72	2.51	2.97	2.84	3.15
19-Sep	3.62	2.55	2.97	2.78	3.41
20-Sep	3.66	2.41	2.96	2.78	4.11
21-Sep	3.67	2.52	2.97	2.80	5.57
22-Sep	3.56	2.49	2.91	2.74	4.66
23-Sep	3.58	2.50	3.06	2.97	4.33
24-Sep	3.28	2.45	3.09	2.98	4.12
25-Sep	3.48	2.46	3.23	2.90	3.95
26-Sep	3.57	2.44	3.14	2.99	3.83
27-Sep	3.53	2.40	3.06	2.88	3.69

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
28-Sep	3.38	2.45	3.11	2.78	3.57
29-Sep	3.34	2.38	2.93	2.78	3.62
30-Sep	3.42	2.22	3.07	2.79	3.46
1-Oct	3.25	2.53	3.23	2.75	3.47
2-Oct	3.28	2.36	3.18	2.77	3.46
3-Oct	3.23	2.33	3.31	2.75	3.38
4-Oct	3.27	2.45	3.33	2.75	3.26
5-Oct	3.50	2.63	3.66	2.66	3.27
6-Oct	3.43	2.51	3.89	2.70	3.30
7-Oct	3.49	2.39	3.76	2.76	3.17
8-Oct	3.24	2.43	3.70	2.81	3.16
9-Oct	3.38	2.34	3.78	2.52	3.13
10-Oct	3.44	2.46	3.60	2.51	3.17
11-Oct	3.51	2.24	3.57	2.41	3.35
12-Oct	3.48	2.32	3.42	2.23	3.42
13-Oct	3.38	2.35	3.16	2.24	3.46
14-Oct	3.34	2.24	3.27	2.26	3.44
15-Oct	3.22	2.29	3.34	2.52	3.35
16-Oct	3.47	3.18	3.33	2.40	3.32
17-Oct	3.35	3.35	3.35	2.27	3.22
18-Oct	3.33	3.30	3.25	2.18	2.96
19-Oct	3.28	3.69	3.16	2.56	3.02
20-Oct	3.15	3.37	2.92	2.56	3.04
21-Oct	3.09	3.04	3.01	2.57	3.02
22-Oct	2.79	3.07	3.00	2.56	3.00
23-Oct	2.91	3.28	2.98	2.55	2.98
24-Oct	2.81	3.19	2.92	2.53	2.86
25-Oct	2.87	3.21	2.87	2.63	2.78
26-Oct	2.82	3.12	2.87	2.69	2.90
27-Oct	2.80	3.19	2.70	2.92	2.94
28-Oct	2.69	2.97	1.95	3.25	2.87
29-Oct	2.78	3.05	2.06	3.08	2.86
30-Oct	2.72	2.99	2.84	3.10	2.86
31-Oct	2.80	3.04	2.21	3.19	2.88
1-Nov	2.74	3.01	2.15	3.05	2.84
2-Nov	2.79	2.83	2.13	3.01	2.95
3-Nov	2.81	2.85	2.12	2.81	2.91
4-Nov	2.82	2.86	2.19	2.90	2.83
5-Nov	2.68	1.86	2.84	3.17	2.80
6-Nov	2.98	2.87	2.85	2.80	2.81
7-Nov	3.96	2.83	2.65	2.95	2.70
8-Nov	2.84	2.91	2.94	2.93	2.67
9-Nov	3.23	2.86	2.77	2.76	2.63
10-Nov	3.17	2.84	2.81	2.72	2.66
11-Nov	2.98	2.64	2.85	2.75	2.66

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
12-Nov	2.95	2.62	2.67	2.90	2.56
13-Nov	3.53	2.79	3.06	2.84	2.50
14-Nov	3.46	2.73	2.82	2.78	2.46
15-Nov	3.22	2.87	2.86	2.07	2.42
16-Nov	3.34	2.76	2.54	2.70	2.45
17-Nov	3.18	2.91	2.36	2.73	2.35
18-Nov	2.97	3.09	2.63	2.86	2.36
19-Nov	3.12	3.54	2.65	2.81	2.34
20-Nov	2.84	3.66	2.87	2.76	2.34
21-Nov	3.04	3.25	2.86	2.77	2.32
22-Nov	2.89	2.99	2.93	2.84	2.23
23-Nov	2.54	2.67	2.14	2.67	2.26
24-Nov	2.58	2.65	2.68	2.91	2.26
25-Nov	2.66	2.72	2.43	2.81	2.21
26-Nov	2.14	2.91	2.62	2.82	2.14
27-Nov	2.90	2.99	2.73	2.57	1.76
28-Nov	3.04	2.95	2.57	2.57	1.83
29-Nov	2.77	2.97	2.25	2.64	1.91
30-Nov	2.94	3.04	2.25	2.55	2.10
1-Dec	2.79	3.00	2.31	2.71	2.20
2-Dec	1.90	2.84	2.61	2.92	1.94
3-Dec	2.81	3.48	2.70	3.00	1.91
4-Dec	2.90	5.52	2.65	2.70	1.97
5-Dec	2.85	4.81	2.70	2.82	2.07
6-Dec	2.91	4.25	2.70	2.70	1.97
7-Dec	2.69	4.17	2.73	2.73	2.10
8-Dec	2.77	3.75	2.53	2.46	2.09
9-Dec	2.72	3.45	2.58	2.63	2.05
10-Dec	2.65	3.45	2.59	2.60	2.10
11-Dec	2.68	3.34	2.66	2.64	2.34
12-Dec	2.92	3.32	2.65	2.61	2.13
13-Dec	3.47	3.16	2.64	2.54	1.96
14-Dec	4.30	3.20	2.50	2.31	1.97
15-Dec	4.51	3.10	2.35	2.26	2.14
16-Dec	4.65	3.06	2.31	2.27	2.36
17-Dec	4.04	3.12	2.22	2.26	2.15
18-Dec	4.13	2.98	2.31	2.28	1.95
19-Dec	3.34	3.07	2.29	2.14	
20-Dec	3.48	3.06	2.22	2.24	
21-Dec	3.51	3.06	2.18	2.20	
22-Dec	3.06	3.04	2.16	2.28	
23-Dec	3.17	2.83	2.15	2.34	
24-Dec	2.94	2.81	2.19	2.27	
25-Dec	2.85	2.73	2.21	2.23	
26-Dec	2.70	2.59	2.09	2.07	

Daily Influent Flows (MGD)

	2006	2007	2008	2009	2010
27-Dec	2.90	2.70	1.25	1.91	
28-Dec	2.92	2.69	1.02	2.03	
29-Dec	2.88	2.58	0.96	2.04	
30-Dec	2.78	2.47	2.12	2.18	
31-Dec	2.68	2.60	2.21	2.15	

APPENDIX D

TCF CONTRACT AND TCF PERMIT

Permit No.: ST-5507
Issuance Date: December 22, 2006
Effective Date: February 1, 2007
Expiration Date: January 31, 2012

STATE WASTE DISCHARGE PERMIT NO. ST-5507

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

In compliance with the provisions of the
State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington, as amended,
Authorizes

TWIN CITY FOODS, INC.
501 WEST FOURTH STREET
ELLENSBURG, WA 98926

to discharge wastewater in accordance with the special and general conditions which follow.

Facility Location: Same as above. Industry Type Production of frozen vegetables SIC Code: 2037	Discharge Location: Legal Description: Sections 11, 12, 13, and 14, Township 17 N, Range 18 E. W. M. Latitude: 46° 13' 00" N Longitude: 120° 32' 30" W

Denise E. Mills, LHG
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

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SUMMARY OF PERMIT REPORT SUBMITTALS

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

Permit Section	Submittal	Frequency	First Submittal Date
S1.C.	MOU for Discharges to the POTW	1/permit cycle	March 1, 2007
S2.E.	Annual Crop Yield and Nutrient Balance Report	1/year	Annually beginning May 15, 2008
S3.A.	Discharge Monitoring Report	Monthly	March 15, 2007
S4.A.	Operations and Maintenance Manual	1/permit cycle	As needed
S4.D.	QAPP Update	1/permit cycle	March 1, 2007
S5.C.	Solid Waste Control Plan Update	1/permit cycle	January 31, 2011
S6.	Duty to Reapply	1/permit cycle	January 31, 2011
S7.1.	Progress Reports	3/permit cycle	October 1, 2007
S7.2.	Draft Engineering Plans	1/permit cycle	April 1, 2010
S7.3.	Approvable Engineering Plans with Construction Schedule	1/permit cycle	October 1, 2010
S7.4.	Letter of Construction Completion	1/permit cycle	January 31, 2012
S8.	Spill and Slug Discharge Prevention and Control Plan	1/permit cycle	January 31, 2011
S9.	Irrigation and Crop Management Plan	1/year	May 15, 2007
G1.	Signature Authorization/Delegation	As needed	As needed

SPECIAL CONDITIONS

S1. DISCHARGE 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 concentration in excess of, that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

Beginning on **February 1, 2007** and lasting through **January 31, 2012**, the Permittee is authorized to discharge wastewater by applying it to land via spray irrigation at permitted rates on the following designated irrigation lands:

> Approximately 150 acres located immediately south of the city of Ellensburg, south of Interstate 90, west of Canyon Road, and east of the Yakima River, and the S½ of Section 11, W½ of Section 13, and the NE¼ of Section 14, Township 17 N, Range 18 E. W. M.

The irrigation season shall run from April through October, annually. In the event the Permittee finds it necessary to irrigate outside the normal irrigation season, the Permittee shall request approval from the Department, in writing, at least 5 business days in advance of the proposed discharge.

Total nutrient loadings applied to the irrigation lands shall not exceed the crop requirements as determined by the Permittee's Crop Management Plan, Condition S7.B. In addition, **hydraulic loading of the sprayfield shall not exceed an annual total of 155.1 million gallons applied at the rate not to exceed the monthly amount contained in the table below:**

A. Interim Sprayfield Limitations

MONTH	GALLONS per MONTH	MONTH	GALLONS per MONTH
April	13,000,000	August	38,800,000
May	21,800,000	September	29,000,000
June	20,000,000	October	20,000,000
July	12,500,000	TOTAL	155,100,000

THIS PAGE REVISED ON MARCH 5, 2007

Discharges to the sprayfield shall incorporate Best Management Practices detailed in Special Condition S4.C. of this permit. Furthermore, pH shall not be outside the range of 6.0 to 9.0.

B. Final Sprayfield Limitations

The final wastewater application limitation schedule to the sprayfield will be established via administrative order following the completion of the sprayfield wastewater storage lagoon at the permitted location.

MONTH	GALLONS per MONTH	MONTH	GALLONS per MONTH
April	20,000,000	August	38,800,000
May	21,800,000	September	29,000,000
June	20,000,000	October	13,000,000
July	12,500,000	TOTAL	155,100,000

C. Discharge to the City of Ellensburg POTW

From November 1st to March 31st of each year of the permit cycle, no more than 60,000 gallons per day of wastewater generated by repacking operations shall be discharged to the Ellensburg Publicly Owned Treatment Works (POTW). Pea brine water is also trucked to the sludge drying beds at the POTW.

The allowable flow, biological oxygen demand (BOD) load, total suspended solids (TSS) load, pH range, and monitoring requirements are to be established in a contact between the City of Ellensburg and TCF. In addition, the handling and disposal of pea brine water containing concentrated sodium chloride shall be established in the contract. The contract is required to be placed in Appendix D of the most recent approved Operations and Maintenance Manual no later than **March 1, 2007.**

THIS PAGE REVISED ON MARCH 5, 2007

S2. MONITORING REQUIREMENTS

A. Wastewater Discharge to Sprayfield Monitoring

The sampling point for the effluent from the above ground treatment works will be at the sprayfield sump after the wastewater has passed through the final rotating screen.

The Permittee shall monitor the wastewater according to the following schedule during the fresh vegetable processing season:

Parameter	Units	Sampling Frequency	Sample Type
Flow	MGD	Daily	Meter
Conductivity	μmhos/cm	Daily	Meter
pH	Standard Units	Daily	Meter
Soluble BOD	mg/L	Weekly	Composite grab
Total BOD	mg/L	Weekly	Composite grab
TKN (as N)	mg/L	Weekly	Composite grab
NO_3 (as N)	mg/L	Weekly	Composite grab
NH_3 (as N)	mg/L	Weekly	Composite grab
Total-P (as P)	mg/L	Weekly	Composite grab
Total Dissolved Solids (TDS)	mg/L	Weekly	Composite grab
Potassium	mg/L	Weekly	Composite grab
Chloride	mg/L	Weekly	Composite grab
Sulfate (as S)	mg/L	Weekly	Composite grab
Sodium	mg/L	Weekly	Composite grab

B. Discharge to Ellensburg POTW

The monitoring requirements shall be established according to a contract between the City and TCF contained in Appendix D of the most recent approved O&M manual according to Special Condition S1.C. of this permit.

C. Ground Water Monitoring

The sampling points for ground water will be monitoring wells numbers 1 through 6. The Permittee shall monitor the ground water according to the following schedule:

Parameter	Units	Monitoring Wells	Sampling Frequency	Sample Type
Ferrous Iron	Present /Absent	1, 3-6	Monthly	Field Measurement
Alkalinity	mg/L as $CaCO_3$	1, 3-6	2/year[a]	Grab
pH	Standard Units	1, 3-6	Monthly	Grab
Conductivity	µmhos/cm	1, 3-6	Monthly	Grab
Fecal Coliform	CPU/100 ml	1, 3-6	Monthly [b]	Grab
Water Level	Tenths of Feet	1, 3-6	Monthly	Measurement
Temperature	°C	1, 3-6	Monthly	Field Measurement
Chloride	mg/L	1, 3-6	Monthly	Grab
Sulfate	mg/L	1, 3-6	2/year	Grab
Total Dissolved Solids (TDS)	mg/L	1, 3-6	Monthly	Grab
NO_3 (as N)	mg/L	1, 3-6	Monthly	Grab
TKN (as N)	mg/L	1, 3-6	Monthly	Grab
Calcium	mg/L	1, 3-6	2/year	Grab
Magnesium	mg/L	1, 3-6	2/year	Grab
Potassium	mg/L	1, 3-6	2/year	Grab
Sodium	mg/L	1, 3-6	2/year	Grab
Manganese	mg/L	1, 3-6	Monthly	Grab[c]
Iron	mg/L	1, 3-6	Monthly	Grab[c]
Total Phosphorus	mg/L	1, 3-6	2/year	Grab
Total Organic Halogens (TOX)	mg/L (as Cl^-)	1, 3-6	Annually [d]	Grab
a-Semi-annual sampling shall be performed in April and November.				
b-Sampling for Fecal Coliform Bacteria shall occur from June through November.				
c-Samples analyzed for manganese and iron shall be filtered with a 0.45-µm filter at the wellhead. Laboratory analysis for total manganese and total iron shall be specified. The lab shall be instructed that the sample has been filtered in the field and that lab filtering is not requested.				
d-Sampling for TOX shall occur during November.				

D. Soil Monitoring

1. Seasonal Monitoring

The Permittee shall perform soil monitoring on the irrigation lands by April 15th of each year of the permit cycle. The sample locations shall be representative of each irrigation site or as represented in the crop management plan. To the extent practicable, sampling sites shall remain the same from year to year. Results shall be submitted with the annual Irrigation and Crop Management Plan.

Composite samples will consist of equal measures of sub-samples taken from six depths [0-12 inches; 12-24 inches; 24-36 inches; 36-48 inches; 48-60 inches; 60-72 inches (or until auger refusal or ground water is encountered)] and will be from a minimum of four (4) cores.

The Permittee shall analyze the sprayfield soil samples according to the following schedule:

Parameter	Units	Sample Point	Depth Increments [a]
Exchangeable sodium percentage	%	Each field	1-6
Cation exchange capacity	meq/100g	"	1-6
Organic matter	%	"	1-6
Moisture content	%	"	1-6
TKN (as N)	ppm [b]	"	1-6
NO_3 (as N)	ppm	"	1-6
NH_3 (as N)	ppm	"	1-6
Total-P (as P)	ppm	"	1-6
Conductivity	µmhos/cm	"	1-6
Sodium	meq/100g	"	1-6
Calcium	meq/100g	"	1-6
Magnesium	meq/100g	"	1-6
Potassium	ppm	"	1-6
Sulfate (as S)	ppm	"	1-6
pH	S.U.	"	1-6

[a] Depth increments in inches for composite samples:

1	0 -12"	4	36-48"
2	12-24"	5	48-60"
3	24-36"	6	60-72"

[b] "ppm" means parts per million

2. Weekly Monitoring

From April through November, surficial soils (to 6-inch depth) shall be tested for the presence or absence of ferrous iron using the 1,000 mg/liter 2-2' dipyridyl indicator solution (*Field Techniques for Measuring Wetland Soil Parameters,* Faulkner, et. al., May-June 1989). Testing shall be on a weekly basis or immediately prior to application, if the application cycle is longer than seven days.

Samples are to be collected from any areas that show indications of ponding of wastewater or poor plant growth which might be associated with saturated soils. In addition, six samples shall be collected from other generally low areas of the sprayfield. A brief summary of the results of these tests is to be included with each monthly report. The locations of any samples which indicate the presence of ferrous iron are to be located on a sketch map and the actions taken to correct the problem are to be described in the report.

