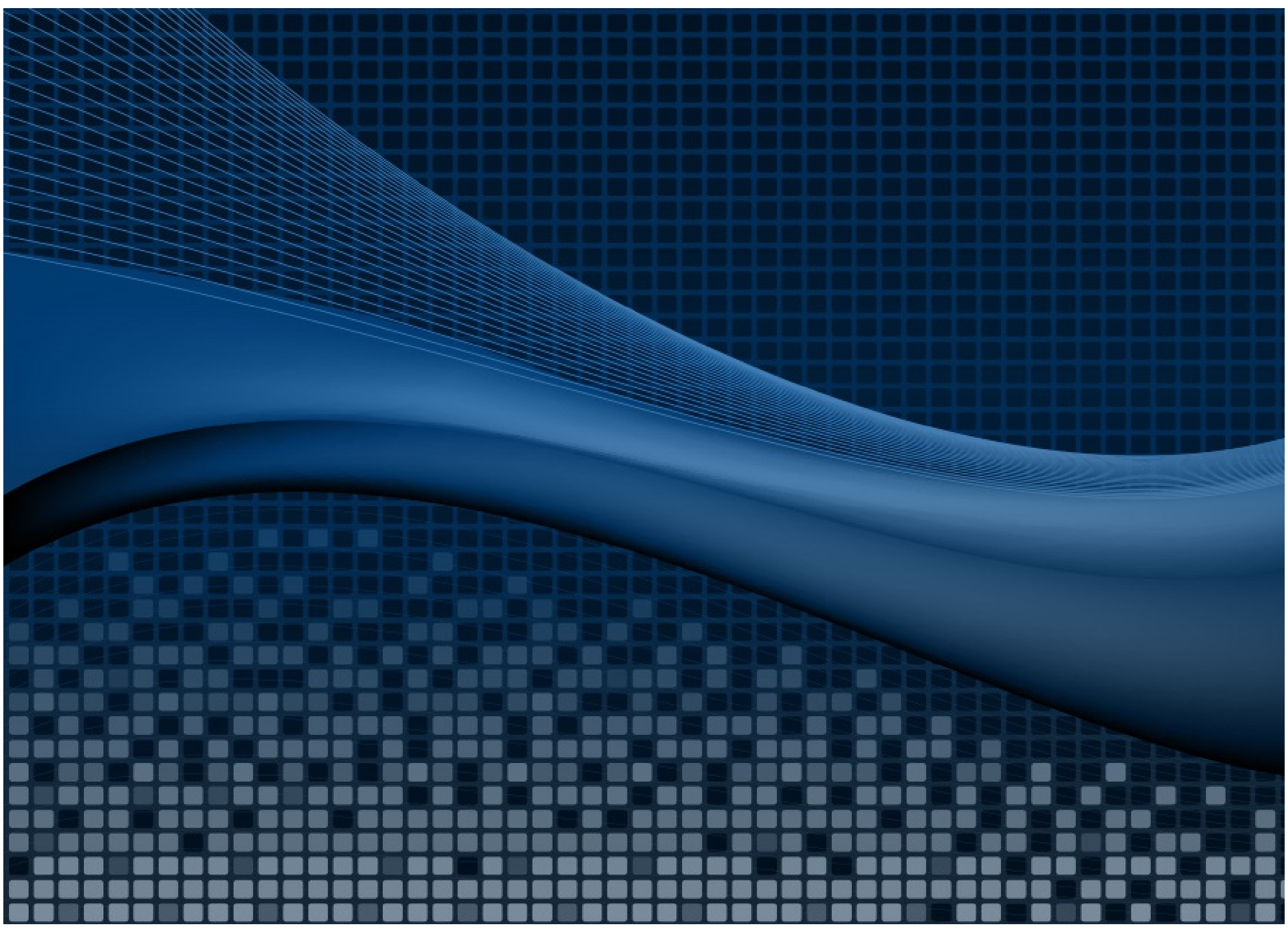
City of Gervais

Wastewater Facilities Plan

Final



TETRA TECH

July 2019

Wastewater Facilities Plan

July 2019

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Tetra Tech Project #200-12578-18001

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ABBREVIATIONS

Abbreviation	Definition
AAF	Average annual flow
ADWF	Average dry-weather flow
AWWF	Average wet-weather flow
BOD	Biochemical oxygen demand
CDBG	Community Development Block Grant
CFR	Code of Federal Regulations
CWSRF	Clean Water State Revolving Fund
DEQ	Oregon Department of Environmental Quality
DMR	Discharge monitoring report
EPA	United States Environmental Protection Agency
ERU	Equivalent residential unit
GIS	Geographic information systems
gpcd	gallons per capita per day
gpm	Gallons per minute
HDPE	High density polyethylene
HP	Horsepower
I/I	Infiltration and inflow
kW	Kilowatt
mgd	Millions of gallons per day
mg/L	Milligrams per liter
MMDWF	Maximum-month dry-weather flow
MMWWF	Maximum-month wet-weather flow
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and maintenance
OSU	Oregon State University
PDF	Peak-day flow
PHF	Peak-hour flow
ppd	Pounds per day
PVC	Polyvinyl chloride
PWF	Peak-week flow
RD	Rural Development Administration
RDII	Rainfall-derived inflow and infiltration
SDC	System development charge
SPWF	Special Public Works Fund
TDH	Total dynamic head
TSS	Total suspended solids
UGB	Urban growth boundary

EXECUTIVE SUMMARY

The *City of Gervais Wastewater Facilities Plan* identifies needs through 2042 for the Gervais wastewater collection and treatment system, which has been in operation since 1965. The wastewater system currently serves areas within the city limits. Its service area for this facilities plan is defined as the area within the City's urban growth boundary (UGB). The projected population to be served within that service area by 2042 is 3,543 (as estimated by the Portland State University Center for Population Research).

EXISTING FACILITIES

Gervais wastewater facilities consist of a gravity sewer collection system, with two pump stations, conveying flows to a wastewater treatment plant that provides secondary treatment and disinfection. Treatment plant effluent is discharged to the Pudding River in winter and to a reuse site for irrigation of poplar trees in summer. There are no known on-site septic systems in the City. Figure ES-1 shows key facilities of the system.

Collection System

The existing collection system includes 17,000 feet of concrete pipe installed in 1965 and 13,000 feet of PVC pipe installed between 1994 and 2017 for new residential development. Significant components are as follows:

- The French Prairie Meadows Pump Station, which conveys all flow from the French Prairie Meadows and Willoria Estates developments and the commercial area at Douglas and Highway 99E
- The Fir Avenue Trunk Main, consisting of a northwest segment conveying flows from the portion of the city northwest of the Union Pacific Railroad and a southeast segment conveying flows from the portion of the city southeast of the railroad
- The 4th Street Pump Station, which receives all flow from the two trunk mains and discharges it via force main to the wastewater treatment plant.

Treatment Facilities

The treatment plant was originally installed in 1967, consisting at that time of two 3.5-acre facultative treatment lagoons. The plant was upgraded in 1981 with the addition of a holding lagoon for storing effluent, a disinfection system and an effluent pumping system. Further improvements in 2001 and 2002 included dredging and a complete rebuild of the treatment lagoons, new headworks and floating aerators, new disinfection and dechlorination equipment, effluent pumping and new submerged diffuser at the river discharge.

The plant is designed for discharge to the Pudding River during wet weather (November through April) and effluent reuse during dry weather (May through October) as irrigation for poplar trees. Significant existing treatment facilities are as follows:

- **Headworks**—The 4th Street Pump Station force main discharges at a headworks facility that includes a 1-inch bar screen for removal of debris and equipment for measuring flow and sampling the influent wastewater.

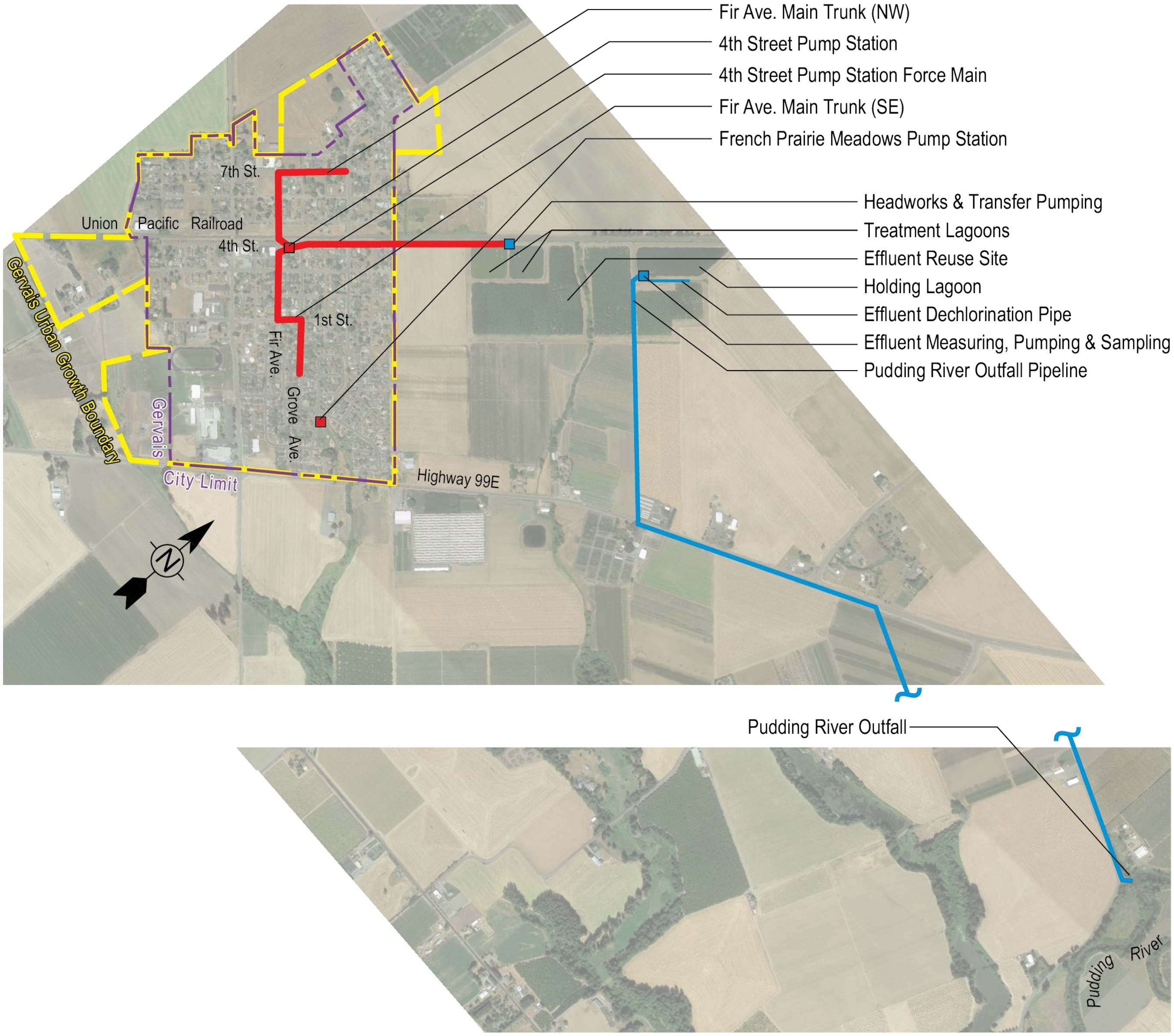

Figure ES-1. Existing Wastewater System

- **Treatment Lagoons**—The two treatment lagoons with floating aerators provide secondary treatment of the wastewater. Aerator controls are located in a control building adjacent to the headworks. Operators can direct influent to one or both treatment lagoons for either series or parallel operation. Both lagoons have a 60-mil polypropylene liner.
- **Transfer Pump Station**—A transfer pump station pumps clarified effluent from the treatment lagoons to the holding lagoon for storage.
- **Holding Lagoon**—The primary purpose of the holding lagoon is to provide buffering capacity to temporarily store peak flows and allow effluent to be discharged at controlled rates to either the river or the effluent reuse site.
- **Effluent Flow Measurement**—The flow of effluent discharged from the holding lagoon is measured in a meter vault upstream from the disinfection injection point.

- **Effluent Disinfection**—Effluent is continuously disinfected using sodium hypochlorite during discharge to both the river and the effluent reuse site. Discharge to the Pudding River also requires dechlorination. Disinfection occurs in 666 feet of 36-inch pipe.
- **Effluent Pumping**—Effluent pumps convey disinfected effluent from the holding lagoon to the Pudding River outfall during wet-weather months.
- **Effluent Sampling—**Effluent is collected and sampled at the effluent sampling manhole downstream of the chlorine contact time pipeline.
- **Pudding River Outfall**—The Pudding River outfall extends approximately one-third the distance across the Pudding River and is fitted with a 4-inch single-port diffuser. Concrete anchors hold the outfall in place and riprap guards it against erosion.
- **Effluent Reuse**—The City operates a 50-acre effluent reuse site based on irrigation of poplar trees. The irrigation system, discharges effluent on a rotating basis to 10 irrigation zones. The planting, harvesting and management of the trees is contracted out.
- **Sludge Storage and Biosolids Land Application**—In 2001, accumulated sludge was removed from the treatment lagoons and land-applied to the effluent reuse site. No dredging or biosolids land application activities have occurred since then.

Backup Power

Four generators provide backup power for the following wastewater facilities:

- French Prairie Meadows Pump Station—35-kW diesel with manual transfer switch
- 4th Street Pump Station—60-kW diesel with automatic transfer switch
- Headworks/Transfer Pumping—diesel with manual transfer switch; power output unknown
- Disinfection/Effluent Pumping—50-kW diesel with manual transfer switch

EXISTING SYSTEM PERFORMANCE

The collection system and treatment plant are generally performing as designed for the most recent upgrades in 2001 – 2002. No known sanitary sewer overflows have occurred since those improvements. The following deficiencies were identified in the evaluations performed for this facilities plan:

- **Collection System**—Computational analysis indicates that both segments of the Fir Avenue Trunk Main have the potential to experience surcharging during peak-hour flows.
- **Infiltration/Inflow**—Collection system infiltration and inflow (I/I) is not to the level where the hydraulic capacity of the treatment plant has been exceeded. However, the ratio of maximum wet-weather flows to average dry-weather flows—an indicator of I/I—has exceeded the level that U.S. Environmental Protection Agency (EPA) considers to be excessive.
- **Headworks Screening**—The headworks is not equipped with a fine screen, so solids smaller than 1 inch frequently enter the lagoons, requiring plant operators to more frequently take the aerators offline and remove them from the lagoons for cleaning.
- **Lagoon transfer pumping capacity**—During wet weather, the two transfer pumps are frequently called to run simultaneously. During extremely high flow conditions, the operator must also install a temporary portable pump for additional pumping capacity.
- **Effluent Storage and Discharge**—On three occasions it has been necessary to allow the holding lagoon water level to rise into the 2-foot freeboard zone. The effluent pumps that discharge to the river outfall sometimes are called on to run at maximum capacity for extended time to accommodate wet-weather flows.

- **Backup Power**—The backup power generator at the French Prairie Meadows Pump Station and the two generators at the treatment plant (headworks/transfer pumping and disinfection/effluent pumping) all use manual transfer switches. The headworks/transfer pumping generator is over 40 years old.

RECOMMENDED IMPROVEMENTS

In the evaluation of treatment plant improvements, four general approaches were initially considered:

- **No-Action**—Make no improvements to address identified deficiencies.
- **Upgrade Existing Facilities**—Improve existing facilities to provide adequate capacity and reliability for the planning period, while maintaining the current quality of treated effluent.
- **Provide Higher Level of Treatment**—Provide higher-quality effluent than produced by existing treatment facilities by replacing existing facilities with different technologies.
- **Regional Opportunities—**Combine the wastewater system with facilities of other nearby communities.

The no-action alternative was found not to be acceptable, as the identified plant deficiencies must be addressed. The higher-level-of-treatment alternative was rejected because no conditions have been identified that require more advanced treatment. Regional opportunities are impractical, as the closest large plant, owned by the City of Woodburn, is 6 miles away. Based on this assessment of general approaches, the only feasible approach is to upgrade existing facilities. The following improvements are proposed to meet existing needs and provide for future development over the planning period:

- Upsizing trunk mains in Fir Avenue, 7th Street, and 1st Street.
- French Prairie Meadows and 4th Street pump station backup power upgrades consisting of installing new automatic transfer switches.
- Treatment plant improvements consisting of:
    - Installation of an automatic fine screen within a new headworks structure
    - Upgrades to the lagoon transfer pumps
    - Aeration improvements in the treatment lagoons
    - Increased capacity of the holding lagoon from raising the dike
    - Dredging of the treatment lagoons, with biosolids applied to the reuse site
    - Effluent pumping system improvements
    - Chlorine contact system improvements.

CAPITAL IMPROVEMENT PLAN

The improvements have been combined into a capital improvement plan (CIP), as shown in Table ES-1. Project locations are shown on Figure ES-2.

The near-term treatment plant projects are necessary to meet current system demand and consequently should be constructed as soon as possible. The following are the key project milestones for the near-term improvement projects:

- Review of draft Facilities Plan complete: March 2019
- Facilities Plan finalized: June 2019
- Apply for construction funding: by September 2019
- Complete design: December 2020
- Bid the project: March 2021
- Construction: May 2020 to October 2021.

Table ES-1. Capital Improvement Plan

CIP Project	Cost
5-Year	
Lagoon Transfer Pumping and Force Main Upgrade	$820,000
Treatment Lagoon Aeration Improvements - Phase 1	$110,000
Effluent Pump System Improvements	$20,000
Standby Operation Improvements at Collection System Pump Stations	$50,000
5-Year Subtotal	*$1,000,000*
10-Year	
Headworks Fine Screen	$500,000
Holding Lagoon Improvements (Raise Dikes)	$390,000
Treatment Lagoon Dredging and Biosolids Land Application	$200,000
Upsize 8-inch Trunk Main in Fir Avenue (northwest) to 12-inch	$510,000
Upsize 8-inch Trunk Main in 7th St to 12-inch	$290,000
Upsize 8-inch Trunk Main in Fir Avenue (southeast) and 1st Street to 10-inch	$390,000
Treatment Lagoon Aeration Improvements - Phase 2	$210,000
10-Year Subtotal	**$2,490,000**
15 Year	
Chlorine Contact Improvements	$100,000
Treatment Lagoon Aeration Improvements - Phase 3	$210,000
15 Year Subtotal	**$310,000**
Total	**$3,800,000**

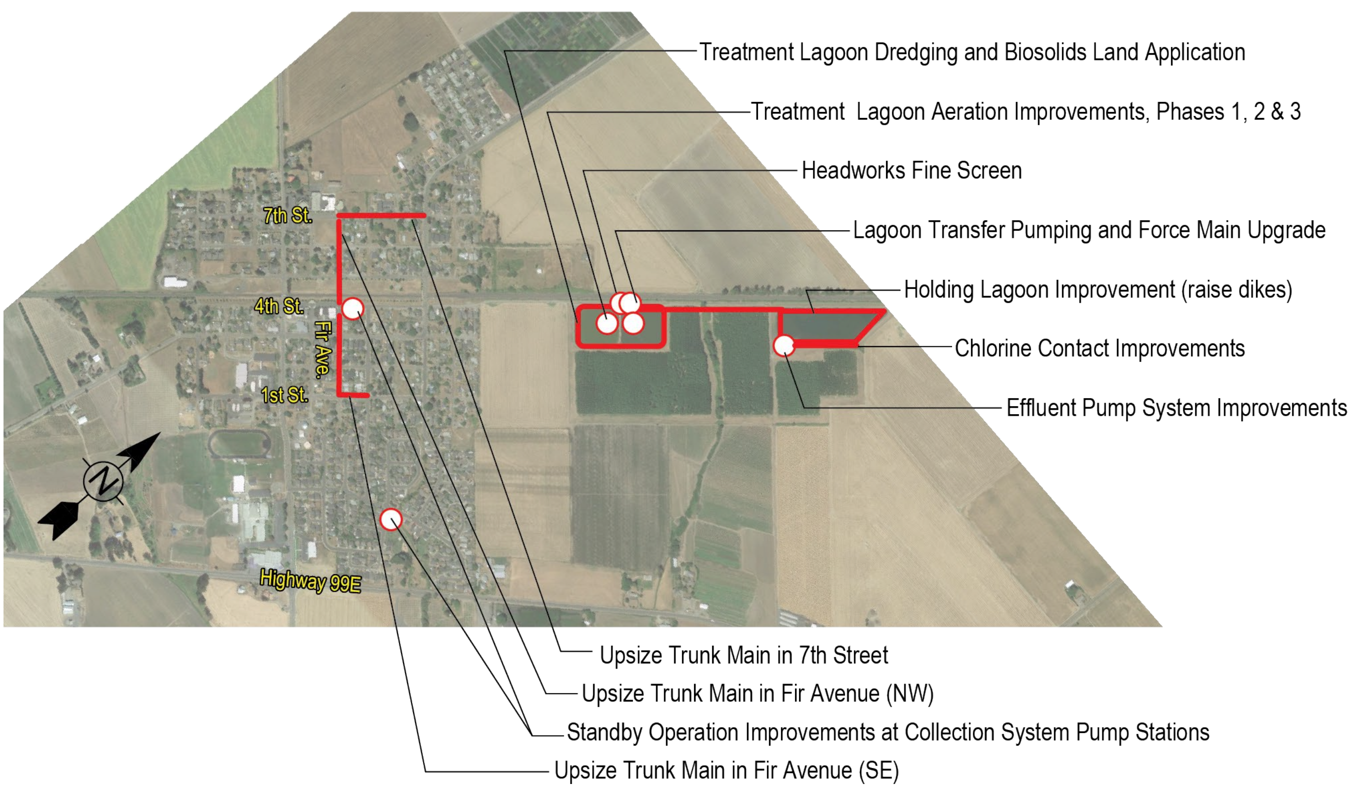

Figure ES-2. Location of Recommended Improvements

ANNUAL COSTS

The $266,000 estimated annual cost for FY-2018 administration and operation and maintenance will be the basis for ongoing annual costs, with adjustments for inflation. Should the City add staff, the operation and maintenance budget would need to be adjusted accordingly.

FINANCIAL PLAN

Wastewater system improvements may be financed by the City's wastewater user fees (rates), system development charges (SDCs), federal or state loan programs, grants, and bonds. SDCs can be used to fund improvements that are needed in order to accommodate future growth. For improvements needed to address existing deficiencies, the City will need to provide funding with a combination of user rate revenue and outside sources.

System Development Charges

SDCs are fees that local governments collect from property developers to offset the cost of public improvements associated with new development. They are one-time fees collected at the time of building permit issuance. The fees collected may only be used for specific capital improvements for municipal services. The current SDC in Gervais is $6,365 per single-family residence or equivalent dwelling unit (EDU). This was last updated in 2006.

The improvements recommended in this facilities plan were evaluated for SDC eligibility. For projects in which all or some of the cost is associated with improvement needed to accommodate future growth, the appropriate SDC rate is determined by allocating the growth-related portion of the cost among the anticipated number of future connections to be served. The results are presented in Table ES-2.

Table ES-2. Portion of Cost for Future Growth; Summary

Project	Cost	Portion for Future Growth	Cost for Future Growth
Lagoon Transfer Pumping Upgrade	$820,000	29.7%	$243,784
Treatment Lagoon Aeration Improvements - Phase 1	$110,000	100 %	$110,000
Holding Lagoon Capacity Improvements (Raise Dikes)	$390,000	100%	$390,000
Headworks Fine Screen	$500,000	29.7%	$148,649
Treatment Lagoon Dredging and Biosolids Land Application	$200,000	5.6%	$11,185
Effluent Pump System Improvements	$20,000	100%	$20,000
Upsize 8-inch Trunk Main in Fir Avenue (northwest) to 12-inch	$510,000	25.8%	$131,663
Upsize 8-inch Trunk Main in 7th Street to 12-inch	$290,000	42.0%	$121,913
Upsize 8-inch Trunk Main in Fir Avenue (southeast) and 1st Street to 10-inch	$390,000	4.9%	$18,975
Treatment Lagoon Aeration Improvements - Phase 2	$210,000	100%	$210,000
Chlorine Contact Improvements	$100,000	100%	$100,000
Treatment Lagoon Aeration Improvements - Phase 3	$210,000	100%	$210,000
Current SDC Budget Balance[a]			***($369,716)***
Total SDC Eligible Costs			**$1,716,169**
Cost per Future EDU			**$5,779**

a. The current balance shown represents SDC funds previously collected that have yet to be spent.
b. Cost per EDU is based on an assumed City growth of 232 EDUs by 2042. This is from the projected population growth of 955 divided by the Gervais average of 4.1 persons per EDU.

For the purposes of determining the SDC rates for multifamily and commercial/industrial zoning, 1 EDU is defined as 27 fixture units (per the current Uniform Plumbing Code), the number of fixtures for a typical single-family house. The number of fixture units per multifamily and commercial/industrial connection will be divided by 27 to determine its EDU total. According to the Uniform Plumbing Code, the standard number of fixtures for a two-bedroom, one-bathroom multifamily unit is 19 fixtures. Based on this, multifamily zoning is assumed to be 0.70 EDU per unit.

Sewer User Rates

Sewer user rates are monthly fees assessed to all users connected to the sewer system. The City currently has 630 single-family users and 18 commercial connections assessed at 18 EDUs, for a total of 648 EDUs. The City's current user rate is $37.00 per EDU per month, last increased in 2001. Based on this, the City's current annual revenue from user fees is $292,000. Current expenses (personnel services, material services and debt services) total $318,000. As current rates do not meet expenses, and with additional funding being needed for the CIP, a rate increase at the beginning of the 2019/2020 fiscal year is recommended. Based on estimates of annual expenses, existing and new debt service, and revenue through the planning period, the recommended base sewer rate for 1 EDU is $43.50 per month.

Each residential unit, regardless of zoning classification, is defined as one EDU. Recommended rates are as shown in Table ES-3. Funding for the second phase of improvements, scheduled for 2027, will require an annual rate increase of 3 percent with a 5 percent increase prior to the 2026/2027 fiscal year. Beyond 2027, the base rate per EDU should be increased annually to account for inflation, in accordance with the Portland Area Consumer Price Index for the preceding year. For the purpose of the analysis, the annual increase for inflation was estimated at 1.5 percent.

Table ES-3. Recommended Rates

User Classification	2019/2020 Monthly Rate
Residential Zoning	$43.50 per EDU for up to 750 cubic feet of water usage, plus the equivalent portion per EDU for each additional cubic foot of water used.
Commercial/Industrial	$43.50 per EDU for up to 1,500 cubic feet of water usage, plus the equivalent portion per EDU for each additional cubic foot of water used.

1. INTRODUCTION AND STUDY AREA DESCRIPTION

1.1 INTRODUCTION

This wastewater facilities plan for the City of Gervais reviews existing conditions in the City's wastewater system, identifies deficiencies, determines regulatory needs, identifies future requirements, evaluates alternatives, and recommends a plan for upgrading wastewater collection and treatment facilities. It addresses the capacity of collection facilities, the capacity of the wastewater treatment plant, Pudding River water quality issues, and financing for capital improvements, operation, maintenance, and equipment replacement.

The Gervais wastewater system has been in operation since 1965. The wastewater treatment plant was last upgraded in 2000 – 2002. The existing collection system and wastewater treatment plant are generally performing as designed at that time, although the current population of 2,570 exceeds the 2020 population projection of 2,168 that was used for the most recent improvements. No known sanitary sewer overflows have occurred since the improvements were completed in 2002.

The facilities plan evaluates system needs through a period ending 20 years after the first recommended improvement is implemented. For planning purposes, it is assumed that initial improvements will be completed in 2022, so the planning period extends through 2042, which is the design year for all identified improvements.

The City of Gervais contracted with Tetra Tech to update this wastewater facilities plan in conformance with regulations and guidelines of the Oregon Department of Environmental Quality (DEQ) and the Oregon Economic and Community Development Department.

1.2 SERVICE AREA

The City of Gervais is in Marion County, 2 miles south of the City of Woodburn and 16 miles north of the City of Salem along Highway 99E. Figure 1-1 is an aerial view of the City and its primary wastewater treatment facilities.

The wastewater treatment plant currently serves areas within the city limits. Its service area for this facilities plan is defined as the area within the City's urban growth boundary (UGB). A buildable lands inventory and land needs analysis, completed in 2015 as part of the update to the City's General Plan, found a need for new developable land and expansion of the UGB. Since then, the population projections that the analysis were based on have been significantly lowered. A new analysis using the revised population projections is necessary to justify any UGB expansion. As it is anticipated by the Mid-Willamette Valley Council of Governments that a new study will show there is sufficient undeveloped land within the current UGB. Therefore, this facilities plan uses the existing UGB in evaluations determining future system needs.

The City's wastewater collection system includes two pump stations: the 4th Street Pump Station and the French Prairie Meadows Pump Stations. To determine pump station capacity requirements, this facilities plan identified service areas for each pump station. The 4th Street Pump Station serves the City's entire service area. The French Prairie Meadows Pump Station serves only the French Prairie Meadows area, Willoria Estates developments and the commercial area at the northwest corner of Douglas Avenue and Highway 99E.

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City of Gervais
WASTEWATER FACILITIES PLAN

Figure 1-1.
CITY OF GERVAIS AND VICINITY

1.3 PHYSICAL ENVIRONMENT

1.3.1 Topography, Soils and Drainage

Gervais is in the central Willamette Valley, primarily surrounded by agricultural land, with elevations from 175 to 185 feet above sea level. The terrain within the UGB is characterized by flat slopes with poorly defined drainage patterns. There are five soil series found in the area: Amity, Concord, Woodburn, Willamette and Dayton. Most of the developed city is situated on Amity and Concord soils. These soils are characterized by a high water table, moderate or slow permeability and low shear strength for building foundations. The relatively impervious and level terrain promotes slow runoff and ponding during storm events.

The planning area generally drains to the northeast by pipe and Sam Brown Creek, a tributary of the Pudding River. The Pudding River is a tributary to the Molalla River, which is a tributary to the Willamette River.

1.3.2 Climate

The climate in Gervais is a modified marine climate typical of the mid-Willamette Valley. Temperature are relatively mild, rising above 90 ºF only 12 to 16 days per year. Freezing temperature occur about 60 days per year and low temperatures rarely reach 0 ºF.

Rainfall events typical of the study area are characterized by large, intermittent frontal storms that move in from the Pacific Ocean. High-intensity, short-duration events are uncommon. The average annual precipitation is 40 inches, approximately 95 percent of which falls from November through June.

Based on historical Oregon rainfall data showing relationships between rainfall depth and storm duration and frequency, as developed by the National Oceanic and Atmospheric Administration, the 24-hour rainfall depths shown in Table 1-1 were used for the analyses in this facilities plan.

Table 1-1. Rainfall Depths for 24-Hour Storm

Recurrence Interval (years)	Rainfall Depth (inches)
2	2.50
5	3.00
10	3.50
25	4.00
50	4.30
100	4.50

1.3.3 Water Resources

The City’s existing water system consists of two wells and well pumps, one treatment facility, two storage reservoirs, and the water distribution system. Based on the two existing city wells, the ground water depth is typically 140 to 145 feet, excluding areas of high water tables.

1.4 ECONOMIC CONDITIONS, LAND USE AND POPULATION

1.4.1 Economic Conditions and Trends

Gervais has a limited economy, with a small downtown area and several small industrial businesses. The city serves primarily as a bedroom community to larger cities such as Woodburn and Salem. Much of the employment for Gervais residents is in the agricultural production industry.

A DATAUSA profile for the City describes a median annual household income of $51,175, which is greater than the median annual household income for Marion County but less than the median annual household income for nearby cities of Woodburn and Silverton. The poverty rate in the city is at 16.2 percent. The median property value is $136,300 and homeownership is at 82 percent.

1.4.2 Zoning and Land Use

The City's General Plan, originally adopted in 1977, was most recently amended in 2015, for a planning period through 2034. The zoning map included in that report is shown in Figure 1-2. The current area in each zone is summarized in Table 1-2.

Table 1-2. UGB Zoning

Zoning Designation[a]	Vacant (acres)	Developed (acres)	Total
Residential District (R1/R2)	17.01	121.08	138.09
Light Industrial (IL)	8.67	4.5	13.17
Commercial General District (CG)	0.23	2.14	2.37
Commercial Retail District (CR)	3.53	0.45	3.98
Commercial/Light Industrial District (CR/IL)	0.0	0.50	0.50
Total			**158.11**

a. Table does not include public land or schools
Source: City of Gervais General Plan, 2015

A significant amount of property owned by the Gervais School District is shown as residential zoning on this map, although the school district property is indicated as public land on the City's Comprehensive Plan Map. For this facilities plan, the public land designation was used for these areas.

1.4.3 Population

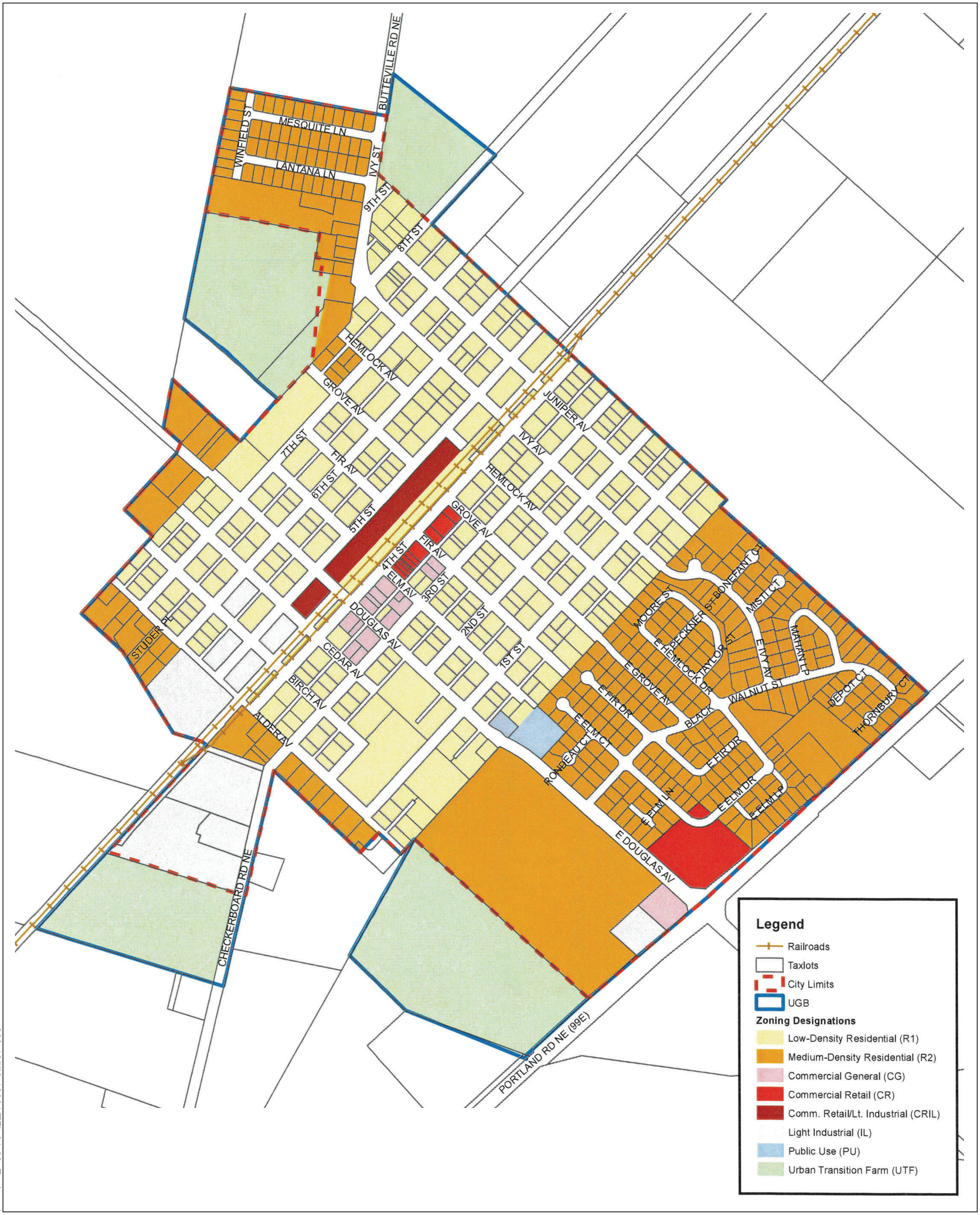
Since a local lumber mill closed in the 1950s, Gervais has been a bedroom community with most working residents commuting to Salem, Portland or Woodburn. Population change has been minimal, affected primarily by factors outside the community. The largest increase in population took place between 1990 and 2000 due to the development of two residential subdivisions—Winfield Ranch and French Prairie Meadows. Another subdivision developed in 2007 and localized infill development have led to further growth since 2000. Table 1-3 shows the City's historical population from 1970 through 2018 and the corresponding average annual growth rates.

Table 1-3. Historical Gervais Population Growth

	1970	1980	1990	2000	2010	2017
Population	746	799	992	2,009	2,464	2,570
Average Annual Growth Rate over Preceding 10 Years		0.8%	2.12%	7.31%	2.06%	0.6%

Source: U.S. Census Data and Portland State University Center for Population Research

As required by DEQ, the Portland State University Center for Population Research was consulted for projected population growth through the design year for this facilities plan (2042). These projections were recently updated and are now lower than the projections used for the City's amended 2015 General Plan. Table 1-4 shows the projected population and corresponding annual growth rates for the planning period. A 57-unit subdivision is currently in the planning stages, with possible start of construction in 2019. Beyond that, any significant increase in population would most likely require an expansion in the UGB.



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City of Gervais
WASTEWATER FACILITIES PLAN

Figure 1-2.
CITY OF GERVAIS ZONING

Table 1-4. Projected Population Growth

	2017	2020	2025	2030	2035	2040	2042
Population	2,570	2,781	2,996	3,175	3,346	3,494	3,543
Average Annual Growth Rate		4.1%	1.9%	1.5%	1.3%	1.1%	1.4%

Source: Population Research Center of Portland State University

2. EXISTING FACILITIES

Wastewater facilities in Gervais consist of a gravity sewer collection system, with two pump stations, conveying flows to a wastewater treatment plant that provides secondary treatment and disinfection. Treatment plant effluent is discharged to the Pudding River in winter and to a reuse site for irrigation of poplar trees in summer. There are no known on-site septic systems in the City. The existing wastewater facilities are shown on Figure 2-1.

2.1 COLLECTION SYSTEM

The wastewater collection system drains primarily by gravity to the 4th Street Pump Station, which discharges flow through a 10-inch PVC force main to the wastewater treatment lagoons. The system serves 630 residences.

2.1.1 Gravity Pipes

Pipes

The collection system consists of a mix of older concrete pipe and newer PVC pipe, generally 8 inches in diameter. Most of the concrete pipe was constructed in 1965 and serves the original platted city. The first major expansion of this system occurred in 1994 with the development the Winfield Ranch subdivision. In 1996 and 2009 the collection system was expanded again to serve the French Prairie Meadows and Willoria Estates PUDs, respectively. The overall gravity collection system includes the following:

- 15,800 feet of 8-inch concrete pipe and 1,426 feet of 6-inch concrete pipe installed in 1965.
- 13,000 feet of 8-inch PVC pipe installed between 1994 and 2017 for new residential development.

Trunk Mains

Two trunk mains convey the city's wastewater to the 4th Street Pump Station:

- Flows from the portion of the city northwest of the Union Pacific Railroad all enter the northwest Fir Avenue Trunk Main. This main extends west from Ivy Avenue and 7th Street to Fir Avenue and 7th Street, then continues south on Fir Avenue to the pump station.
- Flows from the portion of the city southeast of the railroad, including flows pumped to the gravity system from the French Prairie Meadows neighborhood, are conveyed by the southeast Fir Avenue Trunk Main. This main extends north in Grove Avenue from the Prairie Meadows Pump Station force main discharge to 1st Street. From there it continues west in 1st Street to Fir Avenue, then north in Fir Avenue to the 4th Street Pump Station.

2.1.2 Pump Stations and Force Mains

French Prairie Meadows Pump Station

The French Prairie Meadows and Willoria Estates developments, along with the commercial area at Douglas and Highway 99E, drain by gravity to the French Prairie Meadows Pump Station. This station pumps flow to the gravity system in Grove Avenue through a 4-inch force main. It was built in 1996, at the northeast corner of Black Walnut Drive and Hemlock Street (see Figure 2-1 for location and basin limits).

The pumps and control system were replaced in early 2018. A draw-down test on the new pumps indicated a capacity of 330 gallons per minute (gpm) per pump. The constant speed pumps operate in a lead/lag configuration, with wet well level sensing provided by float switches. Under normal operating conditions and during peak flows, only one pump is in operation. High-level alarms and pump failures are signaled to an autodialer. The pump power distribution and controls are housed in an above-ground fiberglass enclosure adjacent to the wet well. A backup generator with a manual transfer switch is provided on site. Table 2-1 summarizes the French Prairie Meadows Pump Station design data.

