CHAPTER 4

EXISTING FACILITIES

This chapter describes existing facilities within the City of Woodland wastewater collection and treatment systems. These facilities include pressure and gravity sewers, pump stations, the wastewater treatment plant, and river outfall.

WASTEWATER COLLECTION SYSTEM

LIFT STATIONS

The City of Woodland operates fourteen lift stations. Station locations and force main routes are shown on Figure 4-1. Currently, all flow passes through Lift Station 4, located on the southeast corner of Lewis River Road (State Route 503) and East C.C. Street, which pumps to the WWTF at 755 Sandalwood Road. Five stations, including Lift Station 4, are located on the east side of Interstate 5, and convey flow from the east side of Woodland generally southward. Lift Station 10, located on Dike Access Road on the west side of Interstate 5, conveys flow from the Dike Access Road area eastward under Interstate 5 on Dike Access Road and south along Old Pacific to Lift Station 4. The remaining eight stations are located on the west side of Interstate 5 and convey flow generally to Lift Station 3, which is located on the northeast corner of Goerig Street and Lakeshore Drive. Lift Station 3 pumps eastward on Lewis River Road to Lift Station 4. Valving is available to allow Lift Station 3 to pump directly into the Lift Station 4 force main, bypassing Lift Station 4, but is not currently used. A schematic showing how the pumps stations are linked is shown on Figure 4-2. In addition to the City lift stations, various commercial establishments maintain private lift stations that pump pretreated process effluent to the City collection system.

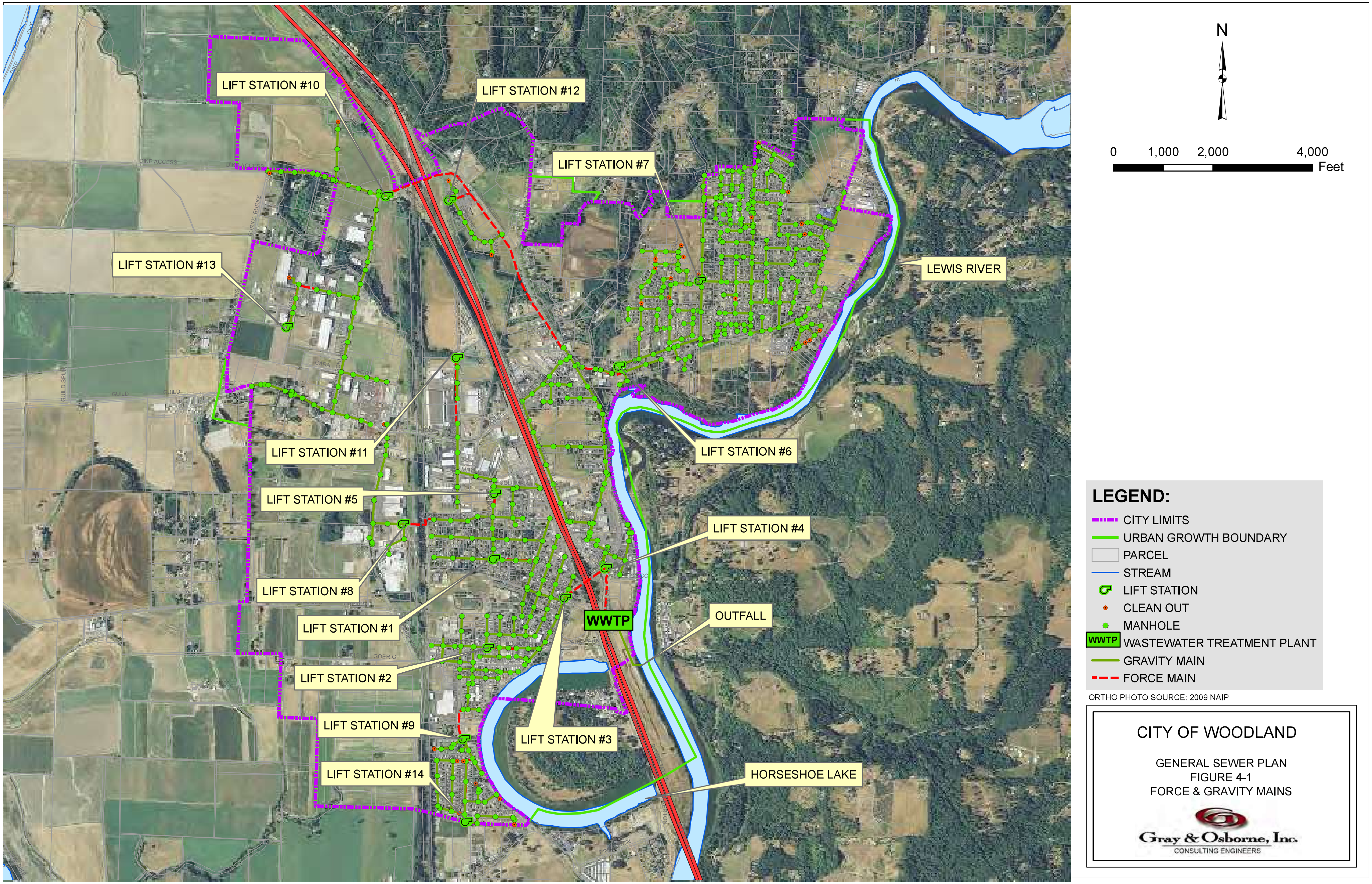
Basic information about the pumps and force mains is shown in Table 4-1. All of Woodland's lift stations are equipped with submersible pumps and all are duplex stations, except Lift Station 4, which is a triplex station. The City has standardized on Flygt submersible pumps and the only station that is not currently equipped with Flygt pumps is Lift Station 8, which has Paco submersibles.