E. Annual Crop Yield and Nutrient Balance Report

The Permittee shall by **May 15, 2008** and for each successive year of the permit term submit to the Department an Annual Crop Yield and Nutrient Balance Report, which details the annual crop yield by harvest by individual field, complete with Total Kjeldahl Nitrogen (TKN) and Total Phosphorus analysis. The report shall provide a detailed nutrient balance describing the wastewater nutrient load compared to the nutrient load estimated to be removed with each harvest.

The Report shall be placed in a separate section of the Annual Irrigation and Crop Management Plan (Special Condition S9.). Information contained in the Annual Crop Yield and Nutrient Balance Report shall be discussed and used to modify the Irrigation and Crop Management Plan as needed.

F. 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.

Ground water sampling shall conform to the latest protocols in the *Implementation Guidance for the Ground Water Quality Standards*, (Ecology 1996).

Sampling and analytical methods used to meet the water and wastewater 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).

All soil analysis and reporting shall be in accordance with *Laboratory Procedures*, Soil Testing Laboratory, Washington State University, November 1981.

G. 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 are consistent with the accepted industry standard for that type of device. Frequency of calibration shall be in conformance with manufacturer's recommendations. Calibration records shall be maintained for at least three years.

H. 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, 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. Soils data are exempted from this requirement pending accreditation of laboratories for analysis of these parameters by the Department.

I. Request for Reduction of Monitoring

The Permittee may request the Department of Ecology (Department) review the data to determine whether a reduction of the sampling frequency or modifications of sampling/analytical methods is warranted after twelve (12) months of monitoring. The request shall: (1) be in written form, (2) clearly state the parameters for which the reduction in monitoring is being requested, and (3) clearly state the statistical justification for the reductions. Any request for reduction in monitoring shall be granted at the Department's discretion and accomplished through an Administrative Order or permit modification.

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.

A. Reporting

The first monitoring period begins on **February 1, 2007**. Monitoring results shall be submitted monthly. Monitoring data obtained during the previous month shall be summarized and reported on a form provided, or otherwise approved, by the Department, and be postmarked or received no later than the 15th day of the month following the completed reporting period. The report(s) shall be sent to:

Permit Data Systems Manager
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, Washington 98902

Discharge Monitoring Report forms must be submitted monthly whether or not the facility was discharging. If there was no discharge or the facility was not operating 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 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 Director.

C. Recording of Results

For each measurement or sample taken, the Permittee shall record the following information: (1) the date, exact place and time of sampling; (2) the individual who performed the sampling or measurement; (3) the dates the analyses were performed; (4) 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 this monitoring shall be included in calculation and reporting of the data submitted in the Permittee's self-monitoring reports.

E. Noncompliance Notification

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

1. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the violation, and correct the problem;

2. Immediately repeat sampling (within 48 hours) and analysis of any violation and submit the results to the Department within 30 days after becoming aware of the violation;

3. Immediately notify the Department of the failure to comply; and

4. Submit a detailed written report to the Department within 30 days, unless requested earlier by the Department, describing the nature of the violation, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of the resampling, and any other pertinent information.

   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. Maintaining a Copy of This Permit

A copy of this permit shall be kept at the facility and be made available upon request to Ecology inspectors.

S4. OPERATION AND MAINTENANCE

The Permittee shall at all times be responsible for the proper operation and maintenance of any facilities or systems of control installed to achieve compliance with the terms and conditions of the permit.

A. Operations and Maintenance Manual

The O&M Manual shall be reviewed by the Permittee at least annually. All manual changes or updates shall be submitted to the Department for review and approval prior to incorporation into the manual. The approved operation and maintenance manual shall be kept available at the permitted facility.

The operation and maintenance manual shall contain the treatment plant process control monitoring schedule. All operators shall follow the instructions and procedures of this manual.

In addition to the requirements of WAC 173-240-150(1) and (2), the manual shall include:

1. Emergency procedures for plant shutdown and cleanup in event of wastewater system upset or failure;
2. Irrigation system operational controls and procedures;
3. The updated Quality Assurance Project Plan (QAPP) for all wastewater and ground water sampling and testing required in Special Condition S4.D;
4. Plant maintenance procedures related to the generation of process wastewater; and,
5. Sprayfield best management practices (BMPs).
6. Appendix D that contains the most recent signed contract between the City and TCF as required in Special Conditions S1.B. and S2.B.

B. Bypass Procedures

The Permittee shall immediately notify the Department of any spill, overflow, or bypass from any portion of the treatment system.

The bypass of wastes from any portion of the treatment system is prohibited unless one of the following conditions (1, 2, or 3) applies:

1. *Unavoidable Bypass* -- 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.

   If the resulting bypass from any portion of the treatment system results in noncompliance with this permit the Permittee shall notify the Department in accordance with condition S3.E "Noncompliance Notification."

2. *Anticipated Bypass That Has The Potential to Violate Permit Limits or Conditions* -- Bypass is authorized by an administrative order issued by the Department. The Permittee shall notify the Department at least 30 days before the planned date of bypass. The notice shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass. The Department will consider the following prior to issuing an administrative order:

   a. If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of the 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.

3. B*ypass 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 the permit, or adversely impact public health as determined by the Department prior to the bypass.

C. Land Application Procedures

1. There shall be no runoff of wastewater applied to land by spray irrigation to any surface waters of the state or to any land not owned by or under control of the Permittee.

2. The Permittee shall use recognized best management practices (BMPs), and all available and reasonable procedures to control odors from the land application system. When notified by the Department, the Permittee shall implement measures to reduce odors to a reasonable minimum.

3. The wastewater shall not be applied to the irrigation lands in quantities that:

   a. Significantly reduce or destroy the long-term infiltration rate of the soil.
   b. Would cause long-term anaerobic conditions in the soil.
   c. Would cause ponding of wastewater or produce objectionable odors or support insects or vectors.
   d. Would cause leaching losses of constituents of concern beyond the treatment zone or in excess of the approved design. Constituents of concern are constituents in the wastewater, partial decomposition products, or soil constituents that would alter ground water quality in amounts that would affect current and future beneficial uses.

4. The Permittee shall maintain all irrigation agreements for lands not owned for the duration of the permit cycle. Any reduction in irrigation lands by termination of any irrigation agreements may result in permit modification or revocation. The Permittee shall immediately inform the Department in writing of any proposed changes to existing agreements.

D. QAPP Update

The Permittee shall update its present QAPP. The QAPP shall incorporate changes in the sampling program detailed in Special Condition S2. of this permit. The updated QAPP shall be submitted for approval no later than **March 1, 2007.** Future revisions to the QAPP shall be submitted to the Department for approval before incorporation into the document.

S5. SOLID WASTE DISPOSAL

A. Solid Waste Handling

The Permittee shall handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

B. Leachate

The Permittee shall not allow leachate from its solid waste material to enter state waters without providing all known, available and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee shall apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

C. Solid Waste Control Plan

The Permittee shall submit all proposed revisions or modifications to the solid waste control plan to the Department. The Permittee shall comply with any plan modifications. The Permittee shall submit an update of the solid waste control plan by **January 31, 2011.**

S6. DUTY TO REAPPLY

The Permittee must apply for permit renewal by **January 31, 2011**.

S7. COMPLIANCE SCHEDULE

The Permittee shall adhere to the compliance schedule and submit the required documents in the following order:

1. Progress Reports

Three progress reports shall be submitted to the Department **annually starting October 1, 2007**, outlining the status of efforts by Twin City Foods toward reaching its decision on the selection of alternative wastewater treatment options as described in the 2004 AKART Analysis Report.

2. Draft Engineering Plans

Submit draft engineering plans of the selected AKART alternative for review by the Department no later than **April 1, 2010.**

3. Approvable Engineering Plans with Construction Schedule

Submit an approvable set of engineering plans with construction schedule for the selected AKART alternative no later than **October 1, 2010.**

4. Letter of Construction Completion

Submit a letter of construction completion indicating the wastewater treatment-sprayfield treatment process is fully operational no later than **January 31, 2012**.

S8. SPILL AND SLUG DISCHARGE PREVENTION AND CONTROL PLAN

By **January 31, 2011**, the Permittee shall submit to the Department a control plan for the prevention, containment, and control of spills or unplanned releases. The Permittee shall review the plan at least annually and update the plan as needed.
The Spill and Slug Discharge Prevention and Control Plan shall include the following:

1. A description of a reporting system to be used to immediately notify facility management and appropriate State, Federal, and local authorities of any slug discharges, and provisions to provide a written follow-up report within five days.

2. A facility map of City storm sewers, sanitary sewers, process wastewater drains, and drywells into which a spill or slug discharge could enter and impact either the environment or wastewater treatment system.

3. A list of all raw materials, products, chemicals, and hazardous materials used, processed, or stored at the facility; the normal quantity maintained on the premises for each listed material; and a map showing where they are located. The list shall include all petroleum products and other materials, which when spilled, or otherwise released into the environment, are designated Dangerous Waste (DW) or Extremely Hazardous Waste (EHW) by the procedures set forth in WAC 173-303-070.

4. A brief description of any unauthorized discharges which occurred during the 36-month period preceding the effective date of this permit and subsequent measures taken by Permittee to prevent or to reduce the possibility of further unauthorized discharges.

5. An implementation schedule including additional operator training and procurement and installation of equipment or facilities required to properly implement the plan.

The Permittee shall review its Spill and Slug Discharge Prevention and Control Plan annually and update it as needed. Substantial revisions or updates of this plan shall be submitted to the Department. The plan shall be maintained on the plant site and be readily available to facility personnel. The Permittee shall submit an update of the plan, or a certification that it is current, by **January 31, 2011**.

S9. IRRIGATION AND CROP MANAGEMENT PLAN

An Irrigation and Crop Management Plan shall be submitted **annually** by **May 15th** for Department review. The plan shall generally conform with *Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems*, Ecology 1993. The plan must be prepared by a soil scientist. The plan shall include the following elements:

A. Annual Summary of Farm Operations for Previous Year

This summary shall include:

1. Annual Crop Yield and Nutrient Balance Report for each crop grown, the total acreage and quantity harvested shall be discussed as part of the annual Irrigation and Crop Management Plan.

2. Calculated balances for nutrients, salts, TDS, or other design limiting parameters. The calculations shall include crop consumptive use, process wastewater loadings of nutrients, salts, TDS or other design limiting parameters, and contributions from commercial fertilizers applied.

3. Calculated water balance. The calculations shall include irrigation system efficiency and application uniformity, the quantity of supplemental irrigation water and process wastewater applied, crop consumptive use, water stored in the soil profile outside the normal growing season, and salt leaching requirements.

4. Soil testing results. A summary of the soil testing results shall be submitted and discussed as part of the annual Irrigation and Crop Management Plan.

B. Cropping Schedule for Upcoming Year

This schedule shall include:

1. A crop management plan which identifies the proposed acreage for each crop, cultivation, and harvesting requirements, expected crop yields, and methods for establishing a crop, and proposed schedule for herbicide, pesticide, and fertilizer application.

2. An irrigation management plan which describes the frequency and timing of wastewater and supplemental irrigation water application (including harvest and non-harvest periods), and recommended rest cycles for wastewater application where organic or hydraulic loading is a concern.

GENERAL CONDITIONS

G1. SIGNATURE AUTHORIZATION/DELEGATION

All applications, reports, or information submitted to the Department shall be signed as follows:

A. All permit applications shall be signed by either a principal executive officer or 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 the person described above and is submitted to the Department at the time of authorization, and

   2. The authorization specifies 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 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 ENTRY

Representatives of the Department shall have the right to enter at all reasonable times in or upon any property, public or private for the purpose of inspecting and investigating conditions relating to the pollution or the possible pollution of any waters of the state.

Reasonable times shall include normal business hours; hours during which production, treatment, or discharge occurs; or times when the Department suspects a violation requiring immediate inspection. Representatives of the Department shall be allowed to have access to, and copy at reasonable cost, any records required to be kept under terms and conditions of the permit; to inspect any monitoring equipment or method required in the permit; and to sample the discharge, waste treatment processes, or internal waste streams.

G3. PERMIT ACTIONS

This permit shall be subject to modification, suspension, or termination, in whole or in part by the Department for any of the following causes:

A. Violation of any permit term or condition;

B. Obtaining a permit by misrepresentation or failure to disclose all relevant facts;

C. A material change in quantity or type of waste disposal;

D. A material change in the condition of the waters of the state; or

E. Nonpayment of fees assessed pursuant to RCW 90.48.465.

The Department may also modify this permit, including the schedule of compliance or other conditions, if it determines good and valid cause exists, including promulgation or revisions of regulations or new information.

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 new or increased discharge or change in the nature of the discharge is anticipated which is not specifically authorized by this permit. This application shall be submitted at least 60 days prior to any proposed changes. Submission of this application 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 should be submitted at least 180 days prior to the planned start of construction. Facilities shall be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in the permit shall be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. PERMIT TRANSFER

This permit is automatically transferred to a new owner or operator if:

A. A written agreement between the old and new owner or operator containing a specific date for transfer of permit responsibility, coverage, and liability is submitted to the Department;

B. A copy of the permit is provided to the new owner and;

C. The Department does not notify the Permittee of the need to modify the permit.

Unless this permit is automatically transferred according to section A. above, this permit may be transferred only if it is modified to identify the new Permittee and to incorporate such other requirements as determined necessary by the Department.

G8. PAYMENT OF FEES

The Permittee shall submit payment of fees associated with this permit as assessed by the Department. The Department may revoke this permit if the permit fees established under Chapter 173-224 WAC are not paid.

G9. 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 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 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 and be deemed to be a separate and distinct violation.

FACT SHEET FOR STATE WASTE DISCHARGE PERMIT NO. ST-5507

TWIN CITY FOODS, INC ELLENSBURG

DATE OF THIS FACT SHEET – DECEMBER 5, 2006
DATE OF EXPIRING PERMIT - JANUARY 31, 2012

SUMMARY

Twin City Foods, Inc. (TCF) is seeking reissuance of the State Waste Discharge permit for its Ellensburg, Washington vegetable processing facility. The facility processes approximately 100 million pounds per year of peas, corn and carrots into frozen products. The peak processing season runs from June through November, although repacking activities take place throughout the year.

The TCF facility discharges process wastewaters generated by the washing and conveyance of vegetables and by washing equipment. Process wastewater is screened onsite, then conveyed through a 21-inch pipe to the company's sprayfield, located approximately 2 miles to the south of the plant. The sprayfield is located immediately south of Ellensburg on the Yakima River floodplain. TCF has utilized part of this sprayfield to land treat its process wastewater since 1967.

During the previous permit cycle the company installed a groundwater monitoring well network to determine the nature and extent of wastewater impact on groundwater quality. Groundwater sampling over the last two years has shown elevated concentrations of total dissolved solids, chloride, total kjeldahl nitrogen, manganese and iron, as compared to background levels.

In response to the demonstrated degradation of groundwater quality beneath the sprayfield the Department required the Permittee to submit an Engineering Report to determine "all known, available and reasonable methods of prevention, control and treatment," or AKART, for the facility's wastewater. The required AKART analysis report has been approved by the Department. The Permittee, under a Schedule of Compliance, is required to provide the Department with an update on its AKART choice of alternatives; submit approvable engineering plans; and a construction schedule leading to a fully operational wastewater treatment process by the end of the proposed permit term.

Nutrient analysis on each individual harvested crop and crop yield per individual field is required to characterize the nutrient balance between wastewater applied to the sprayfield and nutrients removed through harvest.

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INTRODUCTION

This fact sheet is a companion document to the draft State Waste Discharge Permit No. ST-5507. The Department of Ecology (Department) is proposing to issue this permit, which will allow discharge of wastewater to waters of the State of Washington. This fact sheet explains the nature of the proposed discharge, the Department's decisions on limiting the pollutants in the wastewater, and the regulatory and technical bases for those decisions.

Washington State law (RCW 90.48.080 and 90.48.162) requires that a permit be issued before discharge of wastewater to waters of the state is allowed. Regulations adopted by the state include procedures for issuing permits (Chapter 173-216 WAC), and water quality criteria for groundwaters (Chapter 173-200 WAC). They also establish requirements which are to be included in the permit.

This fact sheet and draft permit are available for review by interested persons as described in Appendix A--Public Involvement Information.

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in these reviews have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Changes to the permit will be addressed in Appendix C--Response to Comments.

GENERAL INFORMATION	
Applicant	Twin City Foods, Inc.
Facility Address	501 West Fourth Street Ellensburg, WA 98926
Type of Facility	Processing of fresh vegetables into frozen food products
Type of Treatment	In-plant solids separation and land treatment at a nearby sprayfield
Discharge Location	Latitude: 46° 13' 00" N Longitude: 120° 32' 30" W
Legal Description of Application Area	Sections 11, 12, 13, 14, Township 17 N, Range 18 E. W. M.
Contact at Facility	Name: Tom Foster Telephone No. 509-962-9806
Responsible Official	Name: Rolf T. Skrinde Title: Manager, Corporate Environmental Affairs Address: PO Box 699 Stanwood, WA 98902-0699 Telephone No. 206-417-8235 FAX No. 206-417-8235

DESCRIPTION OF THE FACILITY

Twin City Foods Inc. (TCF), the Permittee, operates a vegetable processing facility which occupies approximately two square blocks within the city of Ellensburg. The company's 150-acre land treatment sprayfield lies approximately 2 miles south of the processing plant, south of Interstate 90 (I-90), and west of I-82.