Table 2-1. French Prairie Meadows Pump Station Data

	Design Data
Pumps	
Type	Constant speed, submersible
Pumps	Two Flygt Model NP-3127
Pump Capacity	Each pump @ 330 gpm
Pump Power	10 hp
Wet Well	
Size	6-foot diameter
Operating Volume	571 gallons
Level Control	Float switches
Overflow	8-inch pipe to Sam Brown Creek
Backup Power	35-kW diesel generator and manual transfer switch
Force Main	
Pipe	4 inch diameter PVC (AWWA C-900)
Length	650 feet
Hydrogen Sulfide Control System	None

4th Street Pump Station

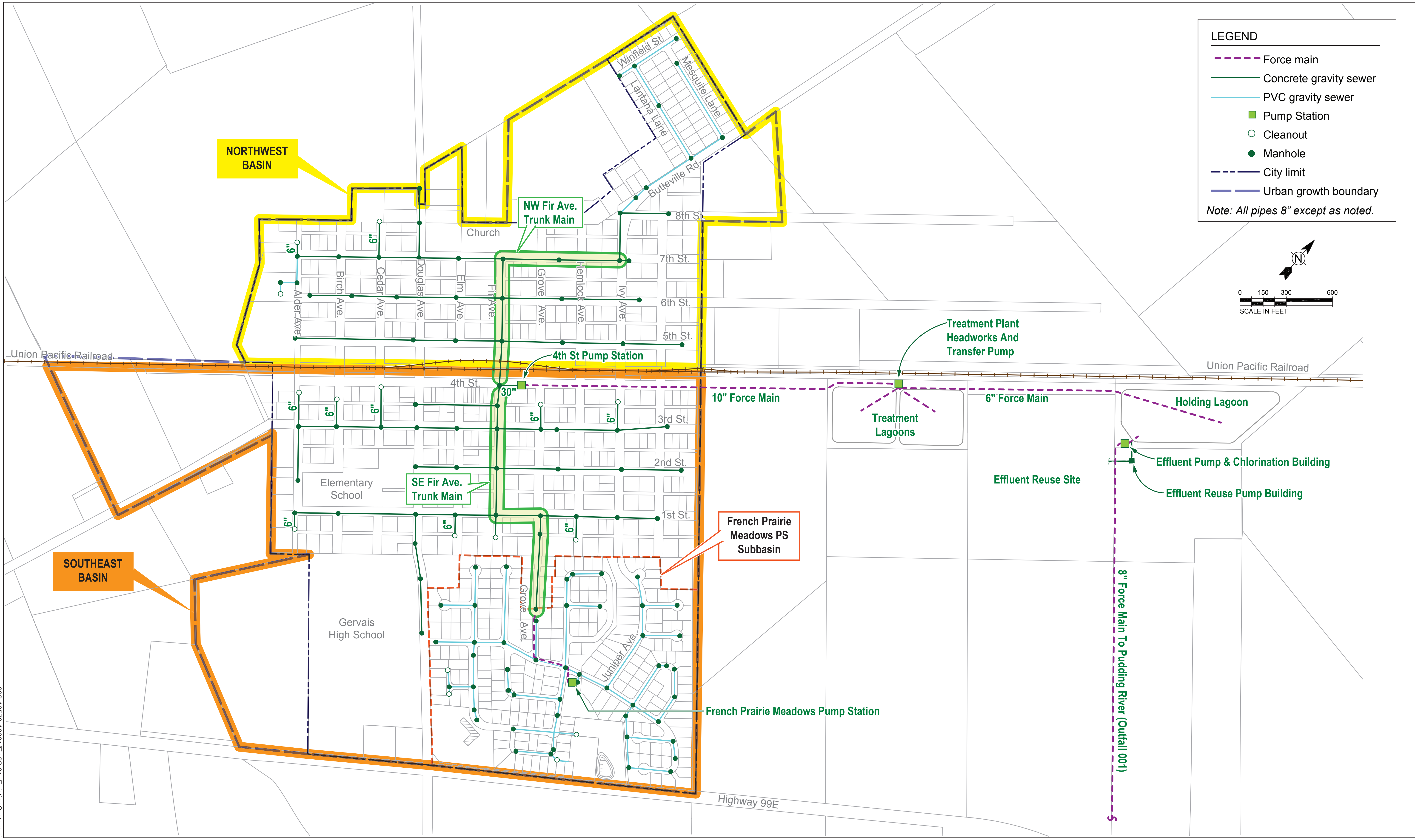
The 4th Street Pump Station pumps all raw sewage from the City to the headworks of the wastewater treatment plant. The station was upgraded in 2001 to a duplex submersible station with a permanent backup generator (utilizing an automatic transfer switch installed in 1981). The storage volume of the 72-inch diameter wet well was increased at that time by installing 135 feet of 30-inch pipe upstream of the station. Controls and the generator are located in a metal building on the opposite side of 4th Street from the station.

In 2017, the pumps and control system were replaced with a Xylem Smart Control System with variable frequency drives that optimize energy efficiency. The current pump station capacity is 1,300 gpm. Under normal operating conditions and during peak flows, only one pump is in operation. High level alarms and pump failures are signaled to an autodialer. Table 2-2 summarizes 4th Street Pump Station design data.

During design of the station upgrade in 2001, the need for odor control was evaluated, given the relatively long force main detention time. At that time, it was concluded to be not necessary for the following reasons:

- There are no existing odor or concrete degradation issues
- Detention time was projected to decrease as flows increase
- The headworks is in an isolated location with over 1,200 feet to the nearest residence.

Since that time there has been little evidence of hydrogen sulfide odors or concrete degradation.



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City of Gervais
WASTEWATER FACILITIES PLAN

Figure 2-1.
EXISTING WASTEWATER SYSTEM

Table 2-2. 4th Street Pump Station Data

	Design Data
Pumps	
Type	Duplex Submersible
Pumps	Two Flygt NP-3171
Pump Capacity	1,290 gpm @ 48 feet of total dynamic head (TDH)
Pump Power	34 hp
Wet Well	
Size	6-foot diameter manhole and 30-inch diameter upstream line
Operating Volume	840 gallons
Level Control	Pressure transducer
Overflow	Top of Wet Well
Backup Power	60-kW diesel generator with automatic transfer switch
Force Main	
Pipe	10-inch PVC (AWWA C 900)
Length	2,470 feet
Maximum Detention Time	9.89 hours
Hydrogen Sulfide Control System	None

2.2 TREATMENT FACILITIES

The City's existing treatment plant is a system of three facultative lagoons designed for discharge to the Pudding River (Outfall 001) during wet weather (November through April) and effluent reuse (Outfall 002) during dry weather (May through October). The treatment plant provides influent screening, secondary treatment and disinfection.

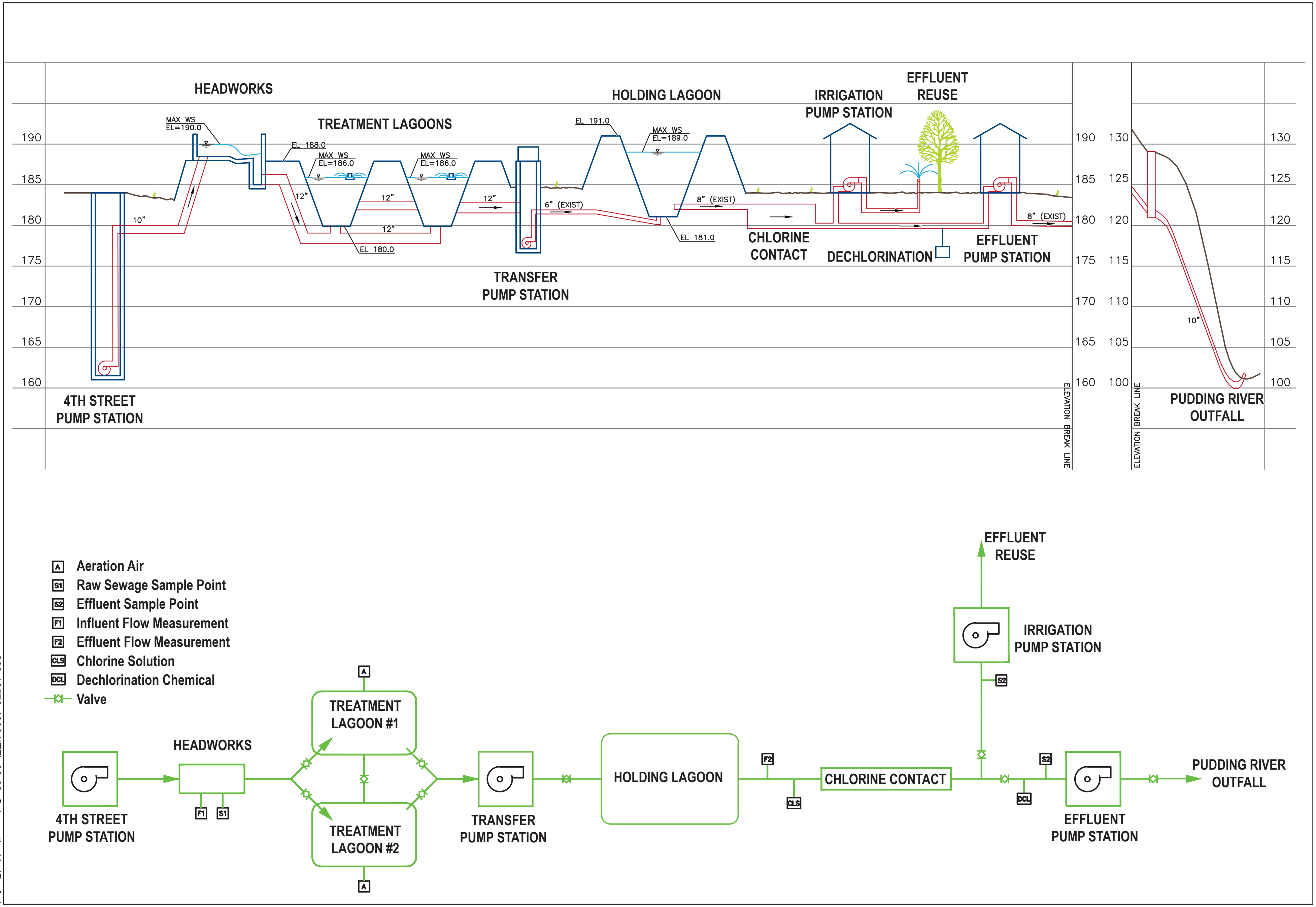
The facility was originally installed in 1967, consisting at that time of two 3.5-acre facultative treatment lagoons. The plant was upgraded in 1981 with the addition of a holding lagoon for storing effluent, a disinfection system and an effluent pumping system. Further improvements in 2001 and 2002 included dredging and a complete rebuild of the treatment lagoons, new headworks and floating aeration, new chlorine contact facilities, disinfection and dechlorination equipment, effluent pumping and new submerged diffuser at the river discharge. These improvements included removal and reconstruction of the treatment lagoon berms and the installation of a 60-mil polypropylene liner.

Table 2-3 summarizes the treatment plant's design flows and loads associated with the 2001 improvements. Figure 2-2 provides a hydraulic profile and schematic flow diagram of the treatment system.

Table 2-3. Treatment Facility Design Flows and Loads

	Design Data
Average Dry-Weather Flow (ADWF)	0.22 million gallons/day (mgd)
Maximum-Month Dry-Weather Flow (MMDWF)	0.46 mgd
Maximum-Month Wet-Weather Flow (MMWWF)	0.81 mgd
Peak-Day Flow (PDF)	1.34 mgd
Average Month Biochemical Oxygen Demand (BOD)	369 pounds/day
Peak-Week BOD	542 pounds /day
Average Month Total Suspended Solids (TSS)	412 pounds /day
Peak-Week TSS	672 pounds /day

Sources: Wastewater Facilities Upgrade – Phase 1 Project Design Data (KCM, 2001)



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City of Gervais
WASTEWATER FACILITIES PLAN

Figure 2-2.
TREATMENT SYSTEM FLOW SCHEMATIC AND HYDRAULIC PROFILE

2.2.1 Headworks

Raw sewage is pumped from the 4th Street Pump Station to the treatment plant headworks, which is shown in Figure 2-3. Design data for the headworks is summarized in Table 2-4. The treatment plant's control building is located at the headworks site.

Figure 2-3. Headworks Channel (Generator and Control Building in Background)

Table 2-4. Headworks Design Data

	Design Data
Peak Flow Capacity	2.53 mgd
Screen	Manually cleaned 1" bar screen
Flow Measurement	6-inch Parshall flume with sonic level sensing device
Influent Sampling	Automatic composite

Screening

A manual bar screen with 1-inch openings collects large and floatable debris from raw sewage as it enters the headworks. Debris is manually removed from the screen during routine operations and transferred to a waste container. The waste container is hauled to a landfill for disposal as needed.

Influent Flow Measurement

The influent flow meter is located at the headworks and consists of a Parshall flume fitted with an ultrasonic water level measuring unit that measures flow depth through the flume and provides a signal of 4 to 20 milliamps to a recorder, which converts the signal to totalized flow. The flow meter readout is located in the control building.

Influent Sampling

The influent sampler is located in the control building at the headworks. Samples are automatically collected from the downstream end of the headworks channel.

Backup Power

An Army surplus generator at the headworks provides backup power for the headworks flow meter and level sensor as well as the control building. It is approximately 50 years old and provided with a manual transfer switch that was installed in 2001. This generator also is the backup power source for the transfer pumps described below.

2.2.2 Lagoons

Treatment Lagoons

The two treatment lagoons were completely reconstructed with the 2001 upgrade project. They share a common berm and are connected by transfer piping that allows the lagoons to operate in series or parallel configuration, or to take either lagoon offline for maintenance or other operations. Flows between the two treatment lagoons are gravity-driven. Figure 2-4 shows Lagoon #2. Table 2-5 summarizes the lagoon design data.

Figure 2-4. Treatment Lagoon #2 (Poplar Reuse Site in Background)

Table 2-5. Treatment Lagoon Design Data

	Design Data
Number	2
Operation	Parallel or Series
Surface Area (each, approximate)	3.3 acre
Design Freeboard	2 feet
Water Depth (below freeboard)	6 feet
Volume (each, approximate)	5.8 million gallons (MG)
Last Leak Test	2001 (after construction completion)
Liner	60 mil polypropylene
Detention Time, Both lagoons	
At Design 2020 MMDWF	25 days
At Design 2020 MMWWF	14 days
BOD Load, Both lagoons	
At Average Design Load	55 pounds/acre/day
At Peak-Week Design Load	82 pounds/acre/day
Aerators	
Type	Surface splasher
Number (each lagoon)	3
Brake Horsepower	5

Lagoon Aeration

The treatment lagoons are equipped with floating aerators (see Figure 2-5), generally aligned between the lagoon inlets and outlets to maximize the flow that is treated. Aerator controls are located in the control building adjacent to the headworks.

Figure 2-5. Treatment Lagoon Aeration

Lagoon Piping

A splitter box located at the discharge end of the headworks is equipped with manually operated slide gates that allow the operator to direct influent to one or both treatment lagoons for either series or parallel operation. A second splitter box with control gates and pipes to both lagoon discharge structures and the lagoon inlets is used to direct flow for series or parallel operation. For the most part, the City has operated the lagoons in series from Lagoon #1 to Lagoon #2.

2.2.3 Transfer Pump Station

The transfer pump station (see Figure 2-6) pumps clarified effluent from the treatment lagoons to the holding lagoon for storage. It is equipped with two constant-speed suction lift pumps, each with a capacity of 500 gpm. The original pumps installed in 1981 were replaced in 1989 and have been rebuilt since.

Figure 2-6. Transfer Pump Station Exterior (left) and Pumps Inside (right)

The transfer pumps are situated over a 6-foot diameter wet well that is connected to both treatment lagoons, allowing withdrawal from either or both lagoons. A bubbler-based leveling sensing system controls operation of the pumps, based on lagoon level. The pumps operate in a lead/lag configuration. Backup power for the transfer pumps is provided by the generator at the headworks. Table 2-6 summarizes the transfer pump station design data.

Table 2-6. Transfer Pump Station Design Data

	Design Data
Pumps	
Type	Two Gorman-Rupp Self-Priming
Capacity, One Pump Running	500 gpm @ 65 feet TDH
Capacity, Two Pumps Running	600 gpm @ 72 feet TDH
Power	20 hp
Force Main	
Pipe	6 inch Diameter PVC (AWWA C 900)
Length	2,300 feet

2.2.4 Holding Lagoon

The holding lagoon (see Figure 2-7) was constructed in 1981 for the purpose of effluent storage during dry-weather months. Since the construction of the effluent reuse system in 2002, the primary purpose of the holding lagoon is to provide buffering capacity to temporarily store peak flows and allow effluent to be discharged at controlled rates to either of the treatment plant's two outfalls (Outfall 001 for river discharge and Outfall 002 for effluent reuse). Table 2-7 summarizes the holding lagoon design data.

Figure 2-7. Holding Lagoon

Table 2-7. Holding Lagoon Design Data

	Design Data
Surface Area (approximate)	5.8 acres
Design Freeboard	2 feet
Total Depth (below freeboard)	8 feet
Volume (approximate)	15.3 MG
Liner	Native Clayey Soil

2.2.5 Effluent Disinfection

Effluent must be continuously disinfected, during discharge to both Outfall 001 and Outfall 002. Dechlorination is required for discharge to the Pudding River (Outfall 001) but not for effluent reuse (Outfall 002). Table 2-8 summarizes the disinfection system design data.

Table 2-8. Disinfection System Design Data

	Design Data
Chlorination	
Type	Liquid sodium hypochlorite
Feed Control	Flow-paced
Feed Rate	1 mg/L
Percent Solution	6.25%
Chemical Storage Tank	Three polyethylene 150-gallon tanks
Chemical Containment	Chemical room designed for containment
Chlorine Contact	
Type	36-inch diameter pipe
Volume	32,000 gallons
Contact Time	
Average Winter Discharge	60 minutes
Peak Winter Discharge	56 minutes
Average Summer Irrigation	100 minutes
Dechlorination	
Type	Liquid sodium bisulfite
Feed Control	Flow-paced
Feed Rate	0.5 mg/L
Percent Solution	37%
Chemical Storage Tank	55 gallon polyethylene
Chemical Containment	Double-walled tank

Sodium Hypochlorite Metering

A mechanical diaphragm type metering pump sends 6.25-percent sodium hypochlorite solution to the chemical injection point located in a manhole installed over the effluent pipe. This injection location is suitable for discharge to both Outfall 001 and Outfall 002. Liquid sodium hypochlorite is stored in a 360-gallon polyethylene tank. The pump and tank are in the chlorination room adjacent to the effluent pump house. A third spare metering pump is onsite for redundancy.

The sodium hypochlorite metering pump operates automatically by being interlocked with operation of the effluent pumps—dosage is flow-paced off the effluent magnetic flow meter. When effluent is discharged to the effluent reuse site for irrigation, the metering pump is manually activated along with the irrigation pumps. The summer dosage is also flow-paced according to flows measured at the effluent flow meter.

Chlorine Contact

Effluent to which sodium hypochlorite has been injected is discharged to a 36-inch diameter HDPE pipe where chlorine contact time for disinfection is provided. The pipe is 666 feet long, providing 60 minutes of contact time for average wet-weather effluent flows.

Sodium Bisulfite Metering

Dechlorination is operated in winter when flows are discharged to the Pudding River through Outfall 001. The City uses a 37-percent solution of sodium bisulfite to dechlorinate the final effluent. The chemical metering pump is a positive-displacement, non-hydraulic, solenoid-drive, diaphragm-type metering pump. Sodium bisulfite is stored in a 55-gallon polyethylene tank. The pump and tank are located in the chlorination room, adjacent to the effluent pump house. A third spare metering pump is onsite for redundancy.

The sodium bisulfite metering pump is interlocked with operation of the effluent pump. Dosage is flow-paced according to flows measured at the effluent magnetic flow meter. Operation and dosage can also be manually controlled. The injection point is located upstream of the effluent pumps to promote mixing.

Backup Power

Backup power for the disinfection system is provided by a 50-kW diesel generator with manual transfer switch that was installed in 2001. This generator also provides backup power for the effluent pumping system.

2.2.6 Effluent Discharge Facilities

Effluent Pumping

The effluent pumps (see Figure 2-8) convey disinfected effluent from the holding lagoon to Outfall 001 at the Pudding River during wet-weather months. The pumps are out of service during dry-weather months. Table 2-9 summarizes the effluent pumping design data.

Figure 2-8. Effluent Pumping

Table 2-9. Effluent Pumping Design Data

	Design Data
Pumps	
Number and Type	Two Gorman Rupp Self-Priming
Capacity, One Pump Running	560 gpm @ 45 feet TDH
Capacity, Two Pumps Running	590 gpm @ 54 feet TDH
Power	15 hp
Force Main	
Diameter	8 inches
Length	7,950 feet

Pumping is provided by two suction-lift, constant-speed 15-hp pumps that were installed in 2001. They are sized to meet the 2020 average winter discharge with one pump running and the 2020 MMWWF design peak flow with both pumps running. Under normal operating conditions, one pump is in service and the pumps are manually started and stopped by the operator. The pumps are capable of providing approximately 590 gpm flow with both pumps operating and 560 gpm with a single pump running.

The pumps are located in the effluent pump/chlorination building at the southeast corner of the holding lagoon. Intake screens at the lagoon were installed to prevent debris in the final effluent. The effluent force main consists of an 8-inch diameter 7,950-foot long PVC main with the alignment shown in Figure 1-1. From the force main discharge, flow is conveyed by gravity to the Pudding River through 5,600 feet of 10- and 12-inch PVC pipe.

Backup power for the effluent pumping is provided by a 50-kW diesel generator with manual transfer switch that was installed in 2001. This is also the generator that provides backup power for the disinfection system.

Effluent Flow Measurement

An 8-inch magnetic flow meter is located in a meter vault on the effluent suction piping, upstream from the disinfection injection point. The location of the flow meter is suitable for measuring both winter and summer discharge, with flows being totalized each day.

Effluent Sampling

Composite effluent samples are collected at the effluent sampling manhole by an automatic sampler, located in the effluent pump/chlorination building. The location of the sampler is suitable for sampling both winter and summer discharge flows. Grab samples for total chlorine residual, pH, and bacteria during both the river discharge season and the irrigation season are taken from a tap on the discharge piping.

Pudding River Outfall

During the 2001 improvements project, based on a mixing zone analysis, the Pudding River outfall was extended approximately one-third the distance across the Pudding River and fitted with a 4-inch single-port diffuser. Concrete anchors hold the outfall in place and riprap guards the port against erosion.

Effluent Reuse

Since 2001, the City has operated a 50-acre effluent reuse site based on irrigation of poplar trees (see Figure 2-9). With the required buffers, about 38 acres is planted in trees. The City operates the irrigation system, discharging effluent on a rotating basis to 10 irrigation zones. The planting, harvesting and management of the trees is contracted out.

Figure 2-9. Irrigation Pumps (left) and Poplar Reuse Site (right)

Disinfected effluent for reuse is pumped by two multi-stage vertical-turbine pumps (see Figure 2-9) located in the irrigation pump house next to the holding lagoon. The reuse site has poplar trees planted in 10 irrigation zones, with two control valve assemblies. Each valve assembly has a programmable controller that allows the operator to set irrigation times for each zone, typically based on weather, holding lagoon level and tree water needs. Above-ground spray heads are fed by PVC distribution pipes and HDPE laterals. Table 2-10 summarizes the irrigation system design data.

Table 2-10. Irrigation System Design Data

	Design Data
Pumps	
Number and Type	Two Vertical Turbine
Capacity	330 gpm each @ 144 feet TDH
Power	20 hp
Distribution Piping	6” PVC Main lines, 6” and 2” PVC distribution lines; 1” HDPE laterals
Crop	Poplar trees
Irrigation Area (approx.)	38 acres
Number of Irrigation Zones	10
Irrigation Equipment	
Type of Sprinkler	Microspray head
Spacing	28 feet by 28 feet triangular
Flow Capacity (each)	0.75 gpm
Pressure Requirement	50 psi (115 feet)

2.3 SLUDGE STORAGE AND BIOSOLIDS LAND APPLICATION

Prior to the 2001 reconstruction, accumulated sludge was removed from Treatment Lagoons #1 and #2 and land-applied to the City's newly acquired effluent reuse site in accordance with a biosolids management plan. No dredging or biosolids land application activities have occurred since the 2001 project.

The City contracted with Oregon Association of Water Utilities in 2017 and 2018 to map the sludge levels in all three lagoons. The results of this work are contained in Appendix A. In general, the mapping found the heaviest sludge deposits in the inlet area of Treatment Lagoon #1, with varying depths elsewhere.

2.4 BACKUP POWER

Critical services associated with wastewater treatment are required to have a backup power source. Table 2-11 summarizes the City's backup systems. Each generator is exercised weekly.

Table 2-11. Backup Power

Location	Description	Date Installed
French Prairie Meadows Pump Station	35-kW diesel with manual transfer switch	1997
4th Street Pump Station	60-kW diesel with automatic transfer switch	Generator – 2001; automatic transfer switch - 1981
Headworks/Transfer Pumping	diesel with manual transfer switch; power output unknown	Generator – ~50 years; manual transfer switch - 2001
Disinfection/Effluent Pumping	50-kW diesel with manual transfer switch	Generator – 2001; manual transfer switch - unknown

2.5 EXISTING SYSTEM PERFORMANCE

2.5.1 Collection System

Generally, the collection system has operated adequately since the 2001 upgrade of the 4th Street Pump Station. No known overflows or pump malfunctions have occurred at the 4th Street Pump Station since 2001. No known overflows or pump malfunctions have occurred at the French Prairie Meadows Pump Station in the last five years.

Due to the flat topography of the city, a large portion of the original concrete pipe collection system (7,550 feet or 48 percent) was built at a grade of 0.30 percent. This grade is 25 percent less than the generally accepted minimum grade of 0.40 percent for 8-inch sewer pipe. This flatter than standard grade results in low flow velocities and higher maintenance due to more deposition of solids.

The older concrete pipe portion of the system has been monitored and repaired on a regular basis to keep infiltration and inflow to acceptable levels. Computational analysis of the collection system indicates that flows in Fir Avenue, both northwest and southeast of 4th Street, have the potential to surcharge during peak-hour flows. However, system operators have seen no evidence that this is occurring on a regular basis or to a degree where services lines have been affected or overflows have occurred.

2.5.2 Infiltration/Inflow

Collection system infiltration and inflow (I/I) is quantified by comparing peak flow to average dry-weather flow (ADWF), which represents a base flow with little I/I. The peak flow used by DEQ for this calculation is the maximum-month wet-weather flow (MMWWF). Table 2-12 lists influent MMWWF and ADWF measured at the treatment plant from 2013 to 2018, with resulting peaking factors.

Table 2-12. Wet-Weather vs. Dry-Weather Flow & Peaking Factor; 2013 to 2018

Rank	MMWWF (million gallons/day)	ADWF (million gallons/day)	Peaking Factor
2013	0.24	0.15	1.6
2014	0.45	0.14	3.2
2015	0.57	0.13	4.5
2016	0.44	0.14	3.1
2017	0.62	0.14	4.3
2018[a]	0.37	0.14	2.8

a. 2018 data represents flows only from January through July.

The peaking ratios shown are typical for older municipal collection systems in the Willamette Valley. The I/I is not to the level where the hydraulic capacity of the treatment plant has been exceeded. However, Oregon DEQ considers a ratio over 3 to be excessive; therefore, I/I is considered a system deficiency that the City must continue to budget for and address.

Based on video inspections over the years, the primary I/I source is general infiltration in the pipe joints and manholes of the concrete pipe portion of the pipe system. The City has maintained an I/I abatement program with regular inspection and repairs. The budget for this work for 2018-2019 is $15,000. Funds are typically used for closed-circuit-television (CCTV) video inspections and trenchless repairs using grout. Based on discussions with DEQ, more smoke testing will be reintroduced into I/I abatement program going forwards. The main program elements will then include the following:

- CCTV and pipe inspections.
- Smoke testing
- Manhole inspections.
- Improve surface drainage.
- Replace perforated manhole covers.
- Perform periodic flow monitoring.

2.5.3 Treatment

Overall the treatment plant has functioned well and, with a few exceptions, has met permit limits over the last five years. Exceptions are discussed in Chapter 4. Deficiencies generally relate to the following:

- **Screening**—As the headworks is not equipped with a fine screen, plastics and solids smaller than 1 inch frequently enter the lagoons, requiring plant operators to more frequently take the aerators offline and remove them from the lagoons for cleaning.
- **Lagoon transfer pumping capacity**—During wet weather, both transfer pump station pumps are frequently called to run due to high levels in the lagoon wet well. During extremely high flow conditions, the operator must also install a temporary portable pump for additional transfer pumping capacity.

Necessary improvements for system capabilities to meet future design flows are discussed in Chapter 5.

2.5.4 Effluent Storage and Discharge

On three occasions it was necessary to allow the holding lagoon water level to rise into the 2-foot freeboard zone. This is undesirable situation that requires addressing. Solutions are discussed in Section 5.3.3. The effluent pumps that discharge to the river outfall sometimes are called on to run at maximum capacity for extended time to accommodate wet-weather flows. The summer reuse irrigation system has worked well, with the first harvest of poplar trees occurring in 2013.

2.5.5 Backup Power

The backup power generator at the French Prairie Meadows Pump Station and the two backup power generators at the treatment plant (headworks/transfer pumping and disinfection/effluent pumping) all use manual transfer switches. Additionally, the headworks/transfer pumping generator is over 40 years old. While these deficiencies have not resulted in any overflows or permit violations, they should be addressed.

3. Flow and Load Projections

3.1 WASTEWATER FLOWS

Evaluation and design of wastewater collection and treatment facilities requires projections of wastewater flow. The projections are used to ensure the facility has capacity to convey, store and treat the highest expected flows over a specific planning period. Design flows for the Gervais wastewater treatment plant are based on the expected 2042 population. Flow projections were developed based on Oregon DEQ's *Guidelines for Making Wet-Weather and Peak Flow Projections for Sewage Treatment in Western Oregon*. The flow evaluation addresses the following flows:

- Average dry-weather flow (ADWF)—Average daily wastewater flow during the dry-weather months of May through October, used to determine expected loads to the plant.
- Average wet-weather flow (AWWF)—Average daily wastewater flow during the wet-weather months of November through April, used to size treatment plants.
- Average annual flow (AAF)—Average daily wastewater flow over the entire year.
- Maximum-month dry-weather flow (MMDWF)—Maximum-month flow during the dry-weather months, used to determine expected summer mass loading rates.
- Maximum-month wet-weather flow (MMWWF)—Maximum-month flow during the wet-weather months of November through April, used to determine expected winter mass loading rates.
- Peak 5-year wet-weather month—Maximum-month flow during a 5-year wet-weather event, used for sizing treatment facilities.
- Peak-week flow (PWF) – Maximum seven-day flow during wet weather, used for sizing treatment facilities.
- Peak-day flow (PDF)—Maximum one-day flow during wet-weather, used for sizing treatment facilities.
- Peak-hour flow (PHF)—Maximum flow over a short duration (peak hour), used for sizing collection piping and pump stations.

3.1.1 Plant Design Flows

Table 3-1 summarizes 2020 design flows for the existing treatment plant, as projected in 1998.

Table 3-1. Existing Plant Design Flows

	Design Data
Design Year	2020
Design Service Area Population	2,168
Average Dry-weather Flow	0.22 mgd
Maximum-Month Dry-Weather Flow	0.46 mgd
Maximum-Month Wet-Weather Flow	0.81 mgd
Peak-Day Flow	1.34 mgd
Peak Instantaneous Flow	1.66 mgd

3.1.2 Past 5-Year Flow Record Summary

Daily monitoring reports from 2013 through 2018 were evaluated to determine current flows to the wastewater treatment plant. Table 3-2 summarizes measured flows. A summary of this data is provided in Appendix B. Additional data are found in Appendix B.

Table 3-2. Summary of Plant Influent Flow Data; 2013 Through 2018

Year	Measured Treatment Plant Influent Flow (mgd)						
	ADWF	AAF	AWWF	MMDWF	MMWWF	PWF	PDF
2013	0.15	0.18	0.22	0.40	0.24	0.32	0.45
2014	0.14	0.23	0.31	0.32	0.45	0.72	0.98
2015	0.13	0.22	0.32	0.22	0.57	0.82	1.53
2016	0.14	0.24	0.35	0.39	0.44	0.64	0.82
2017	0.14	0.25	0.36	0.32	.062	0.89	1.42
2018	0.11	0.19	0.26	0.22	.037	0.52	0.78

3.1.3 Calculated 2018 Flows

Current 2018 flows, on which projected future design flows are based, were generated using procedures developed by DEQ and plant flow data from 2013 through 2018. Although using an extended data period may introduce error due to the population growth over the five years, it is assumed that this error is insignificant compared to the added accuracy provided by the additional data. The graphs generated with this procedure are contained in Appendix C. The resulting 2018 design flows are in Table 3-3.

Table 3-3. 2018 Design Flows

	ADWF	AAF	AWWF	MMDWF	MMWWF	PWF	PDF	PHF
Recurrence Interval	2-Year	2-Year	2-Year	10-Year	5-Year	5-Year	5-Year	5-Year
Flow	0.14 mgd	0.26 mgd	0.38 mgd	0.35 mgd	0.57 mgd	0.89 mgd	1.65 mgd	2.05 mgd

3.1.4 Projected Future Flows

Wastewater flows through the planning period and at buildout were projected based on the 2018 design flows, anticipated population increases (see Section 1.4.3), and standard peaking factors, which relate increases in ADWF to increases in higher flows such as MMWWF and PDF. An alternative approach using calculated peaking factors was also performed for evaluation and comparison (see results in Appendix C). Per capita ADWF flow rates for 2013 through 2018 were lower than typical, averaging 55 gallons per capita per day (gpcd). Projections were developed using both 55 gpcd and a more typical 75 gpcd, along with peaking factors for both values. Flow projections using calculated peaking factors were slightly higher (< 5%) for non-peak flow values, but were increasingly higher for peak flows (MMWWF through PHF), particularly later in the study period. This applied to both the 55- and 75-gpcd flow rates. It was concluded that the calculated peaking factors resulted in excessively conservative peak flows, so the standard peaking factor approach was used. The 75-gpcd flow rate was selected for the final projections as it was a more typical value and the 55 gpcd could result in an underestimation of future flows. Peaking factors and projected flows are summarized in Table 3-4.

Table 3-4. Future Wastewater Flow Projections

Year	Population	Projected Wastewater Flow (mgd)							
		ADWF	AAF	AWWF	MMDWF	MMWWF	PWF	PDF	PHF
			Peaking Factor on ADWF[a]		2.0	3.0	3.4	4.0	5.0
2018	2,588	0.14	0.26	0.38	0.35	0.57	0.89	1.65	2.05
2020	2,781	0.15	0.28	0.41	0.38	0.61	0.94	1.71	2.12
2025	2,996	0.17	0.31	0.44	0.41	0.66	0.99	1.77	2.20
2030	3,175	0.18	0.33	0.47	0.44	0.70	1.04	1.83	2.27
2035	3,346	0.20	0.35	0.50	0.46	0.74	1.08	1.88	2.33
2040	3,494	0.21	0.36	0.52	0.49	0.77	1.12	1.92	2.39
2042	3,543	0.21	0.37	0.53	0.49	0.78	1.13	1.94	2.41

a. Peaking factors shown are industry standards except for peak-week flow, which is based on historical Gervais flow data. Annual increase for each flow is calculated as the annual increase in ADWF multiplied by the peaking factor shown.

3.2 COLLECTION SYSTEM PEAK FLOWS

In order to evaluate the French Prairie Meadows Pump Station and sewer trunk main capacity, the system was divided into two basins—the Northwest Basin and the Southeast Basin—as shown on Figure 2-1. Flows to the French Prairie Meadows Pump Station are pumped to a discharge manhole in Grove Avenue and conveyed through the southeast Fir Avenue Trunk Main, along with flow from the rest of the southeast basin, to the 4th Street Pump Station. Flows from the northwest basin are directed to the northwest Fir Avenue Trunk Main, which also discharges to the 4th Street Pump Station. Both basins are predominantly developed but also contain undeveloped area within the UGB.

Existing and buildout flows for each basin were calculated; calculations and results are presented in Appendix E. Table 3-5 summarizes existing and buildout peak-hour flows for the pump station and trunk mains.

Table 3-5. Trunk Main and French Prairie Meadows Pump Station Peak Flows

	Existing Peak-Hour Flow		Buildout Peak-Hour Flow	
	mgd	gpm	mgd	gpm
Southeast Basin				
French Prairie Meadows PS	0.42	291	0.43	297
Southeast Fir Avenue Trunk Main Total	1.09	759	1.15	798
Northwest Basin				
Northwest Fir Avenue Trunk Main	0.80	555	1.03	715
7th Street Trunk	0.29	198	0.49	342

3.3 LOAD PROJECTIONS

In addition to the expected wastewater flows, evaluation and design of wastewater facilities requires estimates of the expected loads of various pollutants in the wastewater. Treatment facilities must be designed with operating capacity to treat the highest expected loads of pollutants over the planning period. In accordance with DEQ criteria, pollutants used as design parameters were biochemical oxygen demand (BOD), total suspended solids (TSS), and ammonia. The following load classifications were used for this facilities plan:

- Average Load—Average daily wastewater load
- Peak Load—Daily wastewater load during the maximum month.

3.3.1 Plant Load Records

Current loads were calculated using treatment plant discharge monitoring data from January 2013 through December 2018. A summary of this data is provided in Appendix B. The data include two grab-sample tests each month to measure 5-day BOD and TSS concentration and the influent flow on the day of the sampling (these samples are in addition to the composite samples discussed in Chapter 2). Pollutant load in pounds per day (ppd) is calculated from the concentration and influent flow for each day. The average monthly load is the arithmetic average of the two influent loads calculated from the grab samples taken each month. As the lagoons have a combined detention time of at least one month at existing maximum-month flows, a maximum-month design load can be used instead of a peak-week or peak-day load.

Since grab samples were taken only twice a month, it is possible that some of the monthly averages are not representative of actual loads coming into the treatment facility. This concern is addressed by using monitoring data over a period of five years (120 grab samples), providing a large enough data set to reflect actual loads. Although using an extended data period may introduce error due to the population growth over the five years, it is assumed that this error is insignificant compared to the added accuracy provided by the additional data.

Table 3-6 shows unit wastewater loads calculated from the plant records in pounds per capita per day (ppcd). It is assumed that these unit loads can be used to project future loads because the per capita BOD and TSS loads will stay relatively constant through the 2042 design year. This assumption relies on the following understandings:

- Per capita BOD load will stay constant because there will be no significant change in the wastewater sources. The primary sources of wastewater in the City are domestic sources with fairly uniform pollutant concentrations, and there is no reason to believe this will change significantly.
- New sewer extensions added to the system in the future will have less I/I than existing sewers, but the existing sewers' I/I is likely to increase. Although the flows are likely to increase the per capita, loadings are expected to be constant.

Table 3-6. Unit Wastewater Loads

	BOD	TSS
Average	0.24 ppcd	0.25 ppcd
Maximum Month	0.51 ppcd	0.45 ppcd

3.3.2 Load Projections

The unit wastewater loads presented in Table 3-6 and the population increases discussed in Section 1.4.3 were used to project future wastewater loads. Table 3-7 summarizes the resulting load projections. The 2042 wastewater loads represent the design loads.

Table 3-7. Planning Period Wastewater Load Projections

Year	Population	BOD (ppd)		TSS (ppd)	
		Average	Maximum Month	Average	Maximum Month
2018	2,588	621	1,320	647	1,165
2020	2,781	667	1,418	695	1,251
2025	2,996	719	1,528	749	1,348
2030	3,175	762	1,619	794	1,429
2035	3,346	803	1,706	837	1,506
2040	3,494	839	1,782	874	1,572
2042	3,543	850	1,807	886	1,594

3.4 DESIGN CRITERIA FOR THE WASTEWATER TREATMENT PLANT

Modifications to the wastewater treatment facilities must be designed to accommodate wastewater flows and loads based on growth assumptions for the planning period through 2042. Load parameters established in the design criteria are BOD and TSS. Based on the projections developed here, the design criteria are as follows:

- Design Year—2042
- Design Population—3,543
- Flow:
  - Average Dry-Weather Flow—0.21 mgd
  - Maximum-Month Dry-Weather Flow—0.48 mgd
  - Maximum-Month Wet-Weather Flow—0.78 mgd
  - Peak-Week Flow—1.13 mgd
  - Peak-Day Flow—1.89 mgd
  - Peak-Hour Flow—2.41 mgd
- Load:
  - Annual Average BOD Load—850 ppd
  - Maximum-Month BOD Load—1,807 ppd
  - Annual Average TSS Load—886 ppd
  - Maximum-Month TSS Load—1,594 ppd

4. PERMITTING

4.1 EFFLUENT QUALITY REQUIREMENTS

The treatment plant is regulated under the City's National Pollutant Discharge Elimination System (NPDES) permit from Oregon DEQ (see Appendix D). The last renewal was in 2011, with an expiration date of November 30, 2015. This permit has been administratively extended and will remain effective until an updated permit is issued by DEQ. The NPDES permit establishes the following limitations for the Pudding River outfall (Outfall 001) and recycled water reuse (Outfall 002):

- E. coli:
  - Maximum-month geometric mean = 126 organisms/100 ml
  - Single sample maximum = 406 organisms/100 ml
- pH—Shall be within the range 6.0 to 9.0
- Minimum 85-percent removal (monthly average) of five-day BOD (BOD_5)
- Minimum 65-percent removal (monthly average) of TSS
- Total chlorine residual shall not exceed:
  - 0.10 mg/L daily maximum
  - 0.02 mg/L monthly average
- Effluent BOD and TSS concentration and load limits as listed in Table 4-1

Table 4-1. NPDES Permit BOD and TSS Limits for Pudding River Outfall 001; November 1 – April 30

	Maximum Concentration		Maximum Mass Load[a]		
	Monthly Average	Weekly Average	Monthly Average	Weekly Average	Daily
BOD_5	30 mg/L	45 mg/L	110 ppd	160 ppd	210 ppd
TSS	50 mg/L	75 mg/L	160 ppd	240 ppd	320 ppd

a. Average dry-weather design flow to the facility equals 0.22 MGD. Mass load limits based upon the winter discharge rate of 0.63 MGD to allow for disposal of summer accumulations of treated wastewater as well as winter stormwater impacting lagoon surface.

NPDES permit requirements for effluent reuse (Outfall 002) define limits on total coliform in addition to establishing the following non-quantitative conditions:

- Total coliform is limited to 240 organisms per 100 ml in two consecutive samples and a seven-day median of 23 organisms per 100 ml.
- Surface runoff or subsurface drainage through drainage tiles is prohibited.
- Ground surface ponding, creation of odors, mosquito breeding and other nuisance conditions are prohibited.
- Overloading the soil with nutrients, organics or other pollutants, or negatively impacting groundwater usage is prohibited.
- Discharge for irrigation shall be in accordance with an approved effluent reuse plan.

4.2 PERMIT COMPLIANCE

The Gervais wastewater treatment plant's discharge monitoring reports provide data on the plant's effluent that can be used to assess compliance with the NPDES permit requirements. Discharge monitoring report effluent data from January 2013 to July 2018 were reviewed to assess the plant's recent record of compliance.