Pump controls and associated utility service and telemetry are mounted in weather-tight enclosures on unsheltered racks at grade. Depending on the age of the station and space constraints, the physical layout of the equipment differs slightly, but the stations are generally similar. Stations generally consist of a wet well with rail-mounted submersible pumps, a discharge valve vault with check valve and isolation valve for each pump, and an unsheltered rack for electrical power, control, and telemetry equipment. Most stations are equipped with a bypass connection and valving to allow the pumps and/or wet well to be bypassed for maintenance or in an emergency. Most of the newer stations are equipped with security fencing, but fencing is not practical at the older stations due to location and site constraints.

All stations use MultiTrode pump controllers (MT2PC for duplex stations and MT3PC for Lift Station 4) to control the pumps, monitor wet well level and other station parameters, and furnish basis status information and alarms. Wet well levels are detected using the MultiTrode conductance probe, which detects levels in predetermined increments, typically 6 inches, across a range of ten increments. Each increment of level detection is independently hardwired, providing redundancy. Pump starters are either full-voltage non-reversing (FVNR) or soft starters, depending on motor size. None of the lift stations currently uses variable frequency drives to modulate pump speed. All stations are equipped with radio-based telemetry, which transmits limited alarm and status information to the main telemetry computer interface at the City's Operations Center on NW Lakeshore Drive.

The MultiTrode pump controllers monitor pump run time, pump starts, high wet well level, pump fail, pump seal fail, pump thermal overload, and three-phase power failure. High wet well level produces a local alarm, which typically consists of a red light and an audible alarm. The high wet well level alarm is transmitted to the Operations Center, which notifies on-duty personnel of the problem. Pump Run, Pump Fail, Pump Thermal Overload, Pump Seal Fail and 3-Phase Power Fail are displayed on the pump controller and also transmitted to the Operations Center. Operators must visit the station to manually record pump run time data. City personnel visit the stations, typically twice weekly, to check on equipment and log run time, pump starts, and other pertinent information.

All stations are equipped with plugs and a manual transfer switch arrangement to allow the use of portable generators in the event of a power failure. The City has one larger portable generator that is sized to operate Lift Station 4 and is generally assigned to Lift Station 4 in an emergency, due to its critical position in the conveyance network. The City also has two smaller portable generators. One of the smaller generators is typically assigned to Lift Station 3 due to its central location and the other is moved between other affected lift stations as required.