Food processing at this facility began in the mid-1960s when the company bought the existing Stokely Foods plant. In 1982 the processing plant was modernized and a 77,000 square foot cold storage building with refrigeration system was added.

Production Processes

TCF processes and freezes corn, peas and carrots grown on nearby farm lands. Raw product is delivered to the site by truck and is fed to the process line where pre-washing, husk and pod removal, blanching, and grading occur. The vegetables are then run through freezing tunnels and packaged in bulk for distribution or stored for repacking at a later date. A large refrigerated warehouse is used to store the finished product.

The operation is seasonal, with peak activity occurring during the months of June through November, although repacking operations are carried out year around. Approximately 97,000 tons of corn, 4,900 tons of peas, and 18,000 tons of carrots are processed annually. During peak periods, 130 workers are employed on each of two shifts.

Water is used in the plant for washing vegetables, for cleaning of equipment and floors, and to transport product in flumes during the processing operations. Cooler condensate is collected and used in the plant.

The *TCF 2004 AKART Analysis* estimated in its water budget for application of wastewater to a 150-acre sprayfield up to 38,800,000 gallons of wastewater generated during the peak of the corn processing season in August. A low discharge rate of 12,500,000 gallons during the month of July occurs between the spring pea processing season where an estimated 20,000,000 a month of wastewater is generated for April, May and June and, the late summer corn processing season tapering off to 13,000,000 gallons in October at the beginning of carrot processing season. The total water balance for the year is 155,100,000 gallons.

From November to March, the months fresh vegetables are not being processed, stored frozen products are repackaged. Approximately 60,000 gallons per day of domestic strength wastewater is discharged to the Ellensburg Publicly Owned Treatment Works (POTW). Wastewater generated from repacking is collected in a sump, and when the float switches in the sump are activated, the wastewater is discharged to the POTW.

Treatment Processes

Process wastewater was originally discharged to the City of Ellensburg POTW. In 1967 the company leased land from the City for spray irrigation and constructed a pump station and irrigation network. Since that time, TCF acquired the rights to use up to 230 acres owned by four separate organizations, the City of Ellensburg, Kittitas County, Burlington Railroad and the U.S. Bureau of Reclamation, which will not renew the TCF lease. As of 2007, unless TCF can find addition land to replace the lost 80 acres the sprayfield size will be reduced to 150 acres.

The TCF treatment system consists of three principal components: in-plant pretreatment, wastewater pumping facilities, and the waste treatment sprayfield. This system is operated 24 hours a day during the processing season.

The principal pretreatment involves removal of solids from the waste stream. Wastewater is collected in a sump adjacent to the processing plant then passes over 60-mesh screens to remove solids. The screened material is removed and later used as silage. Wastewater from the plant flows about 2 miles through a 21-inch-diameter gravity line to the waste pump station, which is located adjacent to and southeast of the Ellensburg POTW. The flow passes over a rotating screen for additional solids removal and then pumped to the irrigation systems by 150-hp centrifugal pumps. Sediments that collect on the bottom of the sump are conveyed to an adjacent settling pond using an auger.

Re-Route of Pea Brine Water

Pea brine water is collected in tanker truck and then hauled to the Ellensburg POTW. Until 2005 pea brine water was discharged to the sprayfield. In 2003 approximately 194,000 pounds of sodium chloride was used in the pea grading process. This salt contributed to the total dissolved solids (TDS) load at the sprayfield. The AKART analysis provided in the 2004 engineering report indicates that hauling the pea brine water to the POTW significantly reduced the TDS load applied to the sprayfield. The pea brine water is dried in one of the sludge drying bed at the POTW and the solids are hauled off for solid waste disposal.

The proposed permit will require the Permittee to submit to the Department a signed memorandum of agreement or contract between the City and TCF, which specifies the conditions under which TCF may receive treatment of its pea brine water at the POTW and its ultimate disposal.

Grit Settling Pond

In 1968 TCF discovered that grit present in the wastewater was causing impellers and bearings to wear more quickly than expected. Grit consists primarily of the sandy soil particles that cling to the harvested vegetables and are washed off during processing. To correct the problem the company partitioned the pump station wet well with a baffle wall to allow the grit to settle, and constructed the present settling pond near the station. Grit is conveyed from the wet well to the pond utilizing a drag chain and auger.

In 2001 a new grit removal system was constructed at the pump station. It includes two concrete basins, each of which has sufficient capacity to be used alone. Therefore, grit can be cleaned out and hauled away from one basin while the other can be used. In addition, the concrete basins are underlain with 60 mil high density polyethylene plastic liners offering double protection against groundwater contamination.

Sprayfield

Soils in the area are generally gravelly. Crops consist of pasture grass, such as orchard grass, timothy, tall fescue, and rye grass. The grass is mowed, baled for hay, and used for cattle and horse feed.

According to the facility's *Quality Assurance Project Plan* (pp. 2-4), the sprayfield is approximately 230 acres in size and is located between the Burlington Northern Railroad tracks and the Yakima River, approximately 2 miles south of the TCF plant. The system utilizes a 65-acre circle, irrigated with a fixed-distribution and header system, equipped with ten sets of impact sprinklers that can be operated in any combination. The sprayfield is comprised of several irregularly shaped parcels arranged north, south and west of the Ellensburg POTW.

The northern portion of the sprayfield is near I-90. It comprises 80 acres which were leased from Schaake Packing Company under a 20 year lease established in 1990. In 2005 the United States Department of the Interior, Bureau of Reclamation (USBR) purchased the Schaake property and as of the time of this writing (July 2006) the USBR is not willing to extend the TCF lease beyond December 2006. Without replacement acreage or any additional land for sprayfield use, the available sprayfield acreage will be 150 acres.

The original sprayfield is located south of the facility near the Ellensburg POTW. TCF has leased this sprayfield from the city since 1967. Additional acreage to the south has been leased from Kittitas County since 1991.

Groundwater

The TCF sprayfields are located on relatively level alluvial materials adjacent to the Yakima River. Flood-carried materials have resulted in two primary alluvial deposits in the sprayfield area. The Weirman soils consist of very gravelly sand overlain by very gravelly sandy loam at the surface. The Nitzel soils consist of fine sandy loam underlain by sandy clay loam, and deeper, gravelly sandy clay loam.

The hydrogeologic conditions of the sprayfield area are typical of the Kittitas Valley near the Yakima River; with the hydraulic gradient generally extending from north to south, following the downstream course of the Yakima River. Depth to groundwater below the sprayfield varies seasonally and can be as little as 2 feet, an important consideration in sprayfield management planning.

A Department inspection during November 1991 documented the presence of alternating layers of anaerobic and aerobic soil in augered boreholes. Anaerobic conditions were found to extend down into shallow groundwater. In areas where groundwater was observed to be seeping into surface water (Tjossem Ditch, Blossum Pond, and a backwater of the Yakima River), orange staining of iron bacteria and insoluble iron oxide converted from soluble ferrous iron in the groundwater was observed at several locations. Shallow groundwater concentrations of ferrous iron and manganese exceed State groundwater standards beneath the sprayfield during at least part of each year.

PERMIT STATUS

The current permit for this facility was issued on August 13, 2001. The current permit expires September 30, 2006.

An application for permit renewal was submitted to the Department on October 10, 2005, and accepted by the Department on June 21, 2006.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMITS

The facility was inspected on June 23, 2006.

Due to the demonstrated degradation of ground water beneath the sprayfield, the current permit contained a Schedule of Compliance. On the basis of ground water quality data collected, the permit required TCF to submit an Engineering Report to determine "all known, available and reasonable methods of prevention, control and treatment," or AKART, for the facility's wastewater. The Permittee has fulfilled the Compliance Schedule and the proposed permit will contain limits based upon the approved AKART analysis.

WASTEWATER CHARACTERIZATION

The Department has evaluated the concentrations of pollutants reported in TCF's discharge monitoring reports between October 2001 and October 2005. The minimum, maximum and average concentration or values measured in wastewater discharge samples, sampled prior to land application, is characterized for the following parameters:

Table 1: Wastewater Characterization

Parameter	Minimum	Maximum	Average
5-day Biochemical Oxygen Demand (BOD_5), in mg/L	480	6,058	3,041
Total Dissolved Solids (TDS), in mg/L	358	3,873	2,294.8
pH, in Standard Units	5.59	7.9	NA
Conductivity, in µohms/cm	382	1,414	1,367.6
Nitrate-Nitrogen (NO_3-N), in mg/L	0.02	5.5	0.56
Total Kjeldahl Nitrogen (TKN), in mg/L	20.4	181	80.3
Total Phosphate, in mg/L	4.5	41.6	17.5
Chloride, in mg/L	13.9	1,390	169
Potassium, in mg/L	36.5	227	112
Sulfate, in mg/L	4.2	70.2	23.9

NA-Not applicable

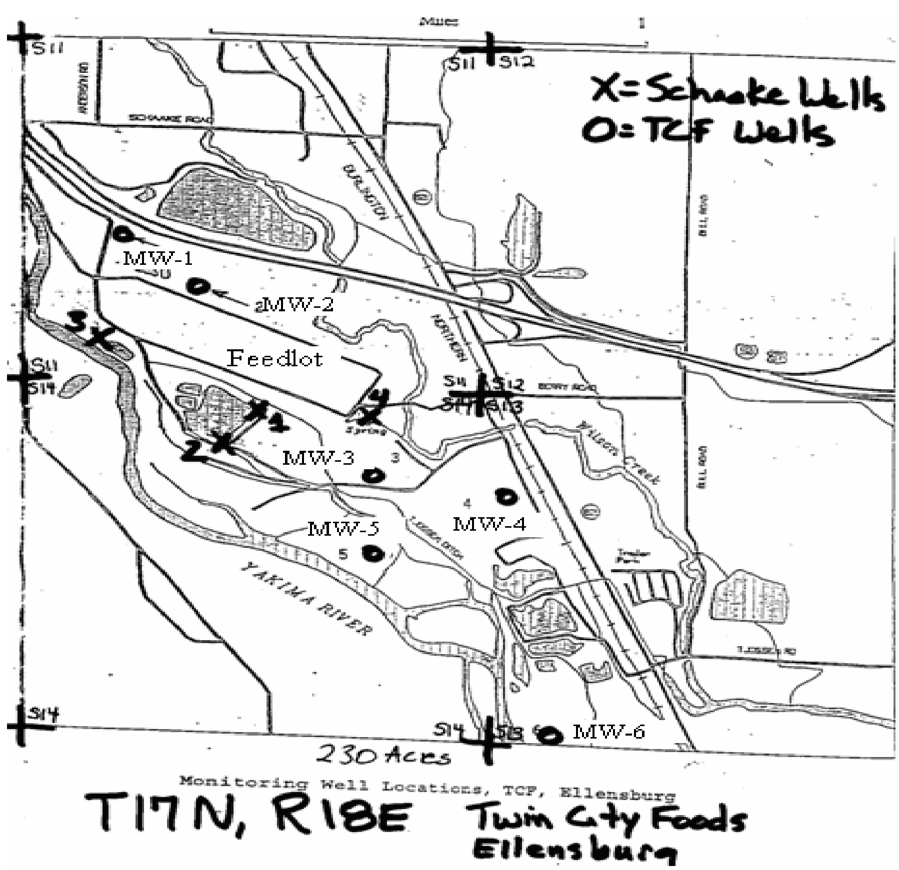
GROUNDWATER CHARACTERIZATION

A characterization of groundwater quality at the sprayfield site was submitted as part of the monitoring requirements for the previous permit. Data from MW-1 reflects background (upgradient) groundwater quality before flowing beneath the sprayfield; data from all other wells reflect groundwater characteristics beneath and downgradient of the sprayfield.

Evidence of impacts to groundwater quality is shown by the concentrations of TDS, Cl, and TKN in downgradient wells, which exceed background concentrations as determined by data from the upgradient well MW-1. Further evidence of wastewater impacts on groundwater quality is the presence of ferrous iron in all wells except the upgradient monitoring well MW-1. MW-2 is the least impacted well. It lies in the northern periphery of the sprayfield with groundwater flowing from the north.

Figure 1 is a map of the sprayfield area with monitoring well locations.

Figure 1: Sprayfield and Monitoring Well Locations



Data collected during the 2000 to 2005 timeframe is presented in time-series diagrams in Figures 2 and 3.

Figure 2 below depicts concentration trends for manganese and iron detected in samples from the six monitoring wells. Monitoring well MW-1 is positioned to sample water that has not been impacted by sprayfield effluent. Water quality data from MW-1 are considered to represent background conditions in the area.

Figure 2: Manganese and Iron Concentrations in Monitoring Wells from 2000 to 2005

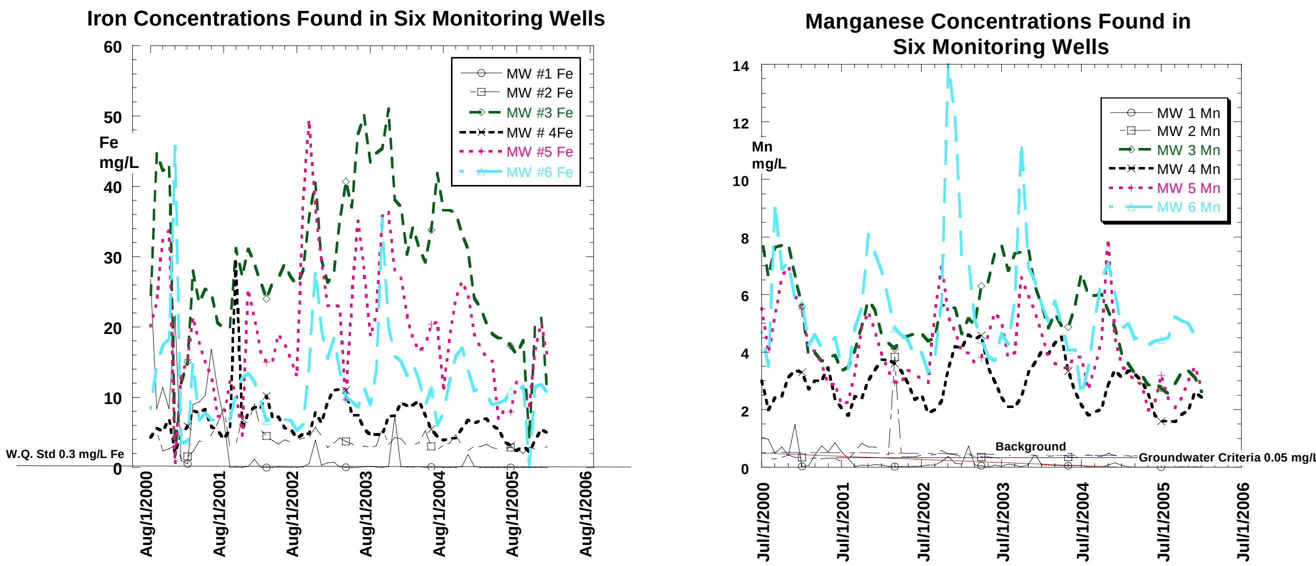
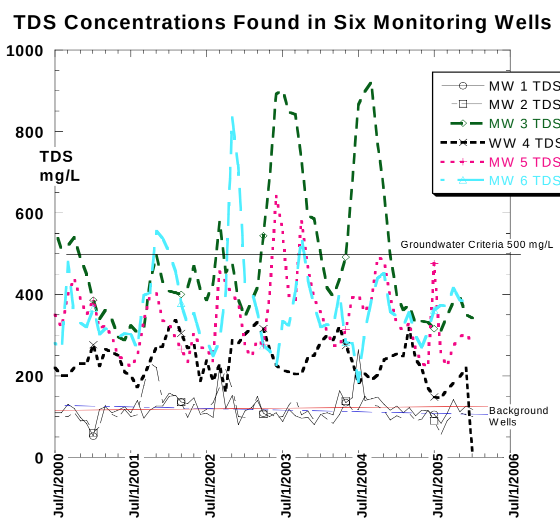


Figure 3 illustrates TDS and Chloride concentration trends found at the six monitoring well locations from July 2000 through October 2005. These trends show evidence of groundwater quality impacts beneath and downgradient of the sprayfield.

Figure 3: TDS and Chloride Concentration in Monitoring Wells from 2000 to 2005



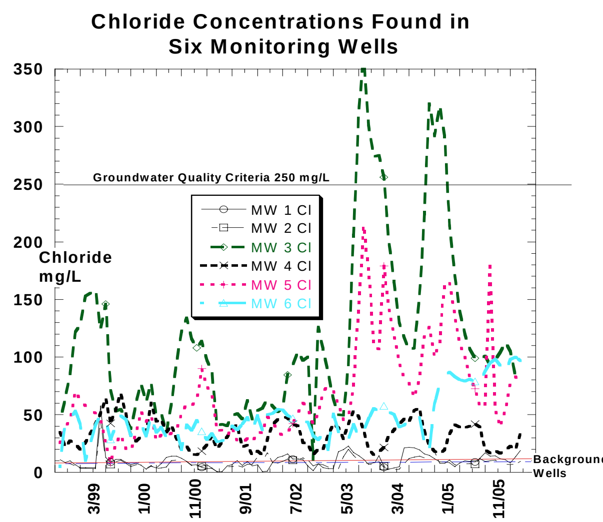


Figure 4 shows the concentration of common cations and alkalinity at each monitoring well location. The data from monitoring wells MW-3 through MW-6 show evidence of groundwater impacts beneath and downgradient of the sprayfield location.