4.2.1 BOD and TSS

Effluent BOD and TSS samples are collected and analyzed once every two weeks. Typical effluent BOD and TSS concentrations are low for a lagoon, at 12.3 mg/L and 11.1 mg/L, respectively, over the last five years. The following permit limit exceedances occurred during the review period:

- Average monthly TSS limits were exceeded in March 2018 and BOD single day limits were exceeded in April. The spike in effluent BOD and TSS during late March and early April are coincident with the lagoons being heavily used by migrating geese. The City is currently investigating measures that can be taken if necessary to discourage use of the lagoons by ducks and geese.

The DMRs also show that higher BOD readings generally occur from February to April, associated with periods of high flow. The likely explanation is that limited aeration of the existing lagoons, combined with high flow, results in higher BOD concentrations. Proposed measures to reduce BOD levels are discussed in Section 5.3.3.

4.2.2 pH

Samples are collected and analyzed twice per week for pH. The following permit limit exceedances occurred:

- The limit level of 9.0 was exceeded with readings as high as 9.4 during the first two weeks of November 2017. Although high pH readings were experienced in September 2015 (during effluent reuse discharge), winter discharge pH limits have not historically been a problem for the plant, even though the City's drinking water is usually alkaline at 8.0 pH.

High pH readings typically are the result of excessive algae growth. Control of algae growth in late summer and fall is a continuing operational challenge for the plant. Chemical additives are currently being used, successfully for the most part. The chemical now being used is ProBiotic Scrubber II, which consists of kelp, blue green algae, minerals and micro nutrients, B. lichiformis, B. subtilis, and S. cerevisiae. It is injected at the French Prairie Meadows Pump Station and subsequently is conveyed to the 4th Street Pump Station and all of the lagoons. More effective chemical treatment, as well as operational changes, are being considered. For example, increased effluent reuse disposal in August and September could lower the holding lagoon level, which should reduce algae.

E. Coli Bacteria

E. coli samples are collected and analyzed once per week during winter discharge and total coliform is tested for during summer effluent reuse. All e. coli samples were within permit limits for the period.

4.2.3 Chlorine Residual

Chlorine residual samples are collected and analyzed daily. All samples were within permit limits for the period.

4.2.4 Total Coliform (Summer Irrigation)

Samples are taken once a week when the effluent reuse system is in operation. Although total coliform usually tests very low, there have been several instances in the last five years when total coliform test results exceeded the permit level. These are generally isolated violations with extremely high readings, in which the 7-day median is exceeded. In three instances, a violation occurred in two consecutive samples. In response, the operators cleaned the chlorine contact pipe, and no violations have occurred since.

4.3 RECYCLED WASTEWATER REQUIREMENTS

Oregon Administrative Rule 340-055 establishes requirements pertaining to recycled water, including reuse site buffers, monitoring, reuse site signage, disinfection, site access and crops that can be grown. To comply with the permit condition of no surface water discharge to the Pudding River during the summer months, the City land-applies effluent in accordance with its approved effluent reuse plan (2000). The City files annual reclaimed water reports with DEQ in compliance with NPDES permit requirements for Outfall 002.

In general, the effluent reuse system has worked well since becoming operational in 2002, meeting all permit conditions. As can be seen from Table 4-2, which summarizes the loading to the site, the system has significant unused capacity, particularly in mid-summer.

Table 4-2. Effluent Reuse Limits and Land Application 2013 - 2017

		Monitoring Results				
	Limit	2013	2014	2015	2016	2017
Total Volume (MG)	39.6	12.27	8.62	7.87	10.35	12.54
Maximum Hydraulic Loading (inches)	29.5	13.5	12.6	8.5	11.1	22.8
Average Nitrogen Loading (pounds/acre)	150	21.4	12.6	12.9	14.34	27.3
Average Phosphorus Loading (pounds /acre)	35	8.2	6.3	6.2	7.43	15.0

4.4 SLUDGE STABILIZATION AND BIOSOLIDS REMOVAL

The treatment plant is required to comply with federal regulations regarding the stabilization and disposal of sewage sludge, as established in the Code of Federal Regulations (40 CFR Part 503). Part 503 classifies biosolids as either Class A or Class B, based on the level of treatment. The criteria are pathogen reduction and vector-attraction reduction. Pathogens are disease-causing organisms that include but are not limited to certain bacteria, protozoa, viruses, and viable helminth ova. Vector attraction is the characteristic of sewage sludge that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents. Pathogen reduction and vector-attraction reduction requirements are much stricter for Class A sludge than for Class B sludge. The City of Gervais currently produces Class B biosolids.

In 2001, the City dredged and land-applied 310 dry tons of biosolids from Treatment Lagoons #1 and #2 to the effluent reuse site, in compliance with the 2001 biosolids management plan. The City amended the biosolids management plan the following year to allow a higher nitrogen loading for land application of the remaining lagoon sludge. The City has not removed or land-applied any lagoon biosolids since that time.

4.5 RELIABILITY/REDUNDANCY CRITERIA

4.5.1 Treatment Facilities

The EPA has established standards of reliability for wastewater equipment whose failure could lead to the release of under-treated effluent. The EPA standards define equipment reliability based on standard classifications. Treatment facilities for Gervais are defined by the DEQ as Reliability Class 1, which applies to equipment that discharges into "navigable waters that could be permanently or unacceptably damaged by effluent which was degraded in quality for only a few hours" (EPA 1974). The Reliability Class 1 designation requires redundant pumping capability and provisions for backup power to keep key equipment operating in the event of the primary power source's failure. In addition, the plant must be able to remain fully operational during a 25-year flood and withstand a 100-year flood without physical damage.

4.5.2 Collection System and Pump Stations

Oregon Administrative Rule 340-041-0009 prohibits the following collection system overflows, effective January 1, 2010:

- Overflows resulting from storm events of lower magnitude than a 5-year, 24-hour event from November 1 through May 31
- Overflows resulting from storm events of lower magnitude than a 10-year, 24-hour event from May 1 through October 31.

There have been no overflow events that the City is aware of since the last upgrade was completed in 2001. Both collection system pump stations have permanent backup power. New automatic transfer switches are needed for both pump stations.

4.5.3 Operation During 25-Year Flood

EPA rules require that the treatment plant remain fully operational during a 25-year flood. The Federal Emergency Management Agency *Flood Insurance Study for the Pudding River* indicates that the flood elevations for a 10-year and 50-year flood at the location of the treatment plant outfall are significantly below the elevation of the treatment plant (a 25-year flood elevation is not included in the study). Pudding River flooding does not affect the plant, as it is situated well above the river.

4.6 MIXING ZONE STUDY

Currently, there are no limits in the discharge permit for ammonia or temperature. However, these are constituents of concern for the future. While there are current discharge limits for pH, it is also a constituent of concern for the future.

A mixing zone study for the Pudding River outfall was performed with the 1998 Facilities Plan. A new submerged diffuser was designed and installed with the upgrade project that followed in 2001. At that time, pH and ammonia were not determined to have a reasonable potential to exceed water quality criterion in the future.

An updated mixing zone study was done in 2009 by DEQ. That study concluded that the following may warrant additional consideration:

- **Nutrients**—Effluent ammonia exceeded the chronic water quality criterion at the point of discharge. However, no exceedances were measured at instream locations. Total Kjeldahl nitrogen and total phosphorus were measured at levels greater than background in the effluent, which coincides with a slight elevation of these nutrients at two downstream locations.
- **Metals**—Several priority pollutant metals were detected in the effluent. However, only copper exceeded the chronic water quality criterion. Copper was not detected at upstream or downstream locations.
- **Mixing Dynamics**—Based on conductivity mapping, effluent remained to the left side of the river. At 250 feet downstream, the effluent and river were uniformly mixed with respect to conductivity. At this location, however the conductivity readings were still greater than 5 percent above background.

According to DEQ, it should be anticipated that a new mixing zone study will be required at some time in the future. A copy of the completed 2009 study can be found in Appendix F.

4.7 MASS LOAD LIMIT INCREASE

The City received a mass load increase at the time of the last major plant upgrade in 2000. A water balance evaluation of the three lagoons determined that a mass load increase is not necessary to achieve current discharge limits with the planning study period.

5. Existing System Improvement Needs

5.2 COLLECTION SYSTEM IMPROVEMENTS

5.2.1 Sewer Pipe Condition

As discussed in Chapter 2, about 50 percent of the gravity collection system consists of concrete pipe installed in the mid-1960s. This pipe is generally in fair condition but is the source of higher than acceptable I/I and requires continued maintenance. Due to the condition of the pipe, it is recommended that the City replace it when the opportunity exists. For example, should the City have a street improvement project in an area with concrete pipe, pipe replacement, pipe relining or pipe bursting should be included with the project. Projects include manhole replacement as well as service line replacement to the property line.

5.2.2 Sewer Trunk Main Capacity

Hydraulic analysis of these trunk mains was performed for existing and buildout flow conditions. Detailed results are presented in Appendix E. Based on the analysis, both trunk mains can be expected to experience localized surcharging during high flow events. The following alternatives were investigated to address this deficiency:

- **Alternative 1, No Action—**The no action alternative would maintain the existing pipes, with monitoring of the surcharging levels and periodic inspections during and after rainfall events.
- **Alternative 2, Replace Pipes to Increase Capacity—**To serve existing and future flows without surcharging, Alternative 2 would upsize the segments of the trunk main with capacity deficiencies, as indicated in Table 5-1 and shown on Figure 5-1.

Table 5-1. Pipe Replacement Program

Project #	Description	Approximate Length
C1A	Upsize 8-inch Trunk Main in Fir Avenue (NW) to 12-inch	847
C1B	Upsize 8-inch Trunk Main in 7th Street to 12-inch	752
C2	Upsize 8-inch Trunk Main in Fir Avenue (SE) and 1st Street to 10-inch	1,129

Alternative Evaluation

Under Alternative 1, costs for improving the sewer would be put off until it is demonstrated flows have exceeded pipeline capacities. This would likely be indicated by surcharging to a point that flows are backed up into service lines or system overflows happen. Service line backups could cause flooding of lower level rooms such as basements, which is a health hazard for which the City would be liable. System overflows are a violation of the City NPDES permit and are also a public health hazard. Immediate action to increase system capacity would be required if either of these events occurred.

While Alternative 1 would delay costs, it could result in higher total costs due to liabilities associated with system overflows, as well as having to construct pipe improvements on an emergency basis. For these reasons, Alternative 2 is considered to be in the best interests of the City and is recommended.

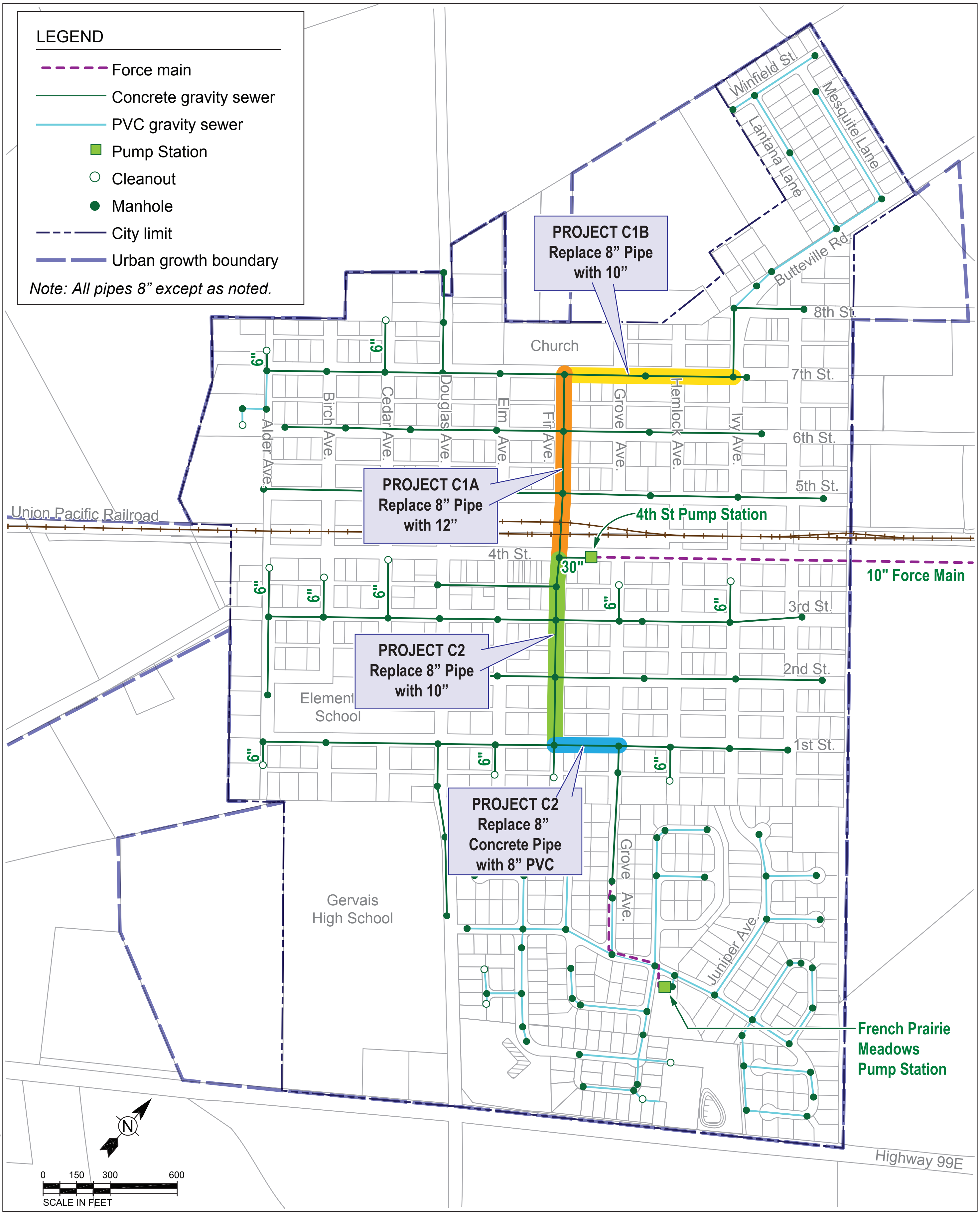

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Figure 5-1.
PROPOSED SEWER IMPROVEMENT PROJECTS

5.2.3 French Prairie Meadows Pump Station

Based on discussion with operations staff and a review of station pump hours, there are no indications in the last five years of surcharging, two-pump operation, or other evidence that the French Prairie Meadows Pump Station is undersized. Due to equipment age, the pumps and control system were replaced in early 2018. The redundant capacity of the new pumps was calculated to be 330 gpm based on a draw-down test. This exceeds the calculated buildout peak-hour flow of 297 gpm. Based on this, no capacity improvements are recommended for this pump station. Deficiencies that should be addressed are the lack of an automatic transfer switch for backup power and a bypass connection on the force main.

5.2.4 4th Street Pump Station

The 4th Street Pump Station was rebuilt in 2001. In 2017, both pumps and the control system were replaced. Based on flow meter readings, the redundant capacity of the station is now 1,300 gpm, or 1.87 mgd. This is slightly less than the calculated 2018 five-year event peak-hour flow of 2.05 mgd and the 2042 projected peak-hour flow of 2.40 mgd (see Table 3-4). Although this does not quite meet the DEQ requirement of providing firm pump capacity (capacity with the largest pump not operating) for the peak hour flow, with the new station upgrade and its history handling peak flows with one pump, DEQ is not requiring an upgrade at this time. Should capacity become an issue later in the planning period, the redundant capacity could be increased to handle the 2042 peak-hour flow by replacing the pumps. The 10-inch force main, also installed in 2001 would be adequate to handle these higher flows. The existing electrical equipment and power service should also be adequate.

5.3 TREATMENT FACILITIES

5.3.1 Alternative Approaches to Treatment Facility Improvements

The treatment plant is in good condition and generally provides adequate treatment. The major issues with the plant are related to hydraulic capacity during extreme wet weather. Future treatment capacity during high flows also is a concern. In the evaluation of treatment plant improvements, four general approaches were initially considered:

- **No-Action**—Make no improvements to address identified deficiencies.
- **Upgrade Existing Facility**—Improve existing facilities to provide adequate capacity and reliability for the planning period, while maintaining the current quality of treated effluent.
- **Provide Higher Level of Treatment**—Implement improvements to provide higher-quality effluent than produced by existing treatment facilities. Existing facilities would be replaced with different technologies—generally mechanical treatment technologies—to achieve a higher quality of effluent.
- **Regional Opportunities—**Combine the wastewater system with facilities of other nearby communities.

The no-action alternative was found not to be acceptable, as the issues caused by identified plant deficiencies must be addressed. The higher-level-of-treatment alternative was rejected because no conditions have been identified that require more advanced treatment; so the increased cost is not warranted. Regional opportunities are impractical, as the closest large plant, owned by the City of Woodburn, is 6 miles away. The pump station and force main required to send Gervais wastewater there could cost $6 to $10 million, in addition to the cost of improvements to the treatment plants that would be required.

Based on this initial assessment of general approaches, the only feasible approach is to upgrade existing facilities. Upgrades to provide additional capacity represent the most cost-effective solution to providing a facility that meets NPDES permitting requirements and the needs of the City for the planning period. The City made a considerable investment in its wastewater plant in the early 2000s, and the plant has worked well and is expandable. Therefore, all improvements described in the following sections represent the upgrade-existing-plant alternative; where multiple upgrade options were identified, an evaluation of each is provided.

5.3.2 Headworks

Headworks facilities remove fine to coarse debris from wastewater to allow more efficient treatment by process units downstream. Data on influent flow quantity and quality is typically collected at the headworks, using a flow meter and a sewage sampler. The existing headworks channel is sized for 2.53 mgd, more than adequate for flows anticipated in the planning period. Currently, the influent channel has a coarse bar screen, and, although it is not required by DEQ, improved screening would be beneficial in removing plastics from the waste stream and marginally lowering influent BOD levels. Two improvement alternatives were considered.

Alternative 1, Improved Screening at Headworks

This alternative consists of installing an automated inclined fine screen (1/4-inch opening). The work would entail the following:

- Demolition and replacement of the existing headworks channel, including installation of a bypass channel, flow measurement and a splitter box to direct flows to either lagoon. The new channel would be built prior to removal of the existing one (see Figure 5-2).
- Installation of the automated fine screen in the new channel to remove debris and a washer/compactor to remove fecal matter from the screenings. Installation of a waste container, possibly at the entrance to the lagoon. This alternative would require regular removal of bagged debris by the operators.

The headworks facilities would be sized for the design peak-hour flow and equipment would be selected to maximize energy efficiency. Odor control facilities are not proposed for the headworks because of the isolated location; with automatic bagging of screenings provided with the new screen, odors will probably be minimized. The new headworks facilities would be constructed adjacent to the existing headworks channel to allow existing facilities to remain in operation during construction. The generator at the headworks will be replaced, but that work element is included in the project for the transfer pumping improvements.

Alternative 2, No Action

The no-action alternative consists of continuing to use the existing headworks, which has sufficient capacity to handle peak design flows through the study period. Improved screening is a DEQ recommendation, not a requirement; consequently, the no-action alternative is feasible from a regulatory standpoint. As the estimated cost of an upgrade would be $460,000 (see Appendix G for cost estimates) there would be a significant initial cost savings with the no-action alternative.

Alternative Evaluation

The benefits of improved headworks screening would consist of the following:

- **Reduced maintenance required for floating aerators**—Currently, a significant amount of undesirable material can pass through the 1-inch bar screen, including plastics from hygiene products, rags, baby wipes, and other small items that get in the collection system. The rags get caught in the rotating mechanisms in the floating aerators (see Section 2.2.2 for aerator description), which then must be removed from the treatment lagoons and cleaned. At times, the aerators have to be removed and cleaned after as little as two weeks. To clean all three aerators in a lagoon requires three employees for 2 to 3 hours. With the improved screening, it is estimated that cleaning could be reduced to once every three to four months. With additional aerators to be added in the future, this would be a significant savings of employee time.

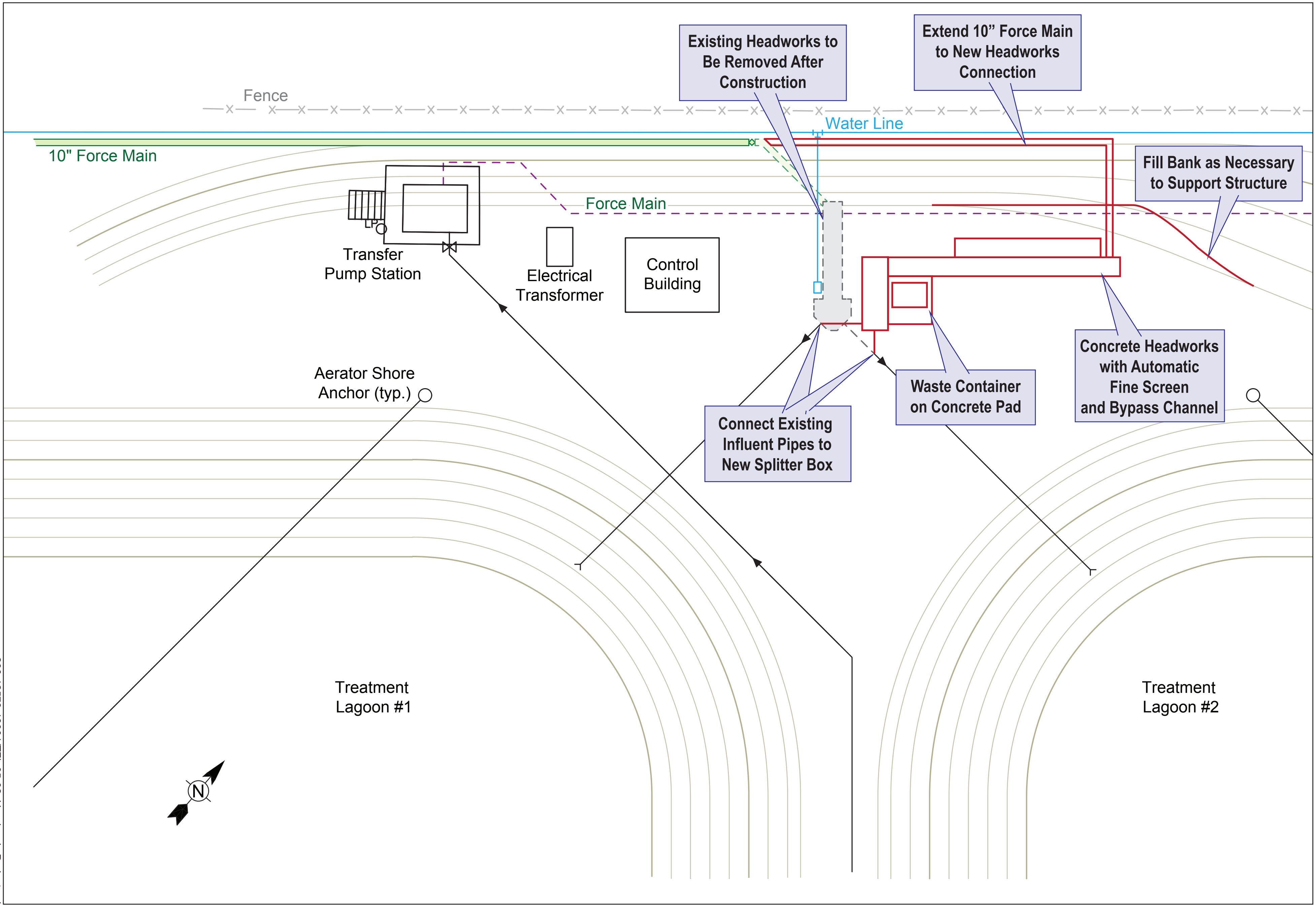

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Figure 5-2.
PROPOSED HEADWORKS IMPROVEMENTS

- **Increased aerator life**—Although difficult to quantify, reduced aerator problems due to foreign objects in the lagoons would increase the operational life of these units, lowering replacements costs.
- **Improved biosolids management**—Periodically, the lagoons must be dredged to remove the sludge layer that settles to the bottom, with the material applied to the poplar plantation site. Plastics and rags create difficulties for the dredge pumps and result in unsightly objects turning up in the soil of the poplar site.

Reduced maintenance cost could be in the range of $15,000 to $20,000 per year, which would increase as additional aerators are installed in the future. The other benefits are difficult to quantify. As the overall benefit of improved screening is substantial and would increase over the life of the treatment plant, it is recommended that it be included in the improvement plan.

5.3.3 Lagoons

Aerators

Treatment lagoon aeration is provided by six floating aerators installed in 2001. The aerators have been well maintained but will eventually require replacement. Current 5-year average BOD and TSS effluent concentrations (12.3 mg/L and 11.1 mg/L, respectively) are low for lagoon treatment. However, effluent BOD concentrations have sometimes been higher than desired in the spring, so increased aeration capacity should be considered.

Aeration requirements were projected for average and maximum-month BOD loads, as shown in Table 5-2. The existing 30-hp aeration capacity is not adequate for even 2020 maximum-month BOD loads, so increased aeration capacity is needed. By 2042, 55.1 hp will be required to meet the aeration demand for maximum-month BOD.

Table 5-2. Total Aeration Requirements for Primary Lagoons

	Maximum-Month BOD (ppd)	Required Aeration Power (hp)	Additional 5-hp Floating Aerators Required
2020	1,418	42.9	2 (Phase 1)
2025	1,528	46.4	0
2030	1,619	49.2	2 (Phase 2)
2035	1,706	52.0	0
2040	1,782	54.3	2 (Phase 3)
2042	1,807	55.1	0

As shown in the table, phasing is possible to minimize up-front costs. For cost estimating purposes it has been assumed that new aerators will be 5.0-hp floating units generally comparable to the existing aerators. The first phase of aeration improvements would include two 5-hp floating aerators installed in 2020 that would provide adequate capacity through 2030. A second phase would install two more aerators approximately five years later. The final two aerators would be installed in Phase 3 after an additional five years. Figure 5-3 shows proposed future aerator placement and phasing.

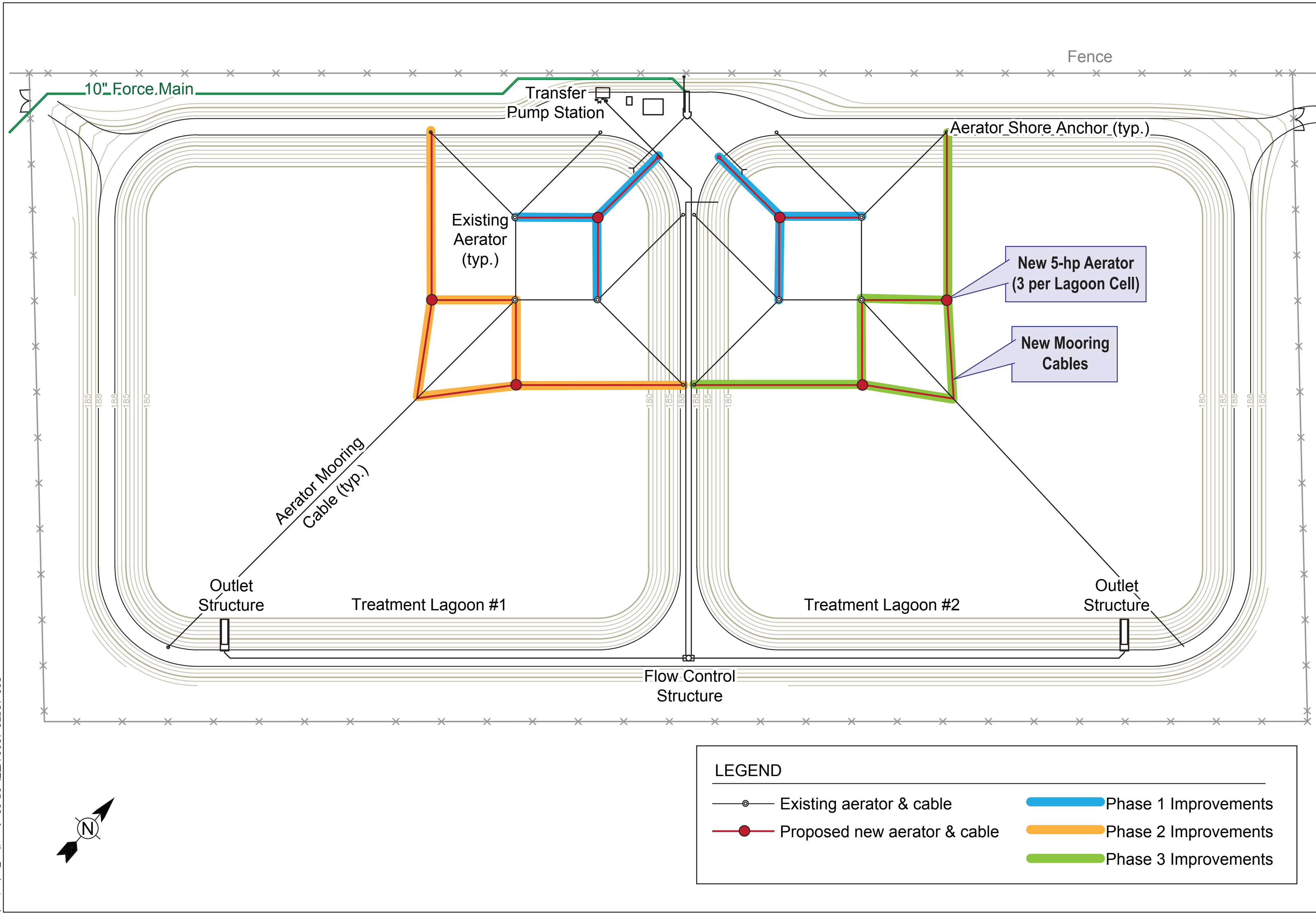

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Figure 5-3.
PROPOSED AERATION IMPROVEMENTS

Lagoon System Hydraulic Capacity

Historical Performance

Lagoon capacity issues in the last five years (see Table 5-3) have resulted from two general types of conditions:

- A rainy October when the reuse site starts to pond water and discharge to the poplar trees would be a permit violation. All effluent has to be stored in the holding lagoon until Pudding River discharge begins in November.
- Extremely prolonged wet weather in winter.

Table 5-3. Lagoon Water Levels During Peak Wet Weather

Month	Monthly Rainfall (inches)	Average Influent Flow (mgd)	Effluent Flow (mgd)		Minimum Freeboard (feet)		Average Chlorine Contact Time (min)
			Average	Peak-Week	Treatment Lagoon	Holding Lagoon	
December 2015	15.2	0.57	0.71	0.90	1.0	1.5	51
October 2016[a]	11.3	0.20	0.11	—	1.7	0.8	—
November 2016	6.9	0.32	0.49	0.62	1.7	0.8	74
February 2017	13.4	0.62	0.66	0.79	0.9	1.8	70

a. No discharge to Pudding River, and reuse discharge limited due to rainfall

As the City grows and flows increase, it is likely these scenarios will become increasingly common. Holding lagoon storage capacity and/or increased discharge needs to be planned for.

The 15.2 inches of rain in December 2015 was one the highest recorded monthly rainfall totals for the Gervais area. The effluent pumping system operated at full capacity virtually the entire month and had the highest weekly average discharge ever recorded at the plant—0.90 mgd. During this week, lagoon freeboard levels were below the design freeboard of 2 feet, and chlorine contact time was below the design value of 56 minutes for peak discharge. Even so, all permit limits were met during the month.

February 2017 was another extremely wet month with record monthly rainfall in the Salem area. Peak effluent flows were below those of December 2015, and the plant met permit requirements although lagoon levels resulted in reduced freeboard. Reduced freeboard also occurred in October 2016, although not to the point where permit violations occurred.

Water Budget Modeling

In addition to the plant data evaluation, the existing and required capacity of the lagoons was modeled using a water budget spreadsheet, which is included in Appendix H. In the model, influent flow and rainwater enter the lagoons, and water leaves the lagoons through evaporation and discharge (to the river or to irrigation). As experienced in 2013 and 2016, the water budget spreadsheet identifies the month of October as the most critical time for storage, and reinforces the need for future improvements to maintain freeboard levels and effluent discharge capacity. Dredging the lagoons could restore some volume lost to accumulating sludge, but recent estimates of sludge depth range from 3 to 8 inches, so the volume increase is not likely to be significant. Removing too much sludge also can affect treatment performance, so other capacity-increase alternatives should be evaluated.

Improvement Measures

Analysis using the water budget spreadsheet indicates that meeting projected 2042 load limits while also remaining within permit effluent limits will require a combination of three measures:

- Increase lagoon capacity.
- Manage lagoon levels by increasing irrigation to provide additional volume at critical times.
- Increase effluent flow to river.

Increase Lagoon Capacity

Two alternatives were identified for increasing total lagoon capacity, as described below.

Alternative 1, Increase Holding Lagoon Storage Volume

The capacity of the holding lagoon could be increased by raising its dikes. The simplest method of doing so would be to add material at the top of the existing dike and the interior bank by increasing the slope from 3:1 to 2:1. Figure 5-4 shows an 18-inch increase in the height in the dike while maintaining a minimum width of 9 feet for the new top of berm, which allows a maintenance vehicle to drive around the lagoon.

A dike raise of 18 inches around the holding lagoon would increase the maximum storage by approximately 3.0 million gallons, an increase of total lagoon volume of 11.0 percent. The water budget analysis indicates that this would be adequate to meet the City’s needs, so a larger dike raise was not considered.

Alternative 2, Increase Treatment Lagoon Storage Volume

Total lagoon capacity could be increased by raising the dikes around both treatment lagoons to increase their capacity. The simplest method of doing so would be to add material at the top of the existing dike and the interior bank by increasing a portion the interior slope from 3:1 to 2:1, similar to raising the holding lagoon dike as shown in Figure 5-4. An 18-inch increase in the height in the dike while maintaining a 12-foot top-of-berm width would increase the maximum treatment lagoon volume by approximately 3.1 million gallons, an 11.5-percent increase in total lagoon volume. This alternative includes the following assumptions:

- The headworks would be raised 2 feet to maintain gravity flow into the treatment lagoons, which would require the headworks to be rebuilt. It is assumed the headworks would be upgraded as described in Section 5.3.2.
- The control building would remain in its current location. It may be necessary to construct a low retaining wall around this structure to transition to the higher berm elevation.
- The TDH at the 4th Street Pump Station would increase by 2 feet. This would reduce the pump capacity by approximately 100 gpm, further decreasing the capacity of the pumps below the peak-hour-flow requirement.
- The TDH on the transfer pump would decrease by 2 feet. This would not change the need to upgrade this pump station but could affect the pump selection.
- The top of the polypropylene liner would need to be extended to properly rekey it into the raised berm.
- Flow control structures and two outlet structures, all built into the lagoon dike, would need to be modified for the higher water level.
- This improvement would not change the need for additional aeration.

Evaluation of Alternatives

Costs were developed for Alternatives 1 and 2. The cost for earthwork and modification of structures would be similar for the two alternatives: $360,000 for Alternative 1 and $400,000 for Alternative 2. Alternative 2 would have additional cost associated with increasing the height of the liner, which the liner manufacturer’s representative indicated may only be feasible by replacement, since welding seams on the existing 18-year-old polypropylene is probably not possible.

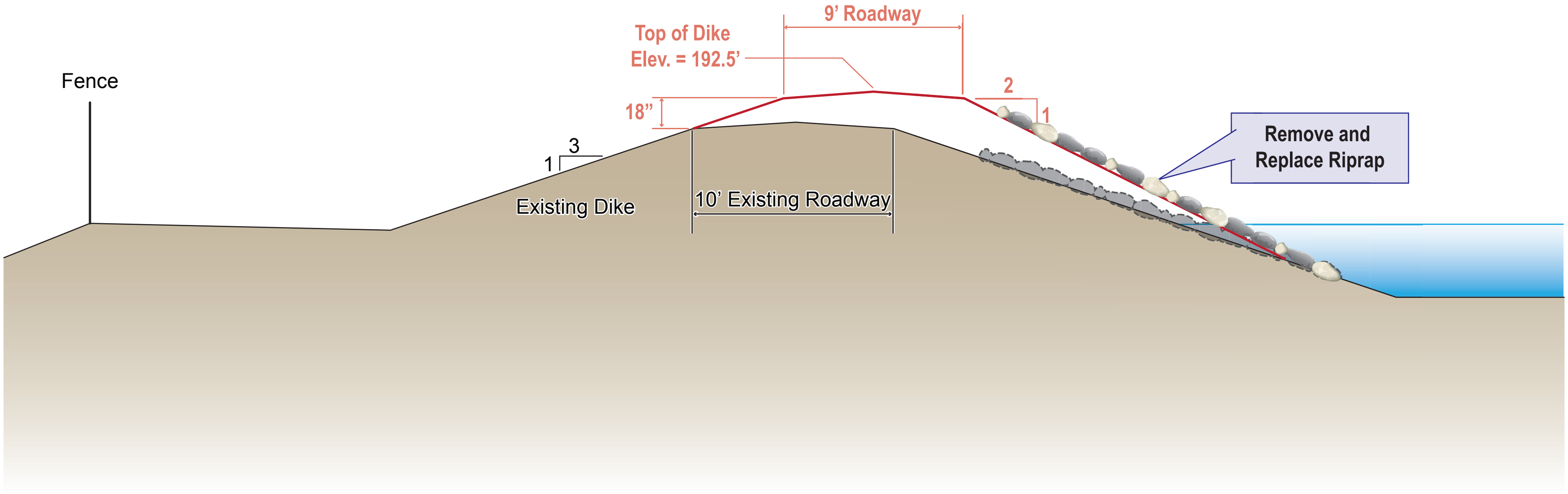

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Figure 5-4.
HOLDING LAGOON DIKE CROSS SECTION
FOR 1.5-FOOT DEPTH INCREASE

Although Alternative 2 would reduce the TDH requirement of the transfer pumps, this would not change the need for upgrading these pumps. An additional concern with Alternative 2 is the reduced capacity of the 4th Street Pump Station. With marginal peak capacity for existing conditions, this may trigger the need to upgrade the capacity of this pump station.

With the higher costs of Alternative 2, the unknowns regarding the feasibility of extending the liner, and the impacts on the capacity of the 4th Street Pump Station, Alternative 1 is the preferred approach to increasing lagoon capacity.

Managing Lagoon Levels

The water budget spreadsheet assumes that water level in the holding lagoon will be drawn down at the end of the river discharge period (late April). The water level will be maintained at a relatively low level during the summer, as irrigation and evaporation roughly balance influent flows. Drawing down the lagoons provides the necessary storage when net flow increases in October. It is assumed that the aerators will be turned off during early and mid-summer; during this period the shallow depth of the lagoons means that surface aeration should be adequate to meet the minimal treatment requirements during irrigation season.

Increasing Effluent Flow to River

Flow to the Pudding River is limited by a BOD mass load limit, chlorine contact time and effluent pumping capacity. To maximize flow, effluent BOD concentration must be reduced, requiring higher levels of treatment. This should be achievable with the additional aeration capacity recommended in this facilities plan.

5.3.4 Lagoon Transfer Pumping

As described in Chapter 2, the transfer pump station is equipped with two pumps, each with a capacity of 500 gpm. The combined capacity is 600 gpm (0.86 mgd). These pumps are currently undersized for the plant PDF of 1.60 mgd. This results in both pumps often running, and even then the pump station is not able to keep up with influent flows during heavy rain periods. The ability of the two 6-inch force mains to convey peak-day flows is marginal, with projected pipe velocities as flows increase through the planning period varying from 6.3 to 7.4 feet per second. Pipe velocities in this range are inefficient from an energy and cost standpoint. Two alternatives were evaluated to increase capacity of the transfer pump.

Alternative 1, Upgrade Transfer Pump Station and Force Main

Alternative 1 would consist of following (see Figure 5-5):

- Replace the suction lift pumps with two submersible pumps within the existing concrete pump structure. The inside of the structure will need to be modified to provide better hydraulics, and a new larger top slab on the structure will be needed.
- Install a new level sensor and control system.
- Replace the generator that provides backup power for the transfer pumps with a new generator equipped with an automatic transfer switch.

The transfer pumping system would be sized to accommodate the 2042 peak-week flow of 1.13 mgd in combination with a 5-year 24-hour rainfall over the treatment lagoons. This totals 1.67 mgd, or 1,160 gpm.

Alternative 2, Upgrade Transfer Pump Station Only

Alternative 2 is a lower-cost option that would use the two existing 6-inch force mains rather than replacing them with a new 10-inch force main. The upgraded pump station discharge piping would connect to the existing force mains downstream of the new valve box.