CITY OF WOODLAND

GENERAL SEWER PLAN
FIGURE 4-1
FORCE & GRAVITY MAINS

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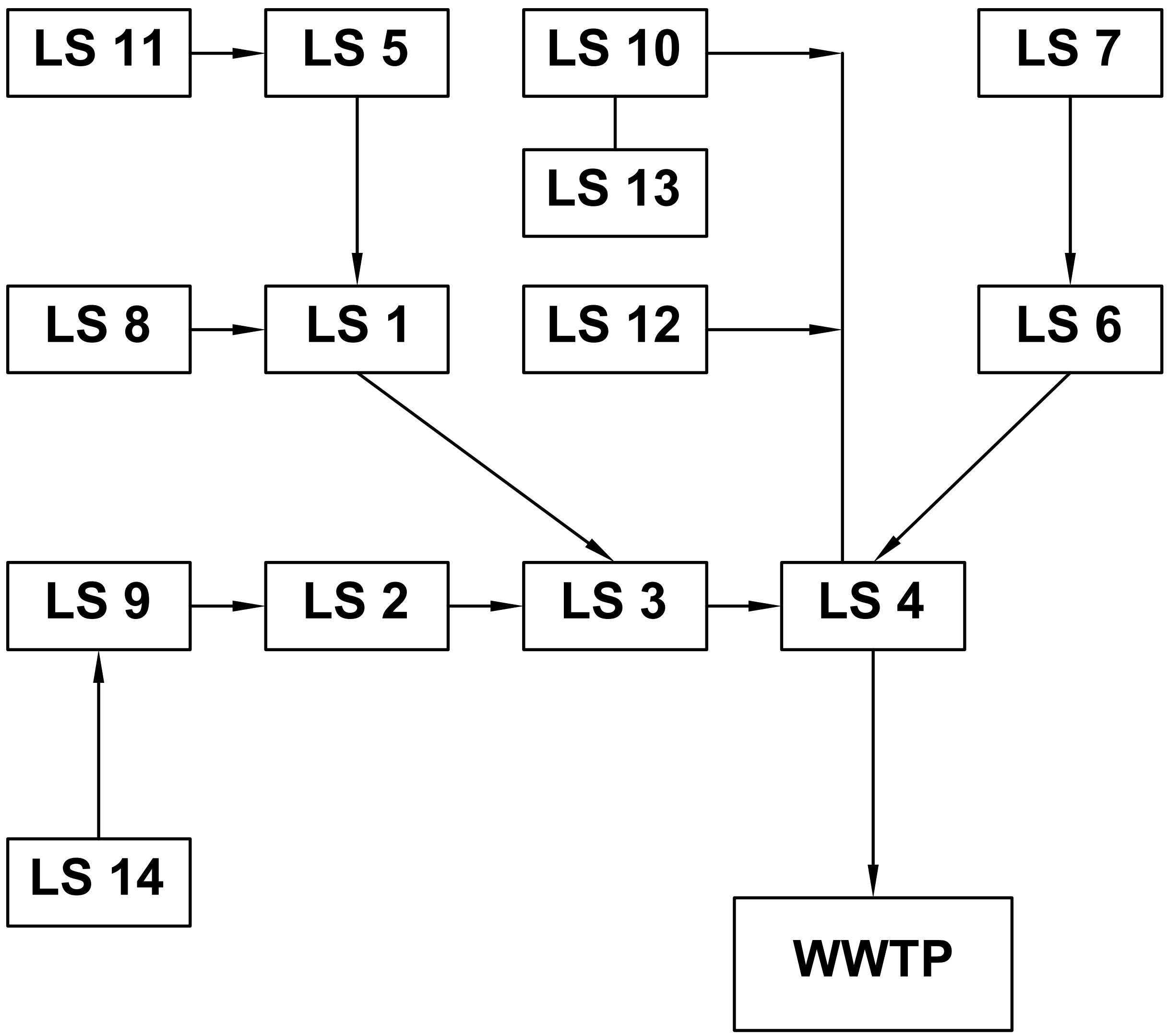

CITY OF WOODLAND

GENERAL SEWER PLAN

FIGURE 4-2

LIFT STATION FLOW SCHEMATIC

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TABLE 4-1

Lift Stations and Force Mains

Pump Station	Location	Basin No.	Qty. of Pumps	Pump Mfr.	Pump Motor Size (hp)	Pump Capacity Each (gpm)	Total Station Capacity (gpm)	TDH (ft)
Lift Station 1	554 C.C. Street	1	2	Flygt	7.5	275[(1)]	275	27[(2)]
Lift Station 2	386 Bozarth Avenue	2	2	Flygt	5	250[(1)]	250	35[(2)]
Lift Station 3	906 Goerig Street	3	2	Flygt	7.5	330[(1)]	330	43[(2)]
Lift Station 4	1013 Lewis River Road	4	3	Flygt	20	425[(3)]	850	57[(3)]
Lift Station 5	1390 Glenwood	5	2	Flygt	3	220[(1)]	220	26[(2)]
Lift Station 6	1709 Lewis River Road	6	2	Flygt	7.5	345[(4)]	345	42[(4)]
Lift Station 7	300 Insel Road	7	2	Flygt	5	300[(1)]	300	26[(2)]
Lift Station 8	348 North Pekin Road	8	2	Paco	5	200[(2)]	200	38[(2)]
Lift Station 9	108 South Pekin Road	9	2	Flygt	5	300	300	30
Lift Station 10	1481 Dike Access Road	10	2	Flygt	7.5	170[(4)]	170	52[(4)]
Lift Station 11	755 Down River Drive	11	2	Flygt	3	250[(5)]	250	16[(5)]
Lift Station 12	1931 Belmont Loop	12	2	Flygt	10	290[(4)]	290	63[(4)]
Lift Station 13	1775 Howard Way	13	2	Flygt	2.4	250[(2)]	250	--[(6)]
Lift Station 14	250 Raspberry Lane	14	2	Flygt	5	135[(2)]	135	--[(6)]

(1) Data from 1999 General Sewer and Facility Plan.
(2) Data provided by City.
(3) Duplex capacity estimated from WWTP influent flow data; corresponding TDH estimated from pump curve.
(4) Average pump capacity from PS6 Capacity Analysis [Olsen Engineering, 2014] drawdown test data; corresponding TDH estimated from pump curve.
(5) Data from approved 1997 submittal.
(6) Impeller curve information consistent with stated performance was not available.