Figure 4: Common Cations and Alkalinity Found in Monitoring Wells from 2000 to 2005

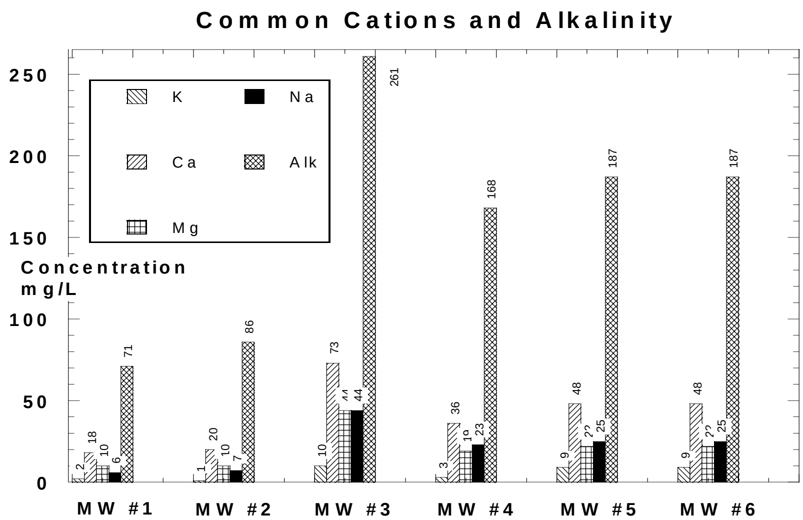
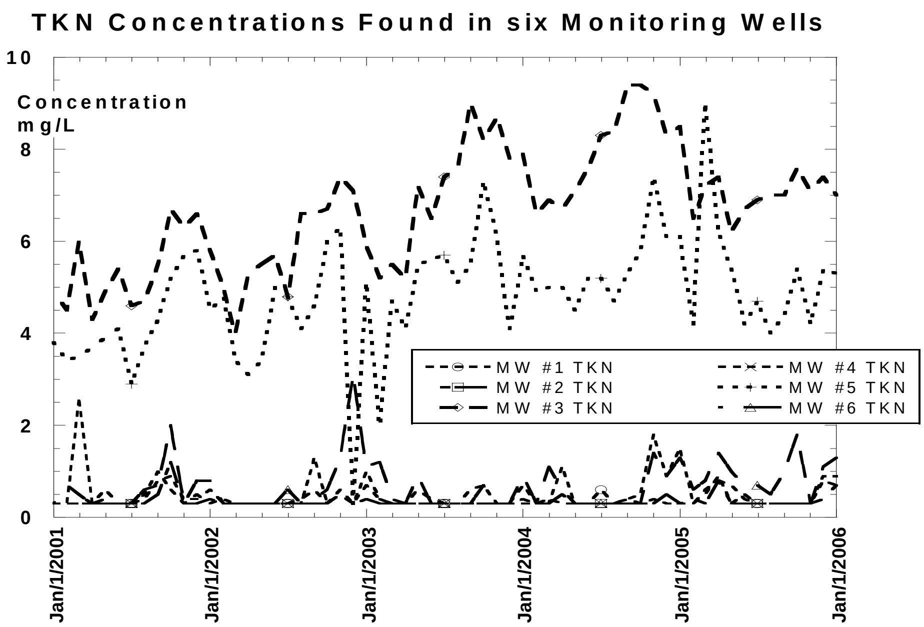


Figure 5 depicts Total Kjeldahl Nitrogen found at the six monitoring well locations. It is not clear what the cause of higher TKN concentrations at MW-3 and MW-5 is except that the wells are downgradient and in close proximity to the site of an abandoned feedlot and primary sewage treatment lagoon.

Figure 5: Kjeldahl Nitrogen Found in Monitoring Well from 2001 to 2005



PROPOSED PERMIT LIMITATIONS

State regulations require that limitations set forth in a waste discharge permit must be either technology- or water quality-based. Wastewater must be treated using all known, available, and reasonable treatment (AKART) and not pollute the waters of the state. The minimum requirements to demonstrate compliance with the AKART standard were determined in the engineering report titled AKART Report and Engineering Addendum Report dated February, 2006, in conformance with *Guidelines for the Preparation of Engineering Reports for Industrial Wastewater Land Application Systems*, May 1993.

The permit includes limitations on the quantity and quality of the wastewater applied to the sprayfield that have been determined to be protective of groundwater quality. The approved engineering report includes specific design criteria for this facility. Water quality-based limitations are based upon compliance with the State’s Groundwater Quality Standards (Chapter 173-200 WAC).

In addition, during the winter and spring, up to 60,000 gpd of domestic strength wastewater generated during repacking operations is permitted to be discharged to the Ellensburg POTW.

The more stringent of the water quality-based or technology-based limits are applied to each of the parameters of concern. Each of these types of limits is described in more detail below.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

All waste discharge permits issued by the Department must specify conditions requiring application of AKART to discharges to waters of the State (WAC 173-216-110). AKART for this facility has been established in the Phase 1 AKART Analysis Engineering Report dated December 2004. The proposed permit requires the Permittee to select one of the alternatives outlined in the report, and to provide the engineering required to implement the selected alternative, and to complete construction of the selected alternative by the end of the proposed permit term.

GROUNDWATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's groundwaters, including the protection of human health, WAC 173-200-100 states that waste discharge permits shall be conditioned in such a manner as to authorize only activities that will not cause violations of the Groundwater Quality Standards. Drinking water is the beneficial use generally requiring the highest quality of groundwater. Providing protection to the level of drinking water standards will protect a great variety of existing and future beneficial uses.

The intent of the standards is not to allow degradation of groundwater up to the standards, but rather to protect background water quality to the extent practical. The antidegradation policy mandates the protection of background water quality and prevents degradation of water quality which would harm a beneficial use or violate the Groundwater Quality Standards.

Groundwater monitoring since 2001 indicates the Permittee's discharge does not comply with the state’s antidegradation policy. Therefore, the previous permit contained a Schedule of Compliance, which required TCF to prepare an Engineering Report that describes AKART for treating the facility's process wastewater. TCF complied with this requirement by submitting the approvable May 2005 revised Phase 1 AKART Analysis. Based on this analysis, TCF has determined that land treatment is the best option. The report developed design criteria which will allow operation of the sprayfield as a sustainable land treatment system that will not further degrade groundwater quality. (See the SCHEDULE OF COMPLIANCE section of this fact sheet for further information concerning the implementation of the report’s recommendations.) Discharge to the ground is restricted to 155.1 million gallons beginning in April and lasting through October of each year. The wastewater portion of the hydraulic loading at the sprayfield may not exceed a maximum monthly rate as determined by TCF in the alternative water balance for 2004 on 150 acres using the Washington State University Public Agricultural Weather System database (PAWS) data (1989-2001) contained in table 2.

Table 2: Gallons of Wastewater Applied to Sprayfield per Month

MONTH	GALLONS per MONTH	MONTH	GALLONS per MONTH
April	20,000,000	August	38,800,000
May	21,800,000	September	29,000,000
June	20,000,000	October	13,000,000
July	12,5000,000	TOTAL	155,100,000

Nutrient loading applied to irrigated lands may not exceed requirements as determined by the Permittee's Crop Management Plan.

The Department has approved an interim wastewater application schedule as requested by TCF. Upon installation of the storage lagoon, or at the end of the permit cycle, the final application schedule will constitute the application limitations as contained in table 2 above. The interim schedule borrows 7 million gallons a month from April and adds that to October, when storage volume needs to be increased to allow TCF continued winter operation. The overall volume of wastewater applied to the sprayfields remains unchanged.

Applicable groundwater criteria as defined in RCW 90.48.520 and in Chapter 173-200 WAC for this discharge are provided in Table 3.

Table 3: Groundwater Quality Criteria

Total Coliform Bacteria	1 Colony/ 100 mL
Total Dissolved Solids	500 mg/L
Chloride	250 mg/L
Sulfate	250 mg/L
Nitrate	10 mg/L
pH	6.5 to 8.5 standard units
Manganese	0.05 mg/L
Total Iron	0.3 mg/L
Toxics	No toxics in toxic amounts

COMPARISON OF PROPOSED LIMITATIONS WITH THE EXISTING PERMIT

Table 4: Comparison of Previous and New Limits

Existing Parameter Limitation	**Existing Limits**	**Proposed Limits**
Maximum Monthly Average Daily Flow Rate	1.8 MGD	As per Table 2
Annual Discharge	NA*	155.1 MG/Annum
Domestic Strength Discharge to POTW	60,000 gpd	60,000 gpd

* NA- means not applicable

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are specified to verify that the treatment process is functioning correctly, that groundwater criteria are not violated, and that effluent limitations are being achieved (WAC 173-216-110).

WASTEWATER MONITORING

The monitoring schedule is detailed in the proposed permit under Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

Monitoring for flow, Conductivity, pH, Soluble BOD, Total BOD, Total Kjeldahl Nitrogen (TKN as N), Nitrate (as N), Ammonia (as N), Total Phosphate (as P), Total Dissolved Solids (TDS), Potassium, Chloride, Sulfate (as S) and Sodium is being required to further characterize the effluent. The pollutants listed can have a significant impact on the quality of the groundwater.

Wastewater discharged to the POTW in the off-processing season (November 1 to March 31) will be required to be monitored monthly for Flow, BOD,TSS and Total Residual Chlorine.

SOIL MONITORING

Special Condition S2.C. in the proposed permit requires the Permittee to perform soil monitoring of the irrigated lands at the start of each irrigation season. This provision also describes the location, depth and method to be used for soil sampling. The Department feels that soil sampling at the beginning of the irrigation season is a minimal requirement to determine the characterization of nutrients and salts in the soil column; therefore, the soil monitoring schedule contained in this permit remains unchanged from the previous permit.

CROP MONITORING

The Department is concerned that the phosphate and nitrogen budget created by additions to the soil through wastewater application and the phosphate and nitrogen removal by crops grown on the sprayfield has been inadequately described. To protect groundwater quality and the quality of surface water in the Yakima River, a crop management plan must ensure that nutrient loading in the soil does not occur. The permit will require the Permittee to monitor crop yield so that each harvest from each individual field is expressed in tons and that each field's harvest is analyzed for total nitrogen and total phosphorous. The data collected is required to be summarized in TCF's Annual Crop Yield and Nutrient Balance Report.

GROUNDWATER MONITORING

Groundwater monitoring at the site is required by the Groundwater Quality Standards, Chapter 173-200 WAC. The Department has determined that this discharge has adversely impacted groundwater quality. Therefore the Permittee is required to evaluate the nature and extent of the impacts on groundwater quality in the sprayfield area.

The groundwater monitoring requirements (i.e., location, frequency and analytes) are changed from the previous permit. Monitoring well, MW-2, is located on land that is no longer used by TCF and no longer under its control. The Bureau of Reclamation now controls the 80 acre site on which TCF maintained a sprayfield; therefore, TCF will not be required to monitor at the MW-2 location during the proposed permit term.

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-216-110).

IRRIGATION AND CROP MANAGEMENT PLANS

The irrigation and crop management plan is required to support the engineering report and operations and maintenance manual. An Annual Crop Yield and Nutrient Balance Report is required to assure that wastewater applications are applied at agronomic rates. The report will describe and evaluate various irrigation controls, evaluate the nutrient balance between wastewater loading and crop uptake, and make recommendations for the next crop cycle to assure nutrients are not impacting the groundwater quality.

OPERATIONS AND MAINTENANCE

This permit contains Special Condition S5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

The Permittee is required to review the plan annually and update the plan as needed. The Permittee is required to submit the updated plan to the Department.

SOLID WASTE PLAN

The Department has determined that the Permittee has a potential to cause pollution of the waters of the state from leachate generated in solid waste from facility operations.

The proposed permit requires, under the authority of RCW 90.48.080 that the Permittee update and submit it to the Department. The solid waste plan is designed to prevent pollution of the waters of the state from this potential source.

SPILL AND SLUG DISCHARGE PREVENTION AND CONTROL PLAN

The Department has determined that the Permittee stores a quantity of chemicals that have the potential to disrupt the wastewater treatment system or degrade the environment if accidentally released. The Department has the authority to require the Permittee to develop best management plans to prevent this accidental release under section 402(a) (1) of the Federal Water Pollution Control Act (FWPCA) and RCW 90.48.080.

This permit requires the Permittee update the Spill and Slug Discharge Prevention and Control Plan, as needed, and review the plan annually.

SCHEDULE OF COMPLIANCE

This permit contains a schedule of compliance, which requires the Permittee to submit an engineering report and schedule of construction leading to a completed wastewater treatment sprayfield configuration in keeping with one of the AKART scenarios as outlined in the previously approved May 2005 AKART analysis. The schedule of compliance is contained in Table 5.

Table 5: Schedule of Compliance

Year Required	Action Required
October 1, 2007	Update on the Sprayfield Project
October 1, 2008	Update on the Sprayfield Project
October 1, 2009	Update on the Sprayfield Project
April 1, 2010	Draft Engineering Report
October 1, 2010	Approvable Engineering Report with Construction Schedule
Date permit expires 2011	Project Completion Letter

GENERAL CONDITIONS

General Conditions are based directly on state laws and regulations and have been standardized for all industrial waste discharge to groundwater permits issued by the Department.

Condition G1. requires responsible officials or their designated representatives to sign submittals to the Department. Condition G2. requires the Permittee to allow the Department to access the treatment system, production facility, and records related to the permit. Condition G3. specifies conditions for modifying, suspending or terminating the permit. Condition G4. requires the Permittee to apply to the Department prior to increasing or varying the discharge from the levels stated in the permit application. Condition G5. requires the Permittee to construct, modify, and operate the permitted facility in accordance with approved engineering documents. Condition G6. prohibits the Permittee from using the permit as a basis for violating any laws, statutes or regulations. Conditions G7. and G8. relate to permit renewal and transfer. Condition G9. requires the payment of permit fees. Condition G10. describes the penalties for violating permit conditions.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, and to protect human health and the beneficial uses of waters of the State of Washington. The Department proposes that the permit be issued for 5 years.

REFERENCES FOR TEXT AND APPENDICES

Faulkner, S.P., Patrick Jr., W.H., Gambrell, R.P., May-June, 1989. *Field Techniques for Measuring Wetland Soil Parameters*, Soil Science Society of America Journal, Vol. 53, No.3.

Raforth, R. Re: Comments on Draft Engineering Report on Land Application of Food Processing Wastewaters, Twin City Foods, Ellensburg, Washington. Washington State Department of Ecology letter, dated June 5, 2000.

Raforth, R. Re: Comments on the Proposed Operations and Maintenance Manual for Twin City Foods, Ellensburg Facility. Washington State Department of Ecology letter, dated May 12, 1998.

Skrinde, R. Re: Dirt Settling Pond, Ellensburg Facility. Twin City Foods letter, dated April 14, 2000.

Skrinde, R. Re: Dirt Sedimentation Pond at TCF Ellensburg Facility. Twin City Foods letter, dated May 8, 1999.

Skrinde, R. Re: Request for Extension of Dates for Permit Report Submittals, Permit Number ST-5507, Twin City Foods at Ellensburg. Twin City Foods letter, dated May 21, 1997.
Washington State Department of Ecology, 1993. *Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems*, Ecology Publication # 93-36. 20 pp.

Washington State Department of Ecology, 1996. *Implementation Guidance for the Groundwater Quality Standards*, Ecology Publication # 96-02.

Washington State University, November, 1981. *Laboratory Procedures - Soil Testing Laboratory*. 38 pp.

APPENDIX A --PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Public notice of application was published on June 21, 2005 in the Yakima Herald Republic and the Ellensburg Daily Record to inform the public that an application had been submitted and to invite comment on the reissuance of this permit.

The Department will publish a Public Notice of Draft (PNOD) on November 3, 2006 in the Ellensburg Daily Record to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the 30 day comment period to the address above. The request for a hearing shall indicate the interest of the party and reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-216-100). Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing.

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility’s proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within 30 days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department’s response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509/457-7105, or by writing to the address listed above.

This permit was written by Richard A. Marcley.

APPENDIX B -- GLOSSARY

Ammonia—Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation—The average of the measured values obtained over a calendar month's time.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass—The intentional diversion of waste streams from any portion of the collection or treatment facility.

Categorical Pretreatment Standards—National pretreatment standards specifying quantities or concentrations of pollutants or pollutant properties which may be discharged to a POTW by existing or new industrial users in specific industrial subcategories.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the 85 percent removal requirement. Additional sampling may be conducted.

Composite Sample—A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Construction Activity—Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Engineering Report—A document, signed by a professional licensed engineer, which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Grab Sample—A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User—A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater—Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Interference— A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Local Limits—Specific prohibitions or limits on pollutants or pollutant parameters developed by a POTW.

Maximum Daily Discharge Limitation—The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Pass-through— A discharge which exits the POTW into waters of the State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH—The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;
b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--

1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

Slug Discharge—Any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge to the POTW. This may include any pollutant released at a flow rate which may cause interference with the POTW.

State Waters—Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Stormwater—That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit—A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Coliform Bacteria—A microbiological test which detects and enumerates the total coliform group of bacteria in water samples.

Total Dissolved Solids—That portion of total solids in water or wastewater that passes through a specific filter.

Total Suspended Solids (TSS)--Total suspended solids is the particulate material in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Water Quality-based Effluent Limit—A limit on the concentration of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C -- RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.