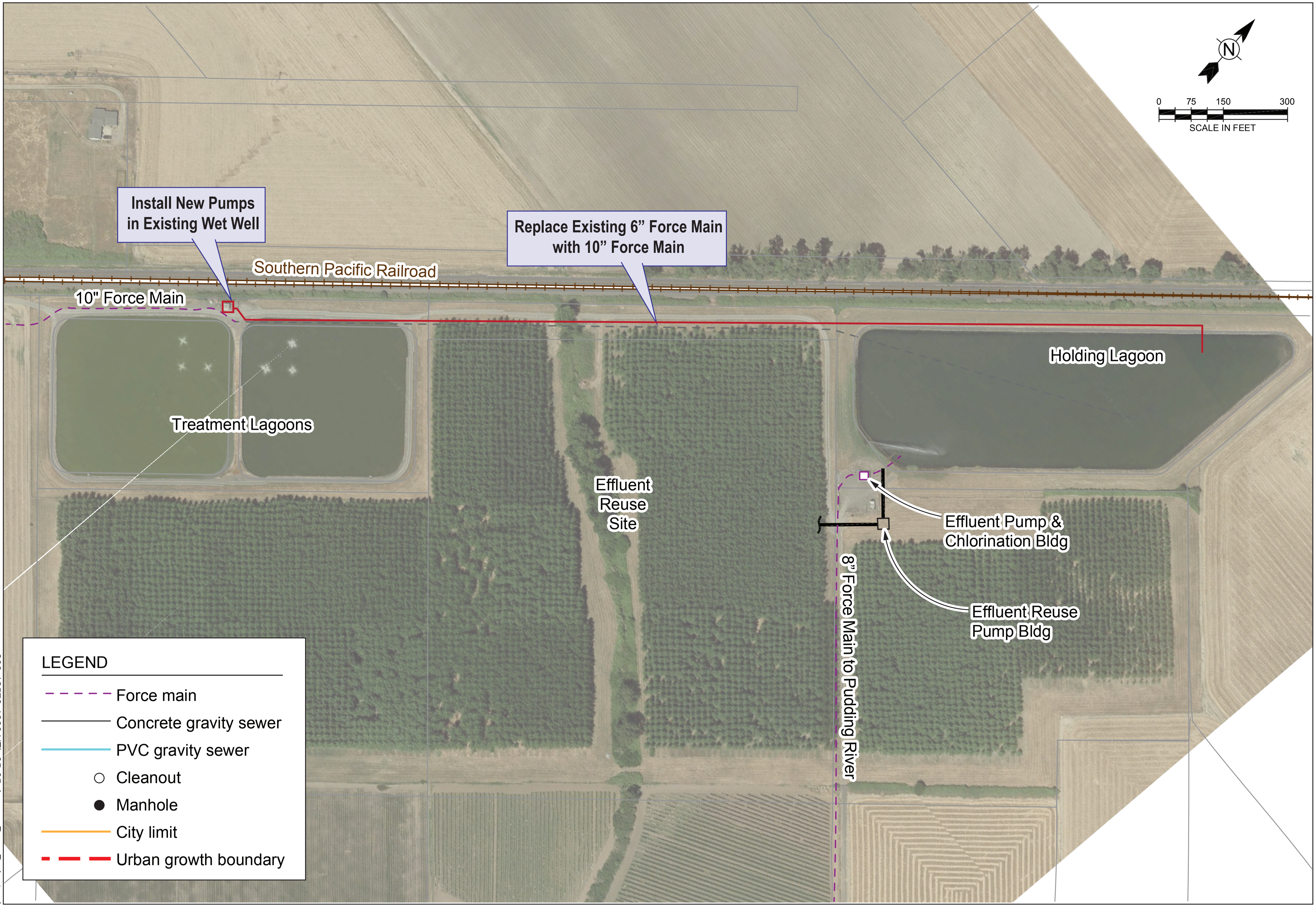

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Figure 5-5.
LAGOON TRANSFER PUMP IMPROVEMENTS

Evaluation of Alternatives

The older of the two parallel 6-inch PVC force mains was installed in 1980 with the construction of the holding lagoon. The second force main was added in 2005 for use with a supplemental pump during high-flow periods. The older pipe, with 38 years of service, has been reliable but has an unknown remaining service life. The following additional factors were considered:

- The estimated project costs for Alternative 1 and Alternative 2 are $750,000 and $630,000, respectively, an initial cost savings of $120,000. Offsetting this savings are increased pump and energy costs due to higher force main velocities with Alternative 2 (4.7 feet per second versus 6.8 feet per second). This would result in a significantly larger pump being required (35 hp vs 15 hp), with higher initial pump cost and annual energy cost. The estimated added energy cost for Alternative 2 is $2,000 for 2018 and would increase every year as flows increase. The calculated 30-year present worth of the additional energy cost is $49,000.
- Alternative 2 would allow the construction of a new force main to be delayed but would not eliminate the eventual need for it. There is a risk that the 38-year old pipe would require replacing, in which case the larger 10-inch pipe would be installed at an increased cost. Should this happen, Alternative 2 would end up being significantly more costly than Alternative 1.

Although Alternative 1 has a higher initial cost compared to continuing to use the existing force mains (Alternative 2), it is the recommended improvement due to the higher operational costs for Alternative 2 and risks of having to replace the force main within the planning period.

5.3.5 Effluent Disinfection

The chlorination system, 32,000-gallon contact pipe, and dechlorination system have all been operating well and in accordance with the permit. However, disinfection upgrades are needed for future design flows. Chlorine contact times have been calculated for the conditions listed in Table 5-4 shows chlorine contact times for existing and future conditions, along with the design requirements for minimum contact time. The projected 2042 peak-week contact time is well below the recommended time of 60 minutes. More contact time can be provided by extending the 30-inch chlorine contact pipes to create additional volume (see Figure 5-6).

Table 5-4. Chlorine Contact Chamber Performance

	Existing Conditions		Future (2042) Conditions		Recommended Contact Time
	Flow	Contact Time	Flow	Contact Time	
AWWF (Influent)	0.38 mgd	121 minutes	0.53 mgd	87 minutes	60 minutes
MMWWF (Influent)	0.57 mgd	81 minutes	0.78 mgd	58 minutes	60 minutes
Peak-Week (Effluent)	0.85 mgd	54 minutes	1.19 mgd	39 minutes	60 minutes

5.3.6 Pudding River Discharge (Outfall 001)

The two 15-hp effluent pumps installed in 2001 provide a maximum of 0.85 mgd flow through the 8-inch, 7,950-foot-long PVC force main and gravity pipe to the Pudding River. Under normal operating conditions, one pump is in service and the pumps are manually started and stopped by the operator. Both pumps are put into service as necessary to maintain adequate freeboard in the holding lagoon. The pumping capacity is 590 gpm with both pumps operating and 560 gpm with a single pump running.

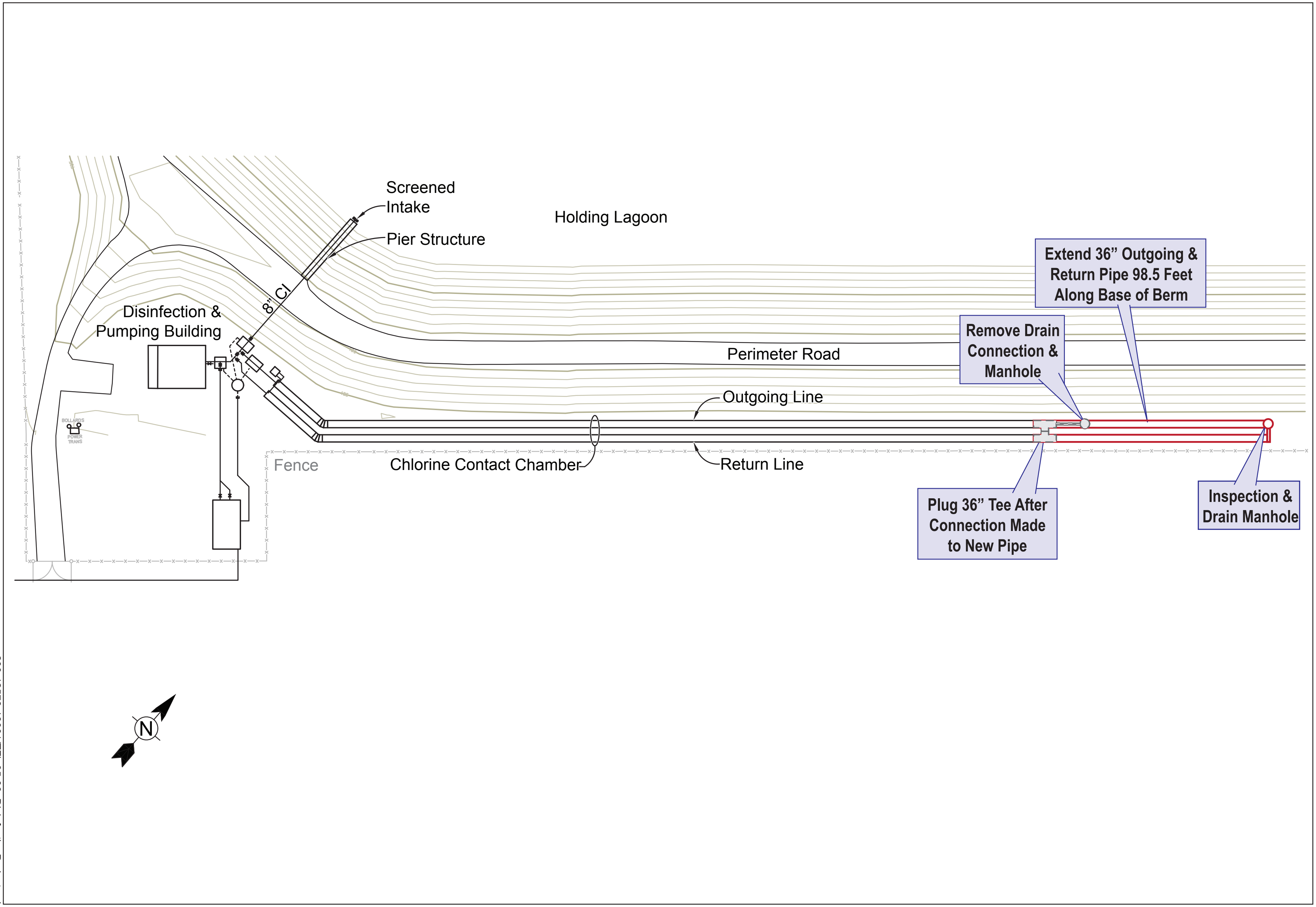

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Figure 5-6.
PROPOSED DISINFECTION IMPROVEMENTS

The existing discharge system capacity has been fully utilized for extended periods on several occasions during extremely wet weather. This indicates that increased outfall capacity or increased holding lagoon storage capacity will be necessary as the City grows. The water budget spreadsheet indicates that increased effluent flow during winter is achievable without a mass load increase if increased aeration at the treatment lagoons ensures that BOD concentrations remain below 20 mg/L. Chlorine contact time will be decreased, though it will still be well above the 20 minutes recommended for the peak day.

Increased pump capacity is achievable at a relatively low cost by replacing the pump sheaves to increase the current 1,050 rpm pump speed to either 1,150 or 1,250 rpm. See Table 5-5 for data on these improvements.

Table 5-5. Increased Pump Capacity Performance

Effluent Pump Speed	Capacity 1 Pump	Capacity 2 Pumps	Chlorine Contact Time	Pump Motor Upgrade
Existing Pump Speed (1,050 rpm)	0.80 mgd	0.85 mgd	54 minutes	None
1,150 rpm	0..86 mgd	0.91 mgd	50 minutes	None
1,250 rpm	0.90 mgd	0.97 mgd	48 minutes	New 20 Hp

Based on the low cost benefit, it is recommended that both the effluent pumping capability and holding lagoon capacity be increased in the near term to accommodate future flows and to maintain acceptable lagoon freeboard levels as flows increase. The 8-inch force main to the river is adequately sized to handle the proposed flow increase to 0.97 mgd (674 gpm). The manual transfer switch for the generator that provides effluent pumping backup power should be replaced with an automatic transfer switch.

5.3.7 Effluent Reuse (Outfall 002)

The effluent reuse system has worked well since becoming operational in 2002, meeting all permit conditions. Based on a review of system data over the last five years, the system has significant unused capacity, particularly in mid-summer. As previously discussed, October operation can be challenging in the event of prolonged heavy rainfall. The only remedy for this is to increase the holding lagoon storage volume. It is recommended that the holding lagoon volume be increased as discussed in Section 5.3.3.

5.3.8 Sludge Removal

The City contracted with the Oregon Association of Water Utilities for sludge depth profiling of the holding lagoon and treatment lagoons in 2014 and 2018, respectively. Data from these surveys are contained in Table 5-6. The sludge volume as a percentage of total lagoon volume is an effective indicator of the need for dredging. Generally it is desirable to keep the percentage of sludge volume below 20 percent. Excess sludge in the lagoons can reduce treatment volume, increase nuisance odors, and reduce treatment efficiency and effluent quality. Lagoon #1, the lead treatment lagoon in series with Lagoon #2, has the highest sludge levels, followed by Lagoon #2 and the holding lagoon. Lagoons #1 and #2 have been accumulating sludge for 17 years; the holding lagoon has been accumulating sludge for 39 years, since it was built in 1980.

Table 5-6. Sludge Depth Profiling Data

	Lagoon Volume (MG)	Average Sludge Depth (inches)	Estimated Sludge Volume (MG)	% Sludge Volume in Lagoon	Current Dry Tonnage	Average Annual Production	Projected Dry Ton Production[a]	Projected Dry Tons for Land Application
Treatment Lagoon #1	5.8	14.4	1.32	18.7%	162	10.1	76	237.5
Treatment Lagoon #2	5.2	8.3	0.73	10.7%	84	5.2	39	122
Holding Lagoon	15.3	9.1	1.36	8.7%	199	5.2	40	239

a. Assumes 8 years to next land application

It is possible to reduce the load to Lagoon #1 until dredging occurs by configuring the treatment lagoons to operate in parallel, but concern about resulting reduced treatment has eliminated this concept. It is not possible to reverse the series operation to make Lagoon #2 the lead lagoon. Table 5-7 shows the calculated time until 20- and 25-percent volume is reached in each lagoon, assuming current loads adjusted for increased population.

Table 5-7. Lagoon Sludge Filling Time

	Years Until 20% Lagoon Sludge Volume	Years Until 25% Lagoon Sludge Volume
Treatment Lagoon #1	2.0	9.4
Treatment Lagoon #2	6.5	9.8
Holding Lagoon	>30	>30

Based on this data, it is recommended that both treatment lagoons be dredged in the next 5 to 10 years. The holding lagoon currently has a lower sludge volume percentage than the treatment lagoons, and it accumulates solids less quickly. However, the 9-inch average sludge depth is higher than desired for a holding lagoon and total solids are significant. Therefore, it is recommended that the holding lagoon be resurveyed for sludge depth within the planning period. Prior to sludge removal, a new biosolids management plan will need to be developed and approved by DEQ. This will require the currently expired permit to be renewed.

For the planning purposes, it is assumed that the most efficient approach will be to land-apply biosolids dredged from the lagoons to the City's effluent reuse site, as was done in 2000.

5.3.9 Sustainability and Constructability

The proposed improvements represent the most cost-effective approach to upgrading the treatment facilities, and offer a number of benefits with regard to sustainability:

- The energy consumption is much lower than other treatment plants that are mechanical in nature.
- There are fewer mechanical parts and equipment, thus reducing the future maintenance and replacement requirements.
- The continued use of existing facilities reduces the resources required for the improvements and makes good use of existing facilities.
- The pipe replacement projects will reduce the I/I in the system, which in the long-term reduces the capacity requirements of the system. Also, more concrete pipe replacement beyond the study period will reduce the expansion requirements of the treatment plant in the future.
- Maintaining the on-site poplar plantation for effluent reuse reduces greenhouse gases.
- Maintaining on-site biosolids disposal minimizes energy usage related to sludge hauling.

Standard constructability issues can be addressed in design by means such as the following:

- Keeping the treatment plant operational while the improvements are completed.
- Providing for bypass pumping while replacing sanitary sewer pipe.

5.3.10 Energy Efficiency

Lagoon wastewater treatment systems are inherently energy efficient compared to mechanical treatment plants, as there is much less mechanical equipment that requires energy. Maintaining the treatment plant as a lagoon system keeps the energy consumption low, and thus energy efficient. New equipment associated with the proposed aeration and lagoon transfer pump station will be selected to maximize energy efficiency. It is standard procedure to require energy-efficient motors for pumps, aerators and other mechanical devises, and it is anticipated that it will be required in the design for any treatment plant upgrades.

6. RECOMMENDED PLAN

6.1 PROJECT DESCRIPTION

The following improvements to the City's wastewater facilities are proposed to meet existing needs and provide for future development over the planning period:

- Collection system pipe improvements consisting of upsizing trunk mains in Fir Avenue, 7th Street, and 1st Street.
- French Prairie Meadows and 4th Street pump station backup power upgrades consisting of installing new automatic transfer switches.
- Treatment plant improvements consisting of:
  - Installation of an automatic fine screen (0.25-inch screen opening) within a new headworks structure
  - Upgrades to the lagoon transfer pumps
  - Aeration improvements in the treatment lagoons
  - Increased capacity of the holding lagoon by raising the dike
  - Dredging of the treatment lagoons, with biosolids applied to the reuse site
  - Effluent pumping system improvements
  - Chlorine contact system improvements.

6.2 DESIGN DATA

The recommended improvements were designed to accommodate wastewater flows and loads based on growth assumptions through 2042. Table 3-5 and Table 6-1 summarize the design data for the proposed collection system and treatment plant improvements, respectively.

6.3 PROJECT COSTS

Budget-level estimates developed for this plan are based on recent work in the area and are reliable to within 20 percent. Estimated costs include a 30-percent construction contingency and 25-percent markup for engineering, legal and administrative costs. Costs are in 2018 dollars unless otherwise noted (ENR 20-city average Construction Cost Index = 11185.51). Concept level cost spreadsheets for the recommended improvements are included in Appendix G.

6.3.1 Collection System Improvements

Collection system improvements consist of trunk main replacement projects (see Figure 5-1) and pump station backup power improvements. The trunk mains identified currently surcharge at peak flows, although no overflows are calculated or reported. Based on this, these improvements are not seen as urgent. The pipes should occasionally be monitored during peak flows to identify the level of surcharging that occurs. For planning purposes, it is recommended that the northwest Fir Avenue Trunk Main be replaced in 2025, 7th Street in 2030, and southeast Fir Avenue Trunk Main in 2040. Table 6-2 summarizes estimated costs. Installation of new automatic transfer switches at both pump stations is recommended in the near term to improve system reliability.

Table 6-1. Design Data for Recommended Treatment Plant Improvements

Design Parameter	Design Criteria
Headworks	
Screen Type	Inclined auger; ¼" opening
Peak Flow Capacity	2.4 mgd
Screenings Washing and Compaction	Yes
Bypass Screen	Manually cleaned coarse bar screen
Lagoon Aeration	
Phase 1 (near term)	Add two 5-hp aerators, one in each lagoon
Phase 2 (before 2030)	Add two additional 5-hp aerators in Lagoon #1
Phase 3 (before 2040)	Add two additional 5-hp aerators in Lagoon #2
Transfer Pump	
Pumps	Duplex submersible installed in existing wet well
Capacity	1,160 gpm
Force Main	Replace existing 6" force main with 10-inch force main
Power	
Headworks/Transfer Pumping Generator	Replace existing headworks/transfer pumping generator and provide automatic transfer switch with 60-kW unit
Disinfection/Effluent Pumping Generator	Replace manual transfer switch with automatic transfer switch
Holding Lagoon Capacity	
Total Dike Height Raise	18 inches
Minimum Berm Width at Top	9 feet
Additional Volume provided	3.0 million gallons
Disinfection (Chlorine Contact)	
Existing Facilities	30-inch diameter chlorine contact pipe
Design Contact Time	60 minutes at 2042 effluent peak week (1.19 mgd)
Additional Volume Required	17,600 gallons
Additional Length of 30-Inch Pipe Required	193 feet
Effluent Pumping (Wet-weather Outfall 001, Discharge to the Pudding River)	
Pump Modifications	Replace sheaves to increase pump speed from 1,050 rpm to 1,250 rpm
Capacity	Peak capacity increases from 0.85 mgd to 0.97 mgd
Biosolids Removal	
2025 Treatment Lagoon Dredging and Land Apply	352 dry tons

Table 6-2. Collection System Improvement Costs

Project	Cost
Clay Pipe Replacement Program	
C1A. Upsize 8-inch Trunk Main in Fir Avenue (northwest) to 12-inch	$510,000
C1B. Upsize 8-inch Trunk Main in 7th Street to 12-inch	$290,000
C2. 1 Upsize 8-inch Trunk Main in Fir Avenue (southeast) and 1st Street to 10-inch	$390,000
Subtotal	***$1,190,000***
Pump Stations	
Standby Operation Improvements at French Prairie Meadows and 4th Street Pump Stations	$50,000
Total	**$1,240,000**

6.3.2 Treatment Facility Improvements

Near-Term

It is recommended that a near term project be scheduled for 2020 and consist of improvements to the transfer pump system and increase of the holding lagoon storage, as these are undersized for existing flows. It is also recommended that Phase 1 of the aeration improvements and the effluent pump system upgrades be installed. These improvements will reduce BOD levels and increase the capacity of the treatment plant as a whole. Table 6-3 summarizes the proposed improvements and estimated costs.

Table 6-3. Near-Term Treatment Facility Improvement Costs

Project	Cost
Lagoon Transfer Pumping Upgrade	$820,000
Treatment Lagoon Aeration Improvements - Phase 1	$110,000
Effluent Pump System Improvements	$20,000
Total	**$950,000**

Long-Term

Improvements that are expected to be necessary within the planning period but are not required at this time include Phase 2 of the aeration improvements, chlorine contact improvements, and sludge removal. These improvements should be programmed for 10 to 20 years in the future. Table 6-4 summarizes the long-term treatment plant improvements.

Table 6-4. Intermediate and Long-Term Treatment Facility Improvement Costs

Project	Cost
Headworks Fine Screen	$500,000
Holding Lagoon Capacity Increase – Raise Dikes	$390,000
Treatment Lagoon Dredging and Biosolids Land Application	$200,000
Treatment Lagoon Aeration Improvements - Phase 2	$210,000
Chlorine Contact Improvements	$100,000
Treatment Lagoon Aeration Improvements - Phase 3	$210,000
Total	**$1,610,000**

6.4 ANNUAL COSTS

The $266,000 estimated annual cost for FY-2018 administration and operation and maintenance will be the basis for ongoing annual costs, with adjustments for inflation. Should the City add staff, the operation and maintenance budget would need to be adjusted accordingly.

6.5 CAPITAL IMPROVEMENT PLAN

The improvements have been combined into a capital improvement plan (CIP), as shown in Table 6-5.

Table 6-5. Capital Improvement Plan

CIP Project	Cost
5-Year	
Lagoon Transfer Pumping and Force Main Upgrade	$820,000
Treatment Lagoon Aeration Improvements - Phase 1	$110,000
Effluent Pump System Improvements	$20,000
Standby Operation Improvements at Collection System Pump Stations	$50,000
5-Year Subtotal	**$1,000,000**
10-Year	
Headworks Fine Screen	$500,000
Holding Lagoon Improvements (Raise Dikes)	$390,000
Treatment Lagoon Dredging and Biosolids Land Application	$200,000
Upsize 8-inch Trunk Main in Fir Avenue (northwest) to 12-inch	$510,000
Upsize 8-inch Trunk Main in 7th St to 12-inch	$290,000
Upsize 8-inch Trunk Main in Fir Avenue (southeast) and 1st Street to 10-inch	$390,000
Treatment Lagoon Aeration Improvements - Phase 2	$210,000
10-Year Subtotal	**$2,490,000**
15 Year	
Chlorine Contact Improvements	$100,000
Treatment Lagoon Aeration Improvements - Phase 3	$210,000
15 Year Subtotal	**$310,000**
Total	**$3,800,000**

6.6 SCHEDULE

The near-term treatment plant projects are necessary to meet current system demand and consequently should be constructed as soon as possible. The following are the key project milestones for the near-term improvement projects:

- Review of Draft Facilities Plan complete (DEQ and the City): March 2019
- Facilities Plan finalized: June 2019
- Apply for construction funding: by September 2019
- Complete design: December 2020
- Bid the project: March 2021
- Construction: May 2020 to October 2021.

7. FINANCIAL

Wastewater system improvements may be financed by the City's wastewater user fees (rates), system development charges (SDCs), federal or state loan programs, grants, and bonds. SDCs can be used to fund improvements that are needed in order to accommodate future growth. For improvements needed to address existing deficiencies, the City will need to provide funding with a combination of user rate revenue and outside sources. This chapter includes a financial analysis and evaluation of rates and SDCs to fund the recommended CIP and wastewater system operations through the planning period.

7.1 LOCAL AND OUTSIDE WASTEWATER SYSTEM FUNDING SOURCES

7.1.1 Local Funding Sources

Local funding sources for capital improvements other than SDCs and sewer user fees include various types of loans, bond programs, grants, and ad valorem taxes (property taxes). Local bond funding typically used in Oregon includes general obligation bonds, revenue bonds and improvement bonds (typically used for local improvement districts). Ad valorem taxes provide a tax on all property within the jurisdiction, whether developed or not, and usually are based on assessed value. Connection fees can only include the jurisdiction's actual cost associated with a connection and cannot cover capital improvement costs.

7.1.2 State and Federal Grant and Loan Programs

A number of state and federal grant and loan programs are available to help municipalities finance wastewater system improvements. The following are the primary sources of such funding:

- The Rural Development Administration (RD), a part of the U.S. Department of Agriculture
- The Oregon Economic and Community Development Department, which administers the Special Public Works Fund (SPWF), the Water/Wastewater (W/W) Financing Program, the Community Development Block Grant (CDBG) program, and the Bond Bank Program
- The Oregon DEQ, which administers the Clean Water State Revolving Fund (CWSRF).

Under current programs, the City may qualify for grants available under the RD, W/W, or CDBG programs.

7.2 SYSTEM DEVELOPMENT CHARGES

SDCs are fees that local governments collect from property developers to offset the cost of public improvements associated with new development. They are one-time fees collected at the time of building permit issuance. The fees collected may only be used for capital improvements for municipal services. Under Oregon law, SDCs can be charged for capital improvements associated with the following:

- Water supply, treatment and distribution
- Wastewater collection, transmission, treatment and disposal
- Drainage and flood control
- Transportation
- Parks and recreation.

SDCs can consist of an "improvement fee" (for costs of capital improvements to be constructed), a "reimbursement fee" (to pay back municipalities for capital construction already built that included future capacity needs), or a combination of both. The methodology for determining a city's SDC is not fixed in statute. Instead, local municipalities develop rate structures for any SDCs imposed. Oregon law requires linkages between the charges imposed and the current or projected development. There must be a reasonable connection between the need for new facilities and the new development paying the SDC. SDCs cannot be used for operational costs or for maintenance of existing facilities. SDCs do not require a public vote, but Oregon law requires public notice to adopt or amend SDC methodology.

7.2.1 Current Gervais SDCs

The Gervais City Code authorizes improvement SDCs for the wastewater utility. The current charge of $6,365 per single-family residence or equivalent dwelling unit (EDU) was last updated in 2006.

7.2.2 SDC Methodology

Proposed improvements were evaluated for SDC eligibility. For projects in which all or some of the cost is associated with improvement needed to accommodate future growth, the appropriate SDC rate is determined by allocating the growth-related portion of the cost among the anticipated number of future connections to be served. The methodology and results for each type of facility are presented in the sections below.

Trunk Sewers

Trunk sewers run along Fir Avenue to Fourth Street, in 7th Street to Ivy Avenue, in 1st Street to Grove Avenue, and in Grove Avenue to the manhole where the French Prairie Meadows Pump Station discharges. Proposed improvements to these trunk mains are described in Section 6.3.1. Based on the ratios of existing flows to projected future flows (see Appendix E), the portions of the recommended improvements to these sewers that are attributable to growth are shown in Table 7-1.

Table 7-1. Portion of Cost for Future Growth; Trunk Sewers

Project	Portion of Project for Future Growth
C1A. Upsize 8-inch Trunk Main in Fir Avenue (NW) to 12-inch	25.8%
C1B. Upsize 8-inch Trunk Main in 7th Street to 12-inch	42.0%
C2. 1 Upsize 8-inch Trunk Main in Fir Avenue (SE) and 1st Street to 10-inch	4.9%

Headworks Fine Screen

The proposed headworks fine screen will be designed for 2042 flows and will serve existing and growth-created flows. The portion of this project attributable to future flows is quantified as the ratio of increased average annual future flows to the overall design flow, as shown in Table 7-2.

Table 7-2. Portion of Cost for Future Growth; Headworks Fine Screen and Transfer Pump Improvements

Existing AAF	2042 AAF	Growth Related Increase	Portion for Future Growth
0.26 mgd	0.37 mgd	0.11 mgd	0.11/0.37 or 29.7%

Transfer Pump Station Improvements

The transfer pump improvements will be designed for 2042 flows, but will serve existing flows as well. The portion of these projects attributable to future flows is quantified as the ratio of increased average annual future flows to the overall design flow, as shown in Table 7-2.

Treatment Lagoon Aeration Improvements Phase 1 and 2

Additional aeration for the treatment lagoons is needed only to accommodate future growth-related BOD loads and consequently is 100-percent SDC eligible.

Holding Lagoon Capacity Improvements (Dike Raise)

Additional storage volume for the holding lagoon is needed only to provide the hydraulic capacity for future growth-related projected flows and consequently is 100-percent SDC eligible. Although the 2-foot freeboard was encroached upon by existing users, this could be rectified by operational changes. Consequently, the additional berm height is entirely for future growth.

Effluent Pumping System

Additional effluent pump capacity is needed only to provide hydraulic capacity for future growth-related projected flows and consequently is 100-percent SDC eligible.

Chlorine Contact System Improvements

Additional chlorine contact piping is needed only to provide chlorine contact time for future growth-related projected flows and consequently is 100-percent SDC eligible.

7.2.3 Summary of Costs Attributable to Growth

The capital costs for the recommended improvements are presented in Table 7-3. The costs include construction, contingencies, engineering, legal and administrative costs. The appropriate SDC rate for these improvements is determined by allocating the growth-related portion of the cost among the anticipated number of future connections (or EDUs) to be served. Future EDUs are calculated based on the increase in population from 2018 to 2042 of 955 persons (see Section 1.4.3) divided by the assumed persons per household. Based on Portland State population figures, currently Gervais has 4.1 persons per household. Assuming this number of persons per household (or EDU) will continue, the population increase represents 232 new EDUs.

Table 7-3. Portion of Cost for Future Growth; Summary

Project	Cost	Portion for Future Growth	Cost for Future Growth
Lagoon Transfer Pumping Upgrade	$820,000	29.7%	$243,784
Treatment Lagoon Aeration Improvements - Phase 1	$110,000	100 %	$110,000
Holding Lagoon Capacity Improvements (Raise Dikes)	$390,000	100%	$390,000
Headworks Fine Screen	$500,000	29.7%	$148,649
Treatment Lagoon Dredging and Biosolids Land Application	$200,000	5.6%	11,185
Effluent Pump System Improvements	$20,000	100%	$20,000
Upsize 8-inch Trunk Main in Fir Avenue (northwest) to 12-inch	$510,000	25.8%	$131,663
Upsize 8-inch Trunk Main in 7th Street to 12-inch	$290,000	42.0%	$121,913
Upsize 8-inch Trunk Main in Fir Avenue (southeast) and 1st Street to 10-inch	$390,000	4.9%	$18,975
Treatment Lagoon Aeration Improvements - Phase 2	$210,000	100%	$210,000
Chlorine Contact Improvements	$100,000	100%	$100,000
Treatment Lagoon Aeration Improvements - Phase 3	$210,000	100%	$210,000
Current SDC Budget Balance[a]			***($369,716)***
Total SDC Eligible Costs			**$1,716,169**
Cost per Future EDU			**$5,779**

a. The current balance shown represents SDC funds previously collected that have yet to be spent.

As shown in Table 7-3, the calculated SDC is $5,779 per EDU. It is recommended that this figure be updated annually to account for inflation as determined by the previous year's Consumer Price Index (West Region).

7.2.4 SDCs for Multifamily and Commercial/Industrial Zoning

For the purposes of determining the SDC rates for multifamily and commercial/industrial zoning, 1 EDU is defined as 27 fixture units (per the current Uniform Plumbing Code), the number of fixtures for a typical single-family house. The number of fixture units per multifamily and commercial/industrial connection will be divided by 27 to determine its EDU total. According to the Uniform Plumbing Code, the standard number of fixtures for a two-bedroom, one-bathroom multifamily unit is 19 fixtures. Based on this, multifamily zoning is assumed to be 0.70 EDU per unit.

7.3 RATE ANALYSIS

The rate analyses performed for this facilities plan centers on the required rate revenue to fund the following:

- New debt service to finance the existing users' share of the capital improvements
- Increased administration costs and operation, maintenance and replacement (OM&R) costs associated with expanded facilities.

7.3.1 Existing and Future Expenses

Debt Service

The City currently services a debt of $381,749 (as of June 2018) associated with revenue bonds issued in 2001, which expire in 2031. Annual payments on the bonds are $57,800. For this facilities plan, it was assumed that the remaining balance on the bonds will be paid off with user fees over the next 12 years.

Future debt service will be necessary to fund the recommended improvements. For the purposes of the rate analysis, two loans through the DEQ's CWSRF program were assumed: one in fiscal year 2020/2021 of $620,000, and one in fiscal year 2026/2027 of $1,800,000 to complete funding for the 5-year and 10-year CIP projects, respectively. The current annual interest rate for low income communities, for which Gervais qualifies is 1.7 percent. A 20-year term is assumed for each loan. The annual debt service is estimated to be increased in 2020 to $95,717, and in 2026 to $205,799. Once the 2001 loan expires in 2031, the City debt service will be reduced to $148,000.

Annual Administration, Operation, Maintenance & Replacement Costs

Annual administration and OM&R costs are recurring costs typically funded through user rates. OM&R includes a set-aside into a fund for future replacement of equipment as needed; the City does not currently set aside any revenue into a replacement fund. The City's 2017/2018 fiscal year annual cost for administration, operations and maintenance was $266,000. For this analysis, it was estimated that these costs would increase by 2 percent per year over the planning period, including a set-aside into a replacement fund.

7.3.2 Existing and Future Rate Revenue

Current User Rates

Sewer user rates are monthly fees assessed to all users connected to the sewer system. The City currently has 630 single-family users and 18 commercial connections assessed at 18 EDUs, for a total of 648 EDUs. The City's current user rate is $37.00 per EDU per month, last increased in 2001. Based on this, the City's current annual revenue from user fees is $292,000. Current expenses (personnel services, material services and debt services) total $323,926.

For comparison purposes, the most recent available survey of sewer user rates was done by the League of Oregon Cities in 2014. The average monthly EDU rate for cities in the Willamette Valley at that time was $45.44. The Cities of Woodburn and Aurora currently have rates of $44.64 and $59.22 per month, respectively.

Projected User Rate

As current rates do not meet expenses, and with additional funding being needed for the CIP, a rate increase at the beginning of the 2019/2020 fiscal year is recommended. Based on estimates of annual expenses, existing and new debt service, and revenue through the planning period, budget projections were developed under various funding scenarios. The recommended funding plan resulted in a base sewer rate for 1 EDU of $43.50 per month, with an annual 3 percent increase until 2026/2027. Funding for the second phase of improvements, scheduled for 2027, requires a one-time rate increase of 5 percent prior to the 2026/2027 fiscal year. Beyond 2027, the base rate per EDU should be increased annually to account for inflation, in accordance with the Portland Area Consumer Price Index for the preceding year. For the purpose of the analysis, the annual increase was estimated at 1.5 percent.

7.3.3 Recommended Rate Schedule

Each residential unit, regardless of zoning classification, is defined as one EDU. Recommended rates are as shown in Table 7-4. Table 7-5 provides examples of how these rates would be applied. To account for inflation, the base rate per EDU should be increased annually, starting July 1, 2020, in accordance with the Portland Area Consumer Price Index for the preceding year.

Table 7-4. Recommended Rates

User Classification	2019/2020 Monthly Rate
Residential Zoning	$43.50 per EDU for up to 750 cubic feet of water usage, plus the equivalent portion per EDU for each additional cubic foot of water used.
Commercial/Industrial	$43.50 per EDU for up to 1,500 cubic feet of water usage, plus the equivalent portion per EDU for each additional cubic foot of water used.

Table 7-5. Example Monthly Rates

Example	EDUs	Monthly Rate
Single family dwelling with 750 cubic feet of water usage	1	$43.50
Single family unit with 1,000 cubic feet of water usage	1.33	$57.85
Three-family dwelling with 1,500 cubic feet of water usage	3	$130.50

8. ENVIRONMENTAL ASSESSMENT

8.1 ALTERNATIVES TO PROPOSED ACTION

The National Environmental Protection Act (NEPA) requires an environmental evaluation of at least two alternatives for projects that must prepare an environmental review. The proposed project presented in this facilities plan (the recommended plan) consists of the set of projects described in Chapter 6, which were developed through an extensive planning analysis. The only identified alternative to the proposed project is to make no improvements (the no-action alternative).

Under the no-action alternative, no wastewater facilities improvements would be constructed. The City's wastewater system would remain at capacity. Future development within the city limits and urban growth boundary would be limited by the existing capacity of the treatment plant.

8.2 AFFECTED ENVIRONMENT/ENVIRONMENTAL CONSEQUENCES

8.2.1 Land Use

Affected Environment

The proposed improvements to the treatment plant are within the existing property designated for the wastewater treatment plant; no expansion of the site is required.

Environmental Consequences

The proposed treatment plant improvements will be at the existing treatment plant site and will not affect land use.

With the no-action alternative, new development in the treatment plant's service area could be restricted if the system has inadequate capacity to serve future growth.

Mitigation

The proposed improvements will have no adverse impact on land use, so no mitigation is required.

8.2.2 Floodplains

Affected Environment

There are no designated floodplains within the existing property designated for the wastewater treatment plant

Environmental Consequences

All of the proposed improvements are outside mapped flood zones and therefore will have no impact on flooding.

The no-action alternative would have no temporary or permanent impact on flooding.

Mitigation

The proposed improvements will have no adverse impact on land use, so no mitigation is required.

8.2.3 Wetlands

Affected Environment

All of the proposed improvements are outside mapped wetlands and therefore will have no effect on the wetlands.

Environmental Consequences

All of the proposed improvements are outside mapped wetlands and therefore will have no environmental impact.

The no-action alternative would have no temporary or permanent impact on wetlands.

Mitigation

The proposed improvements will have no adverse impact on wetlands, so no mitigation is required.

8.2.4 Wild and Scenic Rivers

Affected Environment

There are no rivers classified as a wild and scenic within the project area.

Environmental Consequences

Neither the proposed project nor the no-action alternative would directly or indirectly impact any wild or scenic river.

Mitigation

No mitigation of any known wild or scenic river is necessary.

8.2.5 Cultural Resources

Affected Environment

The National Register of Historic Places was reviewed and no historic properties were identified within the vicinity of the treatment plant improvements.

The Digital Archeological Record was reviewed for archaeological sites in the Gervais area and none were found in the vicinity of the wastewater facilities.

The improvements at the treatment plant, holding lagoon and pump stations will all occur within the vicinity of existing wastewater facilities which are developed; therefore, any unknown sites are previously disturbed.

Environmental Consequences

The proposed project would not directly or indirectly impact known historic or cultural resources. However, unknown prehistoric, historic or cultural resources may exist below the surface that are not detectable without subsurface probing or excavation.

The no-action alternative would have no temporary or permanent impact on cultural resources.

Mitigation

Disturbance of any soils below ground level will require notification of the State Historical Preservation Officer, and preconstruction surveys and construction monitoring may be required. If any historical or archaeological artifacts are discovered during the course of construction, work must be temporarily halted and the engineer must be contacted.

8.2.6 Biological Resources

Affected Environment

Investigation of potential impacts on threatened and endangered species was performed as part of the effluent reuse construction in 2001. At that time there were no listed or proposed species within the project site.

The improvements at the existing treatment plant, holding lagoon and pump stations will all occur within the vicinity of existing wastewater facilities which are developed; therefore the sites are previously disturbed.

Environmental Consequences

Neither the proposed project nor the no-action alternative would directly or indirectly impact any known threatened or endangered species or their habitat.

Mitigation

No mitigation for threatened or endangered species or their habitat is necessary. All construction shall comply with the Endangered Species Act. If any evidence of threatened or endangered species or their habitat is discovered during the course of construction, work must be temporarily halted and the engineer must be contacted. Work may proceed at the direction of the engineer following consultation with the U.S. Fish and Wildlife Services and National Marine Fisheries Service.

Should federal funding assistance be applied for, informal consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service will be required.

8.2.7 Water Quality

Affected Environment

The affected environment for water quality consists of surface water (Pudding River) and groundwater.

Environmental Consequences

Proposed Project

Construction activities associated with the proposed project may impact water quality in the short term. Construction activities, including clearing and grading, would lead to increased potential for erosion and sedimentation in downstream drainages. Accidental spills of oils, fuels, or solvents during construction could impact groundwater. Release of any potentially toxic materials such as hydraulic fluid, gasoline, chlorine, raw sewage or oil could impact surface or groundwater quality.

Post-construction activities at the treatment plant, holding lagoon and pump stations may impact water quality if an accidental spill of chemicals occurs or if a general failure of the facilities results in the release of raw or partially treated sewage into the Pudding River.

No-Action Alternative

Under the no-action alternative, the wastewater treatment facilities would not be improved and would remain at capacity for the current level of development in the service area. Future development could result in flows exceeding the wastewater facilities' capacity, with the potential for overflow of untreated wastewater, which could have a negative impact on surface waters or groundwater.

Improvements necessary to meet the City's NPDES water quality permit would not be performed, so the City could be out of compliance with permit requirements.

Mitigation

Mitigation measures for water quality issues include the following:

- A 1200C general NPDES permit will need to be obtained for water quality for the construction site.
- Existing components of the treatment plant will need to be kept on-line until new components can be brought on-line to ensure that the treatment plant's NPDES permit requirements are met during construction.
- Water used to mitigate for dust created during construction activities will be prevented from entering drainages and must be collected and disposed of in accordance with DEQ water quality standards and NPDES permit requirements.
- To reduce the possibility of chemical spills or releases of contaminants, including any non-stormwater discharge to drainage channels, the contractor will implement appropriate hazardous material management practices.
- When bypass pumping of sewage is required, the contractor will have multiple pumps on hand to ensure that sewage spills and overflows do not occur.

Appendix A. Wastewater Lagoons Sludge Profile Final Report

City of Gervais

Wastewater Lagoons Sludge Profile

Final Report

November 2018

Prepared by:

Oregon Association of Water Utilities

City of Gervais Wastewater Lagoon Sludge Profile – November 2018 –

This Study, by Oregon Association of Water Utilities, is a summary report, written for the City of Gervais, to assist in establishing the levels of sludge accumulation in the first two lagoon cells. The combined acreage of the primary and secondary lagoon consist of approximately 7.21 total acres of open space and receives the entire portion of the treated effluent wastewater from the City of Gervais's collection system. A third lagoon, which was profiled in September 2014 was not part of the process, but the data collected in 2014 will be provided as supplemental information.

On November 6, 2018 the Oregon Association of Water Utilities arrived to begin the sludge profiling, by using a tube style sludge judge sized 1.5-inch diameter by 15 feet in length. The tube has a one-way check valve that allows materials (water and sludge) to enter. The tube is labeled with both one-inch and one-foot increments. The process involved collecting designated probes throughout each cell by means of following a 75 foot grid pattern using traffic cones placed as markers along the edges of the cell. These probes are collected only for the purpose of determining the depth of sludge accumulated at various locations throughout each cell. Each probe indicates both the total depth of water and the depth of the bottom solids. The locations for probing is accomplished by means of a small boat to the approximate center of two markers, sampling the sludge blanket depth, and noting the depth measurement and any visual comments within the field notes.