COLLECTION SYSTEM

Gravity sewer lines in downtown Woodland were first constructed in the 1950s and are mainly constructed of 8-inch concrete pipe. Much of this original sewer pipe is still in place today. As the City has grown and replaced pipe, PVC pipe has been installed to reduce infiltration and improve the condition of the sanitary sewer system. In 2013, 13,521 feet of concrete mains and 3,959 feet of transite mains were relined and 257 feet of main was replaced with PVC.

Figure 4-1 shows the existing sewer system. Wastewater is discharged to the City's wastewater treatment facility, which has an outfall in the Lewis River. The sewer system service area is generally flat and gradually slopes toward the Lewis River, where the treatment facility is located. Most of the collection system consists of gravity sewers, which drain to pump stations, and force mains. The current system consists of 4-inch to 16-inch diameter pipe, constructed of concrete, PVC and transite.

A summary of the various pipe diameters within the City's gravity sewer system are provided in Table 4-2. This summary is an estimate based on review of as-built drawings, previous survey, and information provided by the City.

TABLE 4-2

Sewer Pipe Summary, Woodland Collection System

Pipe Diameter and Type	Length (feet)
4-inch Force Main	4,678
6-inch Force Main	9,510
8-inch Force Main	2,105
12-inch Force Main	116
4-inch Gravity	207
6-inch Gravity	1,790
8-inch Gravity	91,291
10-inch Gravity	10,780
12-inch Gravity	18,657
15-inch Gravity	3,589
16-inch Gravity	934
Unknown Diameter Gravity	2,213
Total	**145,870**

The Woodland sanitary sewer system contains a total of approximately 566 manholes. These manholes vary in construction material from all-brick to the newer precast concrete manholes. The older, all-brick and concrete block manholes present a greater opportunity for infiltration to occur, due to the mortar joints between the bricks or concrete blocks, than the newer precast manholes.

COLLECTION AREAS

For the purposes of this plan, the Woodland collection system is divided into a total of fourteen collection areas, or drainage basins. These collection areas predominantly follow the natural drainage patterns of the service area and each area drains to a pump station. The fourteen major basins are shown on Figure 4-3. The basin boundaries reflect developments and flow routing.

The following section describes the boundaries and land use designations of each basin as well as information about the sewer lines within each basin.

Basin 1

Basin 1 consists of an area of about 995 acres in downtown Woodland west of the Interstate 5 corridor. Basin 1 includes areas primarily designated for low-density residential use and small areas for high-density multifamily, medium-density residential, and highway commercial areas. Wastewater from this area flows by gravity to Lift Station 1, which conveys the wastewater into Basin 3 via 831 feet of force main. Basins 5 and 8 drain through Basin 1.

Basin 2

Basin 2 is located directly south of Basin 1 and consists of about 85 acres. Basin 2 includes areas designated for light industrial, low-density residential, high-density multifamily, and central business use. Wastewater from this basin flows into Lift Station 2, which conveys the wastewater into Basin 3 through approximately 566 feet of 6-inch force main. Basin 9 drains through Basin 2.

Basin 3

Basin 3 consists of an area of about 55 acres in downtown Woodland, between Basins 1 and 2. Basin 3 includes areas designated for low-density residential, high-density multifamily, highway commercial, and central business use. Wastewater from this basin flows into Lift Station 3, which conveys the wastewater into Basin 4 through approximately 1,021 feet of force main. Basins 1 and 2 drain through Basin 3.

Basin 4

Basin 4 is located between the Lewis River and Interstate 5 and consists of an area of about 140 acres. Basin 4 includes areas primarily designated for highway commercial use with smaller areas for low-density residential, high-density multifamily, and light industrial use. Wastewater from this area flows by gravity to the east into Lift Station 4, which conveys the wastewater to the WWTF through approximately 1,084 feet of force main. All wastewater from the City flows through Basin 4. Flows from Basins 3, 6, 10 and 12 flow directly into Basin 4.

Basin 5

Basin 5 consists of an area of about 91 acres north of Basin 1 and west of Interstate 5. Basin 5 includes areas designated for light industrial and highway commercial use. Wastewater from this area flows by gravity to Lift Station 5 and is then pumped into Basin 1 via 264 feet of force main. Flows from Basin 11 drain into Basin 5.

Basin 6

Basin 6 consists of an area of about 85 acres and is located in northeast Woodland. Basin 6 has varied zoning and land use; it has areas designated for high-density multifamily, light industrial, low-density residential, and medium-density residential use. Wastewater from this area flows by gravity to Lift Station 6 and is then pumped into Basin 4 via 957 feet of force main. Flows from Basin 7 drain into Basin 6.