CITY OF ELLENSBURG
INDUSTRIAL WASTEWATER DISCHARGE AGREEMENT

In accordance with the provisions of city of Ellensburg Municipal Code chapter 9.20

Twin City Foods, Inc
501 West Fourth Street
Ellensburg, WA 98926

Is hereby authorized to discharge industrial wastewater from the repack processing activities at the above identified facility and through the discharge point identified herein in this agreement. Compliance with this agreement does not relieve Twin City Foods, Inc. of its obligation to comply with any applicable pretreatment regulations, standards, or requirements under local, state, and federal laws, including any such regulations, standards, or laws, that may become effective during the terms of this agreement.

Non-compliance with any term or condition of this agreement shall constitute a violation of the Ellensburg Municipal Code, Section 9.20. All terms and definitions are the same as those found in Ellensburg Municipal Code Section 9.20.This agreement incorporates by reference all of the applicable provisions of the Ellensburg Municipal code, including but not limited to Section 9.20.

This agreement shall become effective on January 1, 2007, and shall expire on January 1, 2012, unless modified or terminated earlier.

Twin City Foods and the City of Ellensburg will re-negotiate this agreement 90 days prior to expiration.

Authorization To Discharge
Capacity Limit

January 1, 2007 – January 1, 2012

In accordance with the provisions of City of Ellensburg Municipal Code 9.2 SEWER USE AND PRETREATMENT REGULATIONS,

Industry name and site location:	Twin City Foods, Inc
Mailing Address:	501 West Fourth Street Ellensburg, WA 98926

is hereby authorized to discharge wastewater from the above-identified facility into the City of Ellensburg's collection system in accordance with the capacity limitations as set forth in this authorization.

Twin City Foods will be allowed to discharge the following during the repack season from November 1st through April 30th.

Repack wastewater:

Average Monthly Discharge Limitations

Total BOD = to be determined as outlined below
TSS = to be determined as outlined below
Chlorine = .05 mg/L
Flow = 60,000 gallons/day.
pH = > 5.5 and < 9.0

To provide reliable statistical information to establish appropriate limits the City will request a preliminary testing schedule as follows:

Twin City Foods hereby agrees to sample the waste stream three times per week at a location downstream of all treatment processes at the facility. BOD and TSS samples will be composite samples. Each composite sample will consist of a minimum of eight grab or sampler samples taken throughout the day to determine the average flow strength. After 8 composite samples have been analyzed, variability in strength will be assessed and a further testing schedule will be adopted if necessary. If there is small variability limits will be set at this time. Limits will be set according to Twin City foods needs and capacity of the Ellensburg WwTP including capacity for future population growth.

Minimum sampling and testing will be performed by Twin City Foods consisting of Total BOD mg/L, TSS mg/L, Total Chlorine Residual, and pH every two weeks. Flow measurement will be taken daily. Sampling and testing schedules pertain only to months when Twin city Foods is discharging to the City sewer.

All sample analysis for BOD and TSS will be performed by a Department of Ecology accredited Laboratory. Twin City Foods personnel will perform the analysis for Chlorine Residual and pH. pH samples will be grab samples, chlorine residual will be performed on the composite sample.

Composite samples will be taken daily to allow the City to randomly perform BOD, TSS, pH and Chlorine tests in the Ellensburg wastewater laboratory. Random testing will be done at the Cities expense. The random tests should fall within the range of the Twin City Foods samples analyzed. If the tests exceed reasonable variation, causes for variation and sur charges will be discussed.

Strength fees will be determined from tests performed by Twin City Foods and the City of Ellensburg.

If at any time Twin City Foods exceeds the limits, Twin City Foods must apply for additional capacity at the City's POTW if it is available, and is responsible for all costs involved. This charge would be in addition to any strong waste surcharge applied to wastewater with a BOD and/or TSS concentration greater than 200 and 250 mg/L respectively.

All discharges authorized will be consistent with the terms and conditions of this agreement. The discharge of the listed pollutants at a level in excess of that authorized will constitute a violation of this authorization if additional capacity is not applied for by Twin City Foods upon notification by the City.

If additional capacity is not available to be allocated, Twin City Foods must modify its process to accommodate the discharge capacity limits as outlined by this Agreement to Discharge.

Either party may request an amendment to this agreement, due to changing circumstances. Requests for changes must be submitted in writing, a minimum of thirty days prior to any renegotiation.

Pea Brine wastewater

The City agrees to rent drying bed space or part of the biosolids storage area at the treatment plant to dry pea brine that is trucked to the treatment plant. Twin City Foods must provide a water tight liner for the bed or containment, for the salt brine to prevent the salt from filtering into the adjacent beds or to the treatment plant through the drying bed under drains. Pea brine wastewater will be allowed to dry and then be removed by Twin City Foods from the Treatment Plant when dry enough to be taken to a land fill. Strength charges will not apply to this wastewater. Testing will only be required if needed to provide information for land filling of this material. Twin City Foods will be responsible for any damages to the drying bed or surrounding facilities done during this activity.

All costs incurred for bed lining, testing, removal, trucking and disposal will be the responsibility of Twin City Foods Inc. Twin City foods will be responsible for a spill control plan if needed for transport.

Rental charge for drying bed or adjoining area will be determined by size and location of area needed. A maximum of one small drying bed will we allowed. Rental will be $1.00 per square foot for 60 days. Maximum rental space is 625 square feet.

Required REPORT SUBMITTALS

Submittal	Frequency	First Submittal Date
Hours, clean up time, project type and number type of lines running operation schedule during the initial testing schedule and for each test submitted	Monthly limits are set	**February 1, 2007**
Laboratory reports for all testing performed from November1 through March 30	monthly	**January 1, 2007**
Accidental Spills	Each occurrence	Immediate phone contact, written notification within five working days
Planned changes in wastewater characteristics	Each occurrence	Written notice 2 working days prior to change
Daily Flow Record	monthly	February 1, 2007
MSDS for all chemicals stored in bulk and used for repack cleanup and updates as chemical use changes	1/Permit cycle	January 1, 2007 and updates of changes within two weeks of change

COMPLIANCE SCHEDULE

	Due Date
Composite sampler installation and/or composite sampling plan.	January 1, 2007
Drying bed liner or containment installation for Pea Brine, prior to first delivery	May, 2007
Removal of salt and salt brine liner from drying bed within 2 weeks of complete drying.	Variable depending on weather and quantity
Removal of all discharges to the City's sewer system and storm drain system except through manhole 55-432 (Does not include domestic wastes from restrooms)	June 1, 2007

All monitoring records will be maintained for a minimum of 3 years.

Twin City Foods will allow the City of Ellensburg Representative to enter, and inspect Twin City Foods premises where a regulated facility or activity is located or conducted. The City representative will be allowed access to and copy, at reasonable time, any records that must be kept as conditions of this agreement. The City may split samples or set a city sampler to compare sampling results.

The City may seek any or all of the remedies or penalties provided in the Municipal Code, including recovery costs incurred by the City, in response to a violation of this agreement by Twin city foods.

Process discharge will enter into the City of Ellensburg's collection system through manhole number 55-432 only. Domestic wastewater is discharged separately from repack wastewater and is not covered by this agreement. No process water will be allowed into the City storm drain system.

This authorization shall become effective January 1, 2007, and will remain effective until January 1, 2012, unless changes in the process or changes in the characteristics of the wastewater occur.

By:

City of Ellensburg
John Akers
Director of Public Works

Signature ____________________

Issued: January 1, 2007

For:

Twin City Foods Inc
Tom Foster
General Manager

Signature ____________________

CITY OF ELLENSBURG
Department of Public Works
501 North Anderson, Ellensburg, WA 98926
(509) 962-7230 - Telephone
(509) 962-7127 – Fax

LETTER OF TRANSMITTAL

TO:

Twin City Foods
501 West Fourth Street
Ellensburg, WA 98926

Date	11/29/2001	Job No.	NA
Attn:	Grant Craig		
Submittal for:			
TCF discharge contract			
Transmittal No:			
1			

COPIES	NUMBER	DESCRIPTION
1	2	Executed Ammonia Discharge Amendment

☐ For YourInformation ☐ Resubmit ☑ Other Your Copy

☐ For Processing ☐ For Review

REMARKS:

Grant: We will begin billing for ammonia under the terms of the amendment. Let me know if you have questions or concerns.

SIGNED

Ammonia Discharge Amendment

To

CITY OF ELLENSBURG
INDUSTRIAL WASTEWATER DISCHARGE AGREEMENT

In accordance with the provisions of city of Ellensburg Municipal Code chapter 9.20 and the referenced agreement dated January 1, 2007, with:

Twin City Foods, Inc
501 West Fourth Street
Ellensburg, WA 98926

Whereas Twin City Foods (TCF) desires to discharge wastewater containing minor concentrations of ammonia, and

Whereas the City of Ellensburg Publically Owned Treatment Works (POTW) is regulated by the State Department of Ecology and hold a NPDES discharge permits that includes a limit for ammonia discharge.

Now Therefore: TCF will be allowed to discharge water from its chiller waste stream under the following terms and conditions:

Sampling: For the purpose of discharge acceptance, a grab sample that is representative of the material to be discharged will be obtained by the City when requested by TCF. The representative sample will be used to determine the concentration of ammonia to be discharged to the city system.

Testing: In advance of the discharge of waste containing ammonia, The City will perform testing to determine the concentration of ammonia reported in mg/l. Waste below 2.0 mg/l may be discharged upon providing notice to the POTW in advance of the discharge. Material exceeding 2.0 mg/l may be discharged if loading at the POTW is such that the addition ammonia load from TCF would not create an operational problem at the POTW. In the event the ammonia concentration exceeds 2.0 mg/l and the POTW cannot accept the material due to current ammonia loading from other sources, TCF will be responsible to make other arrangements for disposal.

Rates: Billing for ammonia accepted at the POTW will be at the rate of 4 times the rate being charged for BOD. In addition to the weight charge the City will be conducting ammonia testing and will be charging TCF for this testing at the rate of $45 per sample.

This amendment also adjusts the average monthly discharge limits for repack wastewater as follows:

Average Monthly Discharge Limitations

Total BOD = 750 mg/L
TSS = 250 mg/L
Chlorine = .05 mg/L
Flow = ~~60,000~~ 100,000 gallons/day.
pH = > 5.5 and < 9.0

Notice: For the purposes of this amendment notice required to be given to the City will be received at the POTW by email to zimnyj@ci.ellensburg.wa.us .

The authorization provided under this amendment shall become effective upon signing by both parties, and shall remain in effect so long as the original agreement between TCF and the City remains in effect.

By:

City of Ellensburg
John Akers
Public Works Director

Dated: 11-15-2010

Twin City Foods Inc
Grant Craig
General Manager

Grant Craig

Dated: 11/15/2010

APPENDIX E

COST ESTIMATE

CITY OF ELLENSBURG
ELECTRICAL UPGRADE
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$110,000	$110,000
2	6-section MCC(1)	4	EA	$140,000	$560,000
3	New Service Equipment	1	LS	$165,000	$165,000
4	New Electrical Room Digester Building(2)	1	LS	$40,000	$40,000
5	New Electrical Building	1,200	SF	$120	$144,000
6	Influent Pump Station Upgrade(3)	1	LS	$135,000	$135,000
7	Site Work	1	LS	$175,000	$175,000
8	Miscellaneous Upgrades (site lighting, etc.)	1	LS	$100,000	$100,000
				Subtotal:	$1,429,000
				Construction Contingency (25%):	$357,000
				Construction Subtotal:	$1,786,000
				Washington State Sales Tax (8.0%):	$143,000
				Construction Total:	$1,929,000
				Administration Legal and Engineering (25%):	$482,000
				Total Estimated Project Cost:	$2,411,000

(1) Includes replacement of the MCCs at the influent pump station, aeration basin, recirculation pump station and digester
(2) Assumes a small building modification to the digester to have an electrical room
(3) The influent pump station HVAC would have to be upgraded when the electrical system is upgraded to comply with fire protection standards and electrical codes.

CITY OF ELLENSBURG
BIOSELECTORS
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$44,000	$44,000
2	Demolition	1	LS	$2,000	$2,000
4	Structure	1	LS	$190,000	$190,000
5	Aeration Equipment and Piping	1	LS	$100,000	$100,000
6	Aeration Blowers	2	EA	$30,000	$60,000
7	Electrical and Control	1	LS	$70,000	$70,000
				Subtotal	$466,000
				Contingency (25%)	$116,500
				Construction Subtotal	$582,500
				Sales Tax (8%)	$46,600
				Construction Total	$629,100
				Administration Legal and Engineering (25%)	$157,000
				Total Estimated Project Cost	$786,100

CITY OF ELLENSBURG
INFLUENT FLOW METER
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$8,000	$8,000
2	Influent Flowmeter	1	LS	$75,000	$75,000
3	Electrical	1	LS	$15,000	$15,000
				Subtotal:	$98,000
				Construction Contingency (25%):	$25,000
				Construction Subtotal:	$123,000
				Washington State Sales Tax (8.0%):	$10,000
				Construction Total:	$133,000
				Administration Legal and Engineering (25%):	$33,000
				Total Estimated Project Cost:	$166,000

CITY OF ELLENSBURG
SCADA SYSTEM
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Hardware	1	LS	$85,000	$85,000
2	Software	1	LS	$60,000	$60,000
3	HMI PLC Programming	1	LS	$250,000	$250,000
				Subtotal:	$395,000
				Construction Contingency (15%):	$59,000
				Construction Subtotal:	$454,000
				Washington State Sales Tax (8.0%)(1):	$13,340
				Construction Total:	$467,340
				Administration Legal and Engineering (10%):	$47,000
				Total Estimated Project Cost:	$514,000

(1) Sales tax only calculated on Hardware & Software

CITY OF ELLENSBURG
RETURN ACTIVATED SLUDGE SYSTEM
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$17,000	$17,000
2	Demolition	1	LS	$3,000	$3,000
3	Temporary Pumping	1		$20,000	$20,000
4	RAS Pumps & Installaion	3	EA	$25,000	$75,000
5	New Structural Wall	1		$15,000	$15,000
6	New RAS Vault	1		$20,000	$20,000
7	RAS Flow Meters	3	EA	$8,000	$24,000
8	Piping	1		$21,000	$21,000
9	Electrical	1	LS	$15,000	$15,000
				Subtotal:	$210,000
				Construction Contingency (25%):	$53,000
				Construction Subtotal:	$263,000
				Washington State Sales Tax (8.0%):	$21,000
				Construction Total:	$284,000
				Administration Legal and Engineering (25%):	$71,000
				Total Estimated Project Cost:	$355,000

CITY OF ELLENSBURG
LAGOON DREDGE[1]
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$5,000	$5,000
2	Demolition	1	LS	$10,000	$10,000
3	Lagoon Dredge[2]	1	LS	$50,000	$50,000
4	Installation (crane rental)	1	LS	$1,000	$1,000
				Subtotal:	$66,000
				Construction Contingency (10%):	$7,000
				Construction Subtotal:	$73,000
				Washington State Sales Tax (8.0%):	$6,000
				Construction Total:	$79,000
				Administration Legal and Engineering (5%):	$4,000
				Total Estimated Project Cost:	$83,000

(1) Assumes that this would be a competitive purchase without contracted engineering.
(2) Assumes that the new dredge does not require modifications to piping or electrical.

CITY OF ELLENSBURG
AERATION BASIN IMPROVEMENTS
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$38,000	$38,000
2	Demolition	1	LS	$10,000	$10,000
3	Blowers & Installation	3	LS	$120,000	$360,000
4	Blower Piping	1	LS	$75,000	$75,000
5	Diffusers & Installation	1	LS	$95,000	$95,000
6	Instrumentaion/Controls(3)	1	LS	$23,000	$23,000
7	Electrical Credit(1)	1	LS	$70,000	($70,000)
8	Electrical(2)	1	LS	$64,800	$64,800
				Subtotal:	$596,000
.				Construction Contingency (25%):	$149,000
				Construction Subtotal:	$745,000
				Washington State Sales Tax (8.0%):	$60,000
				Construction Total:	$805,000
				Administration Legal and Engineering (25%):	$282,000
				Total Estimated Project Cost:	$1,087,000

(1) The turbo blowers are part of the blower package, this would reduce the cost of the electrical upgrade.
(2) Assumes that the VFDs are a part of the turbo blower package and the new electrical is to the building as part of the electrical upgrade.
(3) Assumes blower package has integrated controls.