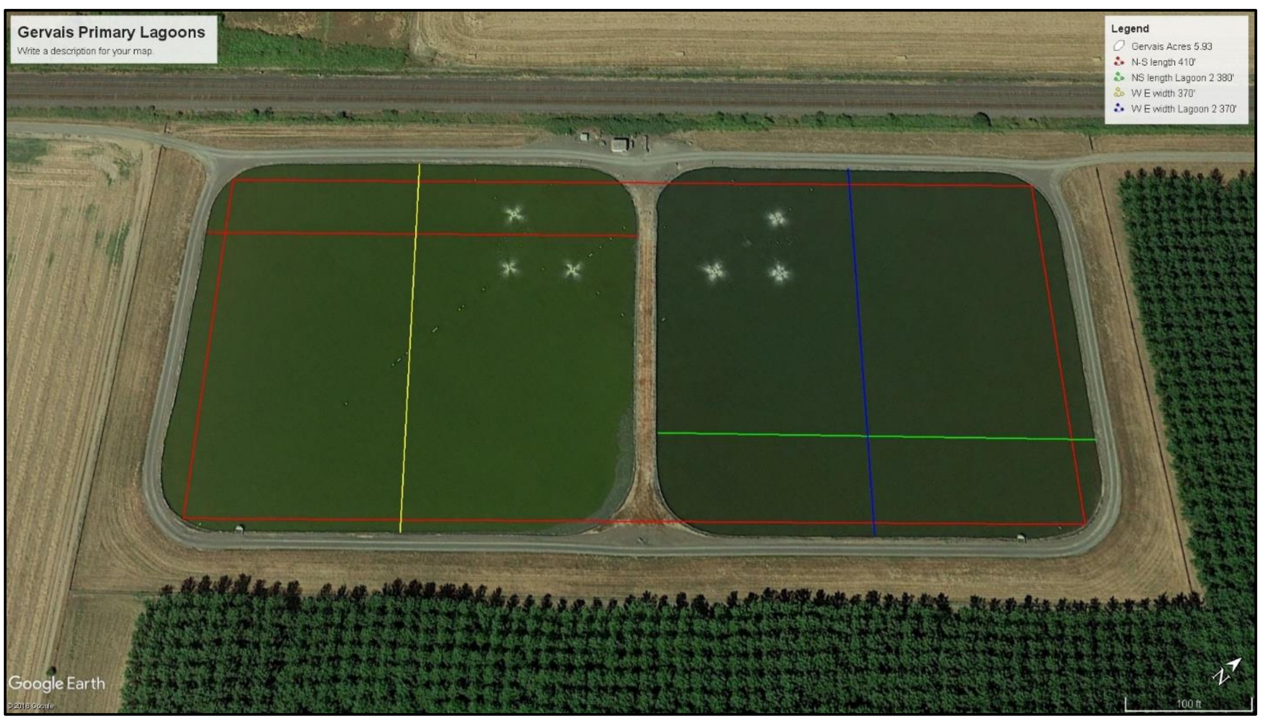
Profiling a lagoon is a way of determining how much sludge has accumulated in the wastewater ponds and the results can be used as a tool to better manage the bio-solids. Better management of bio-solids can improve the water quality of lagoons, help to keep the system in compliance with State and Federal regulations and save a wastewater utility many dollars in preparation and advanced planning to meet operational conditions and needs.

As wastewater lagoon sludge volumes reach 15 percent, operational concerns may begin. However, most of these problems are not visibly noticeable at the time. After sludge levels reach 33 percent, it becomes challenging to remain in compliance with the NPDES permit. Once sludge levels reach a 50 percent level, the lagoon ceases to function properly.

Two sets of charts are presented for each cell. The first chart displays a grid format that correlates the measurements using Google Earth mapping. Pat Claxton provided the measurements in 2014 for the third cell. The grid squares are colored to indicate the boundaries of the ponds. Light blue colored squares represent the lagoon (water) area while the shoreline or land area is indicated by a grey border. Grid numbers and inch measurements illustrate the approximate point of measurement and depth of sludge.

Based on the configuration of our Excel spreadsheet, a second series of charts were produced to show how the depth numbers transfer to diamond shaped points indicating three levels of depth, correlating a deeper depth of sludge with the darker colored areas. Observations are as follows:

An aerial map is provided to gain a sense of perspective as to the location, size and process the wastewater lagoons serve for the City of Gervais:



Cell # One:

On November 6, 2018 OAWU began the lagoon profile process to determine the depth of sludge found in the lagoon system for the City of Gervais. Cell # 1 is the initial storage lagoon that receives the raw sewage from the community. Beginning in the area of the inlet, total depth was measured in several locations, and the operating level at the time of the process was 72 inches. The total height of the water board is 96 inches, yet the cells are usually not operated above 78 inches.

The average depth of the entire cell was calculated at 14.4 inches, with numerous areas measuring a minimum of 9 inches. The greatest depth was just at the inlet and measured 24 inches and 21 inches respectively moving in an eastern direction. These two measurements were taken in the farthest two northwestern sectors. Total measured accumulative sludge was 345 inches. This particular area of the pond also exhibited a sludge that was thick grey and paste-like consistency. Just east of the center line of the cell, the consistency of the sludge had changed to a looser mud-like texture. The sludge would simply rinse off the tube when moved through the water. See first chart with depth figures. The clarity of water (overcast) was approximately 6 inches.

To approximate the total amount of sludge in the cell, an average 14.4 inches or 1.16 feet was multiplied by 410 ft. (L) by 370 ft. (W).

- 410 x 370 x 1.16 = 176,000 cu. ft.
- 176,000 cu. ft divided by 27 cu. ft per cubic yard = 6,518 cu. yds.

Cell # Two:

The second cell was operating at a depth of 65 inches and had a water clarity of 12-inches. The average overall sludge depth was 8.3 inches. The total water board height was 96 inches and the cell is usually operated at a depth of 74 inches. Total measured accumulative sludge was 198 inches. Throughout the entire cell, the consistency was the sludge was mud-like, with the exception near the outlet in the northeastern corner when the sludge became more paste-like, sticky and would not rinse of the tube.

To approximate the total amount of sludge in the cell, an average 8.3 inches or 0.69 feet was multiplied by 380 ft. (L) by 370 ft. (W).

- 380 x 370 x 0.69 = 97,014 cu. ft.
- 97,014 cu. ft divided by 27 cu. ft per cubic yard = 3,593 cu. yds.

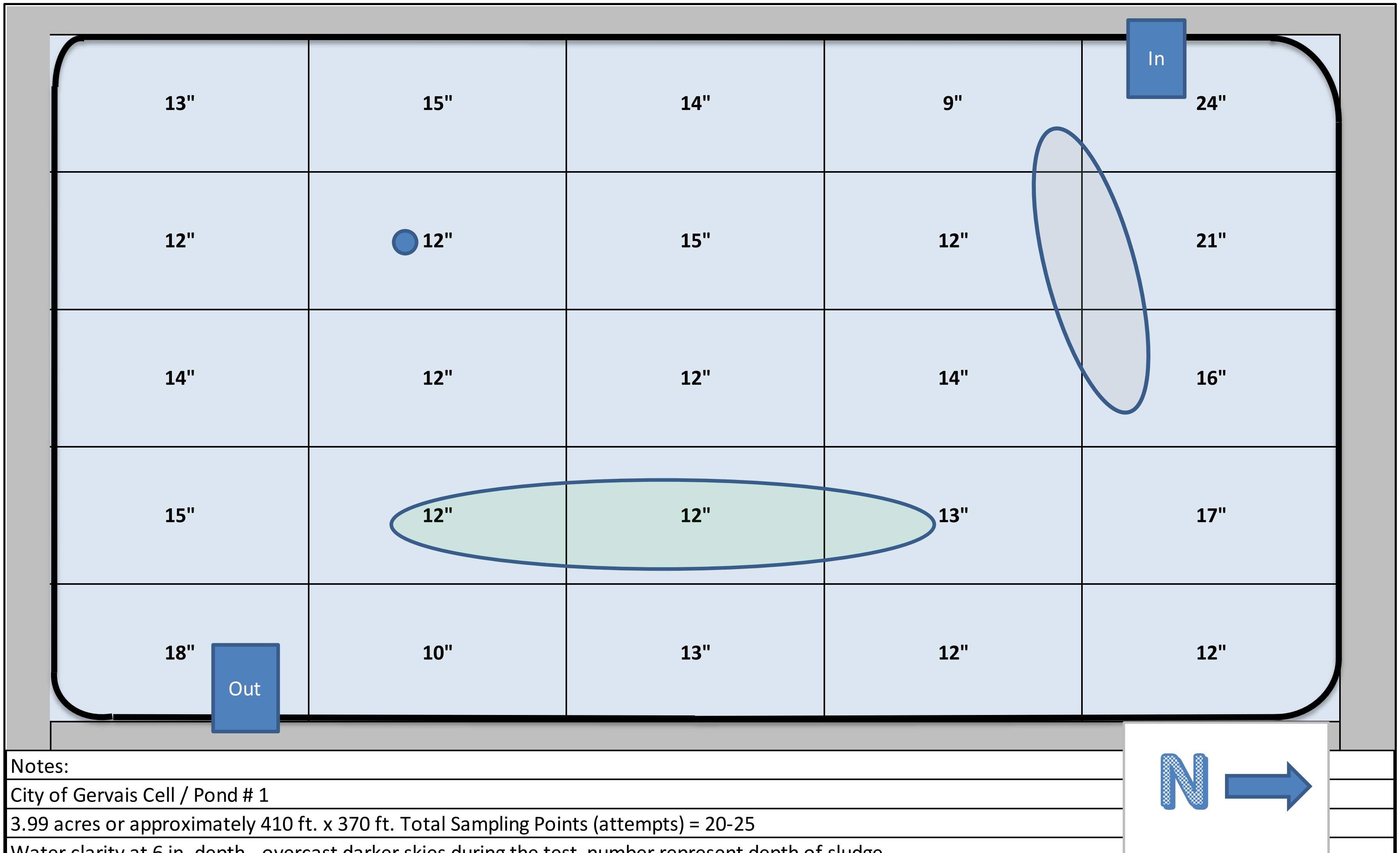
Cell # Three:

Information provided regarding cell # 3 was taken from the profiling report completed in September 2014. The collected findings are:

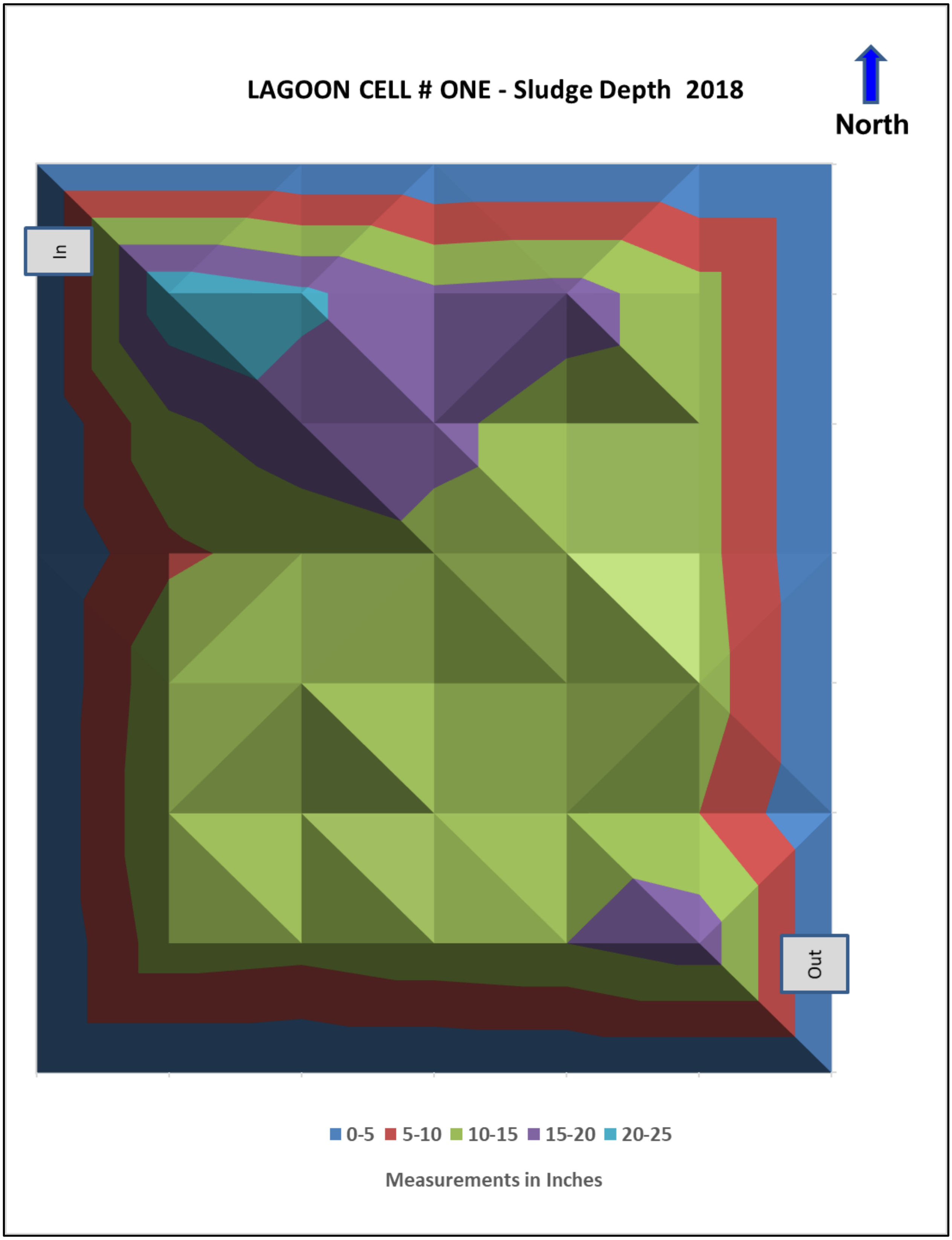
- Approximate size 6.3 acres
- Storage capacity is 15.5 million gallons
- Clarity of water at the time of the profile was 60 inches
- Average sludge depth was 9.07 inches
- 2014 Microbiological product has been applied to collection system

The following pages are the lagoon grids developed to assist in outlining the sampling points as well as the depth interpretation of the measurements as they are transferred into the software. Included on the lagoon grids are notes of the findings as they relate to cell specifically.

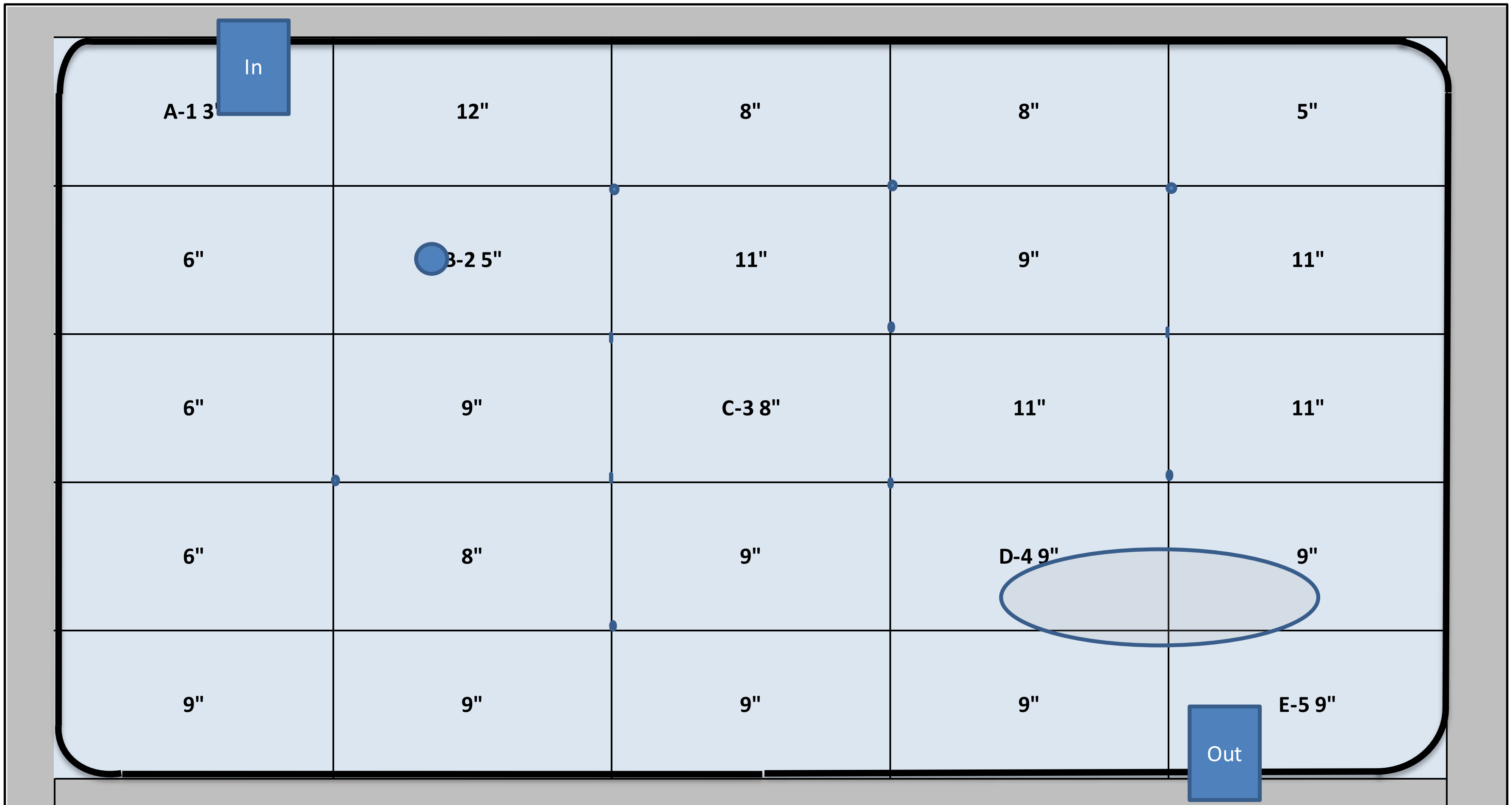
This report is solely for the purpose of determining depth of sludge in the last lagoon cells for the City of Gervais, providing a proactive tool to stay ahead of the compliance curve. There are no regulatory requirements mandating the profiling of the lagoons.



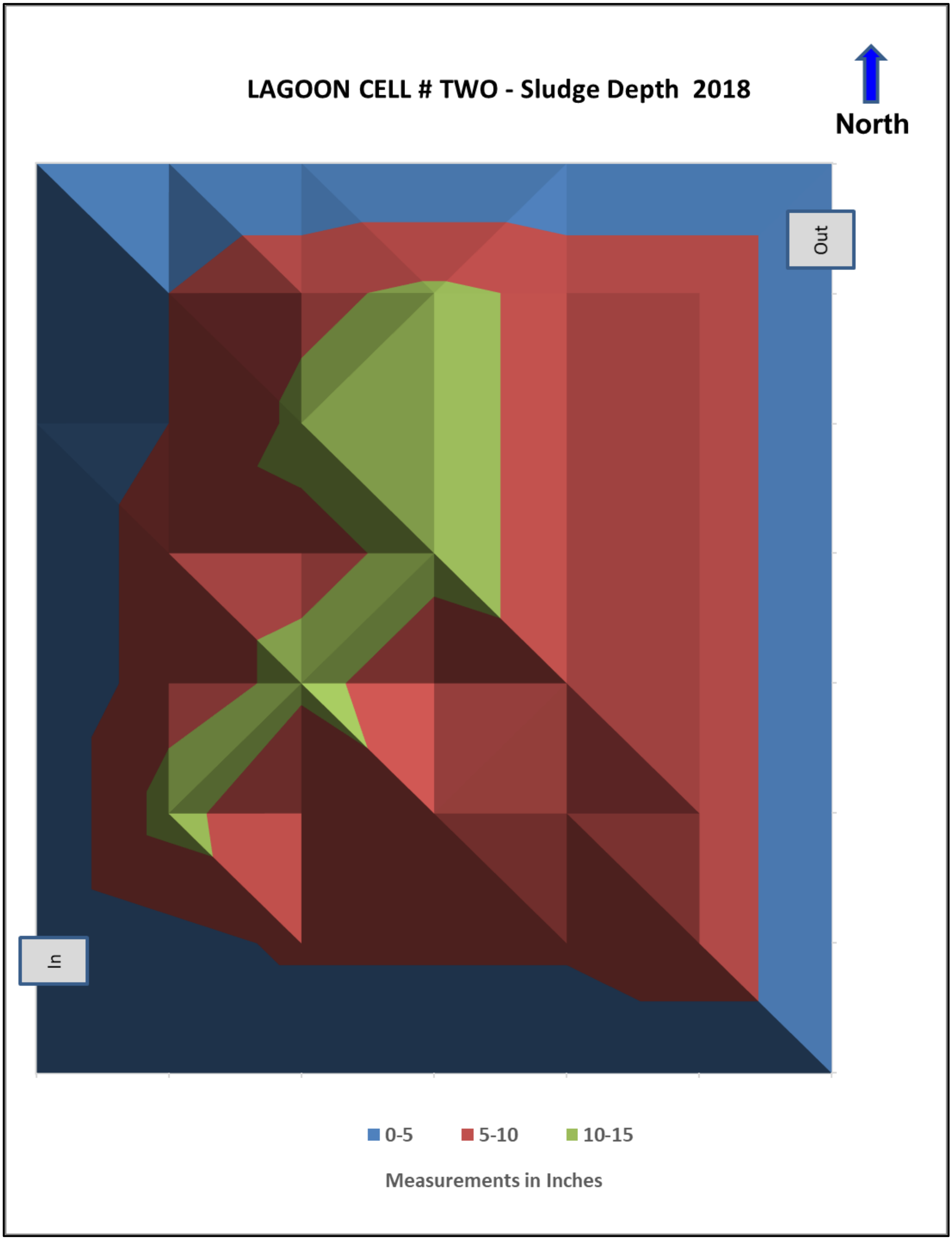
Notes:
City of Gervais Cell / Pond # 1
3.99 acres or approximately 410 ft. x 370 ft. Total Sampling Points (attempts) = 20-25
Water clarity at 6 in. depth - overcast darker skies during the test, number represent depth of sludge
Total operating depth during the profiling at 72 in. Total depth of cell at 78 in.
sludge is greyish, thick, pasty in NW corner, Sludge loose rinses from probe easily, golf ball size grease in NE corner
sampling points - at the center of each section



LAGOON CELL # ONE - Sludge Depth 2018
North
In
Out
0-5
5-10
10-15
15-20
20-25
Measurements in Inches



Notes:
Gervais Cell / Pond # 2
3.22 acres or approximately 380 ft. x 370 ft. Total Sampling Points (attempts) = 20-25
Numbers in each cell represent depth of sludge
sampling points approximately at the center of each cell — sludge is greyish, thick and pasty
Water clarity at 12 in. depth
Total operating depth during the profiling at 65 in. Total depth of cell is 74"


LAGOON CELL # TWO - Sludge Depth 2018
North
Out
In
0-5
5-10
10-15
Measurements in Inches

Appendix B. Historical Treatment Plan Flow and Load Data

Appendix B. Gervais DMR Data Summary, 2013 - 2018
Rev 5.1.19

	FLOW (mgd)				BOD Concentration (mg/L)				BOD Load (pounds/day)				
Month	Total	Daily Min	Daily Max	Monthly Ave	Daily Min	Daily Max	Monthly Avg	Annual Avg	Daily Min	Daily Max	Monthly Avg	Annual Avg	Avg Max
Jan-13	7.16	0.175	0.317	0.231	398	407	402.5		581	1076	775		
Feb-13	6.24	0.178	0.27	0.223	330	656	493		490	1477	917		
Mar-13	7.38	0.182	0.33	0.24	363	1180	656.3		551	3248	1314		
Apr-13	7.21	0.171	0.45	0.24	424	720	572		605	2702	1145		
May-13	5.96	0.139	0.314	0.192	574	1310	912		665	3431	1460		
Jun-13	4.83	0.124	0.201	0.161	448	678	563		463	1137	756		
Jul-13	4.1	0.116	0.143	0.132	818	832	825		791	992	908		
Aug-13	3.79	0.104	0.136	0.122	692	916	809		600	1039	823		
Sep-13	4.51	0.097	0.404	0.151	658	870	764		532	2931	962		
Oct-13	4.42	0.113	0.296	0.143	461	626	544		434	1545	649		
Nov-13	5.43	0.141	0.228	0.191	176	288	232		207	548	370		
Dec-13	5.3	0.127	0.254	0.171	412	580	496		436	1229	707		
								605.73				899	1780
Jan-14	6.6	0.139	0.343	0.213	404	625	482.7		468	1788	857		
Feb-14	12.59	0.208	0.834	0.45	211	316	264		366	2198	991		
Mar-14	13	0.246	0.982	0.419	300	459	380		615	3759	1328		
Apr-14	8.64	0.2	0.458	0.288	291	442	366		485	1688	879		
May-14	6.28	0.148	0.269	0.203	425	497	461		525	1115	780		
Jun-14	4.06	0.11	0.159	0.135	332	675	499		305	895	562		
Jul-14	3.89	0.109	0.141	0.125	578	583	581		525	686	606		
Aug-14	3.63	0.099	0.135	0.117	436	475	435		360	535	424		
Sep-14	3.69	0.104	0.147	0.123	513	734	632		445	900	648		
Oct-14	4.44	0.107	0.321	0.143	548	682	615		489	1826	733		
Nov-14	5.18	0.13	0.285	0.173	857.5	970.5	915		930	2307	1320		
Dec-14	10.23	0.173	0.73	0.33	442	508.8	415.4		638	3098	1143		
								503.84				856	1733
Jan-15	9.08	0.18	0.829	0.293	239.5	474.9	378		360	3283	924		
Feb-15	10.8	0.19	0.92	0.385	460.5	533.8	497		730	4096	1596		
Mar-15	8.39	0.162	0.546	0.271	138.6	656.2	327		187	2988	739		
Apr-15	6.84	0.178	0.292	0.228	331.8	618.6	475		493	1506	903		
May-15	4.76	0.118	0.186	0.154	283	345	314		279	535	403		
Jun-15	3.93	0.107	0.151	0.131	241.8	396.4	319.1		216	499	349		
Jul-15	3.8	0.108	0.139	0.123	235.6	243.1	239.5		212	282	246		
Aug-15	3.72	0.092	0.143	0.12	273	419.5	346		209	500	346		
Sep-15	3.55	0.097	0.143	0.118	301.6	409.6	349		244	488	343		
Oct-15	3.82	0.094	0.221	0.123	348.6	465	407		273	857	418		
Nov-15	4.85	0.103	0.268	0.162	252.7	418.3	335.5		217	935	453		
Dec-15	17.72	0.212	1.53	0.572	92	97.1	95		163	1239	453		
								340.18				598	1434

Appendix B. Gervais DMR Data Summary, 2013 - 2018
Rev 5.1.19

	FLOW (mgd)				BOD Concentration (mg/L)				BOD Load (pounds/day)				
Month	Total	Daily Min	Daily Max	Monthly Ave	Daily Min	Daily Max	Monthly Avg	Annual Avg	Daily Min	Daily Max	Monthly Avg	Annual Avg	Avg Max
Jan-16	13.7	0.225	0.817	0.442	122.8	227.6	175.2		230	1551	646		
Feb-16	9.36	0.248	0.421	0.322	192.8	208.9	201		399	733	540		
Mar-16	11.39	0.232	0.609	0.367	106.1	254	192		205	1290	588		
Apr-16	6.47	0.169	0.279	0.216	171.8	184.1	178		242	428	321		
May-16	4.82	0.116	0.206	0.156	285.2	313.2	299		276	538	389		
Jun-16	4.05	0.114	0.19	0.135	375	391	383		357	620	431		
Jul-16	3.81	0.104	0.147	0.123	207	404	351		180	495	360		
Aug-16	3.7	0.1	0.141	0.119	278.8	477.5	371.4		233	562	369		
Sep-16	3.64	0.096	0.167	0.121	324	530	427		259	738	431		
Oct-16	6.03	0.117	0.394	0.195	286.9	291	289		280	956	470		
Nov-16	9.65	0.131	0.576	0.332	189.1	233.2	211.2		207	1120	585		
Dec-16	12.14	0.251	0.685	0.392	122	248	185		255	1417	605		
								271.90				478	871
Jan-17	11.04	0.22	0.742	0.356	91.8	202.8	148		168	1255	439		
Feb-17	17.3	0.221	1.42	0.618	130	163.4	147		240	1935	758		
Mar-17	13.94	0.299	0.651	0.45	108	167.6	136		269	910	510		
Apr-17	9.03	0.228	0.481	0.301	135.1	170	153		257	682	384		
May-17	6.71	0.161	0.291	0.216	162.9	254.4	209		219	617	377		
Jun-17	4.82	0.122	0.244	0.161	336	390.3	363		342	794	487		
Jul-17	3.81	0.107	0.158	0.123	268.7	410.8	340		240	541	349		
Aug-17	3.6	0.093	0.13	0.116	363	432	391		282	468	378		
Sep-17	3.5	0.086	0.176	0.117	339.4	342	341		243	502	333		
Oct-17	4.01	0.089	0.318	0.129	259.1	362.1	311		192	960	335		
Nov-17	6.26	0.113	0.378	0.209	280.5	552	416		264	1740	725		
Dec-17	7.75	0.147	0.453	0.25	233	380	307		286	1436	640		
								271.83				476	987
Jan-18	11.52	0.259	0.592	0.372	93.2	277.9	168		201	1372	521		
Feb-18	7	0.209	0.339	0.25	231.1	253	242		403	715	505		
Mar-18	9.6	0.21	0.591	0.309	230.8	285	258		404	1405	665		
Apr-18	10.44	0.178	0.784	0.348	84.5	328.5	207		125	2148	601		
May-18	4.89	0.124	0.202	0.158	261.2	389.4	321		270	656	423		
Jun-18	3.74	0.106	0.151	0.125	324	374	349		286	471	364		
Jul-18	3.69	0.105	0.129	0.119	287.6	357	323		252	384	321		
Aug-18	3.59	0.104	0.128	0.116	293	365	329		254	390	318		
Sep-18	3.55	0.095	0.139	0.118	310	396	353		246	459	347		
Oct-18	3.86	0.104	0.22	0.125	275	351	319		239	644	333		
Nov-18	3.89	0.103	0.185	0.13	275	285	280		236	440	304		
Dec-18	5.08	0.096	0.34	0.164	350	362	356		280	1026	487		
								292.08				486	1022
	Monthly Total (mgd)	Daily Min (mgd)	Daily Max (mgd)	Daily Ave (mgd)	Daily Min (mg/L)	Daily Max (mg/L)	Daily Ave (mg/L)		Daily Min (ppd)	Daily Max (ppd)	Daily Ave (ppd)		
AVERAGE	6.68	0.15	0.38	0.221	314.925	454.47	380.93		352.94	1274.42	623.17		
MIN	3.5	0.086	0.128	0.116	84.5	97.1	95		125.44	281.82	245.68		
MAX	17.72	0.299	1.53	0.618	857.5	1310	915		929.70	4095.74	1595.82		

Appendix B.
Rev 5.1.19

	TSS Concentration (mg/L)				TSS Load (pounds/day)				
Month	Daily Min	Daily Max	Monthly Avg	Annual Avg	Daily Min	Daily Max	Monthly Avg	Annual Avg	Avg Max
Jan-13	584	568	576		852	1502	1110		
Feb-13	588	998	793		873	2247	1475		
Mar-13	528	1850	1023.3		801	5092	2048		
Apr-13	434	1380	907		619	5179	1815		
May-13	638	1710	1174		740	4478	1880		
Jun-13	513	755	634		531	1266	851		
Jul-13	1070	1090	1080		1035	1300	1189		
Aug-13	817	1440	1113		709	1633	1132		
Sep-13	873	1270	1071.5		706	4279	1349		
Oct-13	520	600	560		490	1481	668		
Nov-13	268	400	334		315	761	532		
Dec-13	352	560	456		373	1186	650		
				810.15				1225.04	2534
Jan-14	354	764	530		410	2186	942		
Feb-14	254	491	372.5		441	3415	1398		
Mar-14	358	680	519		734	5569	1814		
Apr-14	340	536	438		567	2047	1052		
May-14	478	597	537.5		590	1339	910		
Jun-14	344	642	493		316	851	555		
Jul-14	420	424	422		382	499	440		
Aug-14	226	458	342		187	516	334		
Sep-14	466	660	531		404	809	545		
Oct-14	350	498	424		312	1333	506		
Nov-14	627	1050	838.5		680	2496	1210		
Dec-14	552	586.7	569.35		796	3572	1567		
				501.40				939.25	2053
Jan-15	336	760	548		504	5255	1339		
Feb-15	450	476	463		713	3652	1487		
Mar-15	138	623.3	308		186	2838	696		
Apr-15	195	394	294.5		289	960	560		
May-15	152	164	158		150	254	203		
Jun-15	166	240	203		148	302	222		
Jul-15	120	124	122		108	144	125		
Aug-15	122	298	210		94	355	210		
Sep-15	150	278	213		121	332	210		
Oct-15	182	324	253		143	597	260		
Nov-15	120	684	402		103	1529	543		
Dec-15	78	82	80		138	1046	382		
				271.21				519.65	1439

Appendix B.
Rev 5.1.19

Month	TSS Concentration (mg/L) Daily Min	Daily Max	Monthly Avg	Annual Avg	TSS Load (pounds/day) Daily Min	Daily Max	Monthly Avg	Annual Avg	Avg Max
Jan-16	126	150	138		236	1022	509		
Feb-16	170	240	205		352	843	551		
Mar-16	73	254	158		141	1290	484		
Apr-16	108	125	116.5		152	291	210		
May-16	150	170	160		145	292	208		
Jun-16	142	156	149		135	247	168		
Jul-16	184	240	212		160	294	217		
Aug-16	158	304	219.3		132	357	218		
Sep-16	178	200	189		143	279	191		
Oct-16	198	276	237		193	907	385		
Nov-16	185	220	202.5		202	1057	561		
Dec-16	88	158	123		184	903	402		
				175.78				341.89	648
Jan-17	128	146	137		235	903	407		
Feb-17	143	149	146		264	1765	753		
Mar-17	101	350	208		252	1900	781		
Apr-17	144	166	155		274	666	389		
May-17	146.7	206	176.35		197	500	318		
Jun-17	168	170	169		171	346	227		
Jul-17	152	214	183		136	282	188		
Aug-17	220	294	245		171	319	237		
Sep-17	188	192	190		135	282	185		
Oct-17	214	246	230		159	652	247		
Nov-17	168	470	319		158	1482	556		
Dec-17	176	308	242		216	1164	505		
				200.03				399.32	855
Jan-18	85	252	146		184	1244	453		
Feb-18	210	224	217		366	633	452		
Mar-18	242	358	300		424	1765	773		
Apr-18	110	274	192		163	1792	557		
May-18	154	332	226		159	559	298		
Jun-18	162	180	171		143	227	178		
Jul-18	126.7	240	183.35		111	258	182		
Aug-18	180	183	182		156	195	176		
Sep-18	164	338	251		130	392	247		
Oct-18	172	228	213		149	418	222		
Nov-18	138	148	143		119	228	155		
Dec-18	250	250	250		200	709	342		
				205.05				413.40	702
	Daily Min (mg/L)	Daily Max (mg/L)	Daily Ave (mg/L)		Daily Min (ppd)	Daily Max (ppd)	Daily Ave (ppd)		
AVERAGE	275.91	456.47	360.79		325	1372	627		
MIN	73	82	80		94	144	125		
MAX	1070	1850	1174		1035	5569	2048		

Wastewater Facilities Plan

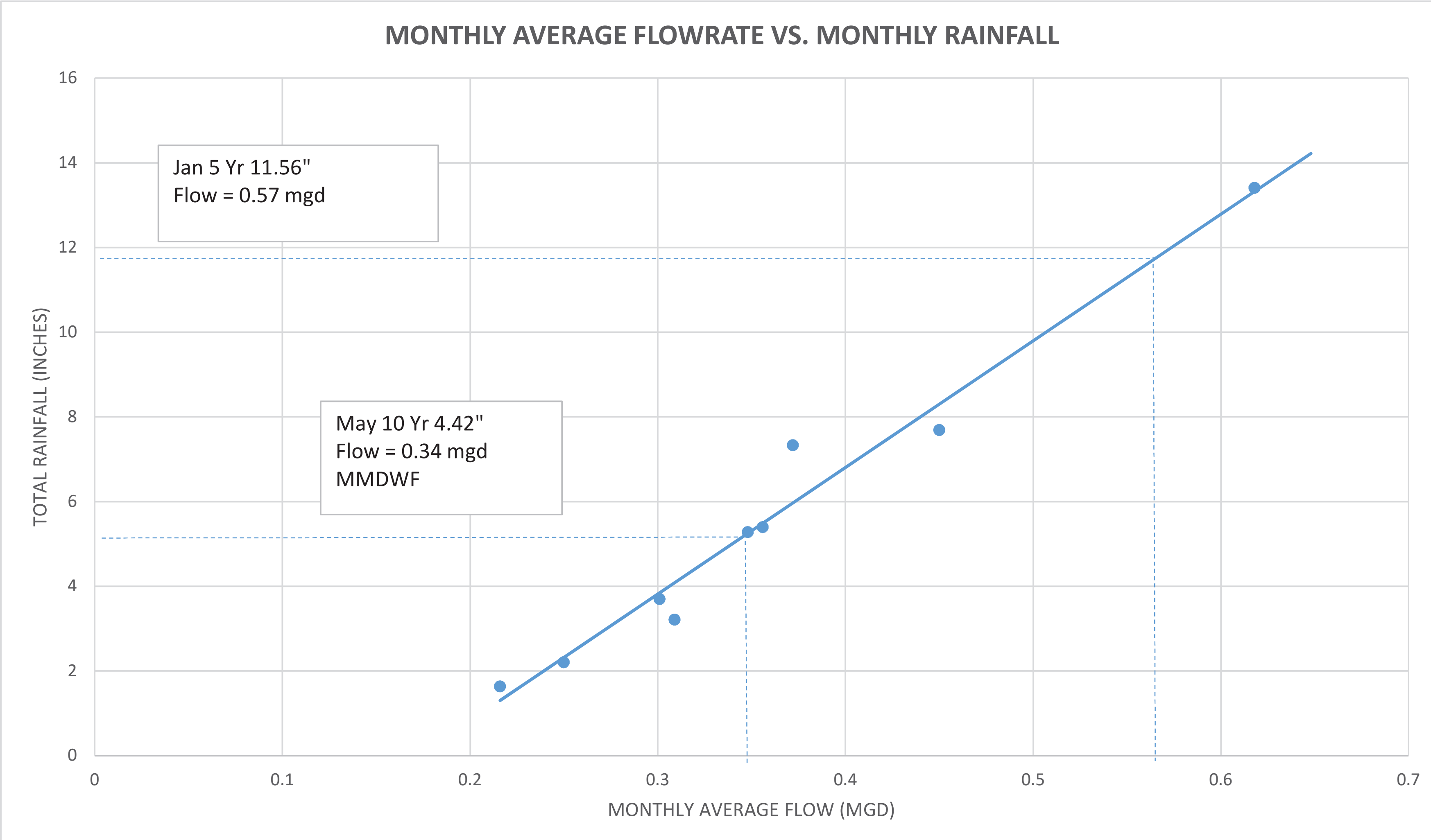
Appendix C. Flow and Load Projections

Gervais Wastewater Plan
Future Flow Projections using DEQ Starting Points for MMDWF, MMWWF, PDF & PHF
Rev 5.2.19