Basin 7

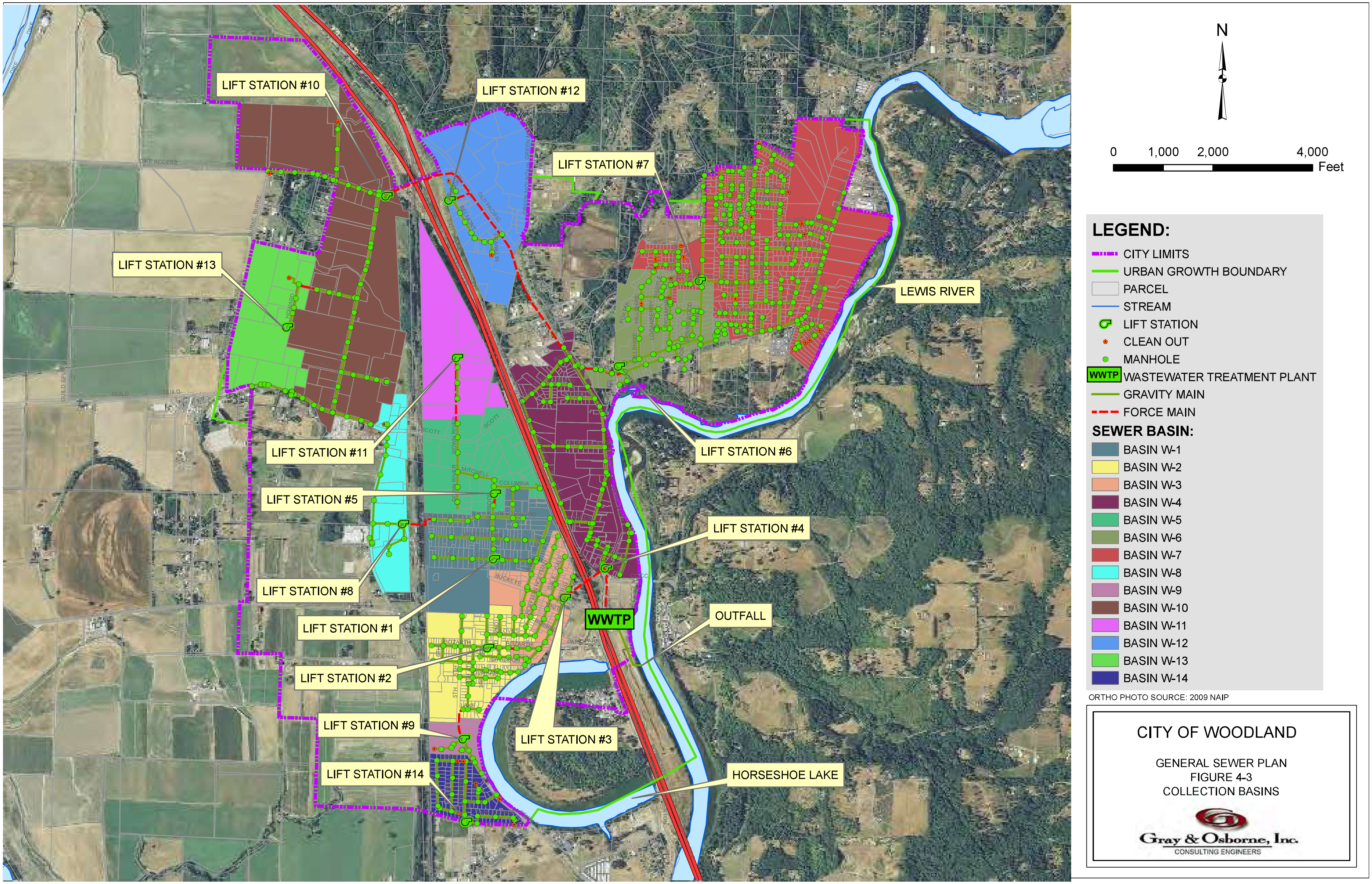
Basin 7 consists of an area of about 296 acres and is located in northeast Woodland. Basin 7 includes areas primarily designated for low-density residential use. Wastewater from this area flows by gravity to Lift Station 6, which conveys the wastewater into Basin 6 via 129 feet of 6-inch steel force main. No other basins drain into Basin 7.

Basin 8

Basin 8 consists of an area of about 58 acres in west Woodland. Basin 8 includes areas designated for light industrial use only. Wastewater from this area flows by gravity to Lift Station 8, which conveys the wastewater into Basin 1 via 721 feet of force main. No other basins drain into Basin 8.

Basin 9

Basin 9 consists of an area of about 17 acres in southeast Woodland. Basin 9 includes areas primarily designated for high-density multifamily and low-density residential use. Wastewater from this area flows by gravity to Lift Station 9, which conveys the wastewater into Basin 2 via 686 feet of force main. Basin 14 drains into Basin 9. The Walt's Meats force main also discharges into Basin 9.