SURFACE AERATORS

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$38,000	$38,000
2	Demolition	1	LS	$0	$0
3	Aerators & Installation	10	LS	$38,000	$380,000
4	Blower Piping	1	LS	$0	$0
5	Diffusers & Installation	1	LS	$0	$0
6	Instrumentaion/Controls	1	LS	$0	$0
7	Electrical(1)	1	LS	$76,000	$76,000
				Subtotal:	$418,000
.				Construction Contingency (25%):	$105,000
				Construction Subtotal:	$523,000
				Washington State Sales Tax (8.0%):	$42,000
				Construction Total:	$565,000
				Administration Legal and Engineering (10%):	$85,000
				Total Estimated Project Cost:	$650,000

(1) Assumes that the new electrical is to the building as part of the electrical upgrade and the cost of the MCCs are included in the electrical upgrade
(2) Assumes a competitive equipment procurement and no engineering contract

CITY OF ELLENSBURG
EFFLUENT FLOW METER
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$3,000	$3,000
2	Demolition	1	LS	$3,000	$3,000
3	Bypass Pumping	1	LS	$7,500	$7,500
4	New Meter & Installation	1	LS	$22,000	$22,000
5	Excavation/Grade Repair	1	LS	$5,000	$5,000
				Subtotal:	$41,000
				Construction Contingency (25%):	$10,000
				Construction Subtotal:	$51,000
				Washington State Sales Tax (8.0%):	$4,000
				Construction Total:	$55,000
				Administration Legal and Engineering (25%):	$14,000
				Total Estimated Project Cost:	$69,000

CITY OF ELLENSBURG
OPERATIONS BUILDING MODIFICATIONS
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$7,000	$7,000
2	Demolition	1	LS	$10,000	$10,000
3	Building Addition	450	SF	$150	$67,500
4	Excavation/Grade Repair	1	LS	$5,000	$5,000
				Subtotal:	$90,000
				Construction Contingency (25%):	$23,000
				Construction Subtotal:	$113,000
				Washington State Sales Tax (8.0%):	$9,000
				Construction Total:	$122,000
				Administration Legal and Engineering (25%):	$31,000
				Total Estimated Project Cost:	$153,000

CITY OF ELLENSBURG
SECONDARY CLARIFIER REHABILITATION
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$11,000	$11,000
1	Demolition	1	LS	$3,000	$3,000
1	New Feedwell & Installation	1	LS	$25,000	$25,000
2	Sandblast & Paing	1	LS	$80,000	$80,000
3	Structural Repair	1	LS	$15,000	$15,000
				Subtotal:	$134,000
				Construction Contingency (25%):	$34,000
				Construction Subtotal:	$168,000
				Washington State Sales Tax (8.0%):	$13,000
				Construction Total:	$181,000
				Administration Legal and Engineering (25%):	$45,000
				Total Estimated Project Cost:	$226,000

CITY OF ELLENSBURG
GRIT REHABILITATION
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$4,000	$4,000
2	Sandblast & Paint Mechanism	1	LS	$15,000	$15,000
3	Drive & Motor	1	LS	$20,000	$20,000
4	Electrical	1	LS	$7,000	$7,000
				Subtotal:	$46,000
				Construction Contingency (25%):	$12,000
				Construction Subtotal:	$58,000
				Washington State Sales Tax (8.0%):	$5,000
				Construction Total:	$63,000
				Administration Legal and Engineering (25%):	$16,000
				Total Estimated Project Cost:	$79,000

CITY OF ELLENSBURG
HEADWORKS SCREENS
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$25,000	$25,000
2	Demolition	1	LS	$2,000	$2,000
3	Screens & Installation[(1)]	1	LS	$250,000	$250,000
4	Electrical[(2)]	1	LS	$25,200	$25,200
				Subtotal:	$302,000
				Construction Contingency (25%):	$76,000
				Construction Subtotal:	$378,000
				Washington State Sales Tax (8.0%):	$30,000
				Construction Total:	$408,000
				Administration Legal and Engineering (25%):	$102,000
				Total Estimated Project Cost:	$510,000

(1) Assumes there will be no structural modifications to the channels.
(2) Assumes that the electircal services is sufficient and motor starters, etc. are mounted in new control panels.

CITY OF ELLENSBURG
CLASS A BIOSOLIDS[2]
TOTAL ESTIMATED PROJECT COST
G&O # 10062.00

NO.	ITEM	Quantity	Unit	Unit Price	Amount
1	Mobilization and Demobilization	1	LS	$12,000	$12,000
2	Storage Building	2,000	SF	$50	$100,000
3	Windrow Turner[1]	1	LS	$25,000	$25,000
4	Instrumentation	1	LS	$10,000	$10,000
				Subtotal:	$147,000
				Construction Contingency (15%):	$22,000
				Construction Subtotal:	$169,000
				Washington State Sales Tax (8.0%):	$14,000
				Construction Total:	$183,000
				Administration Legal and Engineering (10%):	$18,000
				Total Estimated Project Cost:	$201,000

(1) Assumes the type of turner that is pulled behind an existing tractor.
(2) Assumes no bulking agent is used.
(3) Assumes a packaged pole building, competitive equipment procurement, and no contract engineering

APPENDIX F

MIXING ZONE ANALYSIS

APPENDIX F

WATER QUALITY EVALUATION

CITY OF ELLENSBURG

INTRODUCTION

For a surface water discharge to be permitted, it must be demonstrated that the discharge will not harm beneficial use of the receiving water. The objective of this study is to evaluate the City of Ellensburg Wastewater Treatment Plant (WWTP) discharge to determine the adequacy of the outfall to meet water quality standards and effluent limits that may be required in the future. The wastewater collection and treatment facilities are owned and operated by the City of Ellensburg in Washington State. This report establishes acute and chronic dilution factors for future City of Ellensburg WWTP effluent flows using both federal and state guidelines. A mixing zone study was performed, and copies of spreadsheets used in this analysis are provided at the end of this section.

OUTFALL DESCRIPTION

The City's WWTP outfall, as designed, is located in the Yakima River south of the city limits at approximate River Mile 151.6. According to the "Outfall Plan, Profile and Details" (CH_2M Hill, July 1972), the outfall was constructed with a 48-inch ductile iron pipe extending approximately 2-1/2 feet under the river's bottom. Connected to this pipe are six, 14-inch diameter diffuser pipes arranged 4-foot on center with each pipe ending with a 10-inch diameter orifice. All ports are pointing downstream. The diffuser array extends approximately 48 feet into the river. The water depth over the diffuser at critical low flow is approximately 5 feet.

AMBIENT CONDITIONS

RIVER DISCHARGE

Daily long-term streamflow statistics for the Yakima River are available at two locations, one upstream approximately 39 miles and the other downstream approximately 12 miles from the outfall. Both are operated by the United States Geological Survey (USGS). The upstream gage is located at Cle Elum, Washington (USGS Station Number 12479500) (River Mile 191), and the downstream gage is located at Umtanum, Washington (USGS 12484500) (River Mile 139.7). Data is available from 1908 to 1990 for the gage at Cle Elum and from 1934 to the present for the gage at Umtanum.

7Q10 FLOW

7Q10 flow is defined as the lowest 7-day average flow, which occurs (on average) once every 10 years. The 7Q10 low flow for the Yakima River was obtained from the Fact Sheet for NPDES Permit No. WA-002434-1 and is 792 cubic feet per second (cfs).

RIVER VELOCITY

A required input for calculating effluent dilution values necessary for deriving NPDES permit limits is river velocity data. Velocity in the Yakima River is seasonally highly variable, but can be estimated for modeling purposes. According to the Washington State Department of Ecology (Ecology) permit writers reference document, 'Spreadsheets for Water Quality-Based NPDES Permit Calculations' for RIVPLUM5, Step 2, "The product of depth*width*velocity should equal the receiving water discharge rate downstream from the discharge [eg, at 7Q10]". At the outfall discharge location, the Yakima River channel is approximately 120 feet wide with an average depth of 5 feet (Fact Sheet for NPDES Permit No. WA-002434-1). The estimated Yakima River 7Q10 flow is 792 cfs. The Yakima River velocity can be calculated according to the equation:

$$D \times W \times V = R$$

Where,
- D = Depth = 5 feet
- W = Width = 120 feet
- R = Receiving water discharge = 792 cfs

Therefore,
- V = Velocity fps

The calculated river velocity using this set of variables is 1.32 feet per second (fps), which equates to 40.23 cm/sec or 0.78 knots. The river velocity stated in the Fact Sheet for NPDES Permit No. WA-002434-1 was 1.0 ft/sec.

MIXING ZONE

Mixing zones in rivers and streams are defined in WAC 173-201A-400 and are as follows:

(7)(a) In rivers and streams, mixing zones, singularly or in combination with other mixing zones, shall comply with the most restrictive combination of the following:

i) Not extend in a downstream direction for a distance from the discharge port(s) greater than 300 feet plus the depth of water over the discharge port(s), or extend upstream for a distance of over 100 feet;

ii) Not utilize greater than 25 percent of the flow; and
iii) Not occupy greater than 25 percent of the width of the water body.

8) Acute criteria are based on numeric criteria and toxicity tests approved by the department, as generally guided under WAC 173-201A-240 (1) through (5), and shall be met as near to the point of discharge as practicably attainable. Compliance shall be determined by monitoring data or calibrated models approved by the department utilizing representative dilution ratios. A zone where acute criteria may be exceeded is allowed only if it can be demonstrated to the department's satisfaction the concentration of, and duration and frequency of exposure to the discharge, will not create a barrier to the migration or translocation of indigenous organisms to a degree that has the potential to cause damage to the ecosystem. A zone of acute criteria exceedance shall singularly or in combination with other such zones comply with the following maximum size requirements:

(a) In rivers and streams, a zone where acute criteria may be exceeded shall comply with the most restrictive combination of the following:

(i) Not extend beyond 10 percent of the distance towards the upstream and downstream boundaries of an authorized mixing zone, as measured independently from the discharge port(s);
(ii) Not utilize greater than 2.5 percent of the flow; and
(iii) Not occupy greater than 25 percent of the width of the water body.

The City of Ellensburg outfall is approximately 5 feet below the Yakima Rivers' surface. Therefore, the chronic boundary by definition extends 305 feet downstream and 100 feet upstream, and the acute boundary extends 30.5 feet downstream and 10 feet upstream from the discharge point.

DILUTION MODEL SELECTION

Several Ecology and EPA models and spreadsheets have been developed to help evaluate the water quality impact of a wastewater discharge into a receiving stream. The computer model PLUMES (Baumgartner, Frick, Roberts, and Bodeen, June 1993) is commonly used to predict the concentration of pollutants in rivers and streams to define acute and chronic mixing zones. However, this model is not appropriate for shallow rivers, such as the Yakima River. The previous Fact Sheet for NPDES Permit No. WA-

002434-1 utilized the model RIVPLUM5 for modeling the City of Ellensburg/Yakima River outfall.

RIVPLUM5 is a spreadsheet program for modeling dilution in rivers and is based on the work of H.B. Fisher et al. "Mixing In Inland and Coastal Waters," Chapter 5, 1979. RIVPLUM5 calculates the dilution at a specific point of interest downstream from a discharge. The spreadsheet "is based on the assumption that the discharge: 1) is a single point source, which is most appropriate for single port or short diffusers, or side bank discharges; and 2) is completely and rapidly mixed vertically, which usually only occurs in shallow rivers." Although this outfall is not a point source, it was modeled using RIVPLUM5 for the following reasons: 1) Previous modeling efforts used the RIVPLUM modeling software, and 2) Modeling as a point source is conservative. For this dilution model study, scenarios were evaluated using existing flow conditions as well as future flow conditions.

DILUTION MODEL RESULTS

CHRONIC MIXING ZONE

The Chronic Mixing Zone for the City of Ellensburg WWTP is evaluated per WAC 173-201A-400 Subpart (7)(a)(ii). This subpart states that the discharge cannot utilize more than 25 percent of the stream flow. The Ecology Permit Writers Manual requires, when evaluating compliance with chronic water quality criteria, that the projected design flow (highest projected average monthly flow) during the critical conditions is utilized. For Ellensburg, these flows are 4.63 MGD or 7.16 cfs for existing conditions, and 5.90 MGD or 9.13 cfs for future conditions (Year 2031). Dilution factors based on allowable dilution flows are calculated for the WWTP flow and the stream flow during the critical condition. The chronic dilution factors, using 25% of the stream flow as allowed in WAC 173-201A-400(7), are calculated by the following mathematical equations:

Chronic Dilution Factor (DF) = (Qwwtp + (0.25 * Critical Stream Flow)) / (Qwwtp)

Existing Conditions: Chronic DF = (7.16 cfs + (0.25*792 cfs))/(7.16 cfs) = 28.7
Future Conditions: Chronic DF = (9.13 cfs + (0.25*792 cfs))/(9.13 cfs) = 22.7

The above dilution factors set the maximum dilution as provided by WAC 173-201A-400. These dilution factors are then compared to the mixing of the WWTP effluent with the receiving stream as calculated using the computer model, RIVPLUM5. RIVPLUM5 calculated a dilution factor of 87.1 for the existing condition, 68.3 for the future condition. Since the dilution factors using 25 percent of the critical stream flow are more restrictive than dilution factors calculated utilizing the RIVPLUM5 model, the dilution factors of 28.7 and 22.7 will be used to evaluate compliance with water quality criteria.

Table F-1 compares the chronic dilution factor results using 25 percent of the Yakima River 7Q10 flow and the RIVPLUM5 model. The lowest chronic dilution factor of 22.7 was obtained utilizing 25 percent of the 7Q10 flow and the projected WWTP effluent flow in year 2031.

TABLE F-1

Calculation and Comparison of Chronic Dilution Factors

Parameter	Max Month Effluent Flow (MGD)	Max Month Effluent Flow (cfs)	Dilution Factor w/ 25% of Critical Flow	Dilution Factor Calculated from RIVPLUM5
Existing Conditions (Year 2010)	4.63	7.16	28.7(1)	87.1
Future Condition (Year 2031)	5.90	9.13	22.7(1)	68.3

(1) Dilution factor with 25% of critical 7Q10 flow is more restrictive, and governs.

Acute Mixing Zone

A similar process is used to evaluate dilution factors at the boundary of the acute mixing zone, except that the allowable percentage of critical stream flow is only 2.5 percent, and the downstream acute mixing zone boundary is limited to 10 percent of the chronic mixing zone length. Based on the above-calculated length of the chronic mixing zone, the acute mixing zone is limited to 30.5 feet. The Ecology Permit Writers Manual requires, when evaluating compliance with acute water quality criteria, that the Maximum Day Flow projected during the critical conditions is utilized. For Ellensburg, these flows are 6.78 MGD or 10.49 cfs for existing conditions and 8.50 MGD or 13.15 cfs for future conditions (2031). Dilution factors based on allowable dilution flows are calculated for the WWTP flow and the stream flow during the critical condition. The acute dilution factors, using 2.5 percent of the stream flow as allowed in WAC 173-201A-400(7), are calculated by the following mathematical equations:

Acute Dilution Factor (DF) = (Qwwtp + (0.025 * Critical Stream Flow)) / (Qwwtp)

Existing Conditions: Acute DF = (10.49 cfs + (0.025*792 cfs))/(10.49 cfs) = 2.9
Future Conditions: Acute DF = (13.15 cfs + (0.025*792 cfs))/(13.15 cfs) = 2.5

The above dilution factors set the maximum dilution as provided by WAC 173-201A-400. These dilution factors are then compared to the mixing of the WWTP effluent with the receiving stream as calculated using the computer model, RIVPLUM5. RIVPLUM5 calculated a dilution factor of 52.0 for the existing condition, 41.5 for the future condition. Since the dilution factors using 2.5 percent of the critical stream flow are more restrictive than dilution factors calculated utilizing the RIVPLUM5 model, the dilution factors of 2.9 and 2.5 will be used to evaluate compliance with water quality criteria.

Table F-2 compares the acute dilution factor results using 2.5 percent of the Yakima River 7Q10 flow and the RIVPLUM5 model. The lowest acute dilution factor of 2.5 was obtained utilizing 2.5 percent of the 7Q10 flow in year 2031.

TABLE F-2

Calculation and Comparison of Acute Dilution Factors

Parameter	Max Day Effluent Flow (MGD)	Max Day Effluent Flow (cfs)	Dilution Factor w/ 2.5% of Critical Flow	Dilution Factor Calculated from RIVPLUM5
Existing Conditions (2010)	6.78	10.49	2.9(1)	52.0
Future Condition (2031)	8.50	13.15	2.5(1)	41.5

(1) Dilution factor with 2.5% of critical 7Q10 flow is more restrictive, and governs.

REASONABLE POTENTIAL FOR EFFLUENT TO EXCEED WATER QUALITY STANDARDS

After determining the dilution factors, the next step is to determine the water quality criteria for those pollutants of interest. WAC 173-201A-240 lists 29 toxic substances and the methodology to determine water quality criteria. To determine if the discharge has a reasonable potential to exceed the chronic and acute criteria, methods specified in the Water Quality Program Permit Writer's Manual (Publication No. 92-109, November 2010) and the referenced *Technical Support Document for Water Quality-based Toxics Control* (EPA/505/2-90-001, PB91-127415, March 1991) (*TSD*) are used. The *TSD* specifies a statistical procedure to determine if a discharge has the potential to exceed water quality standards. The procedure is based on the dilution factors previously calculated, the maximum measured or estimated concentration of a pollutant, the number of samples represented by the maximum concentration and the ambient concentration of the pollutant as measured or estimated in the receiving stream. A multiplier and coefficient of variability, which amount to safety factors and are dependent on the variability of the data and number of samples, are then used to calculate the "reasonable potential" to exceed water quality criteria.

The receiving water hardness concentration is used to calculate several of the metal criteria. Per Ecology guidance, the hardness value should be the lowest value from the critical period if the data set is less than 20, or the 10th percentile value if the data set is 20 or greater. In the existing NPDES permit, Ecology used a receiving water hardness of 62 mg/L, which represented the average of the receiving water at 35 mg/L and the effluent at 89 mg/L, taken from the 2005 Fact Sheet. Mixed hardness uses a combination of the effluent hardness with the receiving water hardness to more accurately reflect the mixing zone boundary hardness when very limited dilution is available. Table F-3 shows the calculated hardness at both the acute and chronic mixing zone boundaries using the available recent data.