ADWF Exist 2018	55
ADWF Increase	75

	Average	Peak
Projected BOD Loading	0.24	0.51
Projected TSS Loading	0.25	0.45

				Treatment Plant Influent Flows									BOD and TSS Loading					BOD and TSS Loading			
					Peaking Factors		MMWWF	2.00	3.00	3.39	4.00	5.00									
Year	Population	Population Increase	New EDUs	ADWF Increase (MGD)	ADWF (MGD)	AAF (MGD)	AWWF (MGD)	MMDWF (MGD)	MMWWF (MGD)	PWF (MGD)	PDF (MGD)	PHF (MGD)	Average BOD (ppd)	Max Month BOD (ppd)	Average TSS (ppd)	Max Month TSS (ppd)		Average BOD (ppcd)	Max Month BOD (ppcd)	Average TSS (ppcd)	Max Month TSS (ppcd)
2020 Design Flows from 2001 Upgrade	2,168				0.22			0.46	0.81		1.34	1.66	369	542	412	672		0.17	0.25	0.19	0.31
		Historical Data						Historical Flows						Historical Loads							
2013	2,520				0.15	0.18	0.22	0.40	0.24	0.32	0.45		899	1,778	1,225	2,534		0.36	0.71	0.49	1.01
2014	2,530				0.14	0.23	0.31	0.32	0.45	0.72	0.98		856	1,733	939	2,053		0.34	0.68	0.37	0.81
2015	2,555				0.13	0.22	0.32	0.22	0.57	0.82	1.53		598	1,434	520	1,439		0.23	0.56	0.20	0.56
2016	2,565				0.14	0.24	0.35	0.39	0.44	0.67	0.95		478	871	342	648		0.19	0.34	0.13	0.25
2017	2,570				0.14	0.25	0.36	0.32	0.62	0.89	1.42		476	987	399	855		0.19	0.38	0.16	0.33
2018	2,588				0.11	0.19	0.26	0.22	0.37	0.52	0.78		486	1022	431	702		0.19	0.39	0.17	0.27
		Projected Data						Projected Flows						Projected Loads				***Average***	***0.24***	***0.51***	***0.25***	***0.45***
2018	2,588	18	4	0.001	0.14	0.26	0.38	0.35	0.57	0.89	1.65	2.05	621	1,320	647	1,165					
2019	2,685	97	24	0.007	0.15	0.27	0.40	0.36	0.59	0.91	1.68	2.09	644	1,369	671	1,208					
2020	2,781	96	23	0.007	0.16	0.28	0.41	0.38	0.61	0.94	1.71	2.12	667	1,418	695	1,251					
2021	2,823	42	10	0.003	0.16	0.29	0.42	0.39	0.62	0.95	1.72	2.14	677	1,440	706	1,270					
2022	2,865	42	10	0.003	0.16	0.29	0.42	0.39	0.63	0.96	1.73	2.15	688	1,461	716	1,289					
2023	2,908	43	10	0.003	0.17	0.30	0.43	0.40	0.64	0.97	1.75	2.17	698	1,483	727	1,309					
2024	2,952	44	11	0.003	0.17	0.30	0.44	0.40	0.65	0.98	1.76	2.19	708	1,505	738	1,328					
2025	2,996	44	11	0.003	0.17	0.31	0.44	0.41	0.66	0.99	1.77	2.20	719	1,528	749	1,348					
2026	3,030	34	8	0.003	0.18	0.31	0.45	0.42	0.67	1.00	1.78	2.22	727	1,546	758	1,364					
2027	3,065	35	9	0.003	0.18	0.32	0.45	0.42	0.68	1.01	1.79	2.23	736	1,563	766	1,379					
2028	3,101	35	9	0.003	0.18	0.32	0.46	0.43	0.69	1.02	1.80	2.24	744	1,581	775	1,395					
2029	3,136	36	9	0.003	0.18	0.32	0.46	0.43	0.69	1.03	1.81	2.26	753	1,599	784	1,411					
2030	3,175	39	9	0.003	0.19	0.33	0.47	0.44	0.70	1.04	1.83	2.27	762	1,619	794	1,429					
2031	3,208	33	8	0.003	0.19	0.33	0.48	0.44	0.71	1.05	1.84	2.28	770	1,636	802	1,444					
2032	3,242	34	8	0.003	0.19	0.34	0.48	0.45	0.72	1.06	1.85	2.30	778	1,653	811	1,459					
2033	3,276	34	8	0.003	0.19	0.34	0.49	0.45	0.72	1.06	1.86	2.31	786	1,671	819	1,474					
2034	3,310	34	8	0.003	0.20	0.34	0.49	0.46	0.73	1.07	1.87	2.32	795	1,688	828	1,490					
2035	3,346	36	9	0.003	0.20	0.35	0.50	0.46	0.74	1.08	1.88	2.33	803	1,706	837	1,506					
2036	3,375	29	7	0.002	0.20	0.35	0.50	0.47	0.75	1.09	1.89	2.35	810	1,721	844	1,519					
2037	3,404	29	7	0.002	0.20	0.35	0.50	0.47	0.75	1.10	1.89	2.36	817	1,736	851	1,532					
2038	3,434	30	7	0.002	0.21	0.36	0.51	0.48	0.76	1.11	1.90	2.37	824	1,751	859	1,545					
2039	3,464	30	7	0.002	0.21	0.36	0.51	0.48	0.77	1.11	1.91	2.38	831	1,767	866	1,559					
2040	3,494	30	7	0.002	0.21	0.36	0.52	0.49	0.77	1.12	1.92	2.39	839	1,782	874	1,572					
2041	3,519	24	6	0.002	0.21	0.37	0.52	0.49	0.78	1.13	1.93	2.40	844	1,794	880	1,583					
2042	3,543	25	6	0.002	0.21	0.37	0.53	0.49	0.78	1.13	1.94	2.41	850	1,807	886	1,594					

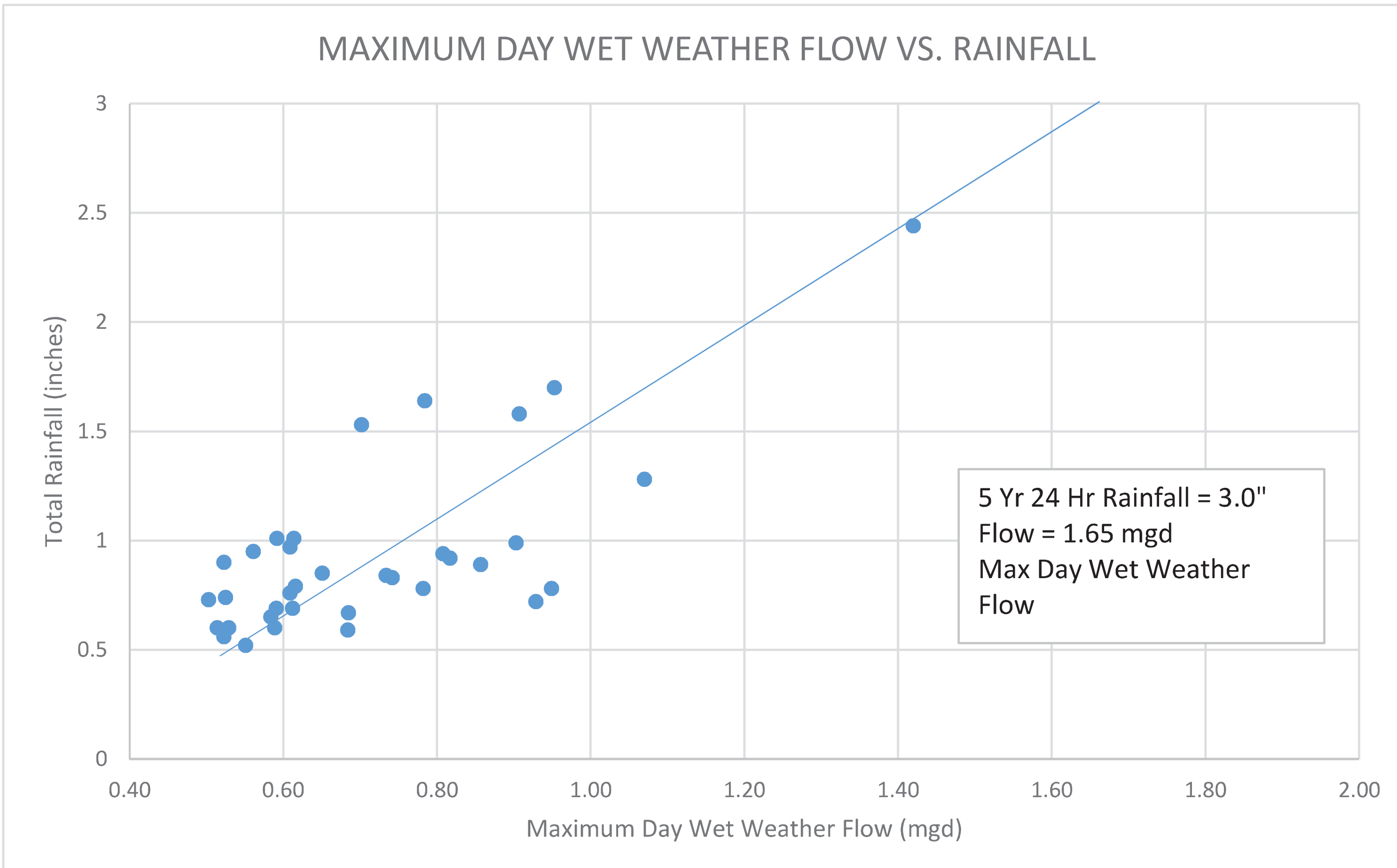

MONTHLY AVERAGE FLOWRATE VS. MONTHLY RAINFALL
Jan 5 Yr 11.56"
Flow = 0.57 mgd
May 10 Yr 4.42"
Flow = 0.34 mgd
MMDWF
TOTAL RAINFALL (INCHES)
0
2
4
6
8
10
12
14
16
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
MONTHLY AVERAGE FLOW (MGD)

Monthly Average Flowrate vs. Monthly Rainfall

Data Group

Date	DMR Data Monthly Average (mgd)	Rainfall Monthly Total (inches)
January 2017	0.356	5.40
February 2017	0.618	13.41
March 2017	0.450	7.69
April 2017	0.301	3.70
May 2017	0.216	1.64
January 2018	0.372	7.33
February 2018	0.250	2.21
March 2018	0.309	3.21
April 2018	0.348	5.28

Rainfall Data Source: National Weather Service, Local Data Records for Salem, Oregon
http://w2.weather.gov/climate/local_data.php?wfo=pqr



MAXIMUM DAY WET WEATHER FLOW VS. RAINFALL
3
2.5
2
1.5
1
0.5
0
Total Rainfall (inches)
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
2.00
Maximum Day Wet Weather Flow (mgd)
5 Yr 24 Hr Rainfall = 3.0"
Flow = 1.65 mgd
Max Day Wet Weather
Flow

Maximum Day Wet Weather Flow vs. Rainfall

Data Group

DATE	FLOW (mgd)	RAIN (inches	DATE	FLOW (mgd)	RAIN (inches	DATE	FLOW (mgd)	RAIN (inches
1/12/2016	0.614	1.01	1/9/2017	0.561	0.95	2/21/2017	0.949	0.78
1/16/2016	0.589	0.6	1/10/2017	0.616	0.79	3/6/2017	0.529	0.6
1/17/2016	0.808	0.94	1/17/2017	0.523	0.9	3/7/2017	0.525	0.74
1/19/2016	0.817	0.92	1/18/2017	0.742	0.83	3/14/2017	0.651	0.85
3/9/2016	0.514	0.6	2/4/2017	0.702	1.53	3/15/2017	0.734	0.84
3/13/2016	0.609	0.97	2/5/2017	1.42	2.44	3/24/2017	0.612	0.69
11/24/2016	0.953	1.7	2/8/2017	1.07	1.28	1/11/2018	0.592	1.01
11/25/2016	0.782	0.78	2/9/2017	0.929	0.72	3/22/2018	0.503	0.73
12/4/2016	0.523	0.56	2/15/2017	0.903	0.99	3/23/2018	0.591	0.69
12/9/2016	0.551	0.52	2/16/2017	0.907	1.58	4/7/2018	0.784	1.64
12/11/2016	0.685	0.67	2/19/2017	0.684	0.59	4/8/2018	0.609	0.76
1/12/2016	0.614	1.01	2/20/2017	0.857	0.89	4/15/2018	0.584	0.65

Note: Flow data $\leq$ 0.5 mgd was removed from the data group
Rainfall data $\leq$ 0.5 inches was removed from the data group

Gervais Wastewater Facilities Plan
Flow Projections
Rev. 4.1.19
Assumed ADWF Flow Increase - 55 gpcd

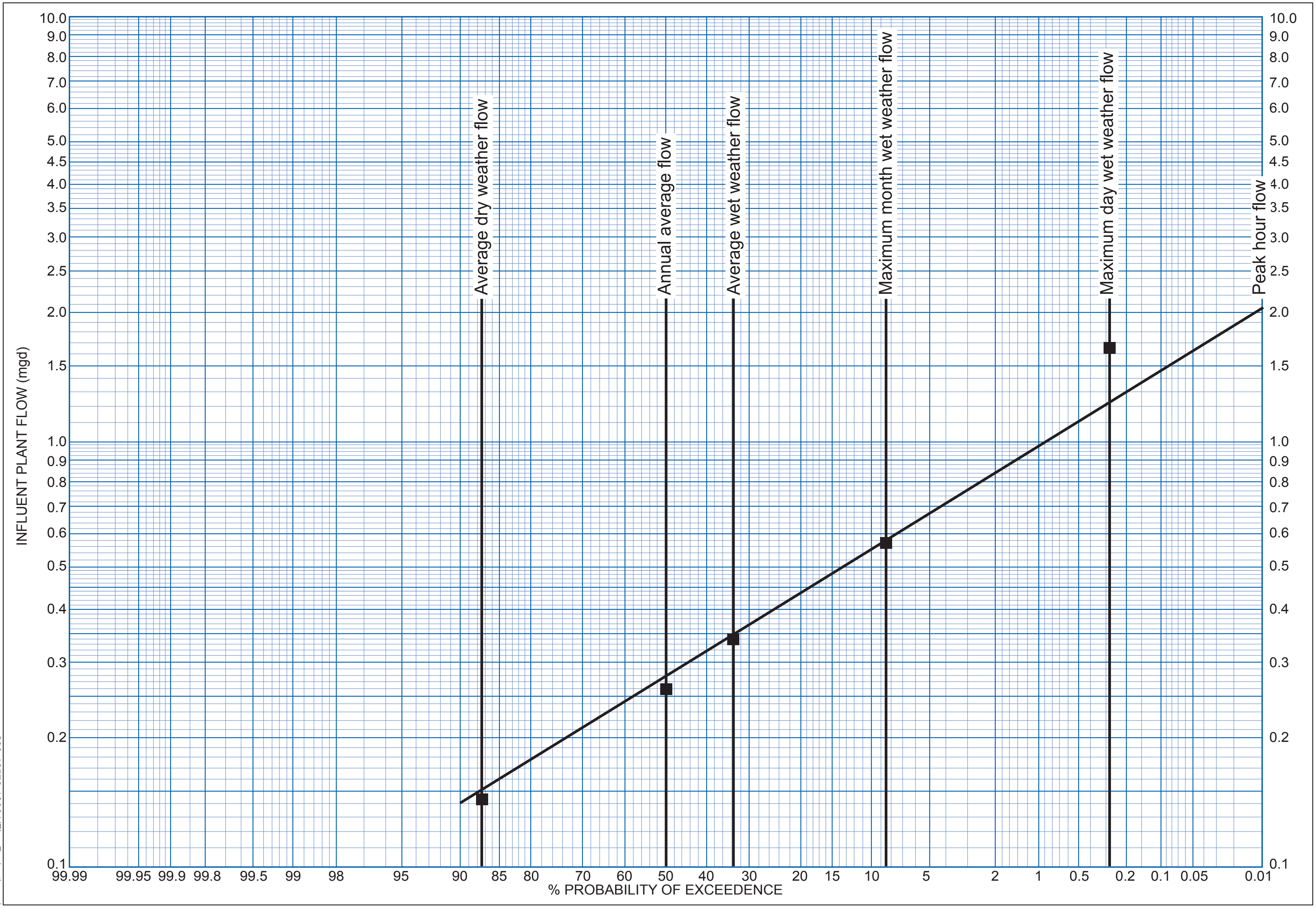
ADWF Exist 2018 55
ADWF Increase 55

Year	Population	Population Increase	ADWF Increase (MGD)	ADWF (MGD)	AAF (MGD)	AAF (MGD)	AWWF (MGD)	AWWF (MGD)	MMDWF (MGD)	MMDWF (MGD)	MMWWF (MGD)	MMWWF (MGD)	PDF (MGD)	PDF (MGD)	PHF (MGD)	PHF (MGD)
		Trial 1	Calculated	Peaking Factors		1.86		2.73		2.50		4.07		11.79		14.64
		Trial 2	Std Peaking Factors						2.00		3.00		4.00		5.00	
2013	2520			0.15	0.18		0.22		0.40		0.24		0.45			
2014	2530			0.14	0.23		0.31		0.32		0.45		0.98			
2015	2555			0.13	0.22		0.32		0.22		0.57		1.53			
2016	2565			0.14	0.24		0.35		0.39		0.44		0.95			
2017	2570			0.14	0.25		0.36		0.32		0.62		1.42			
2018	2588			0.11	0.19		0.26		0.22		0.37		0.78			
Projected Flows																
2018 Design Flows	2588			0.14	0.26	0.26	0.38	0.38	0.35	0.35	0.57	0.57	1.65	1.65	2.05	2.05
2019	2685	97	0.005	0.15	0.27	0.27	0.39	0.40	0.36	0.36	0.59	0.59	1.67	1.71	2.08	2.13
2020	2781	96	0.005	0.15	0.28	0.28	0.40	0.41	0.37	0.38	0.60	0.61	1.69	1.78	2.10	2.21
2021	2823	42	0.002	0.15	0.28	0.29	0.41	0.42	0.38	0.38	0.61	0.62	1.70	1.80	2.11	2.24
2022	2865	42	0.002	0.16	0.28	0.29	0.41	0.42	0.38	0.39	0.62	0.63	1.71	1.83	2.13	2.27
2023	2908	43	0.002	0.16	0.29	0.29	0.42	0.43	0.39	0.39	0.62	0.64	1.72	1.86	2.14	2.31
2024	2952	44	0.002	0.16	0.29	0.30	0.42	0.44	0.39	0.40	0.63	0.65	1.73	1.89	2.15	2.34
2025	2996	44	0.002	0.16	0.29	0.30	0.43	0.44	0.39	0.41	0.64	0.66	1.74	1.91	2.16	2.38
2026	3030	34	0.002	0.16	0.30	0.31	0.43	0.45	0.40	0.41	0.64	0.67	1.75	1.94	2.17	2.41
2027	3065	35	0.002	0.17	0.30	0.31	0.43	0.45	0.40	0.42	0.65	0.68	1.76	1.96	2.18	2.43
2028	3101	35	0.002	0.17	0.30	0.31	0.44	0.46	0.41	0.42	0.65	0.68	1.76	1.98	2.19	2.46
2029	3136	36	0.002	0.17	0.31	0.32	0.44	0.46	0.41	0.43	0.66	0.69	1.77	2.01	2.20	2.49
2030	3175	39	0.002	0.17	0.31	0.32	0.45	0.47	0.41	0.43	0.67	0.70	1.78	2.03	2.21	2.52
2031	3208	33	0.002	0.17	0.31	0.32	0.45	0.47	0.42	0.44	0.67	0.71	1.79	2.05	2.22	2.55
2032	3242	34	0.002	0.18	0.32	0.33	0.45	0.48	0.42	0.44	0.68	0.72	1.79	2.07	2.23	2.58
2033	3276	34	0.002	0.18	0.32	0.33	0.46	0.49	0.43	0.44	0.68	0.72	1.80	2.10	2.24	2.60
2034	3310	34	0.002	0.18	0.32	0.34	0.46	0.49	0.43	0.45	0.69	0.73	1.81	2.12	2.25	2.63
2035	3346	36	0.002	0.18	0.32	0.34	0.47	0.50	0.43	0.45	0.70	0.74	1.82	2.14	2.26	2.66
2036	3375	29	0.002	0.18	0.33	0.34	0.47	0.50	0.44	0.46	0.70	0.75	1.82	2.16	2.27	2.68
2037	3404	29	0.002	0.18	0.33	0.34	0.47	0.50	0.44	0.46	0.70	0.75	1.83	2.18	2.27	2.71
2038	3434	30	0.002	0.19	0.33	0.35	0.48	0.51	0.44	0.47	0.71	0.76	1.84	2.20	2.28	2.73
2039	3464	30	0.002	0.19	0.33	0.35	0.48	0.51	0.45	0.47	0.71	0.77	1.84	2.22	2.29	2.76
2040	3494	30	0.002	0.19	0.34	0.35	0.48	0.52	0.45	0.47	0.72	0.77	1.85	2.24	2.30	2.78
2041	3519	24	0.001	0.19	0.34	0.36	0.48	0.52	0.45	0.48	0.72	0.78	1.85	2.25	2.31	2.80
2042	3543	25	0.001	0.19	0.34	0.36	0.49	0.53	0.46	0.48	0.73	0.78	1.86	2.27	2.31	2.82

Gervais Wastewater Facilities Plan
Flow Projections
Rev. 4.1.19
Assumed ADWF Flow Increase - 75 gpcd

ADWF Exist 2018 55
ADWF Increase 75

		Trial 1	Calculated	Peaking Factors		1.86		2.73		2.50		4.07		11.79		14.64
		Trial 2	Std Peaking Factors						2.00		3.00		4.00		5.00	
Year	Population	Population Increase	ADWF Increase (MGD)	ADWF (MGD)	AAF (MGD)	AAF (MGD)	AWWF (MGD)	AWWF (MGD)	MMDWF (MGD)	MMDWF (MGD)	MMWWF (MGD)	MMWWF (MGD)	PDF (MGD)	PDF (MGD)	PHF (MGD)	PHF (MGD)
2013	2520			0.15	0.18		0.22		0.40		0.24		0.45			
2014	2530			0.14	0.23		0.31		0.32		0.45		0.98			
2015	2555			0.13	0.22		0.32		0.22		0.57		1.53			
2016	2565			0.14	0.24		0.35		0.39		0.44		0.95			
2017	2570			0.14	0.25		0.36		0.32		0.62		1.42			
2018	2588			0.11	0.19		0.26		0.22		0.37		0.78			
Projected Flows																
2018 Design Flows	2588			0.14	0.26	0.26	0.38	0.38	0.35	0.35	0.57	0.57	1.65	1.65	2.05	2.05
2019	2685	97	0.007	0.15	0.27	0.27	0.40	0.40	0.36	0.37	0.59	0.60	1.68	1.74	2.09	2.16
2020	2781	96	0.007	0.15	0.28	0.29	0.41	0.42	0.38	0.39	0.61	0.63	1.71	1.82	2.12	2.26
2021	2823	42	0.003	0.16	0.29	0.29	0.42	0.43	0.39	0.39	0.62	0.64	1.72	1.86	2.14	2.31
2022	2865	42	0.003	0.16	0.29	0.30	0.42	0.44	0.39	0.40	0.63	0.65	1.73	1.89	2.15	2.35
2023	2908	43	0.003	0.16	0.30	0.31	0.43	0.45	0.40	0.41	0.64	0.67	1.75	1.93	2.17	2.40
2024	2952	44	0.003	0.17	0.30	0.31	0.44	0.46	0.40	0.42	0.65	0.68	1.76	1.97	2.19	2.45
2025	2996	44	0.003	0.17	0.31	0.32	0.44	0.47	0.41	0.43	0.66	0.69	1.77	2.01	2.20	2.50
2026	3030	34	0.003	0.17	0.31	0.32	0.45	0.47	0.42	0.43	0.67	0.71	1.78	2.04	2.22	2.54
2027	3065	35	0.003	0.18	0.31	0.33	0.45	0.48	0.42	0.44	0.68	0.72	1.79	2.07	2.23	2.57
2028	3101	35	0.003	0.18	0.32	0.33	0.46	0.49	0.43	0.45	0.69	0.73	1.80	2.10	2.24	2.61
2029	3136	36	0.003	0.18	0.32	0.34	0.46	0.49	0.43	0.45	0.69	0.74	1.81	2.13	2.26	2.65
2030	3175	39	0.003	0.18	0.33	0.34	0.47	0.50	0.44	0.46	0.70	0.75	1.83	2.17	2.27	2.69
2031	3208	33	0.003	0.19	0.33	0.35	0.48	0.51	0.44	0.47	0.71	0.76	1.84	2.20	2.28	2.73
2032	3242	34	0.003	0.19	0.33	0.35	0.48	0.52	0.45	0.47	0.72	0.77	1.85	2.23	2.30	2.77
2033	3276	34	0.003	0.19	0.34	0.36	0.49	0.52	0.45	0.48	0.72	0.78	1.86	2.26	2.31	2.81
2034	3310	34	0.003	0.19	0.34	0.36	0.49	0.53	0.46	0.49	0.73	0.79	1.87	2.29	2.32	2.84
2035	3346	36	0.003	0.20	0.35	0.37	0.50	0.54	0.46	0.49	0.74	0.80	1.88	2.32	2.33	2.88
2036	3375	29	0.002	0.20	0.35	0.37	0.50	0.54	0.47	0.50	0.75	0.81	1.89	2.35	2.35	2.91
2037	3404	29	0.002	0.20	0.35	0.38	0.50	0.55	0.47	0.50	0.75	0.82	1.89	2.37	2.36	2.95
2038	3434	30	0.002	0.20	0.36	0.38	0.51	0.56	0.48	0.51	0.76	0.83	1.90	2.40	2.37	2.98
2039	3464	30	0.002	0.21	0.36	0.38	0.51	0.56	0.48	0.51	0.77	0.84	1.91	2.42	2.38	3.01
2040	3494	30	0.002	0.21	0.36	0.39	0.52	0.57	0.49	0.52	0.77	0.85	1.92	2.45	2.39	3.05
2041	3519	24	0.002	0.21	0.37	0.39	0.52	0.57	0.49	0.52	0.78	0.85	1.93	2.47	2.40	3.07
2042	3543	25	0.002	0.21	0.37	0.39	0.53	0.58	0.49	0.53	0.78	0.86	1.94	2.49	2.41	3.10



200-12578-18001/FlowProjection.ai

TETRA TECH

15350 SW Sequoia Parkway, Suite 220
Portland, Oregon 97224
Tel 503.684.9097 Fax 503.598.0583

City of Gervais

WASTEWATER FACILITIES PLAN

PEAK-HOUR FLOW PROJECTION

Wastewater Facilities Plan

Appendix D. NPDES Permit

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:
City of Gervais
PO Box 329
Gervais, OR 97026

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 29.2
Recycled Water Reuse	002	

FACILITY TYPE AND LOCATION:
Stabilization Lagoons with Aeration
Gervais STP
13307 Portland Rd. NE
Gervais, Oregon

RECEIVING STREAM INFORMATION:
Basin: Willamette
Sub-Basin: Molalla-Pudding
Receiving Stream: Pudding River
LLID: 1227161452842 29.2 D
County: Marion

Treatment System Class: Level I
Collection System Class: Level II

EPA REFERENCE NO: OR-002739-1
Issued in response to Application No. 971551 received 6/17/2009. This permit is issued based on the land use findings in the permit record.

Steve Schnurbusch, Acting Water Quality Manager
Western Region

December 21, 2011
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge of waste is prohibited, including discharge to waters of the state or an underground injection control system.

SCHEDULE A

1. Waste Discharge Limitations not to be exceeded after permit issuance.

a. Treated Effluent Outfall 001

(1) May 1 - October 31: No discharge to waters of the State

(2) November 1 - April 30:

Parameter	Average Effluent Concentrations Monthly	Average Effluent Concentrations Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	110	160	210
TSS	50 mg/L	75 mg/L	160	240	320

* Average dry weather design flow to the facility equals 0.22 MGD. Mass load limits based upon the winter discharge rate of 0.63 MGD to allow for disposal of summer accumulations of treated wastewater as well as winter stormwater impacting lagoon surface.

(3) Other Parameters

Year-round (except as noted)	Limitations
E. coli Bacteria	Must not exceed 126 organisms per 100 mL monthly geometric mean. No single sample may exceed 406 organisms per 100 mL. **(See Note A1)**
pH	Must be within the range of 6.0 – 9.0
BOD_5 and TSS Removal Efficiency	Must not be less than 85% monthly average for BOD_5 and 65% monthly for TSS.
Total Residual Chlorine	Must not exceed a monthly average concentration of 0.02 mg/L and a daily maximum concentration of 0.06 mg/L. **(See Note A2)**

(4) No wastes may be discharged or activities conducted that cause or contribute to a violation of water quality standards in OAR 340-041 applicable to the Willamette basin except as provided for in OAR 340-045-0080 and the following regulatory mixing zone:

> The regulatory mixing zone is that portion of the Pudding River where the effluent mixes with 25 percent of the stream flow but in no case may it extend further then ten (10) feet upstream of the outfall to a point one hundred (100) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) is defined as that portion of the regulatory mixing zone that is within five (5) feet of the point of discharge.

(5) Iron **(see Note A3)**
The 2008 Molalla-Pudding Total Maximum Daily Load (TMDL) allots this discharge an iron wasteload allocation equal to the facility's current conditions. No measurable increase in in-stream iron is allowed.

(6) DDT and Dieldrin
The 2008 Molalla-Pudding Total Maximum Daily Load (TMDL) allots this discharge a DDT and Dieldrin wasteload allocation equal to the facility's current conditions. No measurable increase in in-stream DDT or Dieldrin concentration is allowed.

b. Recycled Wastewater Outfall 002

No discharge to state waters is permitted. Recycled water shall be treated to the appropriate level and reused for the following beneficial purposes:

Level of Treatment	Beneficial Purpose	Alternative Approval?
Class C	Any purpose allowed by OAR 340-055 for Class C recycled water	No

(1) All recycled water use distributed on land for dissipation by evapotranspiration and controlled seepage shall follow sound irrigation practices so as to prevent:

- Prolonged ponding of treated recycled water on the ground surface;
- Surface runoff or subsurface drainage through drainage tile;
- The creation of odors, fly and mosquito breeding or other nuisance conditions;
- The overloading of land with nutrients, organics, or other pollutant parameters; and,
- Impairment of existing or potential beneficial uses of groundwater.

(2) Prior to use, the Class C recycled water shall receive at least Class C treatment as defined in OAR 340-055 to:

Oxidized and must reduce Total Coliform to 240 organisms per 100 mL in two consecutive samples, and a seven-day median of 23 organisms per 100 mL.

(3) All use of recycled water shall conform to the Recycled Water Use Plan approved by the Department. Upon approval of the Recycled Water Use Plan, the Plan shall become enforceable through this permit action

c. Groundwater
No activities may be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals must be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

NOTES:

A1. If a single sample exceeds 406 organisms per 100 mL, then five consecutive re-samples may be taken at four-hour intervals beginning within 48 hours after the original sample was taken. If the log mean of the five re-samples is less than or equal to 126 organisms per 100 mL, a violation will not be triggered.

A2. When the total residual chlorine limit is lower than 0.10 mg/l, the DEQ will use 0.10 mg/l as the compliance evaluation concentration (i.e., daily maximum concentrations below 0.10 mg/l will be considered in compliance with the limit.)

A3. Based on the iron characterization monitoring required in Schedule B, Condition 1b., DEQ will evaluate the discharge for potential to cause or contribute to iron water quality exceedances. If the evaluation indicates a measurable increase in receiving water iron concentrations from the discharge, DEQ may reopen this permit in include additional limits, monitoring requirements or other conditions.

SCHEDULE B

1. **<u>Minimum Monitoring and Reporting Requirements</u>.**
The permittee must monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples must have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results must be included in the report, but not used in calculations required by this permit. When possible, the permittee must re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent
Influent grab samples and measurements and composite samples are taken just after the bar screen and just before the Parshall flume.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
BOD_5	1 per 2 Weeks	24-hour Composite
TSS	1 per 2 Weeks	24-hour Composite
pH	2/Week	Grab

b. Treated Effluent Outfall 001
Facility effluent flow measurements are taken just after lagoon cell 3 and prior to the chlorine contact chamber. Composite samples, bacteria samples, total residual chlorine samples, and all samples for toxics are taken just after the dechlorination tank and just before the effluent pump station.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annual	Verification
BOD_5	1 per 2 Weeks	24-hour Composite
TSS	1 per 2 Weeks	24-hour Composite
Pounds Discharged (BOD_5 and TSS)	1 per 2 Weeks	Calculation
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
pH	2/Week	Grab
E. coli	Weekly	Grab
Total Chlorine Residual	Daily	Grab
Quantity Chlorine Used	Daily	Measurement
Effluent Temperature	2/Week	Measurement
Iron (dissolved)	Quarterly **(see Note B1)**	24-hour Composite

c. Recycled Wastewater Outfall 002

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD) or Quantity Irrigated (inches/acre)	Daily	Measurement
Flow Meter Calibration	Annually	Verification

c. Recycled Wastewater Outfall 002 (continued)

Item or Parameter	Minimum Frequency	Type of Sample
Quantity Chlorine Used	Daily	Measurement
Chlorine Residual	Daily	Grab
pH	2/Week	Grab
Nutrients (TKN, NO_2+NO_3-N, NH_3, Total Phosphorus)	Quarterly	Grab
Total Coliform	1/Week	Grab

d. Facultative Lagoon

Item or Parameter	Minimum Frequency	Type of Sample
Sludge Depth	Once during 2014	Measurement
Water Level	Weekly	Measurement
Perimeter Inspection	2/Week	Observation

2. <u>Reporting Procedures</u>

a. Monitoring results must be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the appropriate DEQ office by the 15th day of the following month.

b. State monitoring reports must identify the name, certificate classification, and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports must also identify each system classification as found on page one of this permit.

c. Monitoring reports must also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

3. <u>Report Submittals</u>

a. The permittee must have in place a program to identify and reduce inflow and infiltration into the sewage collection system. An annual report must be submitted to the DEQ by February 1 each year which details sewer collection maintenance activities that reduce inflow and infiltration. The report must state those activities that have been done in the previous year and those activities planned for the following year.

b. By no later than January 15 of each year, the permittee must submit to the DEQ an annual report describing the effectiveness of the recycled water system to comply with approved recycled water use plan, the rules of Division 55, and the limitations and conditions of this permit applicable to reuse of recycled water.

NOTES:

B1. The Permittee must monitor the discharge for dissolved iron quarterly for a total of eight (8) quarters. Upon completion of eight monitoring events, the monitoring may be discontinued unless otherwise notified in writing by DEQ.

SCHEDULE D

Special Conditions

1. The permittee must meet the requirements for use of recycled water under Division 55, including the following:

   a. All recycled water must be managed in accordance with the approved Recycled Water Use Plan. No substantial changes may be made in the approved plan without written approval of the DEQ.

   b. No recycled water may be released by the permittee to another person, as defined in Oregon Revised Statute (ORS) 468.005, for use unless there is a valid contract between the permittee and that person that meets the requirements of OAR 340-055-0015(9).

   c. The permittee must notify the DEQ within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with OAR 340-055. When the DEQ offices are not open, the permittee must report the incident of non-compliance to the Oregon Emergency Response System (Telephone Number 1-800-452-0311).

   d. No recycled water will be made available to a person proposing to recycle unless that person certifies in writing that they have read and understand the provisions in these rules. This written certification must be kept on file by the sewage treatment system owner and be made available to the DEQ for inspection.

2. The permittee must comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

   a. The permittee must have its wastewater system supervised by one or more operators who are certified in a classification <u>and</u> grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

   b. The permittee's wastewater system may not be without supervision (as required by Special Condition 2.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified in the proper classification <u>and</u> at grade level I or higher.

   c. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

   d. The permittee must notify the Department of Environmental Quality in writing within thirty (30) days of replacement or re-designation of certified operators responsible for supervising wastewater system operation. The notice must be filed with the Water Quality Division, Operator Certification Program, 2020 SW 4th Avenue, Suite 400, Portland OR. 97201. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

   e. Upon written request, the DEQ may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 2.b. above.

3. Recycled water used by a wastewater treatment system owner for landscape irrigation or for in plant processes at a wastewater treatment system is exempt from the rules of this division if:

   a. The recycled water is an oxidized and disinfected wastewater;

   b. The recycled water is used at the wastewater treatment system site where it is generated or at an auxiliary wastewater or sludge treatment facility that is subject to the same NPDES or WPCF permit as the wastewater treatment system. Contiguous property to the parcel of land upon which the treatment system is located is considered the wastewater treatment system site if under the same ownership;

   c. Spray or drift or both from the use does not occur off the site; and

   d. Public access to the site is restricted.

4. The permittee will not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

   a. The facilities are operated in accordance with the permit conditions, and
   b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

   If warranted, at permit renewal the DEQ may evaluate the need for a full assessment of the facilities impact on groundwater quality.

5. The permittee must notify the appropriate DEQ office in accordance with the response times noted in the General Conditions of this permit, of any malfunction so that corrective action can be coordinated between the permittee and the DEQ.

SCHEDULE F
NPDES GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

A1. Duty to Comply with Permit

The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of Oregon Revised Statutes (ORS) 468B.025 and the federal Clean Water Act and is grounds for an enforcement action. Failure to comply is also grounds for DEQ to terminate, modify and reissue, revoke, or deny renewal of a permit.

A2. Penalties for Water Pollution and Permit Condition Violations

The permit is enforceable by DEQ or EPA, and in some circumstances also by third-parties under the citizen suit provisions 33 USC § 1365. DEQ enforcement is generally based on provisions of state statutes and Environmental Quality Commission (EQC) rules, and EPA enforcement is generally based on provisions of federal statutes and EPA regulations.

ORS 468.140 allows DEQ to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit. The federal Clean Water Act provides for civil penalties not to exceed $32,500 and administrative penalties not to exceed $11,000 per day for each violation of any condition or limitation of this permit.

Under ORS 468.943, unlawful water pollution, if committed by a person with criminal negligence, is punishable by a fine of up to $25,000, imprisonment for not more than one year, or both. Each day on which a violation occurs or continues is a separately punishable offense. The federal Clean Water Act provides for criminal penalties of not more than $50,000 per day of violation, or imprisonment of not more than 2 years, or both for second or subsequent negligent violations of this permit.

Under ORS 468.946, a person who knowingly discharges, places, or causes to be placed any waste into the waters of the state or in a location where the waste is likely to escape into the waters of the state is subject to a Class B felony punishable by a fine not to exceed $250,000 and up to 10 years in prison. ORS 161. The federal Clean Water Act provides for criminal penalties of $5,000 to $50,000 per day of violation, or imprisonment of not more than 3 years, or both for knowing violations of the permit. In the case of a second or subsequent conviction for knowing violation, a person is subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

A3. 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. In addition, upon request of DEQ, the permittee must correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

A4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application must be submitted at least 180 days before the expiration date of this permit.

DEQ may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

A5. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute.
b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts.
c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.
d. The permittee is identified as a Designated Management Agency or allocated a wasteload under a total maximum daily load (TMDL).
e. New information or regulations.
f. Modification of compliance schedules.
g. Requirements of permit reopener conditions
h. Correction of technical mistakes made in determining permit conditions.
i. Determination that the permitted activity endangers human health or the environment.
j. Other causes as specified in 40 CFR §§ 122.62, 122.64, and 124.5.
k. For communities with combined sewer overflows (CSOs):
   (1) To comply with any state or federal law regulation for CSOs that is adopted or promulgated subsequent to the effective date of this permit.
   (2) If new information that was not available at the time of permit issuance indicates that CSO controls imposed under this permit have failed to ensure attainment of water quality standards, including protection of designated uses.
   (3) Resulting from implementation of the permittee's long-term control plan and/or permit conditions related to CSOs.

The filing of a request by the permittee for a permit modification, revocation or reissuance, termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

A6. Toxic Pollutants

The permittee must comply with any applicable effluent standards or prohibitions established under Oregon Administrative Rule (OAR) 340-041-0033 and section 307(a) of the federal Clean Water Act for toxic pollutants, and with standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

A7. Property Rights and Other Legal Requirements

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other private rights, or any infringement of federal, tribal, state, or local laws or regulations.

A8. Permit References

Except for effluent standards or prohibitions established under section 307(a) of the federal Clean Water Act and OAR 340-041-0033 for toxic pollutants, and standards for sewage sludge use or disposal established under section 405(d) of the federal Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

A9. Permit Fees

The permittee must pay the fees required by OAR.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

B1. Proper 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 or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

B2. Need to Halt or Reduce Activity Not a Defense

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee must, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

B3. Bypass of Treatment Facilities

a. Definitions
   (1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs b and c of this section.
   (2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.
b. Prohibition of bypass.
   (1) Bypass is prohibited and DEQ may take enforcement action against a permittee for bypass unless:
      i. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
      ii. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventative maintenance; and
      iii. The permittee submitted notices and requests as required under General Condition B3.c.
   (2) DEQ may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, if DEQ determines that it will meet the three conditions listed above in General Condition B3.b.(1).
c. Notice and request for bypass.
   (1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, a written notice must be submitted to DEQ at least ten days before the date of the bypass.
   (2) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required in General Condition D5.

B4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.
b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of General Condition B4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.
c. Conditions necessary for a demonstration of upset. 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 causes(s) of the upset;
   (2) The permitted facility was at the time being properly operated;

(3) The permittee submitted notice of the upset as required in General Condition D5, hereof (24-hour notice); and

(4) The permittee complied with any remedial measures required under General Condition A3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

B5. Treatment of Single Operational Upset

For purposes of this permit, a single operational upset that leads to simultaneous violations of more than one pollutant parameter will be treated as a single violation. A single operational upset is an exceptional incident that causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one federal Clean Water Act effluent discharge pollutant parameter. A single operational upset does not include federal Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational upset is a violation.

B6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definition. "Overflow" means any spill, release or diversion of sewage including:

(1) An overflow that results in a discharge to waters of the United States; and

(2) An overflow of wastewater, including a wastewater backup into a building (other than a backup caused solely by a blockage or other malfunction in a privately owned sewer or building lateral), even if that overflow does not reach waters of the United States.

b. Prohibition of overflows. Overflows are prohibited. DEQ may exercise enforcement discretion regarding overflow events. In exercising its enforcement discretion, DEQ may consider various factors, including the adequacy of the conveyance system's capacity and the magnitude, duration and return frequency of storm events.

c. Reporting required. All overflows must be reported orally to DEQ within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D5.

B7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs that threatens public health, the permittee must take such steps as are necessary to alert the public, health agencies and other affected entities (for example, public water systems) about the extent and nature of the discharge in accordance with the notification procedures developed under General Condition B8. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

B8. Emergency Response and Public Notification Plan

The permittee must develop and implement an emergency response and public notification plan that identifies measures to protect public health from overflows, bypasses, or upsets that may endanger public health. At a minimum the plan must include mechanisms to:

a. Ensure that the permittee is aware (to the greatest extent possible) of such events;

b. Ensure notification of appropriate personnel and ensure that they are immediately dispatched for investigation and response;

c. Ensure immediate notification to the public, health agencies, and other affected public entities (including public water systems). The overflow response plan must identify the public health and other officials who will receive immediate notification;

d. Ensure that appropriate personnel are aware of and follow the plan and are appropriately trained;

e. Provide emergency operations; and

f. Ensure that DEQ is notified of the public notification steps taken.

B9. Removed Substances
Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must be disposed of in such a manner as to prevent any pollutant from such materials from entering waters of the state, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

C1. Representative Sampling
Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring points specified in this permit, and must be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points must not be changed without notification to and the approval of DEQ.

C2. Flow Measurements
Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices must be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected must be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

C3. Monitoring Procedures
Monitoring must be conducted according to test procedures approved under 40 CFR part 136 or, in the case of sludge use and disposal, approved under 40 CFR part 503 unless other test procedures have been specified in this permit.

C4. Penalties of Tampering
The federal 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 may, upon conviction, be punished by a fine of not more than $10,000 per violation, imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both.

C5. Reporting of Monitoring Results
Monitoring results must be summarized each month on a Discharge Monitoring Report form approved by DEQ. The reports must be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

C6. Additional Monitoring by the Permittee
If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR part 136 or, in the case of sludge use and disposal, approved under 40 CFR part 503, or as specified in this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the discharge monitoring report. Such increased frequency must also be indicated. For a pollutant parameter that may be sampled more than once per day (for example, Total Chlorine Residual), only the average daily value must be recorded unless otherwise specified in this permit.

C7. Averaging of Measurements
Calculations for all limitations that require averaging of measurements must utilize an arithmetic mean, except for bacteria which must be averaged as specified in this permit.

C8. Retention of Records
Records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities must be retained for a period of at least 5 years (or longer as required by 40 CFR part 503). Records of all monitoring information including all calibration and maintenance records, all original strip chart

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 must be retained for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of DEQ at any time.

C9. Records Contents

Records of monitoring information must include:

a. The date, exact place, time, and methods of sampling or measurements;
b. The individual(s) who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The results of such analyses.