LIFT STATION #10
LIFT STATION #12
LIFT STATION #7
LIFT STATION #13
LEWIS RIVER
LIFT STATION #11
LIFT STATION #6
LIFT STATION #5
LIFT STATION #4
LIFT STATION #8
LIFT STATION #1
WWTP
OUTFALL
LIFT STATION #2
LIFT STATION #9
LIFT STATION #3
LIFT STATION #14
HORSESHOE LAKE
N
0 1,000 2,000 4,000 Feet
LEGEND:
CITY LIMITS
URBAN GROWTH BOUNDARY
PARCEL
STREAM
LIFT STATION
CLEAN OUT
MANHOLE
WWTP WASTEWATER TREATMENT PLANT
GRAVITY MAIN
FORCE MAIN
SEWER BASIN:
BASIN W-1
BASIN W-2
BASIN W-3
BASIN W-4
BASIN W-5
BASIN W-6
BASIN W-7
BASIN W-8
BASIN W-9
BASIN W-10
BASIN W-11
BASIN W-12
BASIN W-13
BASIN W-14
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CITY OF WOODLAND
GENERAL SEWER PLAN
FIGURE 4-3
COLLECTION BASINS
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Basin 10

Basin 10 consists of an area of about 283 acres in northwest Woodland. Basin 10 includes areas designated for industrial, commercial, and the new high school. Wastewater from this area flows by gravity to Lift Station 10, which conveys the wastewater into Basin 4 via 5,636 feet of 6-inch HDPE force main. Basin 13 drains into Basin 10.

Basin 11

Basin 11 consists of an area of about 86 acres in north Woodland. Basin 11 includes areas designated for light industrial use only. Wastewater from this area flows by gravity to Lift Station 11, which conveys the wastewater into Basin 5 via 1,337 feet of force main. No other basins drain into Basin 11.

Basin 12

Basin 12 consists of an area of about 123 acres in north Woodland. Basin 12 includes primarily highway commercial designated use with a small area for medium-density residential use. Wastewater from this area flows by gravity to Lift Station 12, which conveys the wastewater into Basin 4 via 442 feet of 6-inch HDPE force main. Basin 13 drains into Basin 12.

Basin 13

Basin 13 consists of an area of about 85 acres in west Woodland. Basin 13 includes areas designated for light industrial use only. Wastewater from this area flows by gravity to Lift Station 13, which conveys the wastewater into Basin 12 via 1,270 feet of 4-inch PVC force main. No other basins drain into Basin 13. At the west end of Guild Road are several dry manholes. This project was designed for these manholes to either run by gravity north to Lift Station 13 or have a new lift station installed which would pump into a manhole on Guild Road that drains into Lift Station 10.

Basin 14

Basin 14 consists of an area of about 38 acres in south Woodland. Basin 14 includes areas primarily designated for low-density residential use. Wastewater from this area flows by gravity to Lift Station 14, which conveys the wastewater into Basin 9 via 1,399 feet of 4-inch PVC force main. No other basins drain into Basin 14.

WASTEWATER TREATMENT PLANT

HISTORY

A wastewater treatment plant was first constructed at the current WWTP site in 1954. The original system consisted of a 25-foot diameter clarifier-digester, a control building containing laboratory and chlorination equipment, and sludge drying beds. Major improvements to the plant were completed in 1974, including a new headworks with grit removal facilities, primary clarifier, two rotating biological contactors (RBCs), secondary clarifier, chlorine contact tank, aerobic digester, new chlorination system, sludge and effluent pumps, and sludge drying beds. In 1993, a submerged biological contactor (SBC) was added to the plant to increase capacity. In 1996, a new rotary fine screen was installed at the headworks and a new generator was installed.

The *1999 City of Woodland General Sewer and Facility Plan* (*1999 Sewer Plan*) recommended upgrades to the WWTP to accommodate the then-current and projected future influent flows and loadings which were approaching and exceeding design criteria and NPDES limits. At the direction of the City Council, the *1999 Sewer Plan* used an annual growth rate of 5.0 percent, based on an evaluation of growth rates, including peak growth in 1993 to 1998. As recommended in the *1999 Sewer Plan*, the following improvements were completed in 2001, converting the WWTP from an RBC/SBC plant to a sequencing batch reactor (SBR) plant:

1. A new headworks facility utilizing the existing Hycor screening equipment and new grit removal equipment.

2. Three SBR basins with associated aeration, mixing, decanting, and sludge wasting equipment.

3. A new ultraviolet disinfection system consisting of two 2.6 mgd closed conduit units.

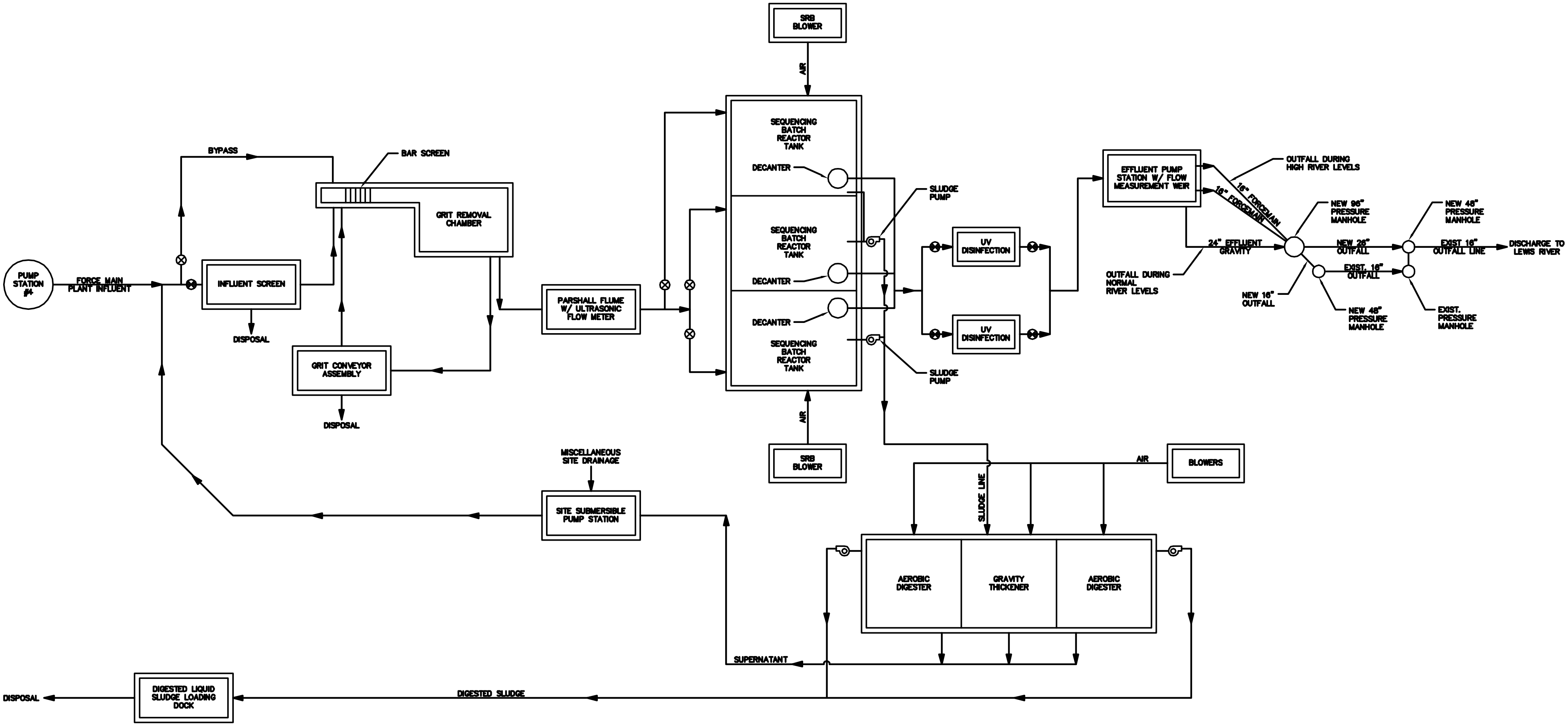
4. A new 100,000-gallon post equalization basin.

5. A new covered aerobic digestion facility consisting of two aerobic digester basins, a premix basin, and a gravity thickener.

6. A new laboratory building.

7. Upgraded effluent pump station and gravity discharge facilities.

8. Installation of new influent and effluent flow meters.



WWTP FLOW SCHEMATIC

NOT TO SCALE

CITY OF WOODLAND
GENERAL SEWER PLAN
FIGURE 4-4
WWTP FLOW SCHEMATIC

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CONSULTING ENGINEERS

9. Required modifications to the existing blower/control building to house new electrical control equipment and blower equipment for the SBRs and aerobic digesters.

CURRENT OPERATION

The following provides brief summary of the WWTP and its current operation. Figure 4-4 shows a schematic of the major components of the WWTP. More detail on the current operation and design and recommended improvements are provided in Chapter 7, Wastewater Treatment Plant Analysis.

Influent flow is screened using a mechanical screen and degritted using a cyclonic grit removal chamber with a grit concentrator. The influent screen is a rotary mechanical screen (Hycor Heliseive) consisting of a stainless steel screening drum and a screw-type conveyor that conveys screenings to a compacting chamber, where the screenings are dewatered and deposited into a dumpster for landfill disposal. Flow is monitored by a Parshall flume with an ultrasonic flow meter. The flow is split to enter one of the two operating SBRs. At current flows and loadings, the third SBR is typically in standby status. The rated treatment plant capacity includes the third basin, however, the City has never used the third SBR basin. Table 4-3 summarizes the design capacity of the WWTP with two and three basins in operation.

Sequencing batch reactors utilize an activated sludge process designed to operate in a true batch mode with aeration and sludge settlement both occurring in the same tank. The major differences between SBR and a conventional continuous-flow, activated sludge system is that the SBR tank carries out the functions of equalization, aeration, and sedimentation in a time sequence rather than in the conventional space sequence of continuous-flow systems. Each batch encounters a series of treatment steps in the same tank including anoxic fill, aerated fill, react (aeration), settle, decant and idle, with control by a programmable logic controller (PLC). Aeration is normally provided for the Woodland WWTP SBRs by four 50-horsepower blowers (with two 75-horsepower blowers on standby), and a grid of medium-bubble diffusers in each SBR tank.

TABLE 4-3

Design Data for Woodland Wastewater Treatment Plant

	2-Basin Operation	3-Basin Operation
Design Population	6,111	12,089
Average Dry Weather Flow (ADWF)	0.64 mgd	1.28 mgd
Average Wet Weather Flow (AWWF)	0.71 mgd	1.42 mgd
Average Annual Flow (AAF)	0.71 mgd	1.42 mgd
Maximum Monthly Flow (MMF)	1.01 mgd	2.02 mgd
Peak Daily Flow (PDF)	1.62 mgd	3.24 mgd

	2-Basin Operation	3-Basin Operation
BOD Loading	1,986 lb/d (372 mg/L @ ADWF)	3,720 lb/da (348 mg/L @ ADWF)
TSS Loading	2,071 lb/d (388 mg/L @ ADWF)	4,142 lb/d (388 mg/L @ ADWF)
Ammonia-N Loading	160 lb/d (30 mg/L @ ADWF)	320 lb/d (30 mg/L @ ADWF)

The secondary effluent decanted from the SBRs during the decant (clarifying) cycle is disinfected with ultraviolet light provided by two parallel in-line, high-intensity, medium-pressure units. The final effluent gravity flows to the river from a concrete basin that used to serve as the chlorine contact chamber. During high flows, the effluent must be pumped from the basin to the river. The effluent flow is measured at a weir in the basin and there is also an effluent monitoring station in the basin. The outfall consists of a 16-inch diameter concrete pipe with a single 16-inch diameter port that ends approximately 60 feet into the river and is embedded in a concrete footing.

Solids removed from the SBRs are treated in a pair of aerobic digesters and a gravity thickener. The digesters were sized to meet the criteria for Class B pathogen reduction using the "time-temperature" method of 40 days mean cell residence time (MCRT) at a minimum temperature of 20 degrees C. After the sludge has been adequately stabilized in the aerobic digesters, it can be pumped to the sludge dewatering equipment or to a sludge truck for disposal in liquid form. The final biosolids are treated to Class B standards and are hauled away in liquid form to a nearby site which has a permit from Ecology to land apply the biosolids.

Grit, rags, scum, and screenings are drained and disposed of as solid waste at the local solid waste transfer station.

NPDES PERMIT

NPDES effluent limits for the Woodland WWTP are presented in Table 4-4. The NPDES permit was issued on April 1, 2012, and expires on March 31, 2017.

TABLE 4-4

NPDES Permit Effluent Limits for Woodland WWTP
Permit WA0020401

Parameter	Average Month Limit[(1)]	Weekly Limit[(2)]
BOD_5	30 mg/L, 466 lb/d 85% removal (minimum)	45 mg/L, 700 lb/d
TSS	30 mg/L, 475 lb/d 85% removal (minimum)	45 mg/L, 711 lb/d
Fecal Coliform[(3)]	200/100 ml	400/100 ml
pH[(4)]	Daily Minimum ≥6 and Daily Maximum ≤9	
Parameter	**Average Monthly Limit**	**Maximum Day Limit[(5)]**
Total Ammonia (as NH_3-N)	The permittee must operate the facility to reduce the ammonia to the maximum extent practicable with existing equipment. [(6)]	

(1) The average monthly effluent limit means the highest allowable average of daily discharges over a calendar month. To calculate the discharge value to compare to the limit, you add the value of each daily discharge measured during a calendar month and divide this sum by the total number of daily discharges measured.

(2) The average weekly discharge limitation means the highest allowable average of "daily discharges" over a calendar week, calculated as the sum of all "daily discharges" measured during a calendar week divided by the number of "daily discharges" measured during that week.

(3) Use geometric mean for average limits. Ecology gives directions to calculate this value and 85 percent removal in Publication 04-10-020, *Information Manual for Treatment Plant Operators*, available on their Web site.

(4) Indicates the range of permitted values. The permittee must report the instantaneous maximum and minimum pH monthly. Do not average pH values.

(5) The maximum daily effluent limit is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For other units of measurement, the daily discharge is the average of the pollutant measured over the day. This does not apply to pH.

(6) Performance to date has resulted in low effluent ammonia levels and no reasonable potential to violate water quality standards at the edge of the authorized mixing zone. A change in performance could trigger the reopening of this permit to include numerical limits for ammonia, copper, and zinc.