TABLE F-3

Calculated Mixed Hardness at Mixing Zone Boundaries

Mixing Zone	Dilution Factor	Effluent Hardness (mg/L as $CaCO_3$)(1)	Receiving Water Hardness (mg/L as $CaCO_3$)(2)	Hardness at Mixing Zone Boundary (mg/L as $CaCO_3$)
Acute	2.5	110	35	65.0
Chronic	22.7	110	35	38.3

(1) Effluent hardness is based on the lowest concentration from two samples collected in June and September 2011.
(2) Receiving water hardness is taken from the 2005 NPDES Fact Sheet.

The current permit required the City of Ellensburg to conduct a study of metal concentrations in the effluent and receiving water in order to assess reasonable potential for the Ellensburg effluent to violate water quality standards. Table F-4 includes the maximum and average concentrations of the total recoverable metals studied based on a total of eight samplings conducted July 2007 through April 2009.

TABLE F-4

Total Recoverable Metal Concentrations in Effluent and Total Dissolved River Concentrations from July 2007 through April 2009

Parameter	Units	Number of Samples	Maximum Concentration		Average Concentration	
			River	Effluent	River	Effluent
Chromium	μg/L	8	0.70	2.74	0.34	0.65
Nickel	μg/L	8	2.24	2.01	1.14	1.29
Copper	μg/L	8	0.59	7.09	0.38	5.58
Zinc	μg/L	8	0.72	47.4	0.44	29.39
Arsenic Filtered(1)(2)	μg/L	8	0.44	0.90	0.26	0.73
Arsenic Non-Filtered(1)(3)	μg/L	8	0.42	0.97	0.31	0.74
Selenium	μg/L	8	ND(4)	ND(4)	ND(4)	ND(4)
Cadmium	μg/L	8	ND(4)	0.11	ND(4)	0.05
Silver	μg/L	1	ND(4)	0.10	ND(4)	0.07
Lead	μg/L	8	0.05	0.46	0.05	0.19
Mercury	ηg/L	8	1.15	2.74	2.62	1.93

(1) Arsenic in both the organic and the more toxic inorganic form is naturally occurring in the region.
(2) Dissolved arsenic.
(3) Total arsenic.
(4) ND is defined as Non-Detected.

WATER QUALITY STANDARDS

The Yakima River (located in Water Resource Inventory Area 39) is listed in Chapter 173-201A-600 Table 602 of the WAC, Water Quality Standards for Surface Waters of the State of Washington. The specific reach where the City of Ellensburg outfall is located is listed as the “Yakima River mainstem from mouth to Cle Elum River (river mile 185.6)”. The applicable listed “Use Designations” for Aquatic Life Uses include Salmonid spawning/rearing; for Recreation Uses is primary contact; for Water Supply Uses is domestic, industrial, agricultural, and stock water supply; and Miscellaneous Uses include wildlife habitat, harvesting, commerce and navigation, boating, and aesthetic values. Table F-5 includes a summary of water quality criteria taken from WAC 173-201A-200 applicable to this reach of the Yakima River. In addition, WRIA 39 has an applicable water temperature requirement as follows; “Temperature shall not exceed a 1-DMax of 21.0°C due to human activities. When natural conditions exceed a 1-DMax or 21.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t = 34/(T+9).”

Furthermore, other water quality standards including Toxic Substances, Radioactive Substances, and Natural Conditions and Other Water Quality Criteria and Applications are found in WAC 173-201A-240, 250, and 260, respectively. Of those, a single Toxic Substance has water quality parameters applicable to Yakima River, ammonia, which is discussed in greater detail later in this appendix.

TABLE F-5

Water Quality Criteria and Uses (WAC 173-201A) Summary Applicable to the Yakima River from its Mouth to River Mile 185.6 at Cle Elum, Washington

Criteria	Category	Parameter
Aquatic Life Temperature	Salmonid Spawning, Rearing, and Migration	17.5°C (63.5°F) Temperature shall not exceed a 1-DMax of 21.0°C due to human activities. When natural conditions exceed a 1-DMax of 21.0°C, no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3°C; nor shall such temperature increases, at any time, exceed t = 34/(T+9).
Aquatic Life Dissolved Oxygen	Salmonid Spawning, Rearing, and Migration	8.0 mg/L Lowest 1-Day Minimum
Aquatic Life Turbidity	Salmonid Spawning, Rearing, and Migration	Turbidity shall not exceed: • 5 NTU over background when the background is 50 NTU or less; or • A 10 percent increase in turbidity when the background turbidity is more than 50 NTU.
Aquatic Life total Dissolved Gas	Salmonid Spawning, Rearing, and Migration	Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.
Aquatic Life pH Criteria	Salmonid Spawning, Rearing, and Migration	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.
Water Contact Recreation Bacteria Criteria	Primary Contact Recreation	Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 200 colonies/100mL.

RECEIVING WATER CHARACTERIZATION

Ambient water quality parameters for the Yakima River that may be used for calculating permit limits in the future were taken from existing sources including the current NPDES permit and fact sheet, USGS website, Ecology's website, and the City's Discharge Monitoring Reports (DMRs). The existing NPDES permit WA-002434-1 was issued on January 14, 2011, effective March 1, 2011, and expires February 28, 2016. Physical characteristics of the Yakima River include average channel depth and average river width downstream from the discharge at design flow, which were obtained from the existing NPDES permit. The data are listed in Table F-6.

TABLE F-6

Parameters Used in Current and Future NPDES Permit Limit Calculations Based on Critical Conditions

Parameter	Value used in Current Permit	Value for Projected Future Permit	Source of Projection for Future Permit
Receiving Water Temperature	17.5°C	17.5°C	WAC 173-201A-200
Effluent Temperature	13.5°C Max Average 18.0°C High Ave Month 20.0°C High Ave Week	13.5°C Max Average 18.0°C High Ave Month 20.0°C High Ave Week	Current Permit
Receiving Water Alkalinity	Not stated	38.3 mg/L (chronic) 65.0 mg/L (acute) (as $CaCO_3$)	City of Ellensburg
Effluent Alkalinity	Not stated	Not stated (mg/L as $CaCO_3$)	City of Ellensburg DMRs
Receiving Water pH	7.5 (high)	7.5 (high)	Current Permit
Effluent pH	6.7-7.7 (Actual) 6.0-9.0 (Limits)	6.7-7.7 (Actual) 6.0-9.0 (Limits)	Current Permit Current Permit
Effluent Flow Rate (Max. Day)	4.27 MGD (2001)	6.78 MGD (2011) 8.50 MGD (2031)	Facility Plan
Effluent Flow Rate (Max. Mo.)	3.44 MGD (2001)	4.63 MGD (2011) 5.90 MGD (2031)	Facility Plan
Receiving Water 7Q10 Flow	792 cfs	792 cfs	Current Permit
Receiving Water Depth	5 feet at diffuser	5 feet at diffuser	Current Permit
Receiving Water Width	120 feet	120 feet	Current Permit
Receiving Water Velocity	1.0 ft/sec	1.33 ft/sec	Calculated at 7Q10
Receiving Water Channel Slope (ft/ft)	0.035 ft/ft	0.035 ft/ft	Current Permit

TABLE F-6 – (continued)

Parameters Used in Current and Future NPDES Permit Limit Calculations Based on Critical Conditions

Parameter	Value used in Current Permit	Value for Projected Future Permit	Source of Projection for Future Permit
Chronic Dilution Factor	94.8 38.2	87.1 (2010) 68.3 (2031) 28.7 (2010) 22.7 (2031)	RIVPLUM5 RIVPLUM5 25% of 7Q10 flow 25% of 7Q10 flow
Acute Dilution Factor	61.1 4.0	52.0 (2010) 41.5 (2031) 2.9 (2010) 2.5 (2031)	RIVPLUM5 RIVPLUM5 2.5% of 7Q10 flow 2.5% of 7Q10 flow
Chronic Mixing Zone	310 feet downstream	310 feet downstream	WAC 173-201A-400
Acute Mixing Zone	30 feet downstream	31 feet downstream	WAC 173-201A-400

(1) Value is from the USGS gage station (12479500) on the Yakima River near Cle Elum upstream from the City of Ellensburg WWTF.

PROJECTED PERMIT LIMITS

According to the City's current NPDES Permit No. WA-002434-1, the effluent discharge limits for Total Ammonia (as NH_3-N) are 8.2 mg/L (547 lbs/day as the maximum daily loading limit). The other parameters that are limited include 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids (TSS), Fecal Coliform Bacteria, and pH. As part of this appendix, permit limits are evaluated for ammonia and pH, the two parameters for which permit limitations exist based on calculations by Ecology utilizing the aforementioned dilution factors. An additional parameter evaluated is dissolved oxygen, which is discussed in more detail below.

Additionally, the Ecology workbook, TSDCALC11 (spreadsheet REASPOT), was utilized to determine whether limits are required for the metals included in Table F-4.

pH

Water quality criteria were determined for pH using the spreadsheet, PHMIX2, provided by Ecology in the workbook PWSPRD. Using the technology based limits of 6-9 standard units; the resulting pH range at the edge of the mixing zones was determined to be between 7.2 and 7.6. This meets the applicable Aquatic Life pH Criteria for Salmonid spawning, rearing and migration for surface water as described in Table F-5.

Dissolved Oxygen

Water quality criteria were determined for dissolved oxygen using the spreadsheet DOSAG2, provided by Ecology in the workbook PWSPREAD. Using this Streeter-Phelps-based model, the applicable Aquatic Life Dissolved Oxygen Criteria for Salmonid spawning, rearing and migration for surface water in Table F-5 (lowest 1-day minimum of 8.0 mg/L) is not violated.

Toxic Pollutants

Water quality criteria were determined for ammonia using the spreadsheet, AMMONIAfw, provided by Ecology in the workbook TSDCALC11. The criteria derived from this spreadsheet were then used in the spreadsheet REASPOT, also provided in TSDCALC11. Additional parameters that were used in REASPOT include the aforementioned acute and chronic dilution factors, historical maximum effluent ammonia concentrations from the city's Discharge Monitoring Reports (DMRs) and a maximum ambient Yakima River ammonia concentration of 0.06 mg/L NH_3-N (data taken from USGS Station 12479500 at Cle Elum, Washington, the closest upstream sample location for which data was available, based on 50 samples collected over a 12-year period). The highest recorded ammonia nitrogen concentration in the city's effluent was 54.6 mg/L, which occurred in February 2009 when Twin City Foods drained its compressor system improperly. The next highest recorded ammonia concentration was 11.6 mg/L NH_3-N (in 2010) based on approximately 780 samples from five years of data (2005-2010). It is reasonable to discount the 54.6 mg/L sample as an outlier in the dataset as it represents a concentration more than 4.5 times the next highest recorded concentration and represents a one-time event due to an improper industrial discharge.

Based on the results from REASPOT, it was determined that a reasonable potential to exceed the ammonia water quality criteria does not exist. However, the existing NPDES Permit No. WA-002334-1 states, "The maximum daily effluent limit of 8.2 mg/L was established in the 1996 permit (see p.14 of the 1996 Fact Sheet). The Fact Sheet does not contain calculations, nor any further documentation, or how the limit was derived. This limit is retained in the proposed permit because the increased dilution factors established in the current permit results in a higher limit, which would constitute backsliding, contrary to State and Federal regulations." In the upcoming renewal of the City's NPDES permit, Ecology has the ability to use their discretion in applying anti-backsliding restrictions for the effluent ammonia limits. Accepting the revised data and reasonable potential calculations as "new information" would allow Ecology to rescind or increase the permit limits for ammonia without backsliding, as noted in 40 CFR 122.62(a)(2)).

Metal sampling data from both the effluent and Yakima River were included in the spreadsheet REASPOT to determine if permit limits are required with the newly calculated dilution factors and effluent / receiving water hardness discussed previously. REASPOT determined that a reasonable potential to exceed water quality criteria does not exist for the metals sampled based on the maximum sample concentration from the total of eight samples. Results are appended to the end of this appendix.

Projected Limits

Even though no ammonia limit is necessary because no reasonable potential exists, it is useful to calculate a future effluent concentration that would result in a reasonable potential and therefore result in a permit limit. A projected permit limit for ammonia was calculated based on the most conservative effluent dilution factor of 2.5 for the acute condition and 22.7 for the chronic condition. Based on the collection of 151 effluent ammonia samples (approximately 13 samples per month for one year), an effluent limit would be triggered when the maximum representative effluent ammonia nitrogen concentration is equivalent to 35.8 mg/L. If effluent ammonia limits were imposed based on the hypothetical effluent ammonia nitrogen concentration of 35.8 mg/L, the permit limits would be 12.6 mg/L for the monthly average and 32.1 mg/L for the maximum day, and not the 8.2 mg/L imposed by the 1996 NPDES Permit.

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.

Revised 22-Feb-96	Acute 2010	Chronic 2010
INPUT		
1. Effluent Discharge Rate (cfs): Max Daily & Max Month Discharge (2010)	10.49	7.16
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	5.00	5.00
Stream Velocity (fps):	1.32	1.32
Channel Width (ft):	120.00	120.00
Stream Slope (ft/ft) or Manning roughness "n":	0.035	0.035
0 if slope or 1 if Manning "n" in previous cell:	0	0
3. Discharge Distance From Nearest Shoreline (ft):	20	20
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	31	310
Distance From Nearest Shoreline (ft):	40	40
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0
OUTPUT		
1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	1,049.00	716.00
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	2.374	2.374
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming		
hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec):	2.374	2.374
3. Transverse Mixing Coefficient (ft2/sec):	7.121	7.121
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.*, 1979)		
Co	1.32E+00	9.04E-01
x'	1.16E-02	1.16E-01
y'o	1.67E-01	1.67E-01
y' at point of interest	3.33E-01	3.33E-01
Solution using superposition equation (Fischer eqn 5.9)		
Term for n= -2	5.06E-163	5.91E-17
Term for n= -1	1.30E-44	4.23E-05
Term for n= 0	5.55E-01	1.53E+00
Term for n= 1	9.26E-22	8.60E-03
Term for n= 2	3.05E-115	3.55E-12
Upstream Distance from Outfall to *Effective Origin* of Effluent Source (ft)	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	31.00	310.00
x' Adjusted for *Effective Origin*	1.16E-02	1.16E-01
C/Co (dimensionless)	1.45E+00	1.27E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	1.92E+00	1.15E+00
Unbounded Plume Width at Point of Interest (ft)	73.157	231.341
Unbounded Plume half-width (ft)	36.578	115.671
Distance from near shore to discharge point (ft)	20.00	20.00
Distance from far shore to discharge point (ft)	100.00	100.00
Plume width bounded by shoreline (ft)	56.58	120.00
Approximate Downstream Distance to Complete Mix (ft):	741	741
Theoretical Dilution Factor at Complete Mix:	75.500	110.615
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	35.597	110.615
Calculated Dilution Factor at Point of Interest:	52.012	87.089

Spread of a plume from a point source in a river with boundary effects from the shoreline based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.

Revised 22-Feb-96	Acute 2031	Chronic 2031
INPUT		
1. Effluent Discharge Rate (cfs): Max Daily & Max Month Discharge (2031)	13.15	9.13
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	5.00	5.00
Stream Velocity (fps):	1.32	1.32
Channel Width (ft):	120.00	120.00
Stream Slope (ft/ft) or Manning roughness "n":	0.035	0.035
0 if slope or 1 if Manning "n" in previous cell:	0	0
3. Discharge Distance From Nearest Shoreline (ft):	20	20
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	31	310
Distance From Nearest Shoreline (ft):	40	40
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modification (enter 1)	0	0
OUTPUT		
1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	1,315.00	913.00
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	2.374	2.374
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming		
hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec):	2.374	2.374
3. Transverse Mixing Coefficient (ft2/sec):	7.121	7.121
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.*, 1979)		
Co	1.66E+00	1.15E+00
x'	1.16E-02	1.16E-01
y'o	1.67E-01	1.67E-01
y' at point of interest	3.33E-01	3.33E-01
Solution using superposition equation (Fischer eqn 5.9)		
Term for n= -2	5.06E-163	5.91E-17
Term for n= -1	1.30E-44	4.23E-05
Term for n= 0	5.55E-01	1.53E+00
Term for n= 1	9.26E-22	8.60E-03
Term for n= 2	3.05E-115	3.55E-12
Upstream Distance from Outfall to *Effective Origin* of Effluent Source (ft)	#N/A	#N/A
Effective Distance Downstream from Effluent to Point of Interest (ft)	31.00	310.00
x' Adjusted for *Effective Origin*	1.16E-02	1.16E-01
C/Co (dimensionless)	1.45E+00	1.27E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	2.41E+00	1.46E+00
Unbounded Plume Width at Point of Interest (ft)	73.157	231.341
Unbounded Plume half-width (ft)	36.578	115.671
Distance from near shore to discharge point (ft)	20.00	20.00
Distance from far shore to discharge point (ft)	100.00	100.00
Plume width bounded by shoreline (ft)	56.58	120.00
Approximate Downstream Distance to Complete Mix (ft):	741	741
Theoretical Dilution Factor at Complete Mix:	60.228	86.747
Calculated Flux-Average Dilution Factor Across Entire Plume Width:	28.397	86.747
Calculated Dilution Factor at Point of Interest:	41.491	68.297

Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

INPUT

1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	3.000
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	17.50
pH:	7.50
Alkalinity (mg CaCO3/L):	65.00
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	20.00
pH:	7.00
Alkalinity (mg CaCO3/L):	100.00

OUTPUT

1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.40
Effluent pKa:	6.38
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.93
Effluent Ionization Fraction:	0.81
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	70.17
Effluent Total Inorganic Carbon (mg CaCO3/L):	124.10
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	18.33
Alkalinity (mg CaCO3/L):	76.67
Total Inorganic Carbon (mg CaCO3/L):	88.14
pKa:	6.39
pH at Mixing Zone Boundary:	7.22

Calculation of pH of a mixture of two flows. Based on the procedure in EPA's DESCON program (EPA, 1988. Technical Guidance on Supplementary Stream Design Conditions for Steady State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

INPUT

1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	23.000
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	16.00
pH:	7.90
Alkalinity (mg CaCO3/L):	24.00
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	20.00
pH:	7.00
Alkalinity (mg CaCO3/L):	100.00

OUTPUT

1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.41
Effluent pKa:	6.38
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.97
Effluent Ionization Fraction:	0.81
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	24.78
Effluent Total Inorganic Carbon (mg CaCO3/L):	124.10
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	16.17
Alkalinity (mg CaCO3/L):	27.30
Total Inorganic Carbon (mg CaCO3/L):	29.10
pKa:	6.41
pH at Mixing Zone Boundary:	7.59

Streeter-Phelps analysis of critical dissolved oxygen sag.