C10. Inspection and Entry

The permittee must allow DEQ or EPA upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

C11. Confidentiality of Information

Any information relating to this permit that is submitted to or obtained by DEQ is available to the public unless classified as confidential by the Director of DEQ under ORS 468.095. The permittee may request that information be classified as confidential if it is a trade secret as defined by that statute. The name and address of the permittee, permit applications, permits, effluent data, and information required by NPDES application forms under 40 CFR § 122.21 are not classified as confidential. 40 CFR § 122.7(b).

SECTION D. REPORTING REQUIREMENTS

D1. Planned Changes

The permittee must comply with OAR 340-052, "Review of Plans and Specifications" and 40 CFR § 122.41(l)(1). Except where exempted under OAR 340-052, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers may be commenced until the plans and specifications are submitted to and approved by DEQ. The permittee must give notice to DEQ as soon as possible of any planned physical alternations or additions to the permitted facility.

D2. Anticipated Noncompliance

The permittee must give advance notice to DEQ of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

D3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and EQC rules. No permit may be transferred to a third party without prior written approval from DEQ. DEQ may require modification, revocation, and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under 40 CFR § 122.61. The permittee must notify DEQ when a transfer of property interest takes place.

D4. Compliance Schedule
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 14 days following each schedule date. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

D5. Twenty-Four Hour Reporting
The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) to the DEQ regional office or Oregon Emergency Response System (1-800-452-0311) as specified below within 24 hours from the time the permittee becomes aware of the circumstances.

a. Overflows.
   (1) Oral Reporting within 24 hours.
      i. For overflows other than basement backups, the following information must be reported to the Oregon Emergency Response System (OERS) at 1-800-452-0311. For basement backups, this information should be reported directly to the DEQ regional office.
         (a) The location of the overflow;
         (b) The receiving water (if there is one);
         (c) An estimate of the volume of the overflow;
         (d) A description of the sewer system component from which the release occurred (for example, manhole, constructed overflow pipe, crack in pipe); and
         (e) The estimated date and time when the overflow began and stopped or will be stopped.
      ii. The following information must be reported to the DEQ regional office within 24 hours, or during normal business hours, whichever is earlier:
         (a) The OERS incident number (if applicable); and
         (b) A brief description of the event.
   (2) Written reporting within 5 days.
      i. The following information must be provided in writing to the DEQ regional office within 5 days of the time the permittee becomes aware of the overflow:
         (a) The OERS incident number (if applicable);
         (b) The cause or suspected cause of the overflow;
         (c) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
         (d) Steps taken or planned to mitigate the impact(s) of the overflow and a schedule of major milestones for those steps; and
         (e) For storm-related overflows, the rainfall intensity (inches/hour) and duration of the storm associated with the overflow.

      DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.
b. Other instances of noncompliance.
   (1) The following instances of noncompliance must be reported:
      i. Any unanticipated bypass that exceeds any effluent limitation in this permit;
      ii. Any upset that exceeds any effluent limitation in this permit;
      iii. Violation of maximum daily discharge limitation for any of the pollutants listed by DEQ in this permit; and
      iv. Any noncompliance that may endanger human health or the environment.
   (2) During normal business hours, the DEQ regional office must be called. Outside of normal business hours, DEQ must be contacted at 1-800-452-0311 (Oregon Emergency Response System).
   (3) A written submission must be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission must contain:
      i. A description of the noncompliance and its cause;
      ii. The period of noncompliance, including exact dates and times;
      iii. The estimated time noncompliance is expected to continue if it has not been corrected;

iv. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
v. Public notification steps taken, pursuant to General Condition B7.

(4) DEQ may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

D6. Other Noncompliance
The permittee must report all instances of noncompliance not reported under General Condition D4 or D5 at the time monitoring reports are submitted. The reports 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; and
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

D7. Duty to Provide Information
The permittee must furnish to DEQ within a reasonable time any information that DEQ may request to determine compliance with the permit or to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit. The permittee must also furnish to DEQ, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it has failed to submit any relevant facts or has submitted incorrect information in a permit application or any report to DEQ, it must promptly submit such facts or information.

D8. Signatory Requirements
All applications, reports or information submitted to DEQ must be signed and certified in accordance with 40 CFR § 122.22.

D9. Falsification of Information
Under ORS 468.953, any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, is subject to a Class C felony punishable by a fine not to exceed $125,000 per violation and up to 5 years in prison. ORS 161. Additionally, according to 40 CFR § 122.41(k)(2), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or non-compliance will, upon conviction, be punished by a federal civil penalty not to exceed $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

D10. Changes to Indirect Dischargers
The permittee must provide adequate notice to DEQ of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the federal Clean Water Act if it were directly discharging those pollutants and;
b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
c. For the purposes of this paragraph, adequate notice must include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

SECTION E. DEFINITIONS

E1. *BOD* or *BOD_5* means five-day biochemical oxygen demand.
E2. *CBOD* or *$CBOD_5$* means five-day carbonaceous biochemical oxygen demand.
E3. *TSS* means total suspended solids.
E4. *Bacteria* means but is not limited to fecal coliform bacteria, total coliform bacteria, and *E. coli* bacteria.
E5. *FC* means fecal coliform bacteria.

E6. *Total residual chlorine* means combined chlorine forms plus free residual chlorine

E7. *Technology based permit effluent limitations* means technology-based treatment requirements as defined in 40 CFR § 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-041.

E8. *mg/l* means milligrams per liter.

E9. *kg* means kilograms.

E10. *m^3/d* means cubic meters per day.

E11. *MGD* means million gallons per day.

E12. *24-hour composite sample* means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow. The sample must be collected and stored in accordance with 40 CFR part 136.

E13. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.

E14. *Quarter* means January through March, April through June, July through September, or October through December.

E15. *Month* means calendar month.

E16. *Week* means a calendar week of Sunday through Saturday.

E17. *POTW* means a publicly-owned treatment works.

Wastewater Facilities Plan

Appendix E. Collection System Flows

City of Gervais
Wastewater Collection System Flow Estimates

Peak Per Capita Flow (gpc)	250
I/I in PVC System < 25 years old (gpad)	4000
i/I in Conc System > 40 years old (gpad)	7000

	Area (ac)	Density (du/ac)	Units	Persons/ Unit[1]	Total People	WW Flow per captia (gpcd)	Total WW Flow (gpd)	Hours of Generation	Total WW Flow (gpm)	I/I per acre (gpad)	I/I Flow (gpd)	I/I Flow (gpm)	Total Peak Hour Flow (gpd)	Total Peak Hour Flow (gpm)
French Prairie Meadows Pump Station														
Existing														
French Prairie Meadows Ph1	18.4		102	4.1	418	250	104,550	24	73	4,000	73,600	51	178,150	124
French Prairie Meadows Ph2	17.5		79	4.1	324	250	80,975	24	56	4,000	70,000	49	150,975	105
Willoria Estates	9.2		50	4.1	205	250	51,250	24	36	4,000	36,800	26	88,050	61
Commercial	3.5				3	100	300	24	0	500	1,750	1	2,050	1
Open Space	3.1						0	24	0	0	0	0	0	0
Existing Pump Station Total	**51.7**		**231**		**950**								**419,225**	**291**
Future														
Residential	1.9		1	5	5	250	1,250	24	1	4,000	7,600	5	8,850	6
Total Pump Station at Buildout													**428,075**	**297**
Fir Ave Trunk (southeast)														
Existing														
French Prairie Meadows Pump Station	51.8		241	4.1	950	250	237,525	24	165		0	0	419,225	291
French Prairie Meadows (Grove)	1.2		10	4.1	41	250	10,250	24	7	4,000	4,800	3	15,050	10
Gervais Elementary and High School	43.7						350	24	0	500	21,825	15	22,175	15
Residential	57.4	3.5	196	4.1	804	250	200,900	24	140	7,000	401,800	279	602,700	419
Water Plant	1.5				3	250	750	24	1	1,000	1,510	1	2,260	2
Commercial	4.5		72	2.9	209	250	300	24	0	7,000	31,500	22	31,800	22
Existing Fir Ave. (SE) Total	160		**519**		**2,007**								**1,093,210**	**759**
Future														
Residential R-1 (Future)	1.8		8	4.1	33	250	8,200	24	6	1,000	1,800	1	10,000	7
Residential R-2 (Future)	1.2	12.0	14.4	4.1	59	250	14,760	24	10	1,000	1,200	1	15,960	11
Checkerboard (Light Ind.)	18.6				10	250	2,500	24	2	1,000	18,600	13	21,100	15
Total Fir Ave. (SE) at Buildout													**1,149,120**	**798**

City of Gervais
Wastewater Collection System Flow Estimates

Peak Per Capita Flow (gpc)	250
I/I in PVC System < 25 years old (gpad)	4000
i/I in Conc System > 40 years old (gpad)	7000

	Area (ac)	Density (du/ac)	Units	Persons/ Unit[1]	Total People	WW Flow per captia (gpcd)	Total WW Flow (gpd)	Hours of Generation	Total WW Flow (gpm)	I/I per acre (gpad)	I/I Flow (gpd)	I/I Flow (gpm)	Total Peak Hour Flow (gpd)	Total Peak Hour Flow (gpm)
Fir Ave Trunk (southeast) Below 1st St.														
French Prairie Meadows Pump Station	51.8		241	4.1	33	250	8,200	24	6		0	0	419,225	291
French Prairie Meadows (Grove)	1.2		10	4.1	41	250	10,250	24	7	4,000	4,800	3	15,050	10
Gervais Elementary and High School	43.7						350	24	0	500	21,825	15	22,175	15
Residential	38.3	3.5	196	4.1	804	250	200,900	24	140	7,000	268,001	186	468,901	326
Water Plant	1.5				3	250	750	24	1	1,000	1,510	1	2,260	2
Commercial	4.5		72	2.9	209	250	300	24	0	7,000	31,500	22	31,800	22
Existing East Fir Ave. (SE) Total	141		**519**		**1,089**								**959,411**	**666**
Future														
Residential R-1 (Future)	1.8		8	4.1	33	250	8,200	24	6	1,000	1,800	1	10,000	7
Residential R-2 (Future)	1.2	12.0	14.4	4.1	59	250	14,760	24	10	1,000	1,200	1	15,960	11
Checkerboard (Light Ind.)	18.6				10	250	2,500	24	2	1,000	18,600	13	21,100	15
Total Fir Ave. (SE) at Buildout													**1,027,571**	**714**
Fir Ave Trunk (northwest)														
Existing														
Winfield Ranch	9.2		57	4.1	234	250	58,425	24	41	4,000	36,800	26	95,225	66
Sacred Heart Church	3				30	250	350	24	0	500	1,500	1	1,850	1
Residential R-1	65.2		26	4.1	107	250	26,650	24	19	7,000	456,400	317	483,050	335
Residential R-2	5.0		24	4.1	98.4	250	24,600	24	17	7,000	35,000	24	59,600	41
Commercial	3.4			1	10	250	300	24	0	7,000	23,800	17	24,100	17
Light Industrial	3.5				10	250		24	0	50	175	0	175	0
Existing Fir Ave. (NW) Total	89.3		**107**		**489**								**664,000**	**461**
Future														
New 8th Ave Sub	13.6		57	4.1	234	250	58,425	24	41	4,000	54,400	38	112,825	78
Residential R-1 (Future)	1.8		29	4.1	119	250	29,725	24	21	4,000	7,200	5	36,925	26
Residential R-2 (Future)	3.5	12.0	42	4.1	172	250	43,050	24	30	4,000	14,000	10	57,050	40
Total Fir Ave. (NW) at Buildout	115		**235**		**1,034**								**895,075**	**622**
Existing Total													**1,757,210**	**1,220**
4th Street Pump Station at Buildout Total													**2,044,195**	**1,420**

1. Based on 2017 Connections (630) and population (2570)

City of Gervais
Wastewater Collection System Flow Estimates

Peak Per Capita Flow (gpc)	250
I/I in PVC System < 25 years old (gpad)	4000
i/I in Conc System > 40 years old (gpad)	7000

	Area (ac)	Density (du/ac)	Units	Persons/ Unit[1]	Total People	WW Flow per captia (gpcd)	Total WW Flow (gpd)	Hours of Generation	Total WW Flow (gpm)	I/I per acre (gpad)	I/I Flow (gpd)	I/I Flow (gpm)	Total Peak Hour Flow (gpd)	Total Peak Hour Flow (gpm)
7th Ave Trunk														
Existing														
Winfield Ranch	9.2		57	4.1	234	250	58,425	24	41	4,000	36,800	26	95,225	66
Sacred Heart Church	3				30	250	350	24	0	500	1,500	1	1,850	1
Residential R-1	16.3		26	4.1	107	250	26,650	24	19	7,000	114,100	79	140,750	98
Residential R-2	5.0		12	4.1	49.2	250	12,300	24	9	7,000	35,000	24	47,300	33
Existing Fir Ave. (NW) Total	33.5		**95**		**420**								**285,125**	**198**
Future														
New 8th Ave Sub	13.6		57	4.1	234	250	58,425	24	41	4,000	54,400	38	112,825	78
Residential R-1 (Future)	1.8		29	4.1	119	250	29,725	24	21	4,000	7,200	5	36,925	26
Residential R-2 (Future)	3.5	12.0	42	4.1	172	250	43,050	24	30	4,000	14,000	10	57,050	40
												Buildout	**Total**	**342**
Fir Ave Trunk (northwest) Above 5th														
Existing														
Winfield Ranch	9.2		57	4.1	234	250	58,425	24	41	4,000	36,800	26	95,225	66
Sacred Heart Church	3				30	250	350	24	0	500	1,500	1	1,850	1
Residential R-1	43.0		26	4.1	107	250	26,650	24	19	7,000	301,224	209	327,874	228
Residential R-2	5.0		12	4.1	49.2	250	12,300	24	9	7,000	35,000	24	47,300	33
Existing Fir Ave. (NW) Total	60.2		**95**		**420**								**472,249**	**328**
Future														
New 8th Ave Sub	13.6		57	4.1	234	250	58,425	24	41	4,000	54,400	38	112,825	78
													Total	**406**

City of Gervais
Wastewater Collection System Flow Estimates

Peak Per Capita Flow (gpc)	250
I/I in PVC System < 25 years old (gpad)	4000
i/I in Conc System > 40 years old (gpad)	7000

	Area (ac)	Density (du/ac)	Units	Persons/ Unit[1]	Total People	WW Flow per captia (gpcd)	Total WW Flow (gpd)	Hours of Generation	Total WW Flow (gpm)	I/I per acre (gpad)	I/I Flow (gpd)	I/I Flow (gpm)	Total Peak Hour Flow (gpd)	Total Peak Hour Flow (gpm)
Fir Ave Trunk (northwest) Above 6th														
Existing														
Winfield Ranch	9.2		57	4.1	234	250	58,425	24	41	4,000	36,800	26	95,225	66
Sacred Heart Church	3				30	250	350	24	0	500	1,500	1	1,850	1
Residential R-1	21.5		26	4.1	107	250	26,650	24	19	7,000	150,612	105	177,262	123
Residential R-2	5.0		12	4.1	49.2	250	12,300	24	9	7,000	35,000	24	47,300	33
Existing Fir Ave. (NW) Total	38.7		**95**		**420**								**321,637**	**223**
Future														
New 8th Ave Sub	13.6		57	4.1	234	250	58,425	24	41	4,000	54,400	38	112,825	78
													Total	302
Fir Ave Trunk (northwest) Above 6th at Buildout														
Existing														
Winfield Ranch	9.2		57	4.1	234	250	58,425	24	41	4,000	36,800	26	95,225	66
Sacred Heart Church	3				30	250	350	24	0	500	1,500	1	1,850	1
Residential R-1	21.5		26	4.1	107	250	26,650	24	19	7,000	150,612	105	177,262	123
Residential R-2	5.0		12	4.1	49.2	250	12,300	24	9	7,000	35,000	24	47,300	33
Existing Fir Ave. (NW) Total	38.7		**95**		**420**								**321,637**	**223**
Future														
New 8th Ave Sub	13.6		57	4.1	234	250	58,425	24	41	4,000	54,400	38	112,825	78
													Total	**302**

CITY OF GERVAIS

Trunk Main Hydraulics
Existing Conditions

System Labels					System Inventory										Hydraulic Calculations				
U/S Station or MH No.	D/S Station or MH No.	Design Discharge Q (gpm)	Design Discharge Q (cfs)	Design Velocity Vf (fps)	Invert Slope S (%)	Pipe Size D (in.)	Pipe Mat'l	Mannings n	Full Flow Capacity Qf (cfs)	Full Flow Velocity Vf (fps)	Length L (ft.)	Pipe Invert Elevations U/S (ft)	Pipe Invert Elevations D/S (ft)	Top of U/S MH Elev. (ft)	TW Elev. (ft)	Head Loss (grav.) (ft)	Head Loss (pres.) (ft)	HW Elev. (ft)	Surch. or Flood (ft)
1	2	3	4	5	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Existing Conditions with New 8th St Sub.																			
NW Fir Ave. Trunk																			
6	5	255	0.6	1.6	0.30	8	Conc	0.013	0.7	1.9	377.0	174.8	173.7	184.0	181.94	0.89	0.83	182.77	**Surch.**
5	4	255	0.6	1.6	0.30	8	Conc	0.013	0.7	1.9	375.0	173.7	172.5	184.0	181.11	0.89	0.83	181.94	**Surch.**
4	3	302	0.7	1.9	0.22	8	Conc	0.013	0.6	1.6	252.0	172.3	171.8	184.0	180.33	0.87	0.78	181.11	**Surch.**
3	2	406	0.9	2.6	0.30	8	Conc	0.013	0.7	1.9	308.0	171.6	170.7	184.0	178.61	1.88	1.72	180.33	**Surch.**
2	1	539	1.2	3.4	0.55	8	Conc	0.013	0.9	2.6	287.0	170.5	168.9	184.0	175.77	3.11	2.83	178.61	**Surch.**
SE Fir Ave. Trunk																			
7	6	291	0.6	1.9	0.40	8	PVC	0.009	1.1	3.2	120.0	172.7	172.2	183.0	178.72	0.25	0.17	178.89	
6	5	291	0.6	1.9	0.37	8	Conc	0.013	0.7	2.1	288.0	172.2	171.2	183.0	177.89	0.91	0.83	178.72	
5	4	450	1.0	2.9	0.30	8	Conc	0.013	0.7	1.9	308.0	171.2	170.3	182.3	175.77	2.31	2.12	177.89	**Surch.**
4	3	600	1.3	3.8	0.30	8	Conc	0.013	0.7	1.9	252.0	170.3	169.5	181.5	172.69	3.42	3.08	175.77	**Surch.**
3	2	759	1.7	4.8	0.30	8	Conc	0.013	0.7	1.9	152.0	169.5	169.1	180.8	169.72	3.52	2.97	172.69	**Surch.**
2	1	759	1.7	4.8	0.30	8	Conc	0.013	0.7	1.9	129.0	169.1	168.7	180.6	136.50	3.07	2.52	139.57	
Note: Flows from 2018 WW Generation Spreadsheet																			

CITY OF GERVAIS

Trunk Main Hydraulics
Existing Conditions

System Labels					**System Inventory**										**Hydraulic Calculations**				
U/S Station or MH No.	D/S Station or MH No.	Design Discharge Q (gpm)	Design Discharge Q (cfs)	Design Velocity Vf (fps)	Invert Slope S (%)	Pipe Size D (in.)	Pipe Mat'l	Mannings n	Full Flow Capacity Qf (cfs)	Full Flow Velocity Vf (fps)	Length L (ft.)	Pipe Invert Elevations U/S (ft)	Pipe Invert Elevations D/S (ft)	Top of U/S MH Elev. (ft)	TW Elev. (ft)	Head Loss (grav.) (ft)	Head Loss (pres.) (ft)	HW Elev. (ft)	Surch. or Flood (ft)
1	2	3	4	5	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
NW Fir Ave. Trunk																			
6	5	342	0.8	1.4	0.30	10	PVC	0.009	1.7	3.2	377.0	174.8	173.7	184.0	174.49	0.26	0.22	174.76	
5	4	342	0.8	1.4	0.30	10	PVC	0.009	1.7	3.2	375.0	173.7	172.5	184.0	173.36	0.26	0.22	173.63	
4	3	716	1.6	2.0	0.22	12	PVC	0.009	2.4	3.1	252.0	172.3	171.8	184.0	172.77	0.34	0.24	173.11	
3	2	716	1.6	2.0	0.30	12	PVC	0.009	2.8	3.6	308.0	171.6	170.7	184.0	171.65	0.39	0.30	172.04	
2	1	716	1.6	2.0	0.55	12	PVC	0.009	3.8	4.9	287.0	170.5	168.9	184.0	169.89	0.37	0.28	170.26	
SE Fir Ave. Trunk																			
7	6	297	0.7	1.9	0.51	8	PVC	0.013	0.9	2.5	120.0	172.9	172.2	183.0	172.91	0.44	0.36	173.35	
6	5	297	0.7	1.9	0.37	8	PVC	0.009	1.1	3.0	288.0	172.2	171.2	183.0	171.88	0.50	0.41	172.37	
5	4	716	1.6	2.9	0.30	10	PVC	0.009	1.7	3.2	308.0	171.2	170.3	183.0	171.09	0.98	0.78	171.88	
4	3	746	1.7	3.0	0.30	10	PVC	0.009	1.7	3.2	252.0	170.3	169.5	183.0	170.36	0.91	0.69	171.06	
3	2	798	1.8	3.3	0.30	10	PVC	0.009	1.7	3.2	152.0	169.5	169.1	183.0	169.88	0.73	0.48	170.36	**Surch.**
2	1	798	1.8	3.3	0.30	10	PVC	0.009	1.7	3.2	129.0	169.1	168.7	183.0	136.50	0.65	0.41	137.15	
SE Fir Ave. Trunk																			
7	6	297	0.7	1.9	0.40	8	PVC	0.009	1.1	3.2	120.0	172.7	172.2	183.0	172.91	0.26	0.17	173.16	
6	5	297	0.7	1.9	0.37	8	PVC	0.009	1.1	3.0	288.0	172.2	171.2	183.0	171.85	0.50	0.41	172.34	
5	4	297	0.7	1.9	0.30	8	PVC	0.009	1.0	2.7	308.0	171.2	170.3	183.0	170.93	0.53	0.44	171.45	
4	3	297	0.7	1.9	0.30	8	PVC	0.009	1.0	2.8	252.0	170.3	169.5	183.0	170.17	0.45	0.36	170.61	

Wastewater Facilities Plan

Appendix F. 2009 Mixing Zone Study

Report

Gervais WWTP

Mixing Zone Study
Final Report

March 2010

State of Oregon
Department of Environmental Quality

Last Updated: 3/18/2010
By: Lori Pillsbury

DEQ09-LAB-0022-TR

Gervais WWTP, Mixing Zone Study, Final Report

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Background

The City of Gervais operates a domestic wastewater treatment facility with an average winter discharge rate of 0.63 MGD. Under permit # 101665, the facility is permitted to continuously discharge to the Pudding River from November 1 through April 30. The facility has a permitted mixing zone defined as *that portion of the Pudding River where the effluent mixes with 25 percent of the streamflow but in no case shall it extend farther than ten feet upstream of the outfall to a point 100 feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within five feet of the point of discharge.*

In order to evaluate 7Q10 low flow conditions, this study was conducted just prior to the permitted discharge season. The facility was granted permission to discharge outside its normal discharge window. In an attempt to sample a representative discharge, the facility was encouraged to begin discharging a few days prior to the sampling date.

Project Summary

Laboratory staff conducted a field mixing zone survey of this site on October 14, 2009. The facility was discharging during the study.

Based on the Regulatory Mixing Zone Internal Management Directive (ODEQ, 2007) and permit staff best professional judgment, this facility meets the two criteria for a Level 1 study:

1. The discharge has no reasonable potential to exceed acute criteria other than potentially chlorine or ammonia and available dilution of greater than 20 times 25% of critical flow
2. The discharge not classified as a "Major".

This report contains data required for this level.

Quality Assurance / Quality Control

Samples were collected at the compliance location for outfall 001 at the facility and three in-stream locations on the Pudding River. All sampling was conducted following the QA/QC procedures outlined in the Quality Assurance Project Plan, Mixing Zone Studies, DEQ06-LAB-0041-QAPP. A complete sampling plan for this project is contained in the Sample and Analysis Plan (SAP), DEQ09-LAB-0022-SAP.

All sampling activities outlined in the SAP were conducted during this study. The outfall pipe is submerged and difficult to locate. Therefore, a dye study was conducted to locate the end of pipe and visually map the plume and mixing dynamics. Samples for metals were added to this sampling plan.

A duplicate sample was collected at the upstream sampling location and met all applicable QA/QC criteria. In addition, a transfer blank was collected. No analytes were detected in the transfer blank above the laboratory's Level of Quantitation (LOQ).

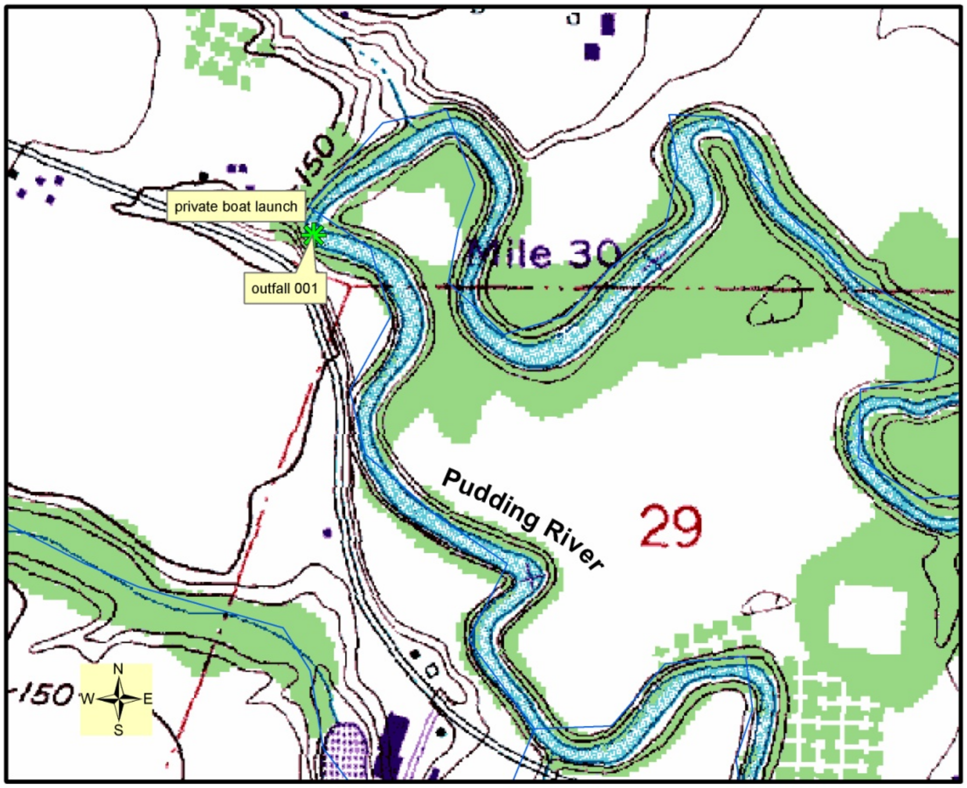
Environmental Mapping

This section of the report is intended to characterize and represent critical habitats, critical resources, and other beneficial uses of the receiving waterbody in the area surrounding the outfall. This portion was completed both in the field and through office research. A schematic of the field sampling area (drawn at the time of sampling) can be found in Appendix C.

The City of Gervais WWTP discharges into the Pudding River at RM 31.2 through Outfall 001. The outfall is contained within the Molalla-Pudding Sub-Basin of the Willamette Basin. Figure 1 shows the location of this outfall on the USGS Quad Map of the area. A TMDL was completed for the Pudding River and approved by EPA in December of 2008. The TMDL includes listings year round for DDT, Dieldrin, *E. coli,* fecal coliform, iron, and temperature (cold water aquatic life use). Based on the ODFW fish habitat maps and Division 41, Water Quality Standards, Figure 340A (Fish Use Designations, Willamette Basin) and 340B (Salmon and Steelhead Spawning Use Designations) (ODEQ, 2010b), the Pudding River is utilized by salmonids for rearing and migration.

There are public access sites to this portion of the river. The Pudding River is utilized for recreation. A private boat launch and access through private property are available near the outfall. No drinking water intakes are located within ½ mile downstream of the outfall. No other NPDES discharges are located within ½ mile upstream or downstream of the outfall (based on information contained in DEQ Facility Profiler database), accessed February 2010.

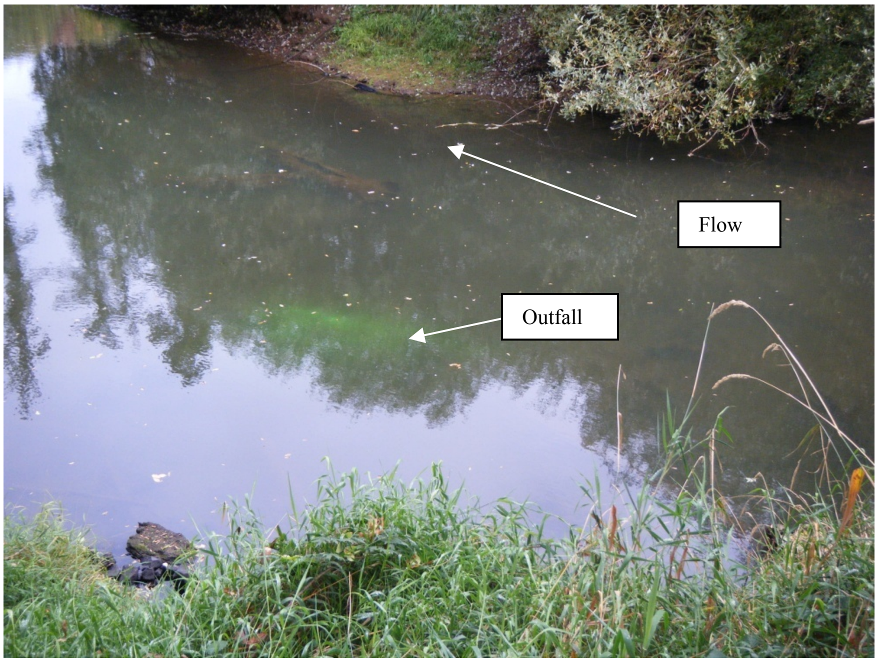
Figure 1 – USGS Quad Map of area surrounding Gervais WWTP's outfall (treatment plant is approximately 2.5 miles west of the outfall, see Figure 6a)



Outfall Description

Gervais WWTP is currently permitted to discharge treated domestic wastewater through outfall 001 to the Pudding River. The outfall is a submerged, single port located approximately 15 feet from the left bank (looking downstream) of the creek, Figure 2. The actual diameter of the pipe could not be determined as the end of the pipe was not clearly visible.

Figure 2 – Location of outfall pipe



Mixing Zone / Receiving Water Conditions

The mixing zone for this facility is defined as *that portion of the Pudding River where the effluent mixes with 25 percent of the streamflow but in no case shall it extend farther than ten feet upstream of the outfall to a point 100 feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within five feet of the point of discharge.*

Pudding River Stream Flow
The field crew was unable to collect flow and depth measurements during the survey because the river was not wadeable. Stream velocity was estimated to be 0.36 ft/sec using the Marsh McBirney flow meter. The depth profile for the river at the outfall location is approximately:

L Bank (5 feet out)	25 feet (mid)	35 feet	Right Bank (45 feet)
3 feet	> 4 feet (approximately six, but could not be measured)	4 feet	3 feet

Conductivity Mapping (All conductivity measurements are temperature compensated to 25°C)
Conductivity mapping was completed during this field study. Figure 3 provides a visual representation of the conductivity data collected. The field crew was unable to find large variations in the conductivity moving downstream. At 250 feet downstream, there was large debris in the stream which prevented farther investigation.

Figure 3 – Conductivity mapping (all measurements in µmhos/cm, temperature compensated to 25°C)

Woody debris

	Left bank		25 feet (mid channel)	Right bank
250 feet DS	190		191	190
120 feet DS	193		184	184
100 feet DS		193		
70 feet DS	192		182	184
35 feet DS	180		179	177
5 feet DS		200		
At outfall				

Woody debris

Upstream	176
Effluent at time of sampling	675

Dye Study / Visual discharge plume
In order to visually locate the discharge pipe, a dye study was conducted. Dye was place in the discharge. Figure 4 documents the mixing dynamics of the dye.

Figure 4 – Dye Study

Stream bottom / bank conditions at outfall (Figure 5)
Manning's roughness coefficient (*n*) is a measure of the friction at the stream bottom and can be estimated from the stream bottom type and channel morphology. The sediment type of the Pudding River at the discharge location was predominantly woody debris and fines (organic mud). The average wetted width was 50 feet with a bank full width of approximately 60 feet. Water depth at the outfall pipe was greater than 4 feet, approximately 6 feet.

Figure 5 – Stream conditions at outfall

Looking upstream from outfall

Looking downstream from outfall

Analytical Results

Water quality samples were collected at the outfall 001 compliance point and at three in-stream (Pudding River) locations, Table 1, Figures 6a and 6b. Samples collected for biochemical oxygen demand (BOD5), nutrients (total nitrogen and phosphorus), *E. coli* and metals were transported to the ODEQ laboratory for analysis. Field parameters (pH, conductivity (temperature compensated to 25°C), dissolved oxygen, temperature, and turbidity were measured by the field sampling crew. Data are summarized in Table 2, Table 3, and Appendix A. A complete report for this sampling event can be found on the LASAR website (http://deq12.deq.state.or.us/lasar2/) under Case # 20090941 (ODEQ, 2010a).

Table 1 – Field Sampling Locations

Map ID	LASAR #	Station Name	Description
A	36066	Gervais STP, final effluent	effluent from plant, sampled at treatment plant, outfall 001
B	36067	Pudding River, 90 feet US of Gervais outfall	Background / upstream location
C	NA	Location of Gervais outfall pipe	no samples at this location, outfall samples collected at location A at plant
D	36068	Pudding River, 5 feet DS of Gervais outfall	downstream edge of Zone of Immediate Dilution (ZID)
E	36069	Pudding River, 100 feet DS of Gervais outfall	downstream edge of regulatory mixing zone (RMZ)

Figure 6a – Wide view, outfall is approximately 2.5 miles from facility

Figure 6b – Sampling locations in the Pudding River around the outfall pipe

Table 2 – Summary of analytical results for sampling event dated October 14, 2009 (ODEQ, 2010a)

Parameter	Units	Acute Water Quality Criteria	Chronic Water Quality Criteria	Permit Limit [a]	Outfall 001 (plant discharge)	Pudding River, 90 feet US of Gervais outfall [b]	Pudding River, 5 feet DS of Gervais outfall	Pudding River, 100 feet DS of Gervais outfall
Conductivity	µmhos/cm				675	178	200	193
Dissolved Oxygen	mg/L	Cold water – Not less than 8.0 mg/L or 90% saturation			4.5	9.9	9.9	9.9
DO % saturation	%				43	90	90	89
pH	s.u.	6.5 ≤ pH ≤ 8.5		6.0 ≤ pH ≤ 9.0	7.5	7.5	7.5	7.5
Temperature	° C	18 °C (cold water species)			13.5	10.9	11.0	10.9
Turbidity	NTU	no more than 10% increase above background			8	3	3	3
E. coli	MPN/ 100mL	406		406	< 1	96	70	115
Alkalinity	mg/L		20		224	64	64	69
Ammonia as N	mg/L	13.3 [c]	4.36 [c]		6.82	< 0.02	0.03	0.13
BOD_5	mg/L			30 (W) 30 (M)	3.8	2.4	2.4	2.7
Nitrate/Nitrite as N	mg/L				0.0357	1.06	1.04	1.03
Total Kjeldahl Nitrogen (TKN)	mg/L				8.1	0.2	0.3	0.4
Total Organic Carbon (TOC)	mg/L				17	3	3	3
Total Phosphorus	mg/L				2.50	0.09	0.13	0.25
Total Suspended Solids (TSS)	mg/L			45 (W) 30 (M)	5	2	2	3

[a] Permit Limits are expressed as single sample limits unless otherwise specified, i.e. W = weekly average effluent concentrations; M = monthly average effluent concentrations. If no limit exists in permit, none is specified in this column.

[b] Duplicate samples collected at this location. All analytical parameters measured were within QA/QC range for a duplicate sample.

[c] Ammonia criteria based on upstream temperature and pH (EPA, 1999).

Based on past data results, metals may be a concern in the receiving water body, therefore, analyses for total metals were added to this study. Table 3 summarizes these results.

Table 3 – Results of samples for total metals (only includes those parameters detected in one or more samples) (ODEQ, 2009a)

Parameter	Units	Acute Water Quality Criteria [a]	Chronic Water Quality Criteria [a]	Outfall 001 (plant discharge)	Pudding River, 90 feet US of Gervais outfall [b]	Pudding River, 5 feet DS of Gervais outfall	Pudding River, 100 feet DS of Gervais outfall
Metal Cations (Total)							
Aluminum	mg/L			< 0.050	0.119	0.132	0.117
Boron	mg/L			0.105	< 0.020	< 0.020	< 0.020
Calcium	mg/L			28.8	16.7	17.3	16.9
Iron	mg/L		1.000	0.083	0.438	0.443	0.432
Magnesium	mg/L			17.5	7.26	7.54	7.52
Manganese	mg/L			0.604	0.0777	0.0829	0.0924
Potassium	mg/L			14.3	1.88	2.01	2.17
Silicon	mg/L			30.3	22.0	22.7	22.1
Sodium	mg/L			81.0	8.37	9.17	10.3
Hardness	mg/L			144	71.5	74.2	73.3
Total Priority Pollutant Metals							
Barium	µg/L			21.8	21.9	21.4	22.3
Cobalt	µg/L			0.36	< 0.20	< 0.20	< 0.20
Copper	µg/L	12.9	8.9	12.6	< 1.5	< 1.5	< 1.5
Nickel	µg/L	1068	118.7	1.2	< 1.0	< 4.0	< 4.0
Vanadium	µg/L			< 4.0	4.1	< 4.0	< 4.0
Zinc	µg/L	88.1	79.8	7.8	< 3.0	9.1	< 3.0

[a] For hardness based criteria, the hardness from the upstream receiving water sample was used for calculations.
[b] Duplicate samples collected at this location. All analytical parameters measured were within QA/QC range for a duplicate sample.

Conclusions

Based on the data collected during the field study, the following items may warrant additional consideration.

Nutrients –Ammonia in the effluent exceeded the **chronic water quality criterion** at the point of discharge, however, no exceedances of criteria were measured at the in-stream locations. Total Kjeldahl nitrogen and total phosphorus were measured at levels greater than background in the effluent. This coincides with a slight elevation of these nutrients at the two downstream locations.

Metals – Several priority pollutant metals were detected in the effluent, however, only copper **exceeded the chronic water quality criterion**. Copper was not detected at either the upstream or any of the downstream locations.

Mixing dynamics – Based on the conductivity mapping, the effluent remained to the left side of the river. At 250 feet downstream, the effluent and river were uniformly mixed with respect to conductivity. At this location, however, the conductivity readings were still greater than 5% above background.