Based on Lotus File DOSAG2.WK1 Revised 19-Oct-93

INPUT

1. EFFLUENT CHARACTERISTICS	
Discharge (cfs): based on 8 MGD (pg 15 of 48 in Fact Sheet)	12.38
CBOD5 (mg/L): pg 12 of 48 in Fact Sheet	45
NBOD (mg/L): estimated	25
Dissolved Oxygen (mg/L): pg 12 of 48 in Fact Sheet (Highest Average Weekly)	8.5
Temperature (deg C): pg 12 of 48 in Fact Sheet (Highest Average Weekly)	20
2. RECEIVING WATER CHARACTERISTICS	
Upstream Discharge (cfs):	792
Upstream CBOD5 (mg/L): estimated	1.5
Upstream NBOD (mg/L): estimated	0.2
Upstream Dissolved Oxygen (mg/L):	10
Upstream Temperature (deg C):	16
Elevation (ft NGVD):	1470
Downstream Average Channel Slope (ft/ft):	0.004
Downstream Average Channel Depth (ft):	5
Downstream Average Channel Velocity (fps):	1.32
3. REAERATION RATE (Base e) AT 20 deg C (day^-1):	1.37

Reference	Applic. Vel (fps)	Applic. Dep (ft)	Suggested Values
Churchill	1.5 - 6	2 - 50	1.03
O'Connor and Dobbins	.1 - 1.5	2 - 50	1.33
Owens	.1 - 6	1 - 2	1.32
Tsivoglou-Wallace	.1 - 6	.1 - 2	21.88

4. BOD DECAY RATE (Base e) AT 20 deg C (day^-1): 1.33

Reference	Suggested Value
Wright and McDonnell, 1979	0.39

OUTPUT

1. INITIAL MIXED RIVER CONDITION	
CBOD5 (mg/L):	2.2
NBOD (mg/L):	0.6
Dissolved Oxygen (mg/L):	10.0
Temperature (deg C):	16.1
2. TEMPERATURE ADJUSTED RATE CONSTANTS (Base e)	
Reaeration (day^-1):	1.25
BOD Decay (day^-1):	1.11
3. CALCULATED INITIAL ULTIMATE CBODU AND TOTAL BODU	
Initial Mixed CBODU (mg/L):	3.2
Initial Mixed Total BODU (CBODU + NBOD, mg/L):	3.8
4. INITIAL DISSOLVED OXYGEN DEFICIT	
Saturation Dissolved Oxygen (mg/L):	9.343
Initial Deficit (mg/L):	-0.63
5. TRAVEL TIME TO CRITICAL DO CONCENTRATION (days):	1.00
6. DISTANCE TO CRITICAL DO CONCENTRATION (miles):	21.58
7. CRITICAL DO DEFICIT (mg/L):	1.11
8. CRITICAL DO CONCENTRATION (mg/L):	8.24

Dissolved oxygen concentration following initial dilution.
References: EPA/600/6-85/002b and EPA/430/9-82-011

Based on Lotus File IDOD2.WK1 Revised 19-Oct-93

INPUT	
1. Dilution Factor at Mixing Zone Boundary:	23
2. Ambient Dissolved Oxygen Concentration (mg/L):	10
3. Effluent Dissolved Oxygen Concentration (mg/L):	2.5
4. Effluent Immediate Dissolved Oxygen Demand (mg/L):	0.5
OUTPUT	
Dissolved Oxygen at Mixing Zone Boundary (mg/L):	9.65

11/2/2011 8:54 AM
TSDCALC11_Ellensburg
AMMONIAfw.XLS

AMMONIA WATER QUALITY CRITERIA CALCULATION

NPDES Permit #

Calculation Of Ammonia Concentration and Criteria for fresh water. Based on EPA Quality Criteria for Water (EPA 400/5-86-001) and WAC 173-201A. Revised 1-5-94 (corrected total ammonia criterion). Revised 3/10/95 to calculate chronic criteria in accordance with EPA Memorandum from Heber to WQ Stds Coordinators dated July 30, 1992.

INPUT	
1. Ambient Temperature (deg C; 0<T<30)	21.0
2. Ambient pH (6.5<pH<9.0)	7.50
3. Acute TCAP (Salmonids present- 20; absent- 25)	20
4. Chronic TCAP (Salmonids present- 15; absent- 20)	15

OUTPUT	
1. Intermediate Calculations:	
Acute FT	1.00
Chronic FT	1.41
FPH	1.44
RATIO	18
pKa	9.37
Fraction Of Total Ammonia Present As Un-ionized	1.3331%
2. Un-ionized Ammonia Criteria	
Acute (1-hour) Un-ionized Ammonia Criterion (ug NH3/L)	181.1
Chronic (4-day) Un-ionized Ammonia Criterion (ug NH3/L)	22.1
3. Total Ammonia Criteria:	
Acute Total Ammonia Criterion (mg NH3+ NH4/L)	13.6
Chronic Total Ammonia Criterion (mg NH3+ NH4/L)	1.7
4. Total Ammonia Criteria expressed as Nitrogen:	
Acute Ammonia Criterion as mg N	11.2
Chronic Ammonia Criterion as N	1.36

REASONABLE POTENTIAL CALCULATION

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

CALCULATIONS

Parameter	Metal Criteria Translator as decimal Acute	Metal Criteria Translator as decimal Chronic	Ambient Concentration (metals as dissolved) ug/L	State Water Quality Standard Acute ug/L	State Water Quality Standard Chronic ug/L	Max concentration at edge of... Acute Mixing Zone ug/L	Max concentration at edge of... Chronic Mixing Zone ug/L	LIMIT REQ'D?	Effluent percentile value	Pn	Max effluent conc. measured (metals as total recoverable) ug/L	Coeff Variation CV	s	# of samples n	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor	COMMENTS
AMMONIA total -see seperate spreadsheets for FW criteria			60.00	11200.00	1360.00	3111.79	396.10	NO	0.95	0.990	11600.00	0.66	0.60	300	0.66	3	23	acute/hardness 65 mg/L
CHROMIUM(HEX) 18540299	0.982	0.962	0.7000	15	10	5.71	1.24	NO	0.95	0.688	7.09	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
NICKEL - 7440020 9M - Dependent on hardness	0.998	0.997	2.2400	983.12	109.18	2.87	2.31	NO	0.95	0.688	2.0100	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
COPPER - 744058 6M Hardness dependent	0.996	0.996	0.5900	11.34	7.86	5.72	1.15	NO	0.95	0.688	7.0900	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
ZINC- 7440666 13M hardness dependent	0.996	0.996	0.7200	79.45	72.55	36.28	4.64	NO	0.95	0.688	47.4000	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
ARSENIC (dissolved) 7440382 2M	1.00	1.00	0.4400	360	190	0.95	0.50	NO	0.95	0.688	0.9000	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
ARSENIC (inorganic)			0.4200	360	190	0.99	0.48	NO	0.95	0.688	0.9700	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
SELENIUM 7782492 10M				20	5			NO	0.95	0.688		0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
CADMIUM - 7440439 4M Hardness dependent	0.943	0.943		2.32	0.75	0.08	0.01	NO	0.95	0.688	0.1100	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
SILVER - 7740224 11M dependent on hardness.	0.85			1.64	NA	0.06	NA	NO	0.95	0.688	0.1000	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
LEAD - 7439921 7M Dependent on hardness	0.466	0.466	0.0500	40.28	1.57	0.19	0.07	NO	0.95	0.688	0.4600	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
MERCURY 7439976 8M	0.85		0.0012	2.10	0.012	0.00	0.00	NO	0.95	0.688	0.0027	0.60	0.55	8	1.90	3	23	acute/hardness 65 mg/L
AMMONIA total -see seperate spreadsheets for FW criteria			60.00	11200.00	1360.00	3111.79	396.10	NO	0.95	0.990	11600.00	0.66	0.60	300	0.66	3	23	chronic/hardness 38.3 mg/L
CHROMIUM(HEX) 18540299	0.982	0.962	0.7000	15	10	5.71	1.24	NO	0.95	0.688	7.09	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
NICKEL - 7440020 9M - Dependent on hardness	0.998	0.997	2.2400	628.45	69.79	2.87	2.31	NO	0.95	0.688	2.0100	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
COPPER - 744058 6M Hardness dependent	0.996	0.996	0.5900	6.89	5.00	5.72	1.15	NO	0.95	0.688	7.0900	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
ZINC- 7440666 13M hardness dependent	0.996	0.996	0.7200	50.75	46.34	36.28	4.64	NO	0.95	0.688	47.4000	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
ARSENIC (dissolved) 7440382 2M	1.00	1.00	0.4400	360	190	0.95	0.50	NO	0.95	0.688	0.9000	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
ARSENIC (inorganic)			0.4200	360	190	0.99	0.48	NO	0.95	0.688	0.9700	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
SELENIUM 7782492 10M				20	5			NO	0.95	0.688		0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
CADMIUM - 7440439 4M Hardness dependent	0.943	0.943		1.31	0.51	0.08	0.01	NO	0.95	0.688	0.1100	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
SILVER - 7740224 11M dependent on hardness.	0.85			0.66	NA	0.06	NA	NO	0.95	0.688	0.1000	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
LEAD - 7439921 7M Dependent on hardness	0.466	0.466	0.0500	22.40	0.87	0.19	0.07	NO	0.95	0.688	0.4600	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L
MERCURY 7439976 8M	0.85		0.0012	2.10	0.012	0.00	0.00	NO	0.95	0.688	0.0027	0.60	0.55	8	1.90	3	23	chronic/hardness 38.3 mg/L

WATER QUALITY BASED
PERMIT LIMIT CALCULATIONS

Dilution (Dil'n) factor is the inverse of the percent effluent concentration at the edge of the acute or chronic mixing zone.

This spreadsheet calculates water quality based permit limits based on the two value steady state model using the State Water Quality standards contained in WAC 173-201A. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 99. Last revision date 9/98. Written by G. Shervey

	Permit Limit Calculation Summary										Waste Load Allocation (WLA) and Long Term Average (LTA) Calculations							Statistical variables for permit limit calculation				
PARAMETER	Acute Dil'n Factor	Chronic Dil'n Factor	Metal Criteria Translat or Acute	Metal Criteria Translat or Chronic	Ambient Concentr ation ug/L	Water Quality Standard Acute ug/L	Water Quality Standard Chronic ug/L	Average Monthly Limit (AML) ug/L	Maximum Daily Limit (MDL) ug/L	Comments	WLA Acute ug/L	WLA Chronic ug/L	LTA Acute ug/L	LTA Chronic ug/L	LTA Coeff. Var. (CV) decimal	LTA Prob'y Basis decimal	Limiting LTA ug/L	Coeff. Var. (CV) decimal	AML Prob'y Basis decimal	MDL Prob'y Basis decimal	# of Samples per Month n	
AMMONIA - total	3	23			60.00	11200.00	1360.00	12587.7	32086.4		27910	29570.00	9493.0	16207.4	0.56	0.99	9493.0	0.66	0.95	0.99	13.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00
															0.60	0.99		0.60	0.95	0.99	4.00	1.00

APPENDIX G

WWTF AERATION ENERGY ANALYSIS

March 26, 2012

Mr. John Akers, P.E.
Public Works Director
City of Ellensburg
501 North Anderson Street
Ellensburg, Washington 98926

SUBJECT: WWTF AERATION ENERGY ANALYSIS
CITY OF ELLENSBURG, KITTITAS COUNTY, WASHINGTON
G&O #10062.00

Dear Mr. Akers:

According to the City's Wastewater Treatment Facility Engineering Report, in order to maintain the current *permitted* capacity the City would need to add aeration capacity. As an alternative to additional surface aerators the Engineering Report proposed the use of fine bubble air diffusion. The purpose of this letter is to provide additional analysis of the energy costs related to operating surface aerators versus blowers and fine bubble diffusers. Energy usage calculations are based on *average annual* values rather than maximum month values, therefore, these life cycle energy costs are based on *average annual* flows and loadings and not the permitted maximum month capacity.

Presently the City operates eight floating surface aerators approximately 52 percent of the time to achieve nitrification and meet the City's NPDES permit discharge limits. As an alternative to additional surface aerators, the Engineering Report proposed the use of fine bubble air diffusion. Fine bubble air diffusion is a subsurface form of aeration in which air is introduced in the form of very small bubbles that provide more bubble surface area per unit volume and therefore greater oxygen transfer efficiency. The blower and fine bubble diffuser option would include the installation of a grid of fine bubble diffusers in each basin, air pipe header and laterals, and new blowers.

Surface aeration is less efficient than diffused air because the oxygen transfer is less effective. In addition, when running, surface aerators must operate at 100 percent speed because the only control is the manually adjusted on-off operation timer. This means that surface aerators cannot precisely be controlled to supply oxygen in response to diurnal fluctuations in the influent load. On the other hand, the oxygen supply from a diffused air system can be precisely controlled by using a dissolved oxygen (DO) sensor and a variable frequency drive (VFD) to automatically adjust the blower motor speed. Based on the signal from the DO sensor, the VFD changes the blower motor speed as the plant load and oxygen demand changes, resulting in a more efficient aeration system. Therefore, the diffused air system saves energy by employing a more effective oxygen transfer mechanism and by more closely matching the energy use to the process demand.

Based on historical data from 2006-2010 the current *average annual* oxygen demand is approximately 438 lbs/hour. Based on this oxygen demand, the City operates the surface aerators 52 percent of the time. This results in an average energy usage of 1,223,334 kilowatt-hour per year (kWh/yr). At a cost of $0.0567 per kWh this usage results in a total cost of $69,559 per year. This is 47 percent of the total energy cost at the WWTF, which is approximately $147,000 per year.

Calculations were performed to determine the projected average annual oxygen demand in five years (2017), the demand in the planning year 2031 and when the surface aerators are running 100 percent of the time. Table No. 1 shows the annual energy costs related to aeration for both the surface aerators and the fine bubble diffusers based on the oxygen demands calculated. At current flows and loadings the more efficient fine bubble diffusers and blowers result in an energy savings at the WWTF of $42,000 annually, or approximately 28 percent of the total WWTF energy cost.

Table 1
Annual Energy Costs for Aeration

	Annual Cost			
Option	**Current**	**2017**	**2031**	**100% On(1)**
Surface Aerators(2)	$70,000	$79,000	$113,000	$133,000
Blowers/Diffusers	$28,000	$32,000	$45,000	$56,000
Annual Savings	**$42,000**	**$47,000**	**$68,000**	**$77,000**

(1) This calculation is based on the existing surface aerators operating 100 percent of the time and the fine bubble diffuser and blowers providing an equivalent oxygen capacity.
(2) The energy consumed by the surface aerators is based on the average annual oxygen demand and the current run time on (52%) and then estimated for the years 2017 and 2031.

The capital cost to install the additional surface aerators is estimated to be $650,000. The capital cost to install the fine bubble diffused air system is estimated to be $1,087,000. The City has stated that its Energy Services Department may have access to energy conservation rebate funds that may help offset the capital cost for the installation of the fine bubble diffusers.

Table 2 presents the 20-year present worth and the number of years for payback for the fine bubble diffused air option based on different rebate amounts. Any rebate over $437,000 would reduce the loan for the fine bubble diffused air system to the less than the loan required for the surface aerators and thus the payback would be instant even without annual energy savings. The calculations in Table 2 are based on the assumption that the City would pay for the capital project with a 20-year, 1% interest rate loan (standard PWTF) minus the rebate received, and that electricity costs would remain constant over the next 20 years at $0.0567 per kWh.

Table 2
20-Year Present Worth & Payback
Fine Bubble Diffused Air with Energy Conservation Rebates

Rebate Amount	20-Year Present[(1)]	Payback (years)[(2)]
$100,000	$1,272,000	8
$200,000	$1,088,000	6
$300,000	$905,000	4
$400,000	$721,000	0

(1) The 20-year present worth for the surface aerator option is $1,910,000.
(2) Number of years to pay back the difference in capital costs between the surface aerators and the fine bubble diffusion system ($1,087,000-$650,000 = $437,000).

Should you have any additional questions regarding energy savings or life cycle costs, please feel free to contact our office.

Very truly yours,

GRAY & OSBORNE, INC.

Nancy J. Morter, P.E.

NJM/msb
Encl.