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Appendix A – Field Data Sheet & Chain of Custody

Oregon Department of Environmental Quality

Laboratory and Environmental Assessment Division Chain of Custody Record [1]

* Office Use Only *

Sampling Event #: 2009 0941 Page 1 of 2

Sampling Event Name [2]: *Gervais STP Mixing Zone Evaluation*

Fund Code [3]: *37443* QAPP/SAP # [4]: *DEQ09-LAB-0022-SAP*

Report Recipients [5]: *Lori Pillsbury, Mark Hamlin (WR)*

Sampling Event Collector (s) [6]: *Lori Pillsbury,*

Sampling Agency [6]: *DEQ*

Project Manager and Contact # [7]: *Lori Pillsbury, 503-693-5735*

Expected Turnaround Time (Default 45 days) [8]: *Default*

Sample Information						Bottle Numbers [16]						
Item	LASAR ID # [10]	Station Name [11]	Sub-Project [12]	Date [13] / Time	QC Type [14] / Matrix [15]	P / R	C / DP	BOD / DO	STP / S	TM		
1	36066	*Gervais STP, final effluent*		10/14/09	S	—	—	—	STP 401	TM 1598		STP 475
				0930	MUN EFF	R2723	—	—	S9655			
2	36067	*Pudding R., 90 feet US of Gervais outfall*		10/14/09	FP	P196	C1504	B 22	—	TM 1641		
				1115	SW	R1956	—	—	—			
3	36068	*Pudding R., 5 feet DS of Gervais outfall*		10/14/09	S	P945	C1503	34	—	TM 1284		
				1110	MZ	R1973	—	—	—			
4	36069	*Pudding R., 100 feet DS of Gervais outfall*		10/14/09	S	P2159	C1443	284	—	TM 1631		
				1105	SW	R151	—	—	—			
5	36067	*Field Duplicate* Pudding R. 90 feet US of Gervais		10/14/09	FD	P427	C1505	554	—	TM 1642		
				1116	SW	R2727	—	—	—			
6	10000	*Transfer Blank*		10/14/09	TSFB	P769	—	—	—	TM 1630		
				1155	SW	R2704	—	—	—			

Event Comments:

Chain of Custody [17]

Relinquished By:	Agency/Company	Date/Time	Received by:	Agency/Company	Date/Time	Location
[illegible]	DEQ	10/14/09 1355	[illegible]	DEQ	10/14/09 1450	

Rev. 1.0 12-Mar-09 DEQ06-LAB-0054-FORM \ COC - WQ SW

Oregon Department of Environmental Quality

Laboratory and Environmental Assessment Division Water Quality Field Data Record [1]

* Office Use Only *

Sampling Event #: 20090941 Page 2 of 2

Sampling Event Name [2]: *Gervais STP Mixing Zone Evaluation*

Fund Code [3]: *37443* QAPP/SAP # [4]: *DEQ09-LAB-0022-SAP*

Sampling Event Collector (s) [6]: *Lori Pillsbury,*

Project Manager and Contact # [7]: *Lori Pillsbury, 503-693-5735*

Report Recipients [5]: *Lori Pillsbury, Mark Hamlin (WR)*

Sampling Agency [6]: *DEQ*

Expected Turnaround Time (Default 45 days) [8]: *Default*

Sample Information					Field Data									
Item	LASAR ID # [10]	Station Name [11]	Date [13] / Time	QC Type [14] / Elevation [19]	Temp [20] (C)	Cond. [21] (umhos)	pH [22] (SU)	Alk. [23] (mg/L)	DO [24] (mg/L)	DO Sat [25] (%)	Turb. [26] (NTU)	TRC (mg/L)		
1	36066	*Gervais STP, final effluent*	10/14/09 / 0930	S / 200	13.5	675	7.5	–	4.5	43	8	–		
					Item Comment: N 45.11637 W 122.88636									
2	36067	*Pudding R.,* 90 *feet US of Gervais outfall*	10/14/09 / 1115	FP / 200	10.9	178	7.5	–	9.9	90	3	–		
					Item Comment: N 45.10785 W 122.83929									
3	36068	*Pudding R., 5 feet DS of Gervais outfall*	10/14/09 / 1110	S / 200	11.0	200	7.5	–	9.9	90	3	–		
					Item Comment: N 45.10785, W 122.83964									
4	36069	*Pudding R., 100 feet DS of Gervais outfall*	10/14/09 / 1105	S / 200	10.9	193	7.5	–	9.9	89	3	–		
					Item Comment: N 45.10810 W 122.83973									
5	36067	*Field Duplicate* Pudding R. 90 feet US of Gervais	10/14/09 / 1116	FD / 200	10.9	178	7.5	–	9.9	90	3	–		
					Item Comment:									
6	10000	*Transfer Blank*	10/14/09 / 1155	TSFB / SW	14.0	1	5.9	–	–	–	<1	–		
					Item Comment:									

pH Meter # [29]: seahorse		Initials	Time	Temp.	Meter Reading	Diff.	<0.1 SU (y/n)
Pre	7	LAP	0730	21.6	7.08	+0.06	Y
	4	↓	↓				
	10	↓	↓	21.5	10.06	–	Y
Post	7	LAP	1350	22.1	7.08	+0.06	Y
	4	↓					
	10	↓	1350	22.0	10.11	+0.05	Y

QC [30] Check	Meter #	Initials	Date	Time	Meter Reading	True Value	Diff. or % Rec	Control Limit
Cond. Low:	seahorse	LAP	10/14/09	0735	149	147.7	1	≤ 7%
Cond. High:	↓	↓	↓	↓	1413	1418	<1	≤ 7%
pH (LIS):								
Turb. Low:	50868	LAP	10/14/09	0800	4.59	4.58	<1	≤ 5%
Turb. Mid.:					49.9	49.5	1	≤ 5%
Turb. High:	↓	↓	↓	↓	483	480	<1	≤ 5%

Appendix B – Field Summary Sheet

Mixing Zone
Field Summary Sheet

General Facility Information

Facility Name: *Gervais STP*	**Address:** *524 4th St. Gervais, OR*	**Date of Survey:** 10/14/2009 **County:** *Marion*
Facility Contact: *Dave Miller*	**Phone #:** *503-792-3577*	**IMD Study Level:** *1*
Receiving Waterbody: *Pudding River*	**NPDES Permit #:** *101665* **Expiration Date:** *12/31/2009*	**Facility Type:** IW / DW Major / Minor
Function of Facility (brief description): *Domestic wastewater treatment facility*		
Discharge Timing & Type: (i.e. seasonality of discharge, batch, continuous) *winter season discharge, Nov. 1 – April 30*		

Outfall Information

Outfall Designation: 001	**Flow at time of sampling:**	**Water Depth @ outfall:** >4 feet	**River mile:**
Type of Outfall: (i.e. single, multi-port) Single	**Orientation of outfall (σ):** 0° (assumption) (in degrees related to bottom of stream, 0° (H), 90° (V))	**Diameter of pipe:** ? pipe not visible	**Latitude / Longitude:**
Nearest bank to outfall (looking downstream): Left		**Outfall distance from nearest bank (looking downstream):** ~15 feet - pipe not visible	
Discharge direction in relation to flow (i.e. perpendicular / horizontal): horizontal		**CORMIX Form completed:** Yes / No	

Sampling Locations – Data Collection

Pudding R.

Parameter	Outfall	Site 1	Site 2	Site 3	Site 4
Description of Sample Site	@ facility	~90 feet US of 001	5 feet DS of 001	100 feet DS of 001	
Latitude / Longitude	N45.11637 W122.88636	N45.10785 W122.83929	N45.10785 W122.83964	N45.10810 W122.83973	
River Mile					
Field Parameters collected	Y / N	Y / N	Y / N	Y / N	Y / N
Water Quality Samples collected	Y / N	Y / N	Y / N	Y / N	Y / N
Substrate Type					
Stream slope					
Stream Bottom Description (Manning's Roughness description)	X	woody debris/ muck			

Mixing Zone
Field Summary Sheet

Other Data Collection

Conductivity Mapping Completed Yes / No
If Yes, attach field form with complete information
If No, provide explanation:

Velocity Transects Completed Yes / No
If Yes, attach form measurement form (Stream Discharge Field Sheet).
If No, provide explanation:
stream was not wadeable - velocity estimated by mmcB @ 0.36 ft/sec.

Macroinvertebrate Sampling Yes / No
If Yes, complete macroinvertebrate field forms & attach.

Photos Taken Yes / No
Take photos of all sampling locations including the outfall and outfall pipe if possible.

Ambient Weather Conditions
windy, overcast, party sunny

Additional Notes:

Pudding R was very deep in area of outfall

dye study conducted
-dye visually spread through mid-left channel dissipated rapidly

*** Manning's Roughness Coefficient – *n***

Description	*n*
Bare earth, straight	0.020 – 0.030
Bare earth, winding	0.040 – 0.05
Mountain streams, gravel, cobbles	0.040 – 0.050
Mountain streams, gravel, cobbles, boulders	0.050 – 0.70
Grass lined, weeds	0.050 – 0.06
Heavy brush, timber	0.10 – 0.12
Major rivers	0.030 – 0.035
Sluggish with pools	0.040 – 0.050

Appendix C – Stream Description & Conductivity Mapping

Mixing Zone
Stream Description & Conductivity Mapping Summary

Sampling Event:	Receiving Waterbody:	Date of Survey:
Gervais mz	Pudding R.	Oct 14, 2009
		County: Marion
Bank Full Width: 60 feet	Wetted Width: 50 feet	

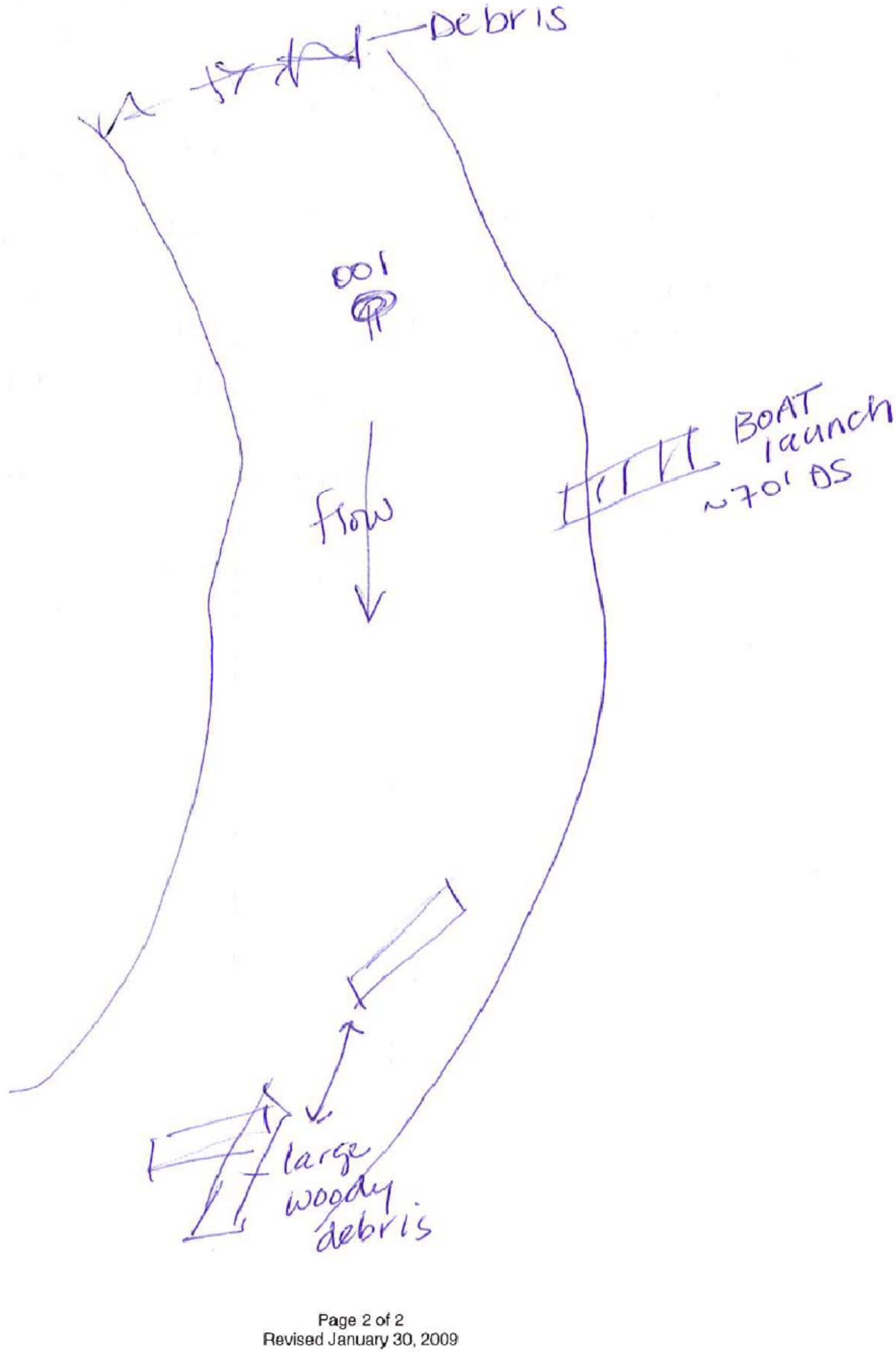
effluent SpC = 675 umhos/cm

Conductivity Mapping
(include approximate location on stream sketch)

Location	Latitude/Longitude	Field Conductivity (µmhos/cm)		
		L ~~Surface~~	Mid	R ~~Bottom~~
upstream/background			176	
35' DS		180	179	177
~~10' DS~~				
70' DS		192	182	184
120' DS		193	184	184
250' DS		190	191	190

Mixing Zone
Stream Description & Conductivity Mapping Summary

Notes / Sketch (include other outfalls or inputs in the stream reach evaluated, note obstructions to flow observed):



Wastewater Facilities Plan

Appendix G. Cost Estimates

City of Gervais
WASTEWATER FACILITIES MASTER PLAN UPDATE
Sewer Pipe Projects

Project C1: SE Fir Trunk Main Replacement

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$17,000	$17,000
10" PVC Sanitary Sewer	841	LF	$120	$100,920
8" PVC Sanitary Sewer	288	LF	$95	$27,360
48" Sanitary Manholes	5	EA	$6,000	$30,000
Service Connections	14	EA	$2,000	$28,000
4" AC Restoration	610	SY	$40	$24,400
Traffic Control	1	LS	$4,000	$4,000
Erosion Control	1	LS	$4,000	$4,000
Construction Subtotal				**$236,000**
Construction Contingencies (% of total)			30%	$71,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$77,000
Total Project Cost				**$390,000**

Project C2: NW Fir Trunk Replacement

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$23,000	$23,000
12" Sanitary Sewer	847	LF	$140	$118,580
24" Steel Casing - Jacked in Place	200	LF	$450	$90,000
48" Sanitary Manholes	5	EA	$6,000	$30,000
Service Connections	7	EA	$2,000	$14,000
4" AC Restoration	620	SY	$40	$24,800
Traffic Control	1	LS	$4,000	$4,000
Erosion Control	1	LS	$4,000	$4,000
Construction Subtotal				**$309,000**
Construction Contingencies (% of total)			30%	$93,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$101,000
Total Project Cost				**$510,000**

City of Gervais
WASTEWATER FACILITIES MASTER PLAN UPDATE
Sewer Pipe Projects

Project C3: 7th Street Pipe Replacement

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$13,000	$13,000
10" Sanitary Sewer	752	LF	$120	$90,240
48" Sanitary Manholes	3	EA	$6,000	$18,000
Service Connections	12	EA	$2,000	$24,000
4" AC Restoration	490	SY	$40	$19,600
Traffic Control	1	LS	$4,000	$4,000
Erosion Control	1	LS	$4,000	$4,000
Construction Subtotal				**$173,000**
Construction Contingencies (% of total)			30%	$52,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$56,000
Total Project Cost				**$290,000**

Total Pipe Project Cost **$1,190,000**

Project P1: Standby Operation Improvements at Pump Stations

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	10%	LS	$3,000	$3,000
Replace ATS at 4th Street PS	1	LS	$6,000	$6,000
Replace MTS with ATS at French Prairie PS	1	LS	$4,000	$4,000
Conduit Wiring	1	LS	$10,000	$10,000
Bypass Connection at French Prairie PS	1	LS	$8,000	$8,000
Construction Subtotal				**$31,000**
Construction Contingencies (% of total)			30%	$9,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$10,000
Total Project Cost				**$50,000**

City of Gervais
WASTEWATER FACILITIES MASTER PLAN UPDATE
Treatment Plant Upgrades

Headworks Upgrade - Alternative 1

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$22,500	$22,500
Structural Backfill	20	CY	$100	$2,000
Fine Screen	1	LS	$112,000	$112,000
Concrete				
Bottom Slab	30	CY	$800	$24,000
Walls	65	CY	$1,000	$65,000
Parshall Flume	1	LS	$9,000	$9,000
Relocate Flow Meter	1	LS	$1,000	$1,000
Manually Cleaned Bar Screen	1	LS	$4,000	$4,000
Sluice Gates	2	EA	$7,000	$14,000
Slide Gates	3	EA	$3,000	$9,000
Handrails	60	LF	$140	$8,400
Grating & Frame	90	SF	$75	$6,750
10" Forcemain (DIP)	100	LF	$130	$13,000
12" Influent, Gravity Piping (PVC)	1	LS	$10,000	$10,000
Site Work	15%	LS	$3,450	$3,450
Construction Subtotal				**$305,000**
Construction Contingencies (% of total)			30%	$92,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$99,000
Total Project Cost				**$500,000**

Lagoon Aeration Improvements - Phase 1

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$5,000	$5,000
5 HP Floating Aerators	2	EA	$21,000	$42,000
Mooring Cables & Installation	1	LS	$8,000	$8,000
Electrical	2	EA	$4,000	$8,000
Construction Subtotal				**$63,000**
Construction Contingencies (% of total)			30%	$19,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$21,000
Total Project Cost				**$110,000**

City of Gervais
WASTEWATER FACILITIES MASTER PLAN UPDATE
Treatment Plant Upgrades

Lagoon Aeration Improvements - Phase 2 or Phase 3

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$9,000	$9,000
5 HP Floating Aerators	2	EA	$21,000	$42,000
Mooring Cables & Installation	1	LS	$20,000	$20,000
New MCC in Control Bldg	1	LS	$15,000	$15,000
Electrical	1	LS	$40,000	$40,000
Construction Subtotal				**$126,000**
Construction Contingencies (% of total)			30%	$38,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$41,000
Total Project Cost				**$210,000**

Transfer Pump Station and Force Main Upgrade - Alternative 1

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$38,000	$3,040
Drain and Clean Wet Well	1	LS	$3,000	$3,000
Wetwell Modifications - Grout & Bottom	1	LS	$20,000	$20,000
Duplex Submersible Pumps, Installed	2	EA	$60,000	$120,000
Fill and Grade Around Structure Top	1	LS	$8,000	$8,000
Install New 6 ft X 10 ft Top Slab and Hatch	1	LS	$10,000	$10,000
New Valve Vault and Mech. (8-inch Piping)	1	LS	$41,800	$41,800
8-inch Discharge Pipe (DIP)	20	LS	$150	$3,000
10" Force Main	2,230	LF	$90	$200,700
Transfer Pipe Discharge Structure	1	LS	$10,000	$10,000
Replace generator and MTS with ATS	1	LS	$60,000	$60,000
Electrical/Instrumentation	1	LS	$20,000	$20,000
Construction Subtotal				**$500,000**
Construction Contingencies (% of total)			30%	$150,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$163,000
Total Project Cost				**$820,000**

Transfer Pump Station Upgrade - Alternative 2

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$31,000	$2,480
Drain and Clean Wet Well	1	LS	$3,000	$3,000
Wetwell Modifications - Grout & Bottom	1	LS	$20,000	$20,000
Duplex Submersible Pumps, Installed	2	EA	$85,000	$170,000
Upgrade Power Service for Larger Pumps	1	LS	$60,000	$60,000
Fill and Grade Around Structure Top	1	LS	$8,000	$8,000
Install New 6 ft X 10 ft Top Slab and Hatch	1	LS	$10,000	$10,000
New Valve Vault and Mech. (8-inch Piping)	1	LS	$41,800	$41,800
8-inch Discharge Pipe; Connection to Exist FM	1	LS	$8,000	$8,000
Transfer Pipe Discharge Structure	1	LS	$10,000	$10,000
Replace generator and MTS with ATS	1	LS	$60,000	$60,000
Electrical/Instrumentation	1	LS	$20,000	$20,000
Construction Subtotal				**$414,000**
Construction Contingencies (% of total)			30%	$124,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$135,000
Total Project Cost				**$680,000**

City of Gervais
WASTEWATER FACILITIES MASTER PLAN UPDATE
Treatment Plant Upgrades
Lagoon Disinfection Improvements

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$3,000	$3,000
Extend 30"-inch Chlorine Contact Pipe (HDPE)	193	LF	$200	$38,600
Demo Drain MH	1	LS	$5,000	$5,000
New Drain MH and Connections	1	LS	$12,000	$12,000
Construction Subtotal				**$59,000**
Construction Contingencies (% of total)			30%	$18,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$19,000
Total Project Cost				**$100,000**

Effluent Pumping Improvements

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$1,000	$1,000
Replace motor and sheaves	1	LS	$5,000	$5,000
Replace MTS with ATS	1	LS	$5,000	$5,000
Construction Subtotal				**$11,000**
Construction Contingencies (% of total)			30%	$3,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$4,000
Total Project Cost				**$20,000**

Treatment Lagoon Modification - Alternate 1

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$13,000	$13,000
Remove Crushed Rock, Scarify Surface	435	CY	$20	$8,694
Remove/Replace Riprap	0	CY	$25	$0
Fill, Compaction	2,793	CY	$60	$167,580
6" Crushed Rock Surface	435	CY	$45	$19,575
Raise Outlet and Control Structures	3	EA	$15,000	$45,000
2' High Retaining Wall by Control Building	40	LF	$200	$8,000
Construction Subtotal				**$262,000**
Construction Contingencies (% of total)			30%	$79,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$85,000
Total Project Cost				**$430,000**

City of Gervais
WASTEWATER FACILITIES MASTER PLAN UPDATE
Treatment Plant Upgrades
Holding Lagoon Modification - Alternate 2

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$15,000	$15,000
Remove Crushed Rock, Scarify Surface	681	CY	$20	$13,611
Remove/Replace Riprap	1,258	CY	$25	$31,448
Fill, Compaction	2,562	CY	$60	$153,720
6" Crushed Rock Surface	465	CY	$45	$20,925
Construction Subtotal				**$235,000**
Construction Contingencies (% of total)			30%	$71,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$77,000
Total Project Cost				**$390,000**

Dredging and Biosolids Land Application - Treatment Lagoons only

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$9,000	$9,000
Suction Hydraulic Dredging & Land Apply	352	Dry Ton	$320	$113,000
Construction Subtotal				**$122,000**
Construction Contingencies (% of total)			30%	$37,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$40,000
Total Project Cost				**$200,000**

Dredging and Biosolids Land Application - Holding Lagoon only

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$7,000	$7,000
Suction Hydraulic Dredging & Land Apply	296	Dry Ton	$300	$88,800
Construction Subtotal				**$96,000**
Construction Contingencies (% of total)			30%	$29,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$31,000
Total Project Cost				**$160,000**

Project T10: Lagoon Disinfection Improvements

Item	Qty	Unit	Unit Cost	Total Cost
Mobilization (percentage of total)	8%	LS	$3,000	$3,000
Extend 30"-inch Chlorine Contact Pipe (HDPE)	193	LF	$200	$38,600
Demo Drain MH	1	LS	$5,000	$5,000
New Drain MH and Connections	1	LS	$12,000	$12,000
Construction Subtotal				**$59,000**
Construction Contingencies (% of total)			30%	$18,000
Engr, Arch, Admin, Legal Fees (% of Total Constr. & Contingency)			25%	$19,000
Total Project Cost				**$100,000**

Wastewater Facilities Plan

Appendix H. Water Budget

City of Gervais - WWTP Facilities Plan Update
Water Balance: 2018 Average Flows and Rain

Assumptions				
Precip Increase [6]	1.00	Effluent BOD Load [4]	55.0	lbs/day
Evap Increase [7]	1.00	Effluent BOD Conc [4]	15.0	mg/L
		Irrigation Acreage	38.0	acres
		Additional Irrigation	0.0	in/day
		is equal to	0	GPD

Lagoon Data		
Treatment Lagoon Area	6.0	acres
Holding Lagoon Area	5.9	acres
Total Lagoon Surface Area	11.9	acres
Depth at Start	6.0	ft
Holding Lagoon Berm Height	10.0	ft
Max Storage Volume	46.8	ac-ft

	Avg Daily Flow[1]	Influent Flow	Monthly Precipitation [2]		Monthly Evaporation [3]		Pudding River Discharge [4]		Summer Effluent Reuse [5]		Net Flow	Holding Lagoon Volume Stored	Holding Lagoon Depth	
Month	MG	MG	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	ac-ft	ac-ft	ft	Free Board
												35.1	6.0	4.0
May	0.214	6.6	2.20	2.18	5.15	-5.1	0.00	0.0	3.2	-10.1	7.3	42.4	7.2	2.8
Jun	0.168	5.0	1.54	1.53	6.01	-6.0	0.00	0.0	5.2	-16.5	-5.4	37.0	6.3	3.7
Jul	0.145	4.5	0.47	0.47	7.40	-7.3	0.00	0.0	7.1	-22.5	-15.5	35.1	6.0	4.0
Aug	0.138	4.3	0.43	0.43	6.78	-6.7	0.00	0.0	6.0	-19.0	-12.2	35.1	6.0	4.0
Sep	0.146	4.4	1.30	1.29	4.68	-4.6	0.00	0.0	6.0	-19.0	-8.9	35.1	6.0	4.0
Oct	0.170	5.3	3.03	3.00	2.39	-2.4	0.00	0.0	2.0	-6.3	10.5	45.6	7.8	2.2
Nov	0.248	7.4	6.50	6.45	1.05	-1.0	0.44	-40.5	0	0.0	-12.3	35.1	6.0	4.0
Dec	0.398	12.3	6.85	6.79	0.57	-0.6	0.44	-41.8	0	0.0	2.3	37.4	6.4	3.6
Jan	0.357	11.1	5.94	5.89	0.63	-0.6	0.44	-41.8	0	0.0	-2.6	35.1	6.0	4.0
Feb	0.464	13.0	4.57	4.53	1.18	-1.2	0.44	-37.8	0	0.0	5.5	40.6	6.9	3.1
Mar	0.406	12.6	3.98	3.95	2.29	-2.3	0.44	-41.8	0	0.0	-1.5	39.0	6.7	3.3
Apr	0.296	8.9	2.80	2.78	3.31	-3.3	0.44	-40.5	0	0.0	-13.8	35.1	6.0	4.0
Total	3.15	95	39.6	39.3	41.4	-41.1	2.64	-244	29.5	-93.4	-46.67	453	77	

Maximum Volume Required	45.6	ac-ft

Notes:

1) Monthly flow distribution for projected flows based on 2013-2017 flow records.
2) Precipitation based on US Climate Data for Salem, OR
3) Evaporation based on historical means for N. Willamette Experiment Station, Oregon Climate Service, 1963-2005.
4) Discharge to Pudding R. limited based on 106 lbs/day mass load limit and 15mg/l effluent BOD concentration
5) Irrigation based on application rates recommended in the Effluent Reuse Plan and past experience with poplar irrigation.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

Water Balance: 2020 with Average Flows and Peak Oct and Dec Rainfall

Assumptions				
Precip Increase [6]	1.00	Effluent BOD Load [4]	55.0	lbs/day
Evap Increase [7]	1.00	Effluent BOD Conc [4]	15.0	mg/L
		Irrigation Acreage	38.0	acres
		Additional Irrigation	0.0	in/day
		is equal to	0	GPD

Lagoon Data		
Treatment Lagoon Area	6.0	acres
Holding Lagoon Area	5.9	acres
Total Lagoon Surface Area	11.9	acres
Depth at Start	6.0	ft
Holding Lagoon Berm Height	10.0	ft
Max Storage Volume	46.8	ac-ft
Min. Storage Level	4.0	ft

													Holding Lagoon		
	Avg Daily Flow[1]	Influent Flow	Monthly Precipitation [2]		Monthly Evaporation [3]		Pudding River Discharge [4]		Summer Effluent Reuse [5]		Net Flow	Volume Stored	Depth		
Month	MG	MG	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	ac-ft	ac-ft	ft	Free Board
												35.1	6.0	4.0
May	0.228	7.1	2.20	2.18	5.15	-5.1	0.00	0.0	3.2	-10.1	8.7	43.8	7.5	2.5
Jun	0.179	5.4	1.54	1.53	6.01	-6.0	0.00	0.0	5.2	-16.5	-4.4	39.3	6.7	3.3
Jul	0.155	4.8	0.47	0.47	7.40	-7.3	0.00	0.0	6.0	-19.0	-11.1	28.2	4.8	5.2
Aug	0.147	4.6	0.43	0.43	6.78	-6.7	0.00	0.0	6.0	-19.0	-11.3	23.4	4.0	6.0
Sep	0.156	4.7	1.30	1.29	4.68	-4.6	0.00	0.0	5.0	-15.8	-4.8	23.4	4.0	6.0
Oct	0.182	5.6	11.25	11.16	2.39	-2.4	0.00	0.0	2.0	-6.3	19.7	43.1	7.4	2.6
Nov	0.264	7.9	6.50	6.45	1.05	-1.0	0.44	-40.5	0	0.0	-10.7	32.4	5.5	4.5
Dec	0.425	13.2	15.24	6.85	0.57	-0.6	0.44	-41.8	0	0.0	4.9	37.3	6.4	3.6
Jan	0.380	11.8	5.94	5.89	0.63	-0.6	0.44	-41.8	0	0.0	-0.4	36.9	6.3	3.7
Feb	0.495	13.9	4.57	4.53	1.18	-1.2	0.44	-37.8	0	0.0	8.1	45.0	7.7	2.3
Mar	0.433	13.4	3.98	3.95	2.29	-2.3	0.44	-41.8	0	0.0	1.0	46.0	7.9	2.1
Apr	0.315	9.5	2.80	2.78	3.31	-3.3	0.44	-40.5	0	0.0	-11.9	34.1	5.8	4.2
Total	3.36	102	56.2	47.5	41.4	-41.1	2.64	-244	27.4	-86.8	-12.29	433	74	
											Maximum Volume Required			46.0	ac-ft

Notes:

1) Monthly flow distribution for projected flows based on 2013-2017 flow records.
2) Precipitation based on US Climate Data for Salem, OR
3) Evaporation based on historical means for N. Willamette Experiment Station, Oregon Climate Service, 1963-2005.
4) Discharge to Pudding R. limited based on 106 lbs/day mass load limit and 15mg/l effluent BOD concentration
5) Irrigation based on application rates recommended in the Effluent Reuse Plan and past experience with poplar irrigation.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Gervais - WWTP Facilities Plan Update
Water Balance: 2025 with Average Flows and Peak Oct Rainfall

Assumptions				
Precip Increase [6]	1.00	Effluent BOD Load [4]	65.0	lbs/day
Evap Increase [7]	1.00	Effluent BOD Conc [4]	15.0	mg/L
		Irrigation Acreage	38.0	acres
		Additional Irrigation	0.0	in/day
		is equal to	0	GPD

Lagoon Data		
Treatment Lagoon Area	6.0	acres
Holding Lagoon Area	5.9	acres
Total Lagoon Surface Area	11.9	acres
Depth at Start	6.0	ft
Holding Lagoon Berm Height	10.0	ft
Max Storage Volume	46.8	ac-ft
Min. Storage Level	4.0	ft

	Avg Daily Flow[1]	Influent Flow	Monthly Precipitation [2]		Monthly Evaporation [3]		Pudding River Discharge [4]		Summer Effluent Reuse [5]		Net Flow	Holding Lagoon Volume Stored	Holding Lagoon Depth	
Month	MG	MG	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	ac-ft	ac-ft	ft	Free Board
												35.1	6.0	4.0
May	0.251	7.8	2.20	2.18	5.15	-5.1	0.00	0.0	3.2	-10.1	10.8	45.9	7.9	2.1
Jun	0.197	5.9	1.54	1.53	6.01	-6.0	0.00	0.0	5.2	-16.5	-2.7	43.2	7.4	2.6
Jul	0.171	5.3	0.47	0.47	7.40	-7.3	0.00	0.0	6.0	-19.0	-9.6	33.6	5.7	4.3
Aug	0.162	5.0	0.43	0.43	6.78	-6.7	0.00	0.0	6.0	-19.0	-9.9	23.7	4.1	5.9
Sep	0.172	5.2	1.30	1.29	4.68	-4.6	0.00	0.0	5.0	-15.8	-3.4	23.4	4.0	6.0
Oct	0.200	6.2	11.25	11.16	2.39	-2.4	0.00	0.0	2.0	-6.3	21.5	44.9	7.7	2.3
Nov	0.291	8.7	6.50	6.45	1.05	-1.0	0.52	-47.8	0	0.0	-15.6	29.2	5.0	5.0
Dec	0.468	14.5	6.84	6.78	0.57	-0.6	0.52	-49.4	0	0.0	1.3	30.5	5.2	4.8
Jan	0.419	13.0	5.94	5.89	0.63	-0.6	0.52	-49.4	0	0.0	-4.3	26.2	4.5	5.5
Feb	0.545	15.3	4.57	4.53	1.18	-1.2	0.52	-44.7	0	0.0	5.6	31.8	5.4	4.6
Mar	0.477	14.8	3.98	3.95	2.29	-2.3	0.52	-49.4	0	0.0	-2.4	29.4	5.0	5.0
Apr	0.347	10.4	2.80	2.78	3.31	-3.3	0.52	-47.8	0	0.0	-16.4	23.4	4.0	6.0
Total	3.70	112	47.8	47.4	41.4	-41.1	3.12	-289	27.4	-86.8	-25.16	385	66	

Maximum Volume Required 45.9 ac-ft

Notes:

1) Monthly flow distribution for projected flows based on 2013-2017 flow records.
2) Precipitation based on US Climate Data for Salem, OR
3) Evaporation based on historical means for N. Willamette Experiment Station, Oregon Climate Service, 1963-2005.
4) Discharge to Pudding R. limited based on 106 lbs/day mass load limit and 15mg/l effluent BOD concentration
5) Irrigation based on application rates recommended in the Effluent Reuse Plan and past experience with poplar irrigation.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Gervais - WWTP Facilities Plan Update
Water Balance: 2030 with Average Flows and Peak October Rainfall

Assumptions				
Precip Increase [6]	1.00	Effluent BOD Load [4]	65.0	lbs/day
Evap Increase [7]	1.00	Effluent BOD Conc [4]	15.0	mg/L
		Irrigation Acreage	38.0	acres
		Additional Irrigation	0.0	in/day
		is equal to	0	GPD

Lagoon Data		
Treatment Lagoon Area	6.0	acres
Holding Lagoon Area	5.9	acres
Total Lagoon Surface Area	11.9	acres
Depth at Start	6.0	ft
Holding Lagoon Berm Height	10.0	ft
Max Storage Volume	46.8	ac-ft
Min. Storage Level	4.0	ft

Month	Avg Daily Flow[1]	Influent Flow	Monthly Precipitation [2]		Monthly Evaporation [3]		Pudding River Discharge [4]		Summer Effluent Reuse [5]		Net Flow	Holding Lagoon Volume Stored	Holding Lagoon Depth	Free Board
	MG	MG	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	ac-ft	ac-ft	ft	
												35.1	6.0	4.0
May	0.268	8.3	2.20	2.18	5.15	-5.1	0.00	0.0	3.2	-10.1	12.4	47.5	8.1	1.9
Jun	0.210	6.3	1.54	1.53	6.01	-6.0	0.00	0.0	5.2	-16.5	-1.6	45.9	7.9	2.1
Jul	0.182	5.6	0.47	0.47	7.40	-7.3	0.00	0.0	6.0	-19.0	-8.6	37.4	6.4	3.6
Aug	0.173	5.3	0.43	0.43	6.78	-6.7	0.00	0.0	6.0	-19.0	-8.9	28.5	4.9	5.1
Sep	0.183	5.5	1.30	1.29	4.68	-4.6	0.00	0.0	5.0	-15.8	-2.3	26.2	4.5	5.5
Oct	0.213	6.6	11.25	11.16	2.39	-2.4	0.00	0.0	2.0	-6.3	22.7	48.9	8.4	1.6
Nov	0.310	9.3	6.50	6.45	1.05	-1.0	0.52	-47.8	0	0.0	-13.9	35.0	6.0	4.0
Dec	0.498	15.4	6.84	6.78	0.57	-0.6	0.52	-49.4	0	0.0	4.2	39.2	6.7	3.3
Jan	0.446	13.8	5.94	5.89	0.63	-0.6	0.52	-49.4	0	0.0	-1.7	37.4	6.4	3.6
Feb	0.580	16.3	4.57	4.53	1.18	-1.2	0.52	-44.7	0	0.0	8.6	46.0	7.9	2.1
Mar	0.508	15.7	3.98	3.95	2.29	-2.3	0.52	-49.4	0	0.0	0.5	46.5	8.0	2.0
Apr	0.370	11.1	2.80	2.78	3.31	-3.3	0.52	-47.8	0	0.0	-14.3	32.2	5.5	4.5
Total	3.94	119	47.8	47.4	41.4	-41.1	3.12	-289	27.4	-86.8	-2.85	471	80	
											Maximum Volume Required			48.9 ac-ft

Notes:
1) Monthly flow distribution for projected flows based on 2013-2017 flow records.
2) Precipitation based on US Climate Data for Salem, OR
3) Evaporation based on historical means for N. Willamette Experiment Station, Oregon Climate Service, 1963-2005.
4) Discharge to Pudding R. limited based on 106 lbs/day mass load limit and 15mg/l effluent BOD concentration
5) Irrigation based on application rates recommended in the Effluent Reuse Plan and past experience with poplar irrigation.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Gervais - WWTP Facilities Plan Update
Water Balance: 2042 with Average Flows and Peak Oct Rainfall

Assumptions				
Precip Increase [6]	1.00	Effluent BOD Load [4]	75.0	lbs/day
Evap Increase [7]	1.00	Effluent BOD Conc [4]	15.0	mg/L
		Irrigation Acreage	38.0	acres
		Additional Irrigation	0.0	in/day
		is equal to	0	GPD

Lagoon 1+2+3		
Treatment Lagoon Area	6.0	acres
Holding Lagoon Area	5.9	acres
Total Lagoon Surface Area	11.9	acres
Depth at Start	6.0	ft
Holding Lagoon Berm Height	10.0	ft
Max Storage Volume	46.8	ac-ft
Min. Storage Level	3.0	ft

Month	Avg Daily Flow[1]	Influent Flow	Monthly Precipitation [2]		Monthly Evaporation [3]		Pudding River Discharge [4]		Summer Effluent Reuse [5]		Net Flow	Holding Lagoon Volume Stored	Holding Lagoon Depth	Free Board
	MG	MG	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	ac-ft	ac-ft	ft	
												35.1	6.0	4.0
May	0.302	9.3	2.20	2.18	5.15	-5.1	0.00	0.0	3.2	-10.1	15.6	50.7	8.7	1.3
Jun	0.237	7.1	1.54	1.53	6.01	-6.0	0.00	0.0	5.2	-16.5	0.9	51.6	8.8	1.2
Jul	0.205	6.4	0.47	0.47	7.40	-7.3	0.00	0.0	6.0	-19.0	-6.4	45.2	7.7	2.3
Aug	0.194	6.0	0.43	0.43	6.78	-6.7	0.00	0.0	6.0	-19.0	-6.8	38.5	6.6	3.4
Sep	0.206	6.2	1.30	1.29	4.68	-4.6	0.00	0.0	5.0	-15.8	-0.2	38.3	6.5	3.5
Oct	0.240	7.4	11.25	11.16	2.39	-2.4	0.00	0.0	2.0	-6.3	25.3	63.5	10.9	-0.9
Nov	0.349	10.5	6.50	6.45	1.05	-1.0	0.60	-55.2	0	0.0	-17.6	45.9	7.8	2.2
Dec	0.561	17.4	6.85	6.85	0.57	-0.6	0.60	-57.0	0	0.0	2.7	48.6	8.3	1.7
Jan	0.503	15.6	5.94	5.89	0.63	-0.6	0.60	-57.0	0	0.0	-4.0	44.6	7.6	2.4
Feb	0.654	18.3	4.57	4.53	1.18	-1.2	0.60	-51.5	0	0.0	8.1	52.7	9.0	1.0
Mar	0.572	17.7	3.98	3.95	2.29	-2.3	0.60	-57.0	0	0.0	-0.9	51.7	8.8	1.2
Apr	0.417	12.5	2.80	2.78	3.31	-3.3	0.60	-55.2	0	0.0	-17.3	34.4	5.9	4.1
Total	4.44	134	47.8	47.5	41.4	-41.1	3.60	-333	27.4	-86.8	-0.71	566	97	

Maximum Volume Required	63.5	ac-ft

Notes:

1) Monthly flow distribution for projected flows based on 2013-2017 flow records.
2) Precipitation based on US Climate Data for Salem, OR
3) Evaporation based on historical means for N. Willamette Experiment Station, Oregon Climate Service, 1963-2005.
4) Discharge to Pudding R. limited based on 106 lbs/day mass load limit and 15mg/l effluent BOD concentration
5) Irrigation based on application rates recommended in the Effluent Reuse Plan and past experience with poplar irrigation.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.

City of Gervais - WWTP Facilities Plan Update

Water Balance: 2042 Flows with Peak Oct Rainfall and 18" higher berm

Assumptions				
Precip Increase [6]	1.00	Effluent BOD Load [4]	75.0	lbs/day
Evap Increase [7]	1.00	Effluent BOD Conc [4]	15.0	mg/L
		Irrigation Acreage	38.0	acres
		Additional Irrigation	0.0	in/day
		is equal to	0	GPD

Lagoon Data		
Treatment Lagoon Area	6.0	acres
Holding Lagoon Area	5.9	acres
Total Lagoon Surface Area	11.9	acres
Depth at Start	6.0	ft
Holding Lagoon Berm Height	11.5	ft
Max Storage Volume	55.6	ac-ft
Min. Storage Level	3.0	ft

Month	Avg Daily Flow[1]	Influent Flow	Monthly Precipitation [2]		Monthly Evaporation [3]		Pudding River Discharge [4]		Summer Effluent Reuse [5]		Net Flow	Holding Lagoon Volume Stored	Holding Lagoon Depth	Free Board
	MG	MG	in	ac-ft	in	ac-ft	mgd	ac-ft	in	ac-ft	ac-ft	ac-ft	ft	
												35.1	6.0	5.5
May	0.302	9.3	2.20	2.18	5.15	-5.1	0.00	0.0	3.2	-10.1	15.6	50.7	8.7	2.8
Jun	0.237	7.1	1.54	1.53	6.01	-6.0	0.00	0.0	5.2	-16.5	0.9	51.6	8.8	2.7
Jul	0.205	6.4	0.47	0.47	7.40	-7.3	0.00	0.0	6.0	-19.0	-6.4	45.2	7.7	3.8
Aug	0.194	6.0	0.43	0.43	6.78	-6.7	0.00	0.0	6.5	-20.6	-8.4	36.9	6.3	5.2
Sep	0.206	6.2	1.30	1.29	4.68	-4.6	0.00	0.0	6.5	-20.6	-4.9	31.9	5.5	6.0
Oct	0.240	7.4	11.25	11.16	2.39	-2.4	0.00	0.0	2.0	-6.3	25.3	57.2	9.8	1.7
Nov	0.349	10.5	6.50	6.45	1.05	-1.0	0.60	-55.2	0	0.0	-17.6	39.6	6.8	4.7
Dec	0.561	17.4	6.85	6.85	0.57	-0.6	0.60	-57.0	0	0.0	2.7	42.2	7.2	4.3
Jan	0.503	15.6	5.94	5.89	0.63	-0.6	0.60	-57.0	0	0.0	-4.0	38.3	6.5	5.0
Feb	0.654	18.3	4.57	4.53	1.18	-1.2	0.60	-51.5	0	0.0	8.1	46.3	7.9	3.6
Mar	0.572	17.7	3.98	3.95	2.29	-2.3	0.60	-57.0	0	0.0	-0.9	45.4	7.8	3.7
Apr	0.417	12.5	2.80	2.78	3.31	-3.3	0.60	-55.2	0	0.0	-17.3	28.1	4.8	6.7
Total	4.44	134	47.8	47.5	41.4	-41.1	3.60	-333	29.4	-93.1	-7.05	513	88	

Maximum Volume Required 57.2 ac-ft

<u>Notes:</u>

1) Monthly flow distribution for projected flows based on 2013-2017 flow records.
2) Precipitation based on US Climate Data for Salem, OR
3) Evaporation based on historical means for N. Willamette Experiment Station, Oregon Climate Service, 1963-2005.
4) Discharge to Pudding R. limited based on 106 lbs/day mass load limit and 15mg/l effluent BOD concentration
5) Irrigation based on application rates recommended in the Effluent Reuse Plan and past experience with poplar irrigation.
6) Precipitation projection factor based on average of "Climate Change for Projected Precipitation", Climate Impacts Group, 2013.
7) Evaporation projection factor based on "Climate Change Projections for USFS lands in Oregon and Washington", Climate Impacts Group, 2